Proceeding of
5th International Conference on Recent Trends in Engineering and Technology

ICRTET'2016

Volume 2

Electronics & Telecommunication Engineering

Mechanical Engineering

About ICRTET'2016

5th International Conference on "Recent Trends in Engineering & Technology"

ICRTET'2016 held during April 28-30, 2016 in Chandwad, Nashik, (Maharashtra) India. ICRTET'2016 helps to bring together researchers, academician and Industrial experts in the field of Civil Engineering, Computer Engineering, Electronics & Telecommunication Engineering, Information Technology and Mechanical Engineering to a common forum.

The primary goal of the conference is to promote research and developmental activities in Engineering & Technology. Secondly, it provides a platform to exchange the knowledge & scientific information amongst academicians, researches, developers, engineers, students, and practitioners working in India and abroad.

The conference held every year to make it an ideal workstation for people to share views and experiences in all the relevant areas. English is considered as an official language of the conference.

ICRTET'2016 is organized by SNJB's Late Sau. Kantabai Bhavarlalji Jain College of Engineering and technically co-sponsored by McGraw Hill Publication. The Proceeding of the ICRTET'2016 is slated to publish by McGraw Hill Publication with ISBN Numbers.

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Message from Editor

It gives me immense pleasure to welcome you all for the 5th International conference on Recent Trends in Engineering & Technology being organized at SNJB's Late Sau. K. B. Jain college of Engineering, Chandwad, Maharashtra on 28th -30th April 2016.

The main objective of this conference is to bring academicians, technocrats and researchers to discuss sunrise technologies in core engineering branches. It also provides a comprehensive forum to discuss recent advances and futuristic trends in Civil Engineering, Mechanical Engineering, Electronics and Telecommunication Engineering, Computer Engineering and Information Technology. This conference would provide the participants a unique opportunity to exchange knowledge and to identify solutions to global engineering challenges.

I am confident that this conference will provide an ideal opportunity for the delegates to deliberate on technological challenges and road maps in above said areas. I am sure that this Conference will ignite the young minds, enrich the experience and benefit the industries with new emerging possibilities.

I wish all the authors and participants a successful meeting, fruitful interactions with eminent personalities and an enjoyable stay at Chandwad, India.

Prof. M. M. Rathore,

Principal(I/c),

SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad.

Message from Program Director

I am delighted to welcome you for the **International Conference on Recent Trends in Engineering & Technology – ICRTET'2016 (April 28-30, 2016).** I am very providential to have so many talented Professors, Scholars and Industry inhabitants implicated in the process of submitting their research papers. Hard working track chairs and veteran reviewers done their work enormously. Moreover I am gratified for the publishing support put forth by McGraw Hill publication. I am thankful to our beloved Principal Prof. M. M. Rathode for his everlasting support. I also take this opportunity to thanks all Heads of Department and my senior colleagues Dr. M. R. Sanghavi, Prof. Mrs. K. M. Sanghavi, Dr. V. A. Wankhede, Prof. P. R. Bhaldhare, Prof. R. C. Patil and Prof. S. D. Sancheti.

A remarkable response is received from all over the world. All the papers are accepted after stringent review process. This was attributed to very strong technical committee that worked so hard to make conference advertisement reach to so many aspirants. The strong commitment shown by all track chairs was stupendous. After submission dead line, they worked very hard to get review process done from expert reviewers to turn around a very high standard review that led to the strong technical program before you.

On behalf of ICRTET'2016 organizing committee, we wish to thank all the members of advisory committee, authors and presenters for their contributions. We would also like to extend sincere thanks and appreciations to all individuals and organizations those who have supported and helped us to make this conference a grand success. We also take this opportunity to put sincere gratitude towards our Management, Administration and all section heads who extended all the facilities and full cooperation during the preparation phase of the conference. Sincere thanks to SNJB Team who have been involved directly/indirectly for producing this good quality and wonderful ICRTET-2016 proceeding publication by McGraw Hill Publication and make this event as a grant success.

We wish and will be very delighted to see you again in the ICRTET' 2017.

Bhirud Y. L.
Program Director,
ICRTET'2016

Contents

Biomedical Images Hiding Based on Integer Transform

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Abstract—In this paper, a currently projected steganography is the approach of hiding confidential facts within any disclosure. Steganography and cryptography are two techniques these are similar in the way that they both are used to safeguard private facts. But because of deficiency in characteristic of original image we recommend a generalized form of Reversible Contrast Mapping (RCM) is a in complex integer transform that applies to pairs of pixels. RCM is invertible procedure, because even if the least significant bits (LSBs) of the transformed pixels are forfeit. The data space occupied by the LSBs is expedient for biomedical images hiding. The embedded biomedical information bit-rates of reversible watermarking scheme are highest bit-rates till date. The scheme does not require additional data compression, and, in terms of mathematical complexity, it comes into sights to be the lowest complexity one proposed up to now. A very fast lookup table exercise is recommended. Also robustness against cropping can be guaranteed.
Keywords-Copyright protection; data compression; distortion control; information hiding;least significant bit; LSB embedding;pixel pairs; reversible contrast mapping.

I. INTRODUCTION

Reversible contrast mapping (RCM) is one of the easy integer transform procedure that is applied to the pairs of pixels which can be row wise or column wise. RCM having the high embedding bit rate and the other benefit is it is having low mathematical complexity. Effective adaptation over previously scheduled RCM is suggested here that offers a better trade-off in optical quality-embedding rate-security of the hidden biomedical data. For reversible watermarking the paths proposed so far incorporate a lossless data compression stage. The benefit of a convoluted data compression stage upturn the mathematical complexity of the watermarking. In this paper, we discuss a contrast mapping procedure which is reversible watermarking technique that gain high data embedding bit rate beyond any additional data compression stage. This proposal is based on the reversible contrast mapping (RCM), a walkover integer transform defined on pairs of pixels. RCM is the invertible procedure, because there is no effect on this procedure though least significant bits (LSB) of the pairs of pixel are misplaced. The data space confiscation by the LSBs is reasonable for biomedical data concealing. Here, a mutated translation that admits robustness in opposition to cropping is proposed. Contrast mapping procedure having very low mathematical complexity. Finally, RCM system is correlate with difference expansion system with respect to the bit rate hiding volume and to the mathematical complexity.

II. BIOMEDICAL DATA HIDING SCHEME

Let [0, M] be image graylevel spectrum (M=255 for eight-bit graylevel images), and let (u, v) be a pair of pixels.

FORWORD TRANSFORM STEP-

For forward transform use below variables

$$u'=2u-v,\quad v'=2v-u \tag{1}$$

For preventingoverflow and Under flow policy, the transform is confined to below levels

$$0 <= 2u-v <= M \quad (2)$$

$$0 <= 2v-u <= M$$

INVERSE TRANSFORM STEP-

Inverse transform procedure is shown by

$$u = [2/3\ (u') + 1/3(v')] \quad (3)$$

$$v = [1/3\ (u') + 2/3(v')]$$

If u' and v' are not swapped, even without the ceil functions, exactly inverts. Using image watermarking technique, the LSBs of u', v' are obscured. Let the LSBs of u' and v' set to "0". It without delay make the LSB of a' was "1," the values in the middle the ceil functions for the summing of u and v decrease with 2/3 and 1/3, respectively. Likewise, if the LSB of v' was "1," the coterminous standards downturn with 1/3 (for the calculation of u) and 2/3 (for the performing arithmetic of v). Omitting when both LSBs are "1," the ceil function recapture the flawless executions. Odd integer number measures by using LSB of "1". From, this measure it tracks that (u', v') are both odd numbers only if (u, v) are odd numbers, too. D be the odd pairs set. Here u'+ v'= u+ v and u'-v'=3(u-v), respectively in this manner. RCM having the graylevel averages. Consequently, image contrast increases is stated here.

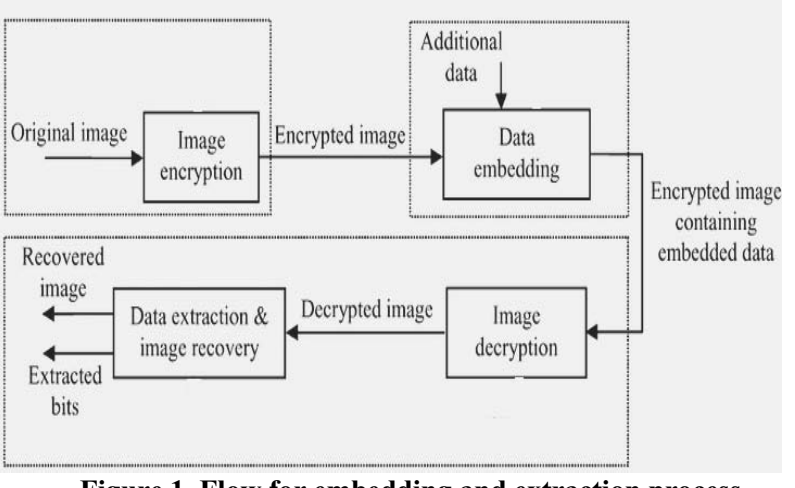

Figure 1. Flow for embedding and extraction process.

III. INTEGER TRANSFORM MAPPING

At detection of the LSBs we get the, the LSB of the first pixel of exclusive pair is used to manifest if a pair was transformed or not is showing here: "1" for transformed pairs and "0" otherwise described here.

The inverse transform contrast mapping deteriorates to recoup the pair of pixels with odd values like (u, v) $\in$ D. In unmasking procedure, set both the LSBs to "1" and keep account (2). If (2) are delighted, this pair was constituted of odd pixels here. For deflecting decoding uncertainties, certain odd pixel pairs should be phase out, those pairs stationed on the borders of D. The pairs prone to ambiguity are commencing by answering in odd numbers the calculations: 2u-v=1, 2v-u=1,2u-v=M and 2v-u=M. When M=255, then 170 pairs are presented here.

IV. INTEGER TRANSFORM FUNCTION

Here entire image divides into pairs of pixels like we can say that (for specimen, on rows, on columns is used here in RCM method).

1) For each pair (u', v') of pixels we go through the following conditions like we can say that here:
a) (u, v) $\in$ D if this is not an adjunct of odd pixel integrity, change this pair by means of the (1), fixed the LSB of u'to "1," and consider the LSB of v' as procurable for data embedding fashion is stated here.

b) If (u, v) $\in$ D and if it is adjunct of odd pixel values, set the LSB of u to "0," and revolve the LSB of v as procurable for data embedding fact is stated here.

c) If, (u, v) $\notin$ D then in this fact fixed the LSB of u to "0," and save the true value for further for consideration here.

V. STEGANOGRAPHY PROCESS HOW WORKS

Steganography is the craft of concealing information in ways that restrict the detection of unseen messages. It has usage in various fields like in military, diplomatic, personal and intellectual property applications. In this paper steganography is explored from its earliest instances through potential future utilization.

Following elements are needed to conceal information into a media which can be any type like text, image etc.:

1) The hidden information in the cover media(C).
2) The text like account number, password, image or any type of data be the Secret message (M).
3) The steganography function (Fg) and its inverse (Fg-1).

Above steganography elements operates as shown in below steganographic operation diagram: -

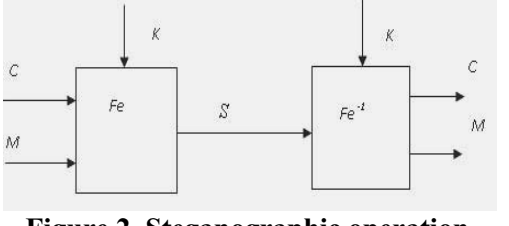

Figure 2. Steganographic operation.

Hiding a secret message into a digital image is most widely technique today. The brightness and Chroma etc. components digitally expressed in terms of 1's and 0's.

Digital image in bitmap format as well as the compressed image format like JPEG, this procedure can be directly applied. The carriers of the unseen messages are the LSB of encoded Discrete Cosine Transformation (DCT) components.

Above procedures details is elaborated in below section:Bitmap format's modification of LSB of a cover image.In this approach, in LSBs of each pixel, binary equivalent of the message. Let's see we will attempt to conceal the character of 'A' into an 8-bit color image.

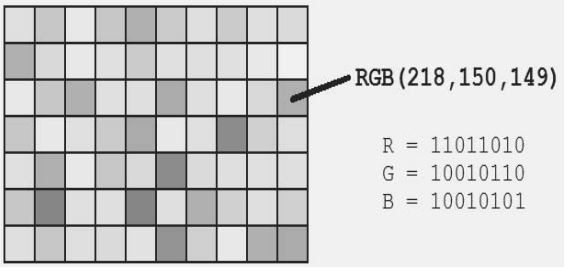

Figure 3. Pixel of an image described by 8-bit binary numbers

From top left corner of the image take eight consecutive pixels here. Those pixels equivalent binary bit pattern may be like this we can say: -

00100111 11101001 11001000 00100111 11001000 11101001 11001000 00100111

Then each bit of binary equivalence of letter 'A' i.e. **01100101** are copied serially (from the left hand side) to the LSB's of equivalent binary pattern of pixels, resulting the bit pattern will become like this: -

00100110 11101001 11001001 00100110 11001000 11101001 11001000 00100111

While at the discovery end extract the last bit of every pixel to get the equivalent binary impression of unseen data.

Masking procedure can be used to perform this movement. Mask the data with 0x1 so that we can get the last bit of each pixel. The mask procedure is as follows -

00100110& 00000001 = 0

11101001& 00000001 = 1

11001001& 00000001 = 1

00100110& 00000001 = 0

11001000& 00000001 = 0

11101001& 00000001 = 1

11001000& 00000001 = 0

00100111& 00000001 = 1

In this way unseen data 'A' i.e. **01100101** can be extracted.By using steganography method we cannot get the original image pixel values in the decoding procedure so that this method becomes the vulnerable to attacks. But we can get the secret image data as it is. So by comparing Steganography method with the RCM we get best result by using the method RCM.

VI. PROPOSED INTEGER TRANSFORM WORK

The PSNR block computes the peak signal-to-noise ratio, in decibels, between two images. This ratio is often used as a quality measurement between the original and a compressed image. The higher the PSNR, the better the quality of the compressed or reconstructed image.

The Mean Square Error (MSE) and the Peak Signal to Noise Ratio (PSNR) are the two error metrics used to compare image compression quality. The MSE represents the cumulative squared error between the compressed and the original image, whereas PSNR represents a measure of the peak error. The lower the value of MSE, the lower the error. To compute the PSNR, the block first calculates the mean-squared error.

Figure 4. Carrier biomedical images sized 512*512.

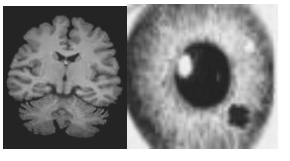

Figure5. Secretbiomedical images sized 50*50.

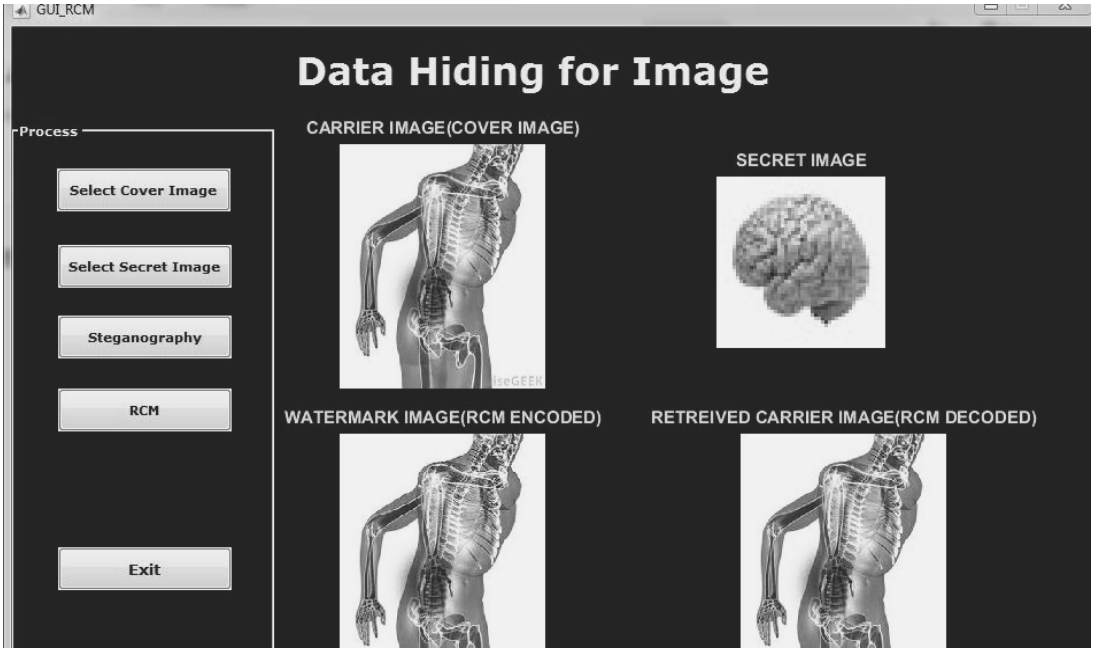

Figure6. Encoding process by integer transform method.

VII. CONCLUSION

This paper examines a spatial domain reversible watermarking providing high biomedical data or images embedding bit-rate at a very low mathematical complexity. As there is loss in quality of original biomedical image by steganography we propose a Reversible Contrast Mapping (RCM) is a simple integer transform that

applies to pairs of pixels. The proposed scheme does not need additional data compression. In Reversible Contrast Mapping there is no loss in quality of original biomedical image. In terms of mathematical complexity, the proposed reversible watermarking appears as being the lowest complexity scheme proposed so far. The computational complexity is reduced for both coding and decoding by using LUT access for each pair of pixels and some low complexity bit manipulation. This makes our scheme very appropriate for real-time applications. Finally, by distributing the location map and by storing the saved true values close to the corresponding pixel pairs, the RCM scheme provides robustness against cropping.

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Content Based Lecture Video Retrieval Using OCR and ASR techniques

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Abstract- The conventional video retrieval is based on available data such as speech recognition using voice of person. In this paper we present the approach of System Automated video indexing and video search in large lecture video archives. Lecture videos contain text information in the visual as well as audio channels the presentation slides and lecturer's speech. To extract the visual information, we apply video content analysis to detect slides and (OCR) Optical Character Recognition to obtain their text and (ASR) Automatic Speech Recognition is used to extract spoken text from the recorded audio. By applying video Optical Character Recognition (OCR) technology on key-frames and Automatic Speech Recognition (ASR) on lecture audio tracks, we extract textual metadata. For keyword extraction, by which both video- and segment-level keywords are extracted for content-based video browsing and search, the OCR and ASR transcript as well as detected slide text line types are adopted.

Keywords- video retrieval; system automated; visual information; textual metadata; content based

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I. INTRODUCTION

Access video independent of time and location, a number of universities and research institutions are taking the opportunity to record their lectures and publish them online for students. On the Web, there has been a huge increase in the amount of multimedia data. To find desired videos without a search function within a video archive, for a user it is nearly impossible. Due to the rapid development in recording technology, improved video compression techniques and high-speed networks in the last few years its becoming very popular in universities to capture and record live presentations of lectures. E-lecturing is used so that students would be able to quickly access and review their required presentations independent of location and time. As a result, there is a huge increase in the amount of multimedia data on the Web. Hence it becomes nearly impossible to find desired videos without a search function within a video data. Also when the user found related video data, it is still difficult for him to judge whether a video is useful by only glancing at the title and other global metadata which are often brief and high level. By applying appropriate analysis techniques, we extract metadata from visual as well as audio resources of lecture videos automatically. Which can guide both visually and text-oriented users to navigate within lecture video, for evaluation purposes we developed several automatic indexing functionalities in a large lecture video portal. To verify the research hypothesis and to investigate the usability and the effectiveness of proposed video indexing features, we conducted a user study intended. For slide video segmentation and apply video OCR to gather text metadata, for visual analysis, we propose a new method. Furthermore, lecture outline is extracted from OCR transcripts by using stroke width and geometric information. search function has been developed based on the structured video text. Which fills the gap in open-source ASR domain; we propose a solution for automatic German phonetic dictionary generation. The dictionary software and compiled speech corpus are provided for the further research use.

II. SYSTEM ANALYSIS

For visual analysis, we propose a new method for slide video segmentation and apply video OCR to gather text metadata. Furthermore, lecture outline is extracted from OCR transcripts by using stroke width and geometric information. A more flexible search function has been developed based on the structured video text.We propose a solution for automatic German phonetic dictionary generation, which fills the gap in open-source ASR domain. The dictionary software and compiled speech corpus are provided for the further research use. In order to overcome the solidity and consistency problems of a content-based video search system, we propose a keyword ranking method for multimodal information resources. In order to evaluate the usability, we implemented this approach in a large lecture video portal. Fig. 1 shows the workflow of system.The developed video analysis methods have been evaluated by using compiled test data sets as well as opened benchmarks. All compiled test sets are publicly available from our website for the further research use.

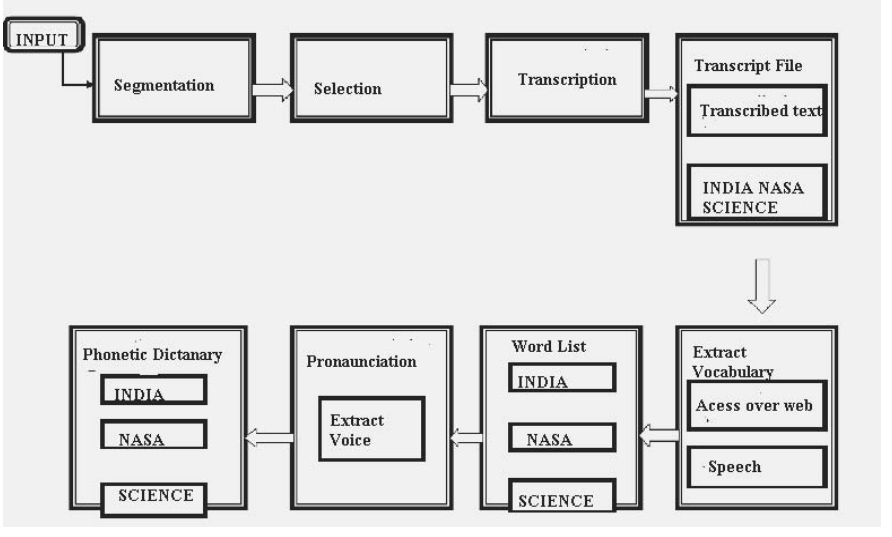

Fig. 1 System Architecture.

2.1 Content-Based Video Search

Several content-based video search engines have been proposed recently. Adcock et al. proposed a lecture webcast search system in which they applied a slide frame segmenter to extract lecture slide images. The system retrieved more than 37.000 lecture videos from different resources such as YouTube, Berkeley Webcast, etc. The search indices are created based on the global metadata obtained from the video hosting website and texts extracted from slide videos by using a standard OCR engine. Since they do not apply text detection and text segmentation process, the OCR recognition accuracy of their approach is therefore lower than our system's. Furthermore, by applying the text detection process we are able to extract the structured text line such as title, subtitle, key-point, etc., that enables a more flexible search function. In the CONTENTUS project, a content based semantic multimedia retrieval system has been developed. After the digitization of media data, several analysis techniques, e.g., OCR, ASR, video segmentation, automated speaker recognition, etc., have been applied for metadata generation. An entity recognition algorithm and an open knowledge base are used to extract entities from the textual metadata. As mentioned before, searching through the recognition results with a degree of confidence, we have to deal with the solidity and the consistency problem. However the reviewed content-based video search systems did not consider this issue. A lot of content for tele-teaching portals was produced in the last decade. But metadata to filter and search through the content was not generated adequately. That is why it

is a new challenge to find solutions how to filter the large amount of data with a small base of metadata available. To engage the user community to generate metadata is one option. Due to the small size of tele-teaching user communities this approach needs to be enhanced with automatic methods. This paper describes community rating and tagging as two widely used social web functionalities and motivates their usage in the tele-teaching context. Furthermore approaches to extend and enhance this user-generated meta- data are explained. The potential of other social web features is explained afterwards. Finally the need to activate more users and the opportunity to connect the social with semantic web features in tele-teaching are motivated.

2.2 Video OCR for Lecture Videos

Texts in the lecture slides are closely related to the lecture content, can thus provide important information for the retrieval task. In our framework, we developed a novel video OCR system for gathering video text. For text detection, we developed a new localization verification scheme. In the detection stage, an edge-based multi-scale text detector is used to quickly localize candidate text regions with a low rejection rate. For the subsequent text area verification, an image entropy-based adaptive refinement algorithm not only serves to reject false positives that expose low edge density, but also further splits the most text- and non-text-regions into separate blocks. Then Stroke Width Transform (SWT) -based verification procedures are applied to remove the non-text blocks. Since the SWT verifier is not able to correctly identify special non-text patterns such as sphere, window blocks, garden fence, we adopted an additional SVM classifier to sort out these non-text patterns in order to further improve the detection accuracy.

III. CONCLUSIONS

Video retrieval automatically, we developed a video OCR system and applied ASR technology.The segment- and video-level keywords are further extracted from OCR and ASR transcripts by extending the original TFIDF algorithm. We proposed a novel concept for content-based video search systems. A user study was conducted to investigate the effectiveness of proposed indexing methods. As future work, we will implement the proposed video search function in our lecture video portal. As the future work, the usability and utility study for the video search function in our lecture video portal will be conducted. Automated annotation for OCR and ASR results using Linked Open Data resources offers the opportunity to enhance the amount of linked educational resources significantly.

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Diabetic Retinopathy Detection using Random Forest

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Abstract- A great challenge in the biomedical engineering is the non-invasive assessment of the physiological changes occurring inside the human body. Specifically, detecting the abnormalities in the human eye is extremely difficult due to the various complexities associated with the process. Retina is the significant part of the human eye which can reflect the abnormal changes in the human eye. Hence, retinal images captured by digital cameras can be used to identify the nature of the abnormalities affecting the human eye. Retinal image analysis has gained sufficient importance in the research arena due to the necessity for disease identification techniques. Abnormality detection using these techniques is highly complex since these diseases affect the human eye gradually. Conventional disease identification techniques from retinal images are mostly dependent on manual intervention. Since human observation is highly prone to error, the success rate of these techniques is quite low. Since treatment planning varies for different abnormalities, the accuracy of the identification techniques must be significantly high. Lack of accuracy in these techniques may lead to fatal results due to wrong treatment. Hence, there is a significant necessity for automation techniques with high accuracy for retinal disease identification applications. One of the techniques used in this paper is Random Forest with and without sampling. With sampling the accuracy is increased and is 74.93% and without sampling it is 52.05%.
Keywords- Diabetic Retinopathy (DR), microaneurysms, hemorrhage, hard exudates, soft exudates, sensitivity, specificity, accuracy.

I. INTRODUCTION

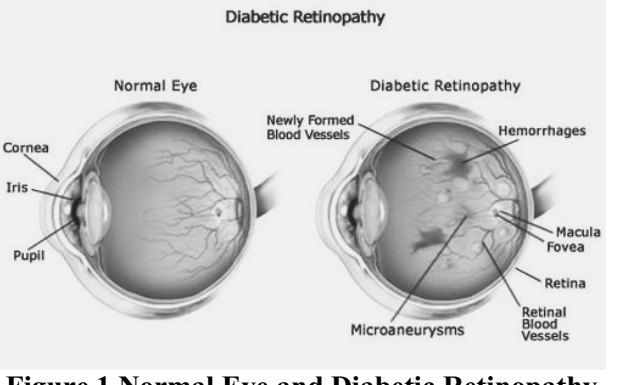

Figure 1 Normal Eye and Diabetic Retinopathy

Diabetic retinopathy occurs in patients suffering from diabetes, which causes damage to the retina of the eye. This eventually leads to total vision loss. Diabetes is caused due to the body's inability to store and make use of the sugar level in the blood .Usually there are no early visible symptoms of the disease and as the disease progresses the presence of micro aneurysms, exudates both hard and soft and new blood vessels can be observed. The main anatomical features in the image, notably the optic disc and the macula. The optic disk is a circular shaped anatomical structure with a bright appearance. The fovea is the very center of the macula, the site of our sharpest vision. The diabetes may cause abnormalities in the retina (diabetic retinopathy), kidneys (diabetic nephropathy), and nervous system (diabetic neuropathy). The diabetes is also a major risk factor in cardiovascular diseases. The diabetic retinopathy typically begins as small changes in the retinal capillaries.

Diabetic retinopathy is of two types namely non proliferative and proliferative type. Non proliferative is the early stage of the disease characterized by the presence of micro aneurysms. As the disease progresses the retina is deprived of oxygen and new blood vessels are formed in the retina. These

vessels eventually leak and leads to clouding vision. The first detectable abnormalities are mircroaneurysms (Ma) which are local distensions of the retinal capillary and which cause intraretinal hemorrhage (H) when ruptured [7] [8]

Micro aneurysms are small red dots on the retinal surface, which occur due to capillary occlusion leading to lack of oxygen and progression of the disease. They are less than the diameter of the optic vein .Accumulation of proteins and lipids occur in the form of exudates. Vision loss occurs when they occur in the macula.

Exudates appear as yellow or white structures in the retina. There are two types of exudates based on their appearance and occurrence. Hard exudates have well defined boundaries and the soft exudates have unclear boundaries also know as cotton wool spots.

Haemorrhages in the retina occur due to bleeding. Dot haemorrhages lie deep within the retina and reflect leakage of the veins and capillaries. Dot haemorrhages are an indication of diabetic retinopathy.

II. LITREATURE REVIEW

Some of the first automated detection methods for diabetic retinopathy were published by Baudoin et al. [1] to detect microaneurysms from fluorescein angiograms. By using a morphological top-hat transform with linear structuring element at different orientations small round shaped microaneurysms were distinguished from connected elongated structures such as vessels. Although the top-hat transform was very sensitive to microaneurysms, it introduced too many false alarms. Spencer et al. [2] exploited this feature and used the top-hat transform to produce candidate microaneurysms. The true microaneurysms were then pruned by using post-processing based on their earlier work [3] and classification. The candidate microaneurysms segmentation was conducted using a combination of top-hat transform and matched filtering with region growing. To improve the sensitivity of the candidate search a shade correction and dynamic range normalization steps were introduced in the pre-processing. After detection and segmentation of the candidate microaneurysms, the true microaneurysms were pruned from the spurious responses using a rule-based classifier with a number of shape and intensity based features. Kanika Verma et al [4] classification of the different stages of eye disease was done using Random Forests technique based on the area and perimeter of the blood vessels and hemorrhages. Accuracy assessment of the classified output revealed that normal cases were classified with 90% accuracy while moderate and severe NPDR cases were 87.5% accurate.

RF is a powerful machine learning method for classification and regression. The strengths of the RF approach are that: 1) it does not overfit; 2) it is robust to noise; 3) it has an internal mechanism to estimate error rates, called out-of-the-bag (OOB) error; 4) it provides indices of variable importance; 5) it naturally works with mixes of continuous and categorical variables; and 6) it can be used for data imputation and cluster analysis. These properties have made RF increasingly popular in the last few years, especially in the field of genetics and imaging [4].

III. AUTOMATIC DETECTION OF DR

3.1 Feature Extraction Using MaZda

The totals of 778 images are used. For feature extraction MaZda software is used. MaZda load images in the form of Windows Bitmap, DICOM and unformatted grey-scale image files (raw images) with pixels intensity encoded with 8 or 16 bits. Additionally, there is an option for reading details of image acquisition protocol extracted from the image information header. Image normalization. There are three options: "default" (analysis is made for original image); "+/-3 sigma" (image mean m value and standard deviation sigma is computed, then analysis is performed for grey scale range between [m-3sigma, m+3sigma]; "1%-99%" (grey scale range between 1% and 99% of cumulated image histogram is taken into consideration during analysis). Defining regions of interest (ROI), then analysis is performed within these regions. Up to 16 regions of any shape can be defined; they can be also edited, loaded and saved as disk files. Additionally, a histogram of defined ROI may be visualized and stored. Image analysis, which is computation of texture feature values within defined ROIs. The feature set (almost 300

parameters) is divided into following groups: histogram-, co-occurrence matrix-, run-length matrix-, gradient, autoregressive model- and Haar wavelet derived features. Displaying image analysis reports, saving and loading reports into disk files. Feature reduction and selection in order to find a small subset of features that allows minimum error classification of analyzed image textures. This is performed by means of two criterions: Fisher coefficient maximization and minimisation of probability of classification error. Selected features can be transferred to B11 program for further processing and/or classification. Image analysis automation by means of text scripts containing MaZda language commands. Scripts allow loading analyzed images and their ROI files, running the analysis and saving report files on disk [6].

Dataset

From the the total 778 images 287 features are extracted using MaZda. After extraction classes are formes as class 0, class 1, class 2, class 3 having 360, 88, 142, 188 respectively. We observe from the above details the data is imbalanced.Imbalanced data sets are a special case for classification problem where the class distribution is not uniform among the classes. Imbalanced data set problem occurs in classification, where the number of instances of one class is much lower than the instances of the other classes. The main challenge in imbalance problem is that the small classes are often more useful, but standard classifiers tend to be weighed down by the huge classes and ignore the tiny ones. In machine learning the imbalanced datasets has become a critical problem and also usually found in many applications such as detection of fraudulent calls, bio-medical, engineering, remote-sensing, computer society and manufacturing industries. After upsampling the dataset the images in all the classes are now 360. The final dataset is 1440 X 287 and Class is 1 X 1440.

3.2 Random forest

The Random Forests algorithm is one of the best among classification algorithms - able to classify large amounts of data with accuracy. Random Forests are an ensemble learning method (also thought of as a form of nearest neighbor predictor) for classification and regression that construct a number of decision trees at training time and outputting the class that is the mode of the classes output by individual trees (Random Forests is a trademark of Leo Breiman and Adele Cutler for an ensemble of decision trees). Random Forests are a combination of tree predictors where each tree depends on the values of a random vector sampled independently with the same distribution for all trees in the forest. The basic principle is that a group of "weak learners" can come together to form a "strong learner". Random Forests are a wonderful tool for making predictions considering they do not overfit because of the law of large numbers. Introducing the right kind of randomness makes them accurate classifiers and regressors. Single decision trees often have high variance or high bias. Random Forests attempts to mitigate the problems of high variance and high bias by averaging to find a natural balance between the two extremes. Considering that Random Forests have few parameters to tune and can be used simply with default parameter settings, they are a simple tool to use without having a model or to produce a reasonable model fast and efficiently.

Random Forests grows many classification trees. Each tree is grown as follows:

1. If the number of cases in the training set is N, sample N cases at random - but with replacement, from the original data. This sample will be the training set for growing the tree.
2. If there are M input variables, a number mM is specified such that at each node, m variables are selected at random out of the M and the best split on these m is used to split the node. The value of m is held
3. Constant during the forest growing.
4. Each tree is grown to the largest extent possible. There is no pruning.

IV. RESULTS

Total images used : 778
Total features extracted from MaZDA =287

Before upsampling

Imbalanced dataset shown in the Table 1
Data matrix : 778 X 287

Class : 1 X 778

Table 1

Classes	Images
Class 0	360
Class1	88
Class 2	142
Class 3	188
Total	778

After upsampling
Final dataset
Data matrix : 1440 X 287
Class : 1 X 1400

Table 2

Classes	Images
Class 0	360
Class1	360
Class 2	360
Class 3	360
Total	1440

Table 3

	Before upsampling	After upsampling
Accuracy	52.05	74.93
Mtry	16	16
Ntree	500	500

CONCLUSION

MaZda package is an efficient and reliable set of tools for analysis of image textures. It provides a complete analysis path for texture images, including feature estimation, statistical analysis of feature vectors, classification and image segmentation. Additional information which includes the list of features produced by MaZda. Use of sampling technique affects the accuracy from the random forest method. However, the scope and direction for further work are to include more instances of retinal images to construct a robust classifier for detecting different stages of diabetic retinopathy (i.e. for training and testing) to achieve higher accuracy. The efficiency of the correct classification can also be improved by extracting more number of features from the images.

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Visible Light Underwater Communication Using Different Light Sources

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Abstract— We all know that light can be used for communication through air. We extended this technology and use this for underwater communication using different light sources. We use LEDs as a light source because LEDs have longer lifespan, low power consumption, lower heat generation, fast switching characteristics and energy efficient. It can be used for high speed data transfer. We use LASERs as another light source because it is highly directional, travels longer range, Monochromatic, highly coherent and it also has faster switching characteristics. We know that the bandwidth of Radio frequency spectrum is limited. Nowadays the demand for communication has drastically increased and the bandwidth of radio frequency spectrum is limited. Therefore the radio frequency spectrum is depleted. Successful underwater communication is achieved at the speed of 115kbps.

Keywords- Laser, VLC, LED, Microcontroller, Photodiode.

I. INTRODUCTION

The visible light communication (VLC) refers to the communication technology which utilizes the visible light source as a signal transmitter, the air as the transmission medium, and the proper photodiode as a signal receiving component. VLC or Li-Fi (Light Fidelity) is a high speed and fully networked optical wireless communication technology which is similar to Wi-Fi. This term was proposed by Prof. Harald Haas and is a form of visible light communication and a subset of optical wireless communications (OWC). It could be a complement to RF communication (Wi-Fi or Cellular). It is measured to be about 100 times faster than some Wi-Fi implementations, reaching with high speeds. It is wireless and uses visible light spectrum for communication (instead of radio frequency waves), part of optical wireless communications technology, which carries much more information, and has been proposed as a solution to the RF-bandwidth limitations.

Li-Fi is advantageous in electromagnetic sensitive areas such as in aircraft cabins, hospitals and nuclear power plants without causing electromagnetic interference. Both Wi-Fi and Li-Fi transmit data using electromagnetic spectrum, but whereas Wi-Fi utilizes radio waves, Li-Fi uses visible light. Li-Fi has almost no limitations on capacity. The visible light spectrum is 10,000 times larger than the whole radio frequency spectrum. Using VLC we can reach data rates of over 10Gbps, which is much faster than typical fast broadband RF networks.

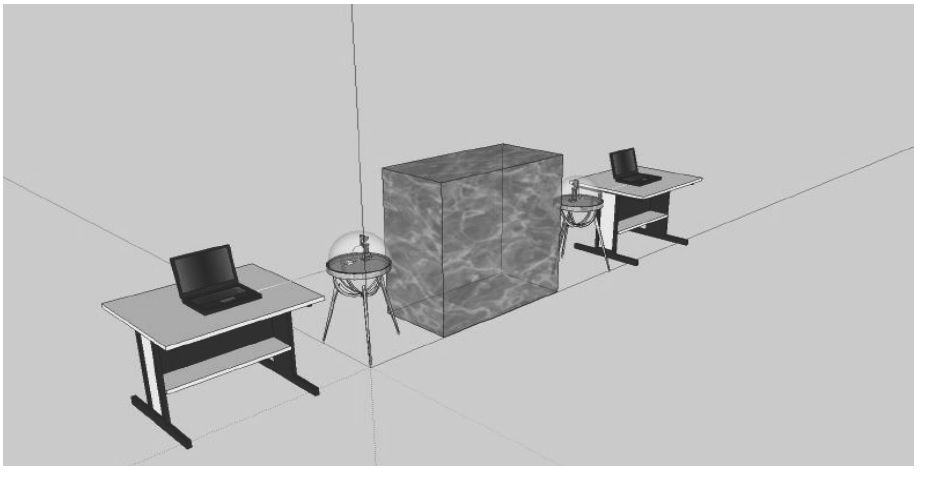
In undersea or ocean exploration the data obtained by the sensors or unmanned systems are need to be measured accurately. Thus there is great need for establishing good communication links in seas and oceans. Radio waves do not propagate underwater. Acoustic methods can be used but is limited. Also acoustic waves face difficulty to penetrate the water-air interface. Thus optical communication has high potential to augment other methods.

II. PROPOSED METHODOLOGY

A) Experimental setup

User will send the data from PC or Laptop, and then it will be passed to the circuitry. The micro controller will drive the light source. The light source is fitted inside the water tank. The source is fully protected from water by proper waterproof coating. We also used Gas and temperature Sensor. Temperature sensor will detect the present temperature at the source. Here we have used two types of light sources. They are LED panel and LASER. LED panel consists of 90 LEDs. We can switch between LEDs and LASER depending upon our requirement.

Figure1:- Setup of VLC underwater



The tank that we have used is of average length such as 1 foot. The tank is filled by water. At the other side the photodiode is also fitted inside the water tank similar to the source. The photodiode is properly aligned with the light source. Photodiode senses the data and it is passed to the microcontroller, and further is obtained on PC or Laptop which is at the other end.

B) Hardware and Software

Microcontroller ATmega 16 is used to convert original signal into data at transmitter and vice versa at the receiver side. It is a CMOS 8-bit microcontroller based on the enhanced RISC architecture. It executes powerful instruction in single clock cycle. The system can be designed optimizing power consumption versus processing speed using AVR ATMega16.

Sensor MQ-6 is used as a Gas sensor. It has sensitivity for LPG, iso-butane and propane. It is fast, stable and has long life. Thermistor TTC-103 is used to measure temperature. It is small and operates in the range of -40C to 125C.

The microcontroller AVR ATmega16 is programmed using C language.

XCTU is used as interfacing software between the circuit and PC/Laptop. XCTU is a free multi-platform application designed to interact with RF modules through a simple graphical interface. XCTU includes all of the tools a developer needs to quickly get up and running with any RF module. XCTU includes a set of embedded tools that can be executed without having any RF module connected.

III. WORKING

User sends the Data through PC/Laptop. The microcontroller is not compatible with USB port, so we used USB to TTL converter. It converts the data from USB logic to TTL logic, the data from PC gets transmitted to the microcontroller. Thus the file is converted into bits with the help of

USB to TTL convertor & ATMEGA-16 Microcontroller. In our project we used two different light sources depending upon our requirement we select the source (either LED or LASER) with the help of switch. Microcontroller forms the driving circuitry of visible light source. The light get intensity modulated which contains the data.

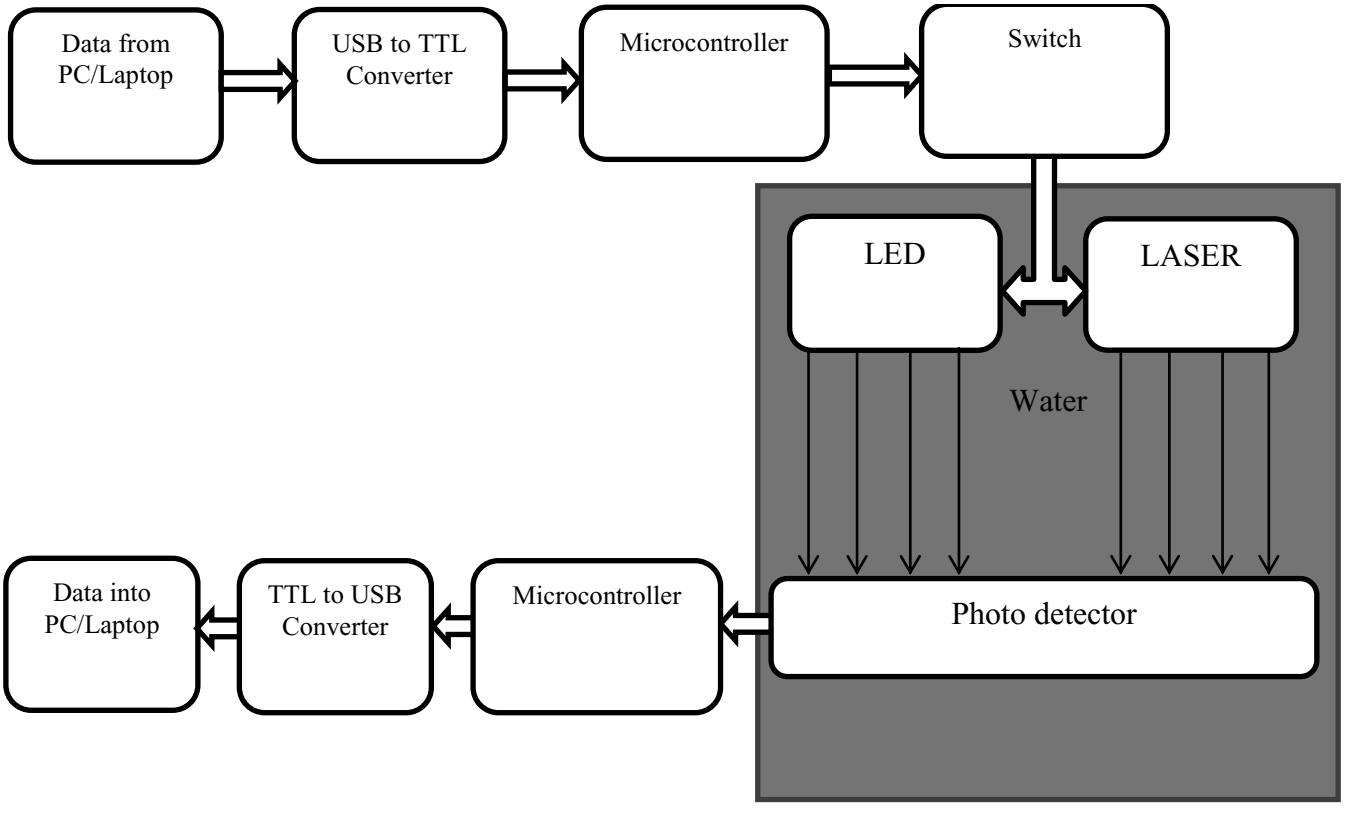


Figure2:- Block Diagram of Visible Light Underwater Communication

In VLC communication the communication is achieved when transmitter and receiver are properly aligned. There is a sensing element at the receiver side called as Photodiode. Photodiode senses the illumination from the light source (either LED or LASER). It converts the optical signal to electrical signal which is passed to microcontroller which is nothing but the regenerated data. Microcontroller identifies the data and route it to the receiver PC through the TTL to USB converter which converts the data from TTL logic to USB logic. Therefore the original data is successfully received at receivers PC. In our project we use two different types of modes viz. 1) PC mode & 2) Sensor Mode. In PC mode, user selects the multimedia file such as image, text, audio or video file. This is fed to the circuitry using interfacing software. Thus the data is transmitted to the receiver. In Sensor mode, the gas sensor senses the LPG, iso-butane gas and thermistor is used to detect the temperature. The sensed data is converted into appropriate units and this data from the sensors (Temperature sensor and Gas Sensor) is transmitted. Thus communication is achieved between to different computers. We can achieve underwater long distance communication underwater using directional high powered visible light sources.

IV. CONCLUSION

- We get accurate underwater communication when the alignment between the transmitter and receiver is achieved properly.
- Successful underwater communication is achieved at the speed of 115kbps.

- Light source is switched between LEDs and LASER. Both the type of sources gives accurate communication, however long distance communication is achieved using LASER.
- When small obstacle blocked the LASER light, so by switching the source to LEDs panel communication is maintained because small obstacle doesn't completely block LED light.
- Gas and temperature sensor data is successfully measured and is transmitted to the receiver side.

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"Measurement of NPK from PH value"

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Abstract- This system is useful to recognize and detect motion automatically around a robot's environment in order to equip a mobile robot for a surveillance task for farm. It helps to manage and measure agricultural micro-parameters .The robot design has been partitioned into camera work, sensor part, controlling part, On-line video and image transmitter system and planning subsystems .This measurement of N,P,K Element in soil is further useful to decide fertilizer requirement and combinations for soil. It can be helpful for chemical industries to manage content of same in chemical mixing during formation of fertilizer. We can minimize no of required nodes used to measure overall field area.

In conventional method of farming, human labors were required to visit the greenhouse at specific time and need to check the humidity level and temperature level and all other micronutrient level manually. This technique is considered time consuming and needs a lot of work and effort. Therefore this research focuses on developing a system that can remotely monitor and predict changes of parameter level in agricultural greenhouse. The objective of the research is to develop a "Measurement of NPK from Ph value". The proposed system has a measurement which capable of detecting the level of temperature, Element contents in soil(N,P,K) , Humidity , Soil moisture Soil , Ph. This system also has a mechanism to alert farmers regarding the temperature changes in the greenhouse so that early precaution steps can be taken. In this research, several tests had been conducted in order to prove the viability of the system.

Keywords- Robot, X-bee; LPC2131/2132/2138 ARM7 Temperature measurement; Humidity measurement ,NPK .

I. INTRODUCTION

In traditional method of farming, human labors were required to visit the greenhouse at specific time and need to check the humidity level and temperature level manually. This conventional method is considered time consuming and needs a lot of work and effort.

2) In traditional method we have to use more no of nodes to measure parameters from various part of the agricultural area. It increase total cost as well as it is somewhat time consuming case to collect the data from each node.

Therefore this research focuses on developing a system that can remotely monitor and predict changes of temperature level in agricultural greenhouse. The objective of the research is to develop a" Measurement of NPK from soil pH. The proposed system has a measurement which capable of detecting the level of temperature, Element contents in soil(N,P,K), Humidity , Soil moisture Soil , Ph. This system also has a mechanism to alert farmers regarding the temperature changes in the greenhouse so that early precaution steps can be taken. In this research, several tests had been conducted in order to prove the viability of the system. Test results indicated that the reliability of the system in propagating information directly to the farmers could be gained excellently in various conditions. increases the value of resistance. But it not happens in capacitance behavior as firmness change. The capacitances were decreased as firmness improved.

According to the past development [1] system based only for the surveillance system ,but this system is now useful to both surveillance and the parameter measurement. Further one more system is designed [2] for only the parameter measurement which is not sufficient. Third system[4] is developed for the water level measurement in soil which is by using moisture sensor but this covers smaller area . Now which overcomes by using this system. Next to this [5] one system is comes which is helpful to measure potassium effectively but it is only up to potassium hence we have decided to include all the parameters.

II. PROPOSED SYSTEM

Following are the block diagram of transmitter , receiver end as well as overall block diagram of robot and user end which having ARM Controller at the center and motor control drives to manage the movements of robot through the agricultural land surface. All needful sensors are mounted on one arm which is placed properly on the robot. Whose motions are managed with help of program . Data can be share in between the robot and user end with help of RF trans receiver. Video Camera is placed over the robot which is also movable according to need. At the receiver end system have CPU with graphical user interface and data storage provision. With the help of DC motors this robot is free to move anywhere in agricultural surface towards the required direction and then collect the amount of content of available parameters and simultaneously it will pick the real time video monitoring which is further useful to find the problems occurred in crops and other elements. Video monitoring is further useful to complete video monitoring, quality inspection. At the receiver end this system have GUI which is capable to display each parameter uniquely along with the real time video. User can manage the required movement from user side by using available provision from movement manager. One can manage the movement of robot towards right, left, forward and Backward.

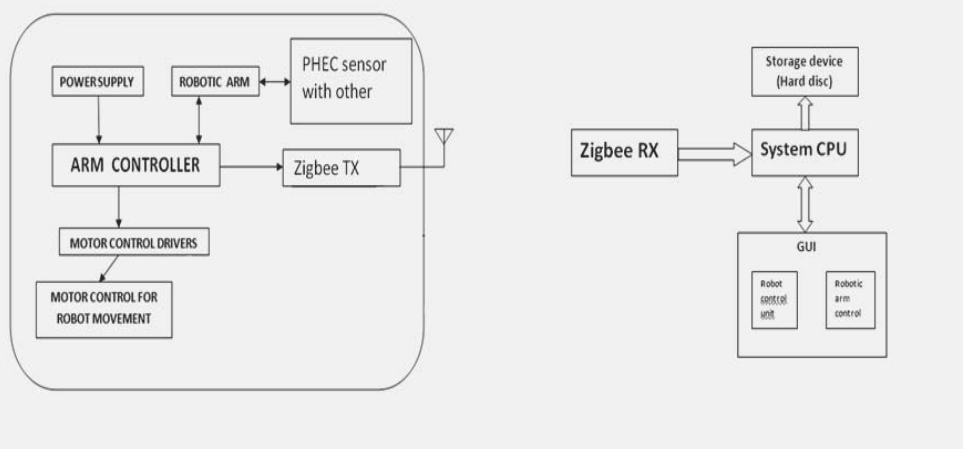


Figure 1.Block Diagram of Project

This system required following sensors to measure the various parameters as

2.1 Humidity Measurement

Humidity is one of the important parameter of any green house. As there are so many types of humidity sensors, here P-Hs-220 humidity sensor is used. The output of this humidity sensor is proportional to output voltage. At 20% relative humidity, the output is 660 mV, while at 90% relative humidity; the output is 2970 mV, i.e. 2.97 V. The output of the Humidity is connected to the ARM processor at pin no.35, which is the analog input (AD 1.2) of the ARM processor.

2.2 pH Measurement

A pH measurement is actually, a precise voltmeter that measures the generated voltage of a pH electrodes .Here Alpha pH 500 Transmitter with pH Electrode (EC100GTSO05B) The requirement of such measurement is an amplifier with high input impedance and has the gain of voltage-pH conversion. The standard pH probe is responsible to generate voltage of the range 59mV/pH .So a pre-amplifier is required with high input impedance input and with gain = 16.7 to give 1 Volt per pH . The schematic diagram of the pH measurement circuit is as shown below.

2.3 LM35 Temperature sensor

LM35 Temperature sensor is the temperature sensor used to sense the temperature from field .It having Linear + 10 mV/°C Scale Factor ,Calibrated Directly in °Celsius (Centigrade) ,0.5°C Ensured Accuracy (at +25°C) ,Rated for Full −55°C to +150°C Range , Operates from 4 to 30 V.

2.4. NPK Microsensors(PHEC 04)

The use of micro-sensors for in-field monitoring of environmental parameters is of great interest, particularly semiconductor-based micro-sensors. These sensors have many advantages over other sensors. The advantages includes smaller size, robustness, less output impedance, fast response.

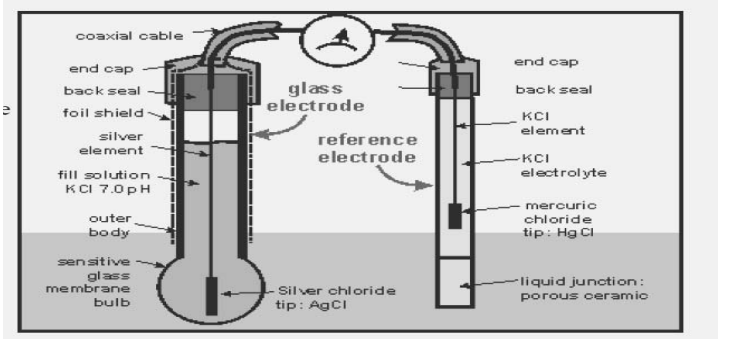


Figure 2 .Working Diagram of PHEC 04

Above fig is shows the PHEC sensor whose range in between 0 to 7 , we can predict specific value for the N,P,K . Following chart shows some ideas about this relations.

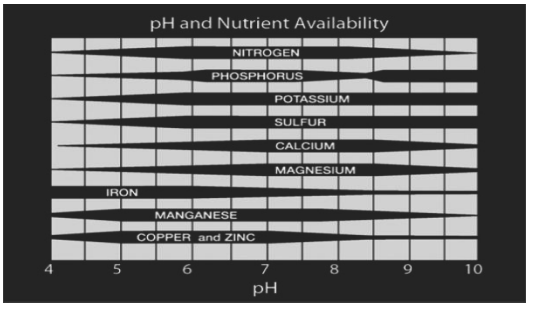


Figure 3. Reference Chart

2.5 Hardware Requirements

1. ARM7 board (LPC2138 Processor)
2. Temperature sensor
3. Humidity Sensor
4. NPK Sensor
5. LCD monitor
6. USB mouse
7. USB Keyboard
8. Laptop
9. Robotic Arm

2.6 Software Requirements

1. Software: Keil 3.0
2. Operating System: Windows XP.

3. Visual Studio 2008
4. Visual Basic 6.0

III. EXPERIMENTAL ANALYSIS

Finally every quantity is displayed over a GUI created at the user end .This part having visual basic studio support at the backend. It includes calibration part as well as displaying part. Following are some steps and results which obtained during the analysis.

Step 1:- log in

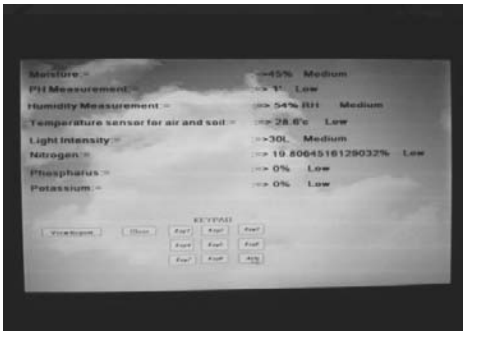
In this step user have to log in by using password and login ID allotted.

Step 2:- Select particular computer port used to connect serial port.

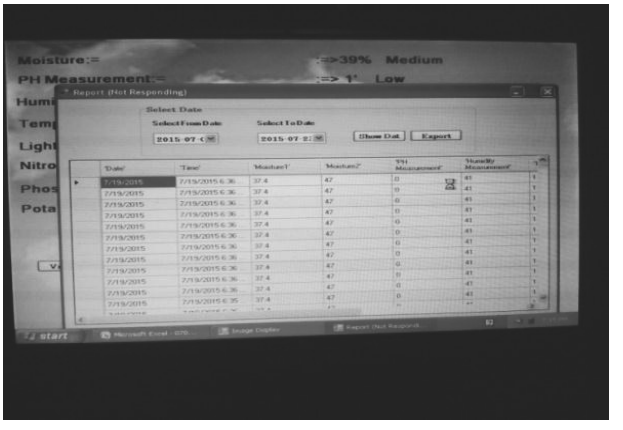
Step 3:- Reset the controller and click over sensor data mode using GUI.

Step 4:- Move Robot as well as robotic arm to pick appropriate location.

Step 5:- Final results.



Step 6:- Report generation with time and date.



IV. CONCLUSION

This System deals with the design, optimization and development of a practical solution for application to the agricultural monitoring and control. The proposed system utilizes sensor for Micro parameter measurement (N,P,K),temperature level detection, Motion detection , Humidity , Soil moisture ,Soil Ph For management of Agricultural environment. It included Real-time Video Monitoring and Agricultural Parameters measurement using Sensor Networks for Precision Agriculture. After the proper measurement of N,P,K content from soil it will become simple to judge about the fertilizer combinations.

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RICE GRAIN AND STONE SORTING USING ARM

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Abstract-Today's world is the world of technology and science. Due to automation, life has become fast and luxurious. Rice is one of the most common sources of food consumed in the world. With the improving living standards of human being, huge amount of rice with higher quality than before is required today. Therefore we are going to Develop a system for farmers & industries for rice grain and stone sorting from mix grain efficiently or faster sorting of rice. To design a system for rice grain and stone sorting based on colour recognition by using colour sensor, microcontroller and nozzle compressor unit. Microcontroller makes decision based on colour sensed by sensor and activates the nozzle compressor unit to sort the stones from rice grain.
Keywords-Colour sensor; Electromagnetic Multivibrator; Microcontroller P89LPC938H; Nozzle Compressor Unit; Switching nozzle.

I. INTRODUCTION

The quality of rice is based on a variety of properties such as cooking texture, colour (whiteness or chalkiness), size, shape and the number of broken rice kernels, stones, earth granules, yellow, immature grains. Rice quality inspection by humans (relying upon naked eyes) is neither objective nor efficient. Error increases sometimes due to inexperience or the inspection may be deliberately shifted out of sympathy for the producers. Traditional mechanical process could only eliminate tiny particles that are smaller than rice, such as crude bran. This kind of purely mechanical method is useless in recognizing and separating rice with different impurity but the same size.

Most of the rice sorting machines available on the market are still based on the technologies of the 20th century, such as centralized control, and programmable logic device. Major shortcomings of such systems are 1) very simple functions, limited software adaptability whereas high design complexity 2) signal attenuation resulting from long distance transmission of the optical sensors output signal connected to the controller by long wire. MVS was developed by Wan, Lin and Chiou to sort rice with an accuracy ranging from 87% to 90%.These methods use a CCD video camera with illumination source for image acquisition and a PC with frame grabber and specially designed software for image processing and analysis. For on line measurement a transport system is used to position the rice kernels below the camera and for sorting a discharging device is used to collect the classified kernels in different containers. MVS is relative expensive, influenced by external light conditions and needs an experienced person to setup the system.

In the conventional rice sorter, colour of fallen rice from a shoot is captured, and then rice colour-stone is compared with some threshold value. If the rice colour-stone is below the threshold value, the rice is rejected as damaged rice. For this conventional rice sorter, when percentage of paddy in polished rice exceeds 1%, it is difficult to exclude all paddies. Furthermore if rice flow exceeds a few thousands [kgh], the recognition percentage is below 90% and recognition ability is not always guaranteed. While small flow of rice guarantees recognition ability, this matter leads a low efficiency for rice sorting. So the efficient system needs to be developed.

II. BLOCK DIAGRAM

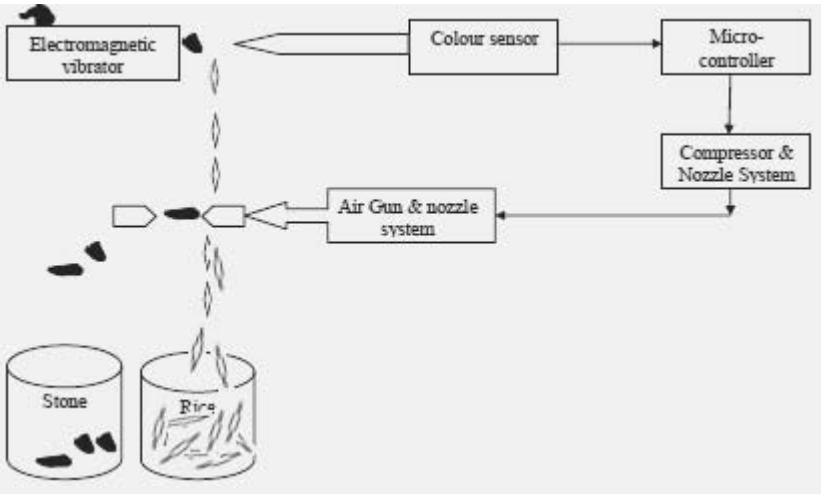

Fig. 1 Block diagram of system

2.1.Microcontroller P89LPC938H

The P89LPC938 is a single-chip microcontroller, available in low cost packages, based on a high performance processor architecture that executes instructions in two to four clocks, six times the rate of standard 80C51 devices. Many system-level functions have been incorporated into the P89LPC938 in order to reduce component count, board space, and system cost.

2.2.True colour sensor (MTCS-iCS)

This color sensor identifies color and gives serial output of RBG value. It can identify 16.7 million color shades giving RGB value for the detected color. The detected color is identified as amount of three primary color values namely Red, Green & Blue with 8 bit accuracy for each primary color. Any color can be separated or combined into three primary colors Red, Green and Blue using the RBG values.

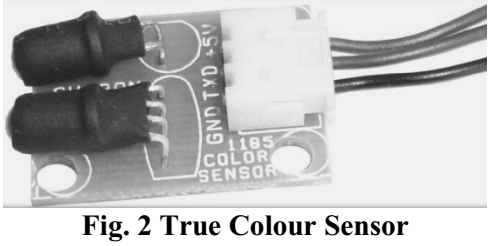

Fig. 2 True Colour Sensor

2.2. Fast switching nozzle (MHE2-MS1H-3/2G-QS-4)

- MH- fast switching valve
- E- individual valve
- 2- flow rate 90 to 100l/m
- M- solenoid switching
- S- 2ms
- 24VDC
- H- Non detenting
- 3/2- 3/2way valve
- G- Closed
- QS4- Push in connector for 4mm O.D tubing

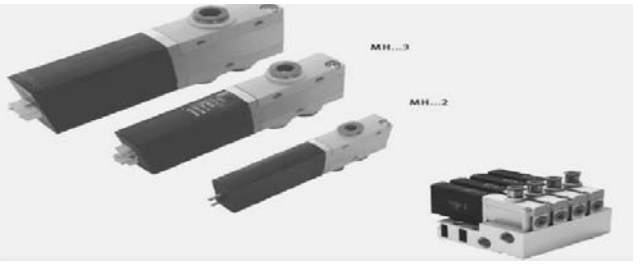

Fig. 3 Fast switching nozzle (MHE2-MS1H-3/2G-QS-4)

2.4. Electromagnetic vibrator

- Can handle hot or abrasive material
- Can handle fragile materials (like potato chips) without degradation.
- Can be easily enclosed even at transfer end
- Special additional operations can be added like magnetic separation, heating, cooling, drying
- Offers completely adjustable control of rate of flow of material
- Available in various models from 200 kg/hr to 200

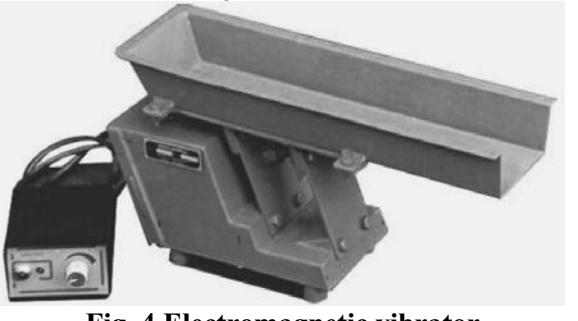

Fig. 4 Electromagnetic vibrator

III. SYSTEM ARCHITECTURE IN DETAIL

This system is used to find the stones or dust and separate them from rice, ultimately makes the rice clean automatically. As shown in fig , the system consists of electromagnetic vibrator which allows falling the rice and stones mixture present in feeding bucket from conveyor belt one at a time.

After the grains of rice are loaded onto a conveyor, they are illuminated and then imaged. After the line scan colour sensor detects the grains of rice, the captured colours are processed on-board by the ARM controller. Typically, colour sensing algorithms determine the grey-scale level of objects within acolour, and then threshold algorithms are used to set the limits of what is sorted. As the rice mixtures are being scanned, the grey-scale is pure black.

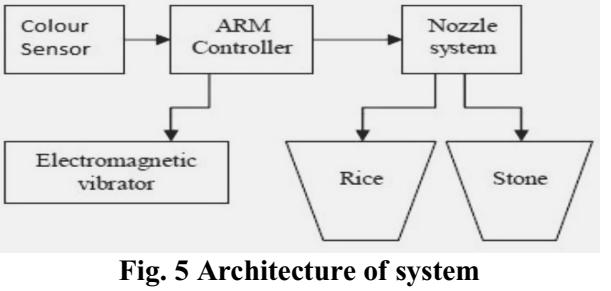

Fig. 5 Architecture of system

Sorting will simply assign a pass or fail based upon the pixel value and the preset threshold limit. After the sorting algorithms determine which grains of rice are passed or failed the camera triggers a number of air-jets. The air-jets push each rejected grain of rice into a separate bin.

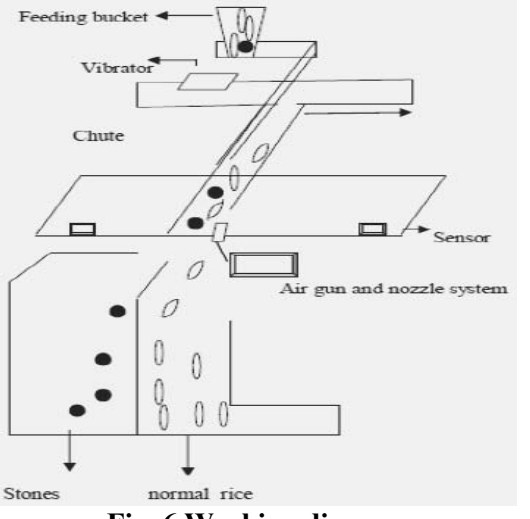

Fig. 6 Working diagram

IV. CONCLUSION

In conclusion, rice grain and stone sorting using ARMhas been successfully developed. The developed system monitorby ARM controller, An automatic, precise and faster system for cleaning of rice, the system can replace the previous conventional methods which earlier uses.

In future, prototype should be considered, can develop for sorting other seeds from stones,multiple seeds can sort by using one system

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Design of Fiber-to-the-home (FTTH) Architecture using Flexible WDM-PON for Long Haul Optical Fiber Communication

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Abstract-Fiber based access systems can demand of execution that can high speed network. One of the new innovations that have risen as of late is Passive Optical Networks (PON). Fiber-to-the-home (FTTH) is encountering awesome open acknowledgment all through the world. For investigate the Fiber-to-the-Home architecture are main work with any users can drop or add in optical fiber communication for long distance. In continues type laser to external modulated source through each user allocated separate wavelength then no inter symbol interference (ISI) and for same wavelength we can nearest distance then drop the same wavelength and same wave allocate for in-line next user. If the new wavelength are add then the simple add the new laser source through the in-line hierarchy. For long distance the maximum channels support up to 1 lakh in single mode fiber cable. Finally, we conduct detailed simulation experiments to research the performance and demonstrate the effectiveness of the proposed scheme.

Keywords- Wavelength Division Multiplexing (WDM); Passive Optical Network (PON); Fiber-to-the-Home (FTTH); Optical Network Unit (ONU); Optical Line Terminator (ONT) etc.

I. INTRODUCTION

In real time higher demand of each user for Fiber-to-the-Home (FTTH) then investigate the new architecture for every user for easily joint and drop the fiber cable architecture [1]. Here the investigate the real time architecture are used to continuous mode laser and number of source ten use for home applications [1]. We have suggested and looked into a precise wavelength-division multiplexing scheme by using lambda conversion in nonlinear fibers [2]. The proposed technique utilizes for carrier multiplexing of difference wavelength division multiplexing for each user can provide the separate wavelength for home appliances for different services [3]. Recently, a concept of an add/drop by using the technique was proposed and has been considered for the possibility to add and drop the new user and drop easily from the continuous wave laser to provide for long distance [1]. Although our approach is expected to be applicable for broadband performance with up, speed up to 5 Gbps for each user. In over real life the analog information to change the digital form after the transmitted the same channel in optical fiber communication[1].

II. NETWORK ARCHITECTURE

A. Optical Line Terminator

When the architecture is to use the laser continuous type, then this light with data source intensity modulation through transmit 3rd window wavelength through for fast communication and long distance. Here, also define the data source bit rate maximum 5 Gbps for each user and they displace up to 90 kilometer.Here, following diagram to record that the CW laser generates the ten numbers of wavelength for each ten user and broadcast through the optical fiber are shown in Figure 1. Here the spacing of each wavelength is 1 nm for fast communication and ignorance of Inter Symbol Interference (ISI) and CW laser most significant transmit.

After broadcast the one 2nd number of wavelengths are dropping at a range of 10 km and after word two wavelength add at 20 km and 30 km in which one is precious and other are new wavelength for next user are shown in Figure 2.

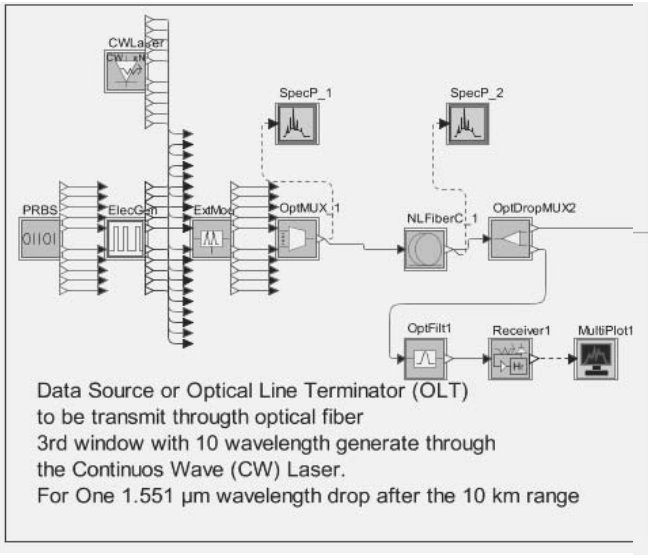

Figure 1. optical Line Terminator with 10 separate user wavelength and one ONT at 10 km

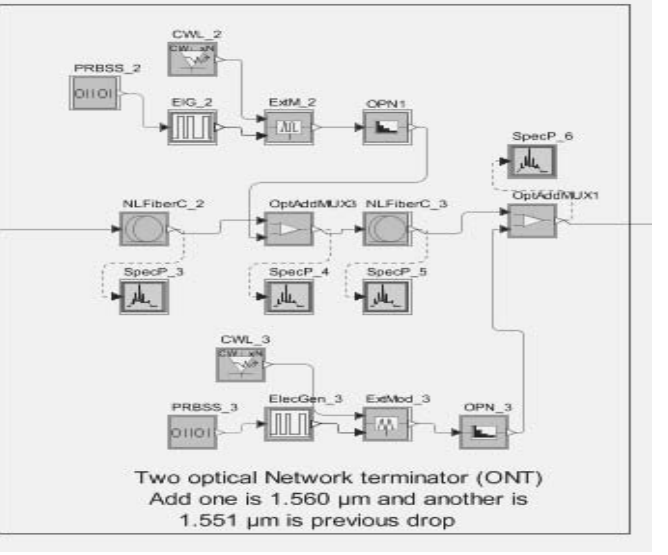

Figure 2. First Wavelength Drop after Two Wavelength Add (One is 1.551 µm & 1.560 µm)

B. ONT to drop each wavelength at various km range

One wavelength drop after remaining the 11th wavelength out of six wavelength drop at one is 10 km and another five is every 5 kilometer orbit. This diagram shown in below Figure 3.

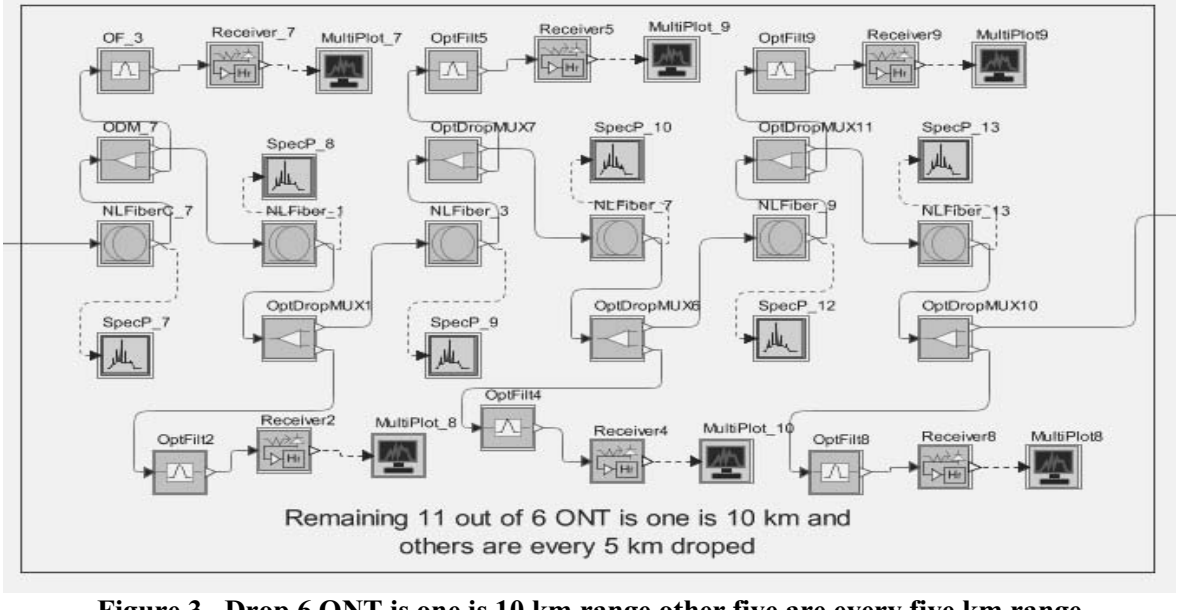

Figure 3. Drop 6 ONT is one is 10 km range other five are every five km range

After word the remaining five wavelength drop at every 5 km and they are shown in Figure 4. But here use one of the Gaussian type filters for separate the each wavelength.And other are compound type receiver use for original data source to be received after every drop the user. Each wavelength range include in 3rd type window use for fast communication.

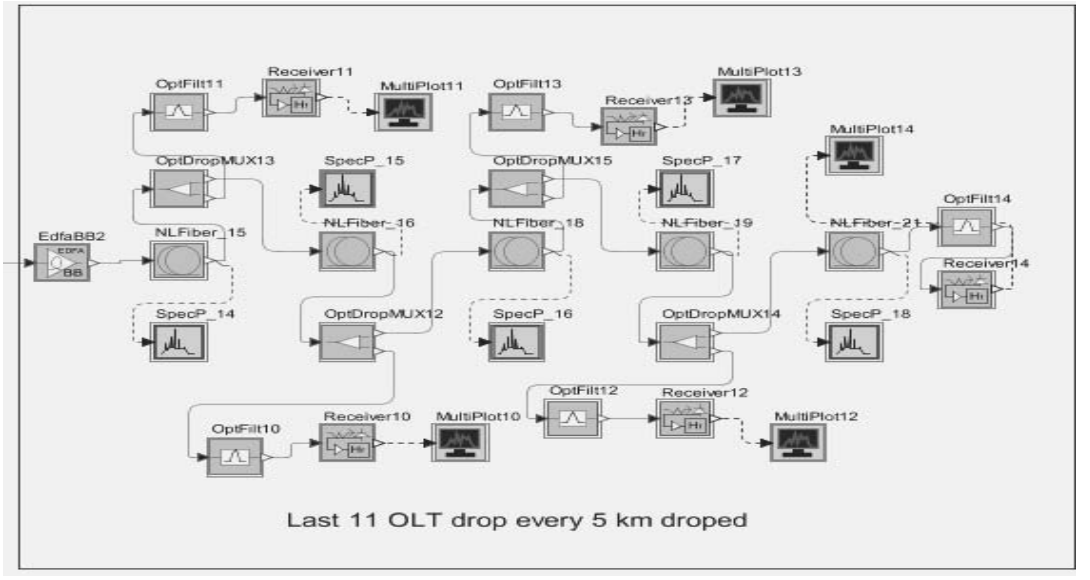

Figure 4. Last 5 ONT drop every 5 km dropped

III. RESULTS AND ANALYSIS

A. Data Signal To be Transmit

Here the data source can be 5 Gbps for each user and they conduct through the fiber cable and loss of fiber cable are to define 0.2 dB/km.They data signal isa Pseudo Random Binary Sequence (PRBS). This data is shown below in Figure 5.

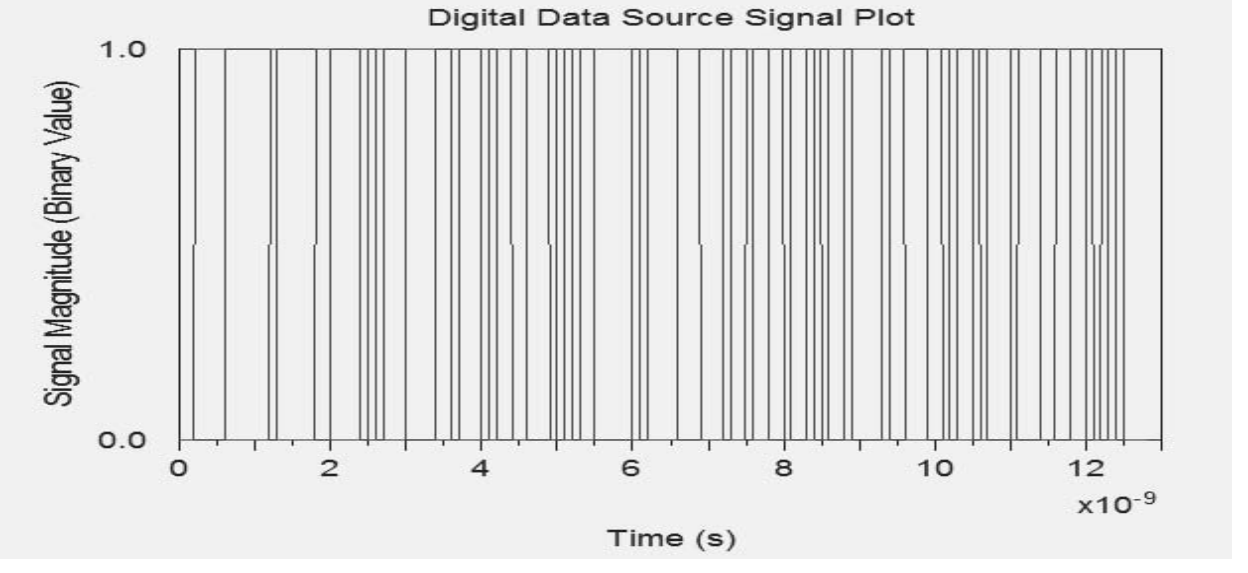

Figure 5.PRBS Sequence Generator

B. Received Signal Wavelength Spectrum

After word the data signal transmitted, then the every user can receive the service at every km range. Here, shown in Figure 6. & Figure 7. In Figure 6. Is shown all generated wavelengths for each ten user and Figure 7. Is shown is over 10 km one wavelength can drop or received, the user services and remaining wavelength are for next user can obtain. Drop wavelength are not matter of sequences and same wavelength are reusesing for next users.

Also, number of wavelength are increases then the Inter Symbol Interference are increase as much as low wavelength then good results. After the distance of fiber cable are increase then the power level are also decreases. When the wavelength separation are to 1 nm for each wavelength.

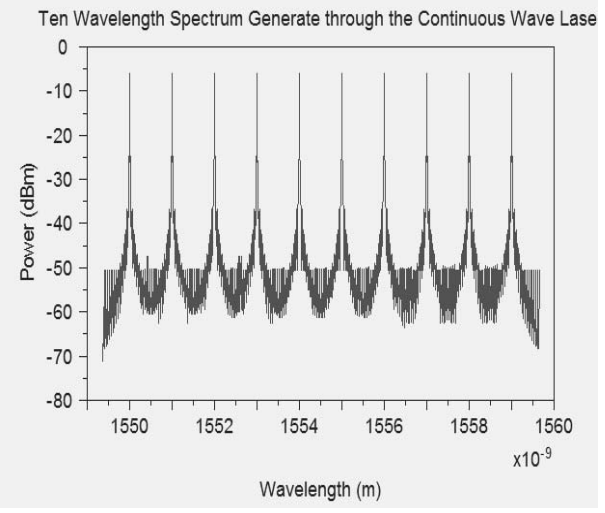

Figure 6. Ten Wavelength Generate through CW Laser

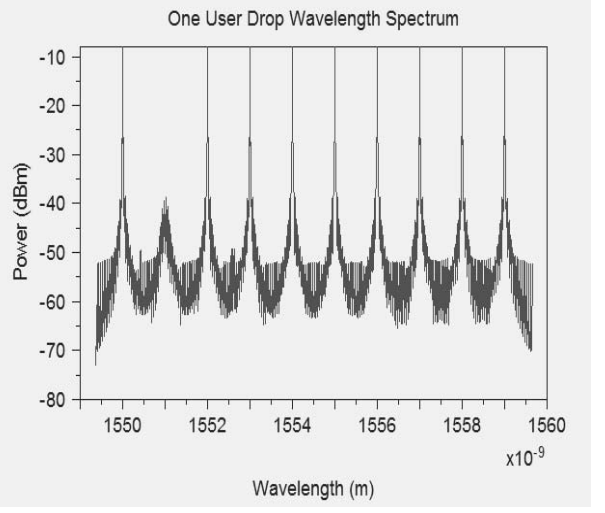

Figure 7. One User Drop at 10 km

C. After 65 km and 90 km OLT drop every 5 km range

Subsequently the 65 km range the five wavelength drop successfully and remaining wavelength is dropped every 5 km are shown in Figure 10.If the remaining wavelength drops every 5 km range drop successfully and after 90 km range wavelength spectrum and one wavelength received are presented in Figure 11.

Main advantages of the dropped wavelength to channel bandwidth requirement are very less and relation between bandwidth and bitrate are shown below Equation 1.in single mode fiber bit rate increases then the bandwidth also increases and time step are inversely proportional to bandwidth and bitrate.

$$BW_{sim} = \frac{1}{T_s} = BitRate \cdot 2^{Point PerBit} \quad (1)$$

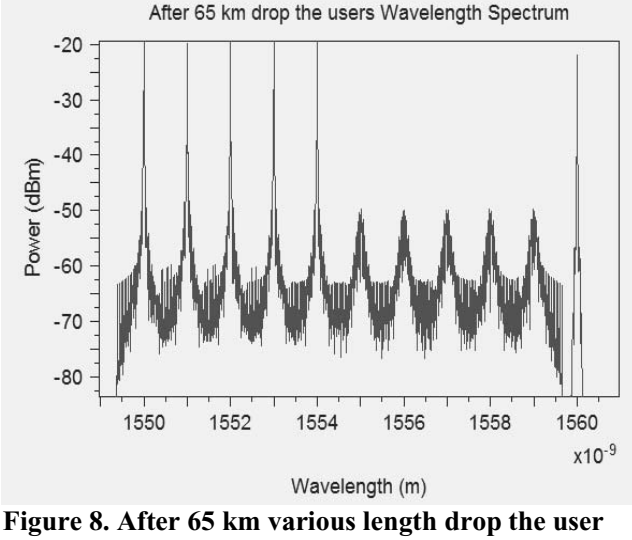

Figure 8. After 65 km various length drop the user wavelength spectrum

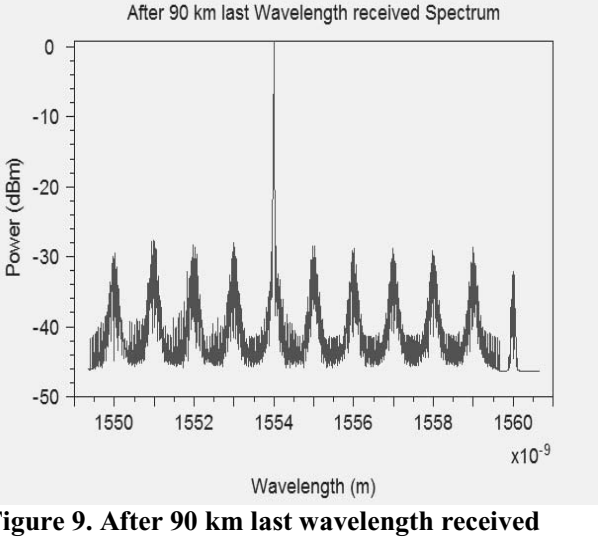

Figure 9. After 90 km last wavelength received for last user's

D. Eye diagram of 10 km, 40 km, 65 km and 90 km range

After the transmitted the signal they can read the voltage level, jitter and signal-to-noise (SNR) we can easily analysis the eye diagram. Here after 10 km range the binary sequenceof eye diagram almost high amplitude and very high SNR.

Later on the 40km range can analysis the voltage level is deceased, then the and small decreases the SNR for distance increases. If we can increase the number of users, then also increases the SNR and depend on the binary bit length sequence.

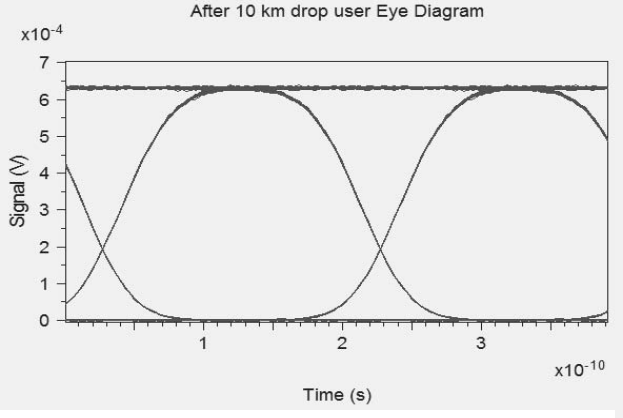

Figure 10. After 10 km received signal eye diagram

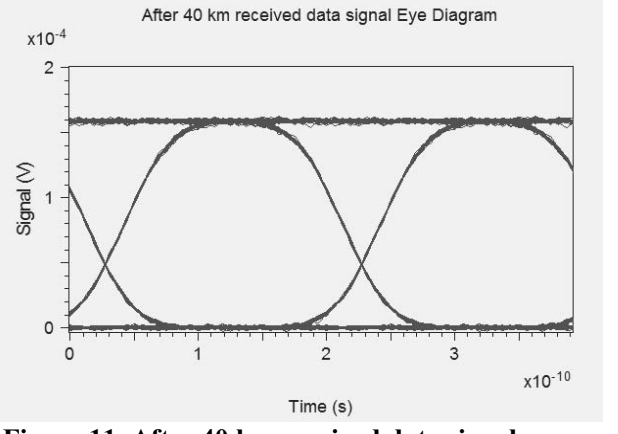

Figure 11. After 40 km received data signal eye diagram

In which 65 km without using amplifier, then the SNR are also decrease and the jitter and sampling time for difference length between 0 to 90 km range.Here, also depict that the without amplifier can signal has distorted and SNR is too depressed.Then, after 65 km range can amplifier 30 dB gain put for long distance and they remove the ISI and also increases the amplitude of signal levels.

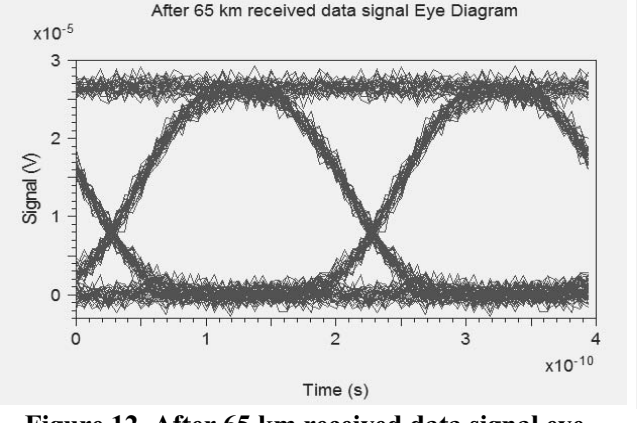

Figure 12. After 65 km received data signal eye diagram

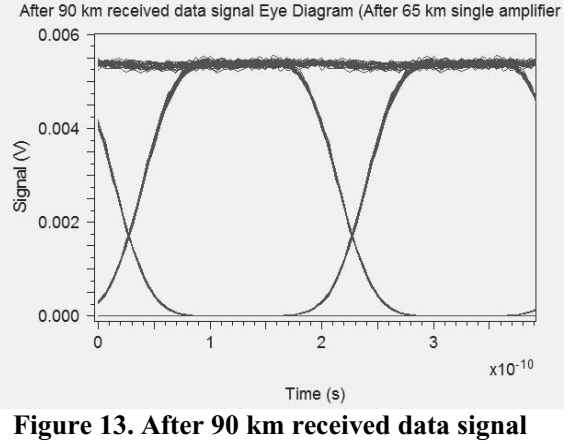

Figure 13. After 90 km received data signal eye diagram (After 65 km use amplifier)

IV. CONCLUSIONS

From above simulated network it is summarized that wavelength reuse concept increases the effectiveness and reliability of the system. Number of users can be added or dropped as per network requirement. PON is the best suitable technique for designing FTTH for long haul communication. Various digital and analog services like television telephone and internet can also be supported using same concepts.

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Copy Move Image Forgery Detection Techniques: Survey

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Abstract- Image forgery is now more customary in our daily lives with improvements in computer and image improvements software. As forgers developing sophisticated software, to combat that we need more advanced ways of detecting these forgeries. There are two major types of forgery detection techniques, active methods and passive methods. Our focus is mainly on pixel based forgery which is one of the type of passive method. Pixel based forgery is the type of forgery which takes place on structural unit of image i.e on pixels. Copy move forgery is one of the type of pixel based forgery. In this paper,various methods of copy move forgery detection are surveyed.

Keywords- Image forgery detection, pixel based forgery, copy move forgery, Image authentication, Image forgery

I. INTRODUCTION

With the increasing demand of image processing software and amelioration in digital cameras lead to rise in many manipulated images with no obvious traces, initiating huge demand for automatic forgery detection algorithms to resolve of truthfulness of an image.The need to legitimate the photographs is crucial as these are supporting evidences and historical records in growing number and wide range of applications from forensic investigation, journalistic photography, criminal investigation, law enforcement, insurance claims and medical Imaging. There are two main types of Image forgery detection techniques: Active or Non Blind Method and Passive or Blind Method [5][6].

Active method are the method which are categorised as digital watermarks [2]. Watermarks are initially used for preservation of an image and if there is any kind of meddling done in image it is further retrieved by watermarks itself. That's how this method got other name as Non blind method. Here original image is accessed before processing it, so the watermarks are inserted. This method is not beneficial on practical basis so we need passive methods.

Passive method or Blind methods require no prior information about the image [1][4]. It is assumed that although forgeries are difficult to detect as they leave no clue, but it mostly likely disturbs the statistical property of a natural image which brings antiquity leading to various forms of disparity.Passive methods can be classified into following categories.

- Pixel Based
- Format Based
- Camera Based
- Physics Based
- Geography Based

Perhaps one of the most common image manipulations is to clone (copy and paste) portions of the image to conceal a person or object in the scene[3]. When it is done precisely, it can be hard to recognize cloning outwardly. Since the cloned areas can be of any shape and area, it is computationally difficult to hunt all conceivable picture areas and sizes. Copymove forgery is pretty much like image splicing in perspective of the way that both methods change certain image locale, with another picture.

Figure 1: An example of copy move forgery

However, rather than having an outer image as the source, copy-move forgery utilizes part of the first base image as its source. In a copy-move forgery, parts of the original image is copied, moved to a desired location, and pasted. The usual purpose of such act isto conceal certain details or to enhance certain aspects of an image. The irregularities of the copied and pasted regions is reduced by some post processing such as blurring, median filtering. Further, in next section existing different methods are discussed which are mainly focusing on making algorithms for copy move forgery detection.

II. EXISTING METHODS FOR COPY MOVE FORGERY DETECTION

Manipulations of an image has become very easy now a days with sophisticated software. Existence of two same regions in normal images is not common and thus this property is used to detect copy move forgery. The methods introduced during the literature survey are only based on copy move forgery detection.

Shaktidev Mukherjee et.al [7] concentrated on DCT algorithm. One of the common method to detect copy move forgery is block matching method where the image is divided into overlapping blocks and further the blocks are matched to find duplicated regions but this type of method lead to exhaustive search and so further efficient block matching detection based on DCT was introduced. To represent an image in frequency domain,DCT is widely usedas it represents most of the intensity distribution details with fewer coefficients. To keep the low frequency coefficients together and before the high frequency coefficients in the row vector, DCT coefficients are arranged in zigzag manner. After applying the algorithm the result is analysed. The high frequency coefficients are susceptible to noise, so the row vectors are curtailed. Experimental results have confirmed a marked improvement in the execution time compared with the existing methods.

Qunting Yang et.al [8] concentrated on approach that used improved DCT. Compared with other methods ,there are certain advantages like dimension of feature vector is lower, it is robust to various attacks, such as multiple copy-move forgery, Gaussian blurring, and noise contamination and lower computational complexity. In this approach image is divided into overlapping blocks and DCT transform is applied to that blocks feature is extracted by circle block and correct blocks are matched and thus we get output. As we know DCT only focuses in low frequency coefficients so the square block is divided into circle blocks which decreases the computational complexity. It also used very less features to represent block.

Gavin Lynch et.al [9] created a new algorithm where blocks are compared against each other in order to see which blocks are matching. Features are extracted ignoring the subtle noise. Further there are few limitations so to overcome that this algorithm is enhanced. Instead of using average gray value of the block as dominant feature, variance is used as the feature since it is not affected by constants. The advantage of the expanding block algorithm is that it can handle block comparison methods that requiretwo blocks to be directly compared with each other and direct block comparison can be done without a large sacrifice in performance time.

Different feature extraction methods are used to improve the capability of the algorithm so in this paper 2D-FT is used to extract features from the blocks. SenihaKetenci et.al [10] here introduced the method that uses 2D-FT to extract features from the overlapping blocks. Predefined number of FT coefficients are used to constitute feature vectors. In this approach firstly the image is made smooth by applying square kernel mean filter to make low frequency components more effective. Then the image is divided into overlapping blocks, search the similarity by comparison and thus lastly create the visual result of the output. This method detected multiple copy move forgeries and is also robust to JPEG compression attacks even at lower quality. Also reducing the dimension of feature vectors improves the computational efficiency of the approach.

The proposed method by SondosM.Fadl et.al [11] accelerated block matching strategy, accelerated copy move forgery detection using automatic blocks clustering. This method is also accurate when the image is affected with Gaussian blur, JPEG compression and rotation angle less than 5 deg. Firstly the image is divided into overlapping blocks, then feature is extracted using DCT. For each class the feature vectors are lexicographically sorted and the correlation between each nearby pairs of blocks are computed. If the correlation is greater than some threshold, then two blocks are considered to be similar. The experiment results show that the proposed method has the ability to detect copy move forgery in an image faster.

After analysing the detection method based on DCT, 2DFT, PCA, expanding block algorithm, Keskar, A.G et.al [12] introduced a method based on Discrete wavelet transform(DWT). Here DWT is used to reduce the dimensions and the primary advantage is that we are using SIFT for the robustness. The method can detect copy move forgery easily. DWT is applied on the image (up to level 1). The image gets divided in to 4 sub bands- LL, HH, LH and HL.SIFT is applied to LL bands only.Occurrence of same features at different locations in the image is searched. Image blocks that return similar SIFT features from all four images are marked as forged regions.

Nandinisinghal et.al [13] generated an algorithm based on DWT. In the given algorithm DWT is applied in input image to obtain LL1 subband, further the subband is divided into subimages. After calculating the phase corelations ,copy move region is detected by pixel matching. Atlast mathematical morphological operations are applied to detect the result. From the results we came to know that the algorithm works efficiently even under noise.

Ghorbani et al. [14] proposed DWT-DCT (QCD)-based copy-move image forgery detection. Authors used DWT and resolved the image into sub-bands and then performed DCT-QCD (quantization coefficient decomposition) in row vectors to reduce vector length. After row vectors are lexicographically sorted, shift vector is computed. Finally, the shift vector is compared with threshold and the forged region is highlighted.

III. CONCLUSION

This paper deliberates various approaches to detect copy move forgery of different images successfully. All the methods and approaches examined in this paper successfully detects the copied and forged regions. But there are limitations in few methods. Few algorithms detect area besides actual forged regions and on other hand,some have very high time complexity. So there is need to develop forgery detection algorithm overcoming this limitations.

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Foot Step Power Generation Using PIC Microcontroller

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Abstract-Man has needed and used energy at an increasing rate for the sustenance and well-being since time immemorial. Due to this a lot of energy resources have been exhausted and wasted. Proposal for the utilization of waste energy of foot power with human locomotion is very much relevant and important for highly populated countries like India where the railway station, temples etc., are overcrowded all round the clock .When the flooring is engineered with piezo electric technology, the electrical energy produced by the pressure is captured by floor sensors and converted to an electrical charge by piezo transducers, then stored and used as a power source. And this power source has many applications as in agriculture, home application and street lighting and as energy source for sensors in remote locations.

Keywords –Piezoelectric transduser; AC ripple neutralizer; microcontroller PIC16f877A; mobile charger unit; LCD; battery.

I. INTRODUCTION

The usage of traditional power generation method such as burning of coal, wood, diesel etc is continuously depleting our natural resources such as fossil fuel which is the demand for power has exceed supply due to the rising population. In addition to this the traditional method cause population.

has the potential to redefine urban space by adding a sense of fluidity and encouraging people to activate spaces with their movement. The crowed farm floor is composed of standard parts that are easily replicated but it is expensive to produce at this stage. This technology would facilitate the future creation of new urban landscape athletic field with a spectator area, music halls, theatres, nightclubs and large gathering space for rallies, demonstrations and celebration

Proposal for the utilization of waste energy of foot power with human locomotion is very much relevant and important for highly populated countries like India and China where the roads,railway stations, bus stands, temples etc. are all over crowded and millions of people move move around the clock. This whole human bio energy being wasted if can be made possible for utilization it will be great invention and crowd energy farms will be very useful energy sources in crowded countries. Walking across a "Crowd Farm", floor, then will be fun for idle people who can improve their health by exercising in such farms with earning. The electrical energy generated at such farms will be useful for nearby application.

II. BLOCK DIAGRAM

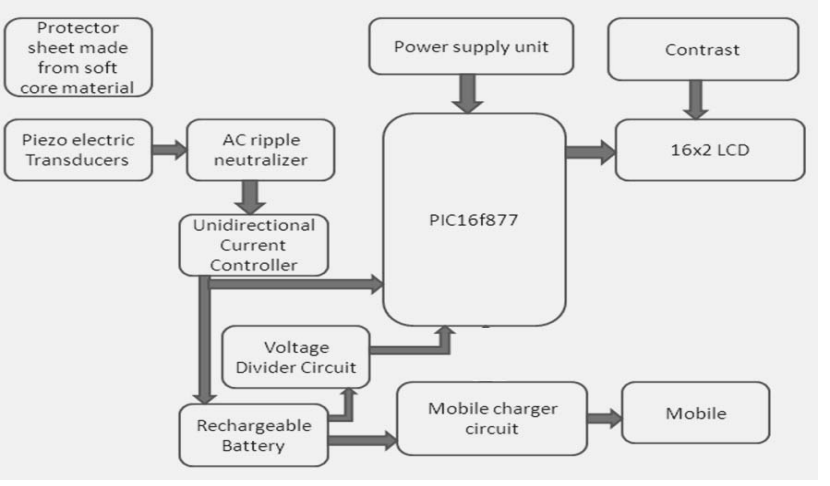

Fig. 1 Block diagram of system

2.1.Microcontroller PIC16F877A

PIC16F877A microcontroller is main part of foot step power generation system. It is used to display battery voltage on LCD. It is also used to measure battery voltage with the help of analog to digital converter of pic microcontroller. 10MHz crystal is used in this project

1.Operating frequency- 20MHz
2.Resets and Delays-POR,BOR(PWRT,OST)
3.Flash memory-8KB
4.Data memory-368Bytes
5.EEPROM-256Bytes
6.I/O ports-A,B,C,D,E

2.2.PIEZO ELECTRIC SENSOR

A piezoelectric sensor is a device that uses the piezoelectric effect to measure pressure, acceleration, strain or force by converting them to an electrical signal.

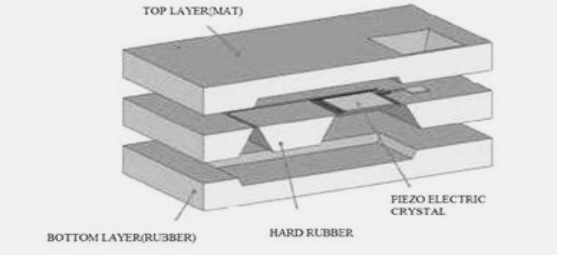

Fig. 2 Piezoelectric Sensor

Piezoelectric sensors have proven to be versatile tools for the measurement of various processes.

Fig. 3 Piezoelectriccrystal

The rise of piezoelectric technology is directly related to a set of inherent advantages. The high modulus of elasticity of many piezoelectric materials is comparable to that of many metals and goes

up to 10e6 N/m²[Even though piezoelectric sensors are electromechanical systems that react to compression, the sensing elements show almost zero deflection.
This is the reason why piezoelectric sensors are so rugged, have an extremely high natural frequency and an excellent linearity over a wide amplitude range. Additionally, piezoelectric technology is insensitive to electromagnetic fields and radiation, enabling measurements under harsh conditions. Some materials used (especially gallium phosphate or tourmaline) have an extreme stability even at high temperature, enabling sensors to have a working range of up to 1000°C. Tourmaline shows pyroelectricity in addition to the piezoelectric effect; this is the ability to generate an electrical signal when the temperature of the crystal changes.

2.3. A.C. RIPPLE NEUTRALIZER:

Capacitive filter is used in this project. It removes the ripples from the output of rectifier and smoothens the D.C. Output received from this filter is constant until the mains voltage and load is maintained constant. However, if either of the two is varied, D.C. voltage received at this point changes. Therefore a regulator is applied at the output stage.

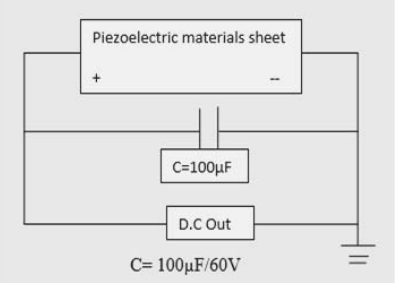

Fig. 4 Capacitor Filter

2.4. BATTERY:

- Manufactured/tested using CAD
- Electrolyte volume
- PE Separators
- Protection against leakage

III. SYSTEM ARCHITECTURE IN DETAIL

The piezoelectric material converts the pressure applied to it into electrical energy. The source of pressure can be either from the weight of the moving vehicles or from the weight of the people walking over it. The output of the piezoelectric material is not a steady one. So a bridge circuit is used to convert this variable voltage into a linear one. Again an AC ripple filter is used to filter out any further fluctuations in the output. The output dc voltage is then stored in a rechargeable battery. As the power output from a single piezo-film was extremely low, combination of few Piezo films was investigated. Two possible connections were tested - parallel and series connections. The parallel connection did not show significant increase in the voltage output. With series connection, additional piezo-film results in increased of voltage output but not in linear proportion. So here a combination of both parallel and series connection is employed for producing 40V voltage output with high current density. From battery provisions are provided to connect dc load. An inverter is connected to battery to provide provision to connect AC load. The voltage produced across the tile can be seen in a LCD. For this purpose microcontroller PIC16F873A is used. The microcontroller uses a crystal oscillator for its operation. The output of the microcontroller is then given to the LCD which then displays the voltage levels

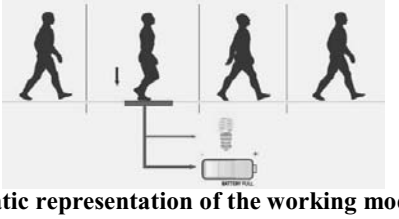

Fig. 5 Schematic representation of the working model

MAXIMUM THEORETICAL VOLTAGE GENERATED

When a force is applied on piezo material, a charge is generated across it. Thus, it can be assumed to be an ideal capacitor. Thus, all equations governing capacitors can be applied to it. In this project, on one tile, we connect 3 piezo in series.10 such series connections are connected in parallel. Thus when 3 piezoelectric discs are connected in series, its equivalent capacitance becomes:

1/Ceq=(1/c1)+(1/c2)+(1/c3)
We know,
Q=C*V
So
C=Q/V
Veq/Q=(V1/Q)+(V2/Q)+(V3/Q)
Thus,
Veq=V1+V2+V3
Hence, the net voltage generated in series connection is the sum of individual voltages generated across each piezoelectric disc. Output voltage from 1 piezo disc is 13V.
Thus, Veq=V1+V2+V3
= 13+13+13 =39V
Thus the maximum voltage that can be generated across the piezo tile is around 39V.
STUDY OF CONNECTIONS
Next to determine the kind of connection that gives appreciable voltage and current necessary, three PZT are connected inseries.

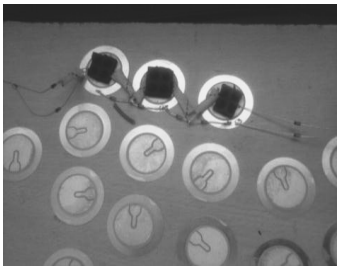

Fig 6.PZT in series connection

A force sensor and voltmeter is connected to this series combination. As varying forces are applied on this connection, corresponding voltages are noted. Also the voltage generated across the series connection and the current is measured. Similarly the connections are done for parallel and series-parallel connections are done and the graphs as shown in fig 7 and 8 respectively

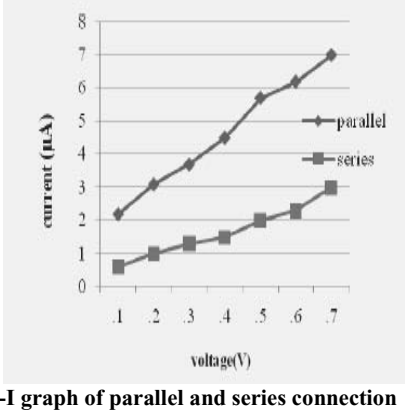

Fig. 7 V-I graph of parallel and series connection

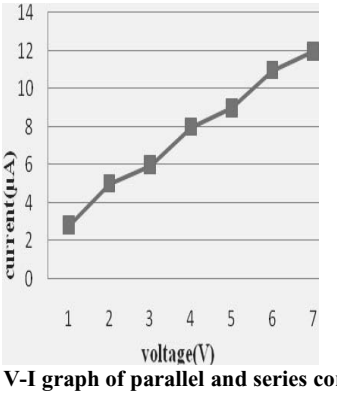

Fig. 8 V-I graph of parallel and series combination

It can be seen from the graph that the voltage from a series connection is good but the current obtained is poor, where as the current from a parallel connection is good but the voltage is poor. But this problem is rectified in a series- parallel connection where a good voltage as well as current can be obtained.

Applications

Street Lighting Operation
Foot step power can be used for agricultural.
Home application.
Street lighting.
Railway station.
Temples and other crowded areas.

IV. CONCLUSION

FOOT STEP POWER GENERATION using PIC16F877A has been successfully developed. The developed system monitor by PIC controller and energy consumption of the prototype should beconsidered. It is a need to develop and energy saving in future application

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Removal of over Segmentation Problem in MRI Spine Images Segmentation using Watershed Algorithm

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Abstract- In computer assisted diagnosis and treatment, segmentation of patient's anatomy is a prerequisite task.The problem of over-segmentation is inherent to existing automatic segmentation methods.Watershed Transform for medical images results in over-segmentation.In this paper, algorithm based onmorphological tools implemented to solve this over-segmentation problem in MRI spine images segmentation using Watershed Algorithm.
Keywords- MRI; biomedical image analysis; over segmentation; watershed transform; spine

I. INTRODUCTION

In computer assisted diagnosis and treatment,segmentation of patient's anatomy is a prerequisite task. So here comes the need for semi- and automatic segmentation of the structure of interest. And which is required in variousfield,for example for reproducible and fast assessment of abnormalities for diagnosis purposes, in surgery assistance, study of anatomical structure,virtual surgery simulation, intra-surgery navigation etc. [1][2][8]. But the problem of over-segmentation is inherent to existing automatic segmentation methods [5].

Thewatershed transform extends an agglomerative, region-based segmentation approach with edge-basedmethods of segmentation. Thus, its comes under hybrid method of segmentation [1] [3]. As this transform is easily adapted to be used indistinguishing complexobjectsof interest in different types of images, it used in biomedical image segmentation. However, the implementation of the Watershed Transform for medical images actually produces over-segmentation [5].

II. OVERSEGMENTATION

Over-segmentation is said to be occurred if a particular structure is disintegrated into many segments or parts of segments. It is a big problem with automatic segmentation used for medical image segmentation.The presence of lots of minima due to extraneous structures or noise that is undesirable to appear after computation of the gradient image leads to over-segmentation. And which further require post processing and also contours of interest are often lost along with irrelevant ones[5].

The so-called classical watershed transform considers all regionalminima of the image to compute a primitive catchment basin for each one.Asimages of complex nature contain many regional minima, in general, too many basinsare created. The image is over-segmented. However,it can be reduced by filtering the image and, therefore,decreasing the number of minima. Other possible ways to handle it is, either by modifying the gradient image or by eliminating irrelevant contours. Various approaches are found in literature,for example, algorithms based on clustering and fuzzy logic, morphological tools etc. [3] [4] [5].

III. WATERSHED ALGORITHM

The watershed transform is the method for image segmentation in the field of mathematical morphology. It consists of an image partitioning into its constitutive regions. This method is able to cope with different variations in the shape and topology for different types of images and it allows distinguishing different complex natured objects.

A.Watershed Transform

Any gray scale image can be seen as a topographic surface where high intensity values denotes peaks and hills while low intensity values denotes valleys. When filling every isolated valleys or catchment basin (local minima) with different colored water (labels). These transform recognizes the outlines of similar topographic regions delimited by hill ridges through the flooding of valleys. As the water level rises, depending on the peaks values (gradients) nearby, water from different valleys having different colors will merge. To avoid that, barriers are built in the locations where water merges. This processis continued until all the peaks are under water. Then the barriers created givethe segmentation result.

Whenapplied to segmentation of medical images, thewatershed transform results in problem of over segmentation but on the other hand, it especially has the following advantages:

- Contiguous segments are obtained inherently (region-based concept).
- Theobjects are exactlydelineated (edge-based concept).
- As the merging of smallerpools is prevented by the watersheds, the problem of under-segmentation is avoided[1].

Definitionby topographical distance

Let *f*be a digital grey scale image. Initially, we assumethat*f*islowering complete, that is, each pixel which is not in a minimum has a neighbor of lower grey value [11] [12]. This assumption will be relaxed later.The lower slope *LS (p)* of *f* at a pixel *p*, is defined as the maximal slope linking *p* to any ofits neighbors of lower altitude. Formally,

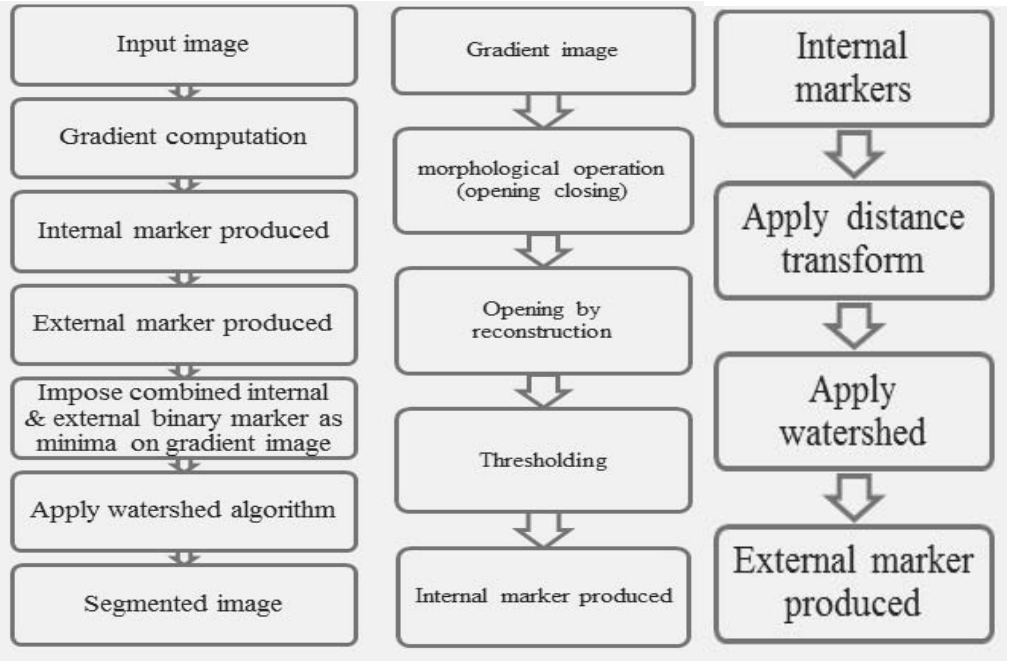
$$LS(p) = \max_{q \in NG(p) U(p)} \frac{f(p) - f(q)}{d(p,q)}, \qquad (1)$$

Where$N_{G\,(p)}$denotes the set of neighbors of pixel *p* on the grid *G*and *d (p, q)* is the distance associated to edge *(p, q)* (for q = p the expression following the max-operator in above equation) is defined to be zero). Forpixels whose neighbors are all of higher grey value, the lower slope
is zero. The cost for walking from pixel *p* to a neighboring pixel *q* is defined as:

$$cost(p,q) = \begin{cases} LS(p).d(p,q) & if\ f(p) > f(q) \\ LS(q).d(p,q) & if\ f(p) < f(q) \\ (1/2)(LS(p) + LS(q)).d(p,q) & if\ f(p) = f(q) \end{cases} \qquad (2)$$

Algorithm

Segmentation of MRI image of spine is implemented here using watershed algorithm as it can handle wide variety of shapes and topologies. It is well known that using watershed algorithm gradient images leads to over segmentation problems and the contours of interest are often lost.



a)Main algorithm b) Flowchart for internal marker c) Flowchart for external marker

Figure 1. Algorithm

Fig. 1 shows the algorithm used to overcome the problem of over segmentation and the detailed flowchart for obtaining internal and external marker.

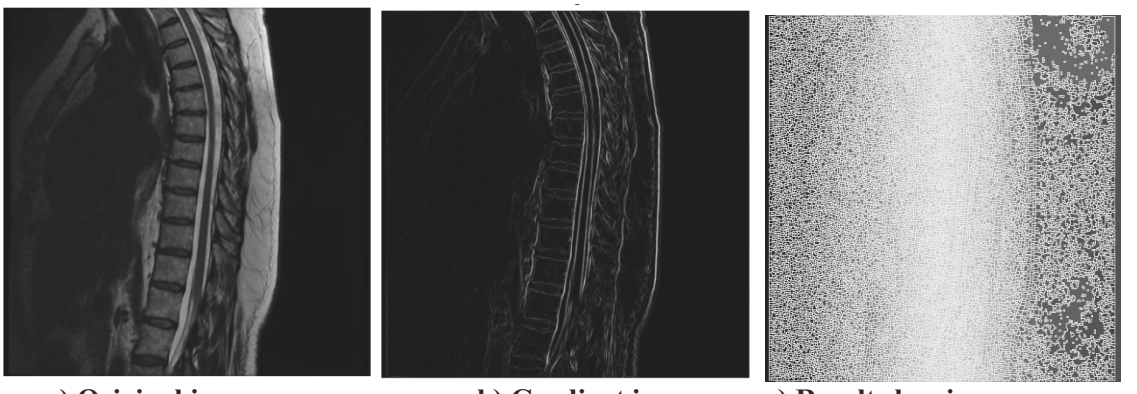
Algorithm description

First of all gradient of input image is computed. Gradients or derivatives measure the rate of change, andthus gives the hint of edges. Then to modify the gradient image by using the internal and external markers to keep only the most relevant contours for the structures of interest. With reference to watershed method, internal markers represent set of connected pixels inside the regions of interest and external markers represent the deepest valley lines surrounding every internal marker. For obtaining internal marker basic morphological operations are first applied, and then opening by reconstruction with suitable structuring element size and shape is applied for achieving uniform intensity. Further thresholding is applied which result in internal marker.

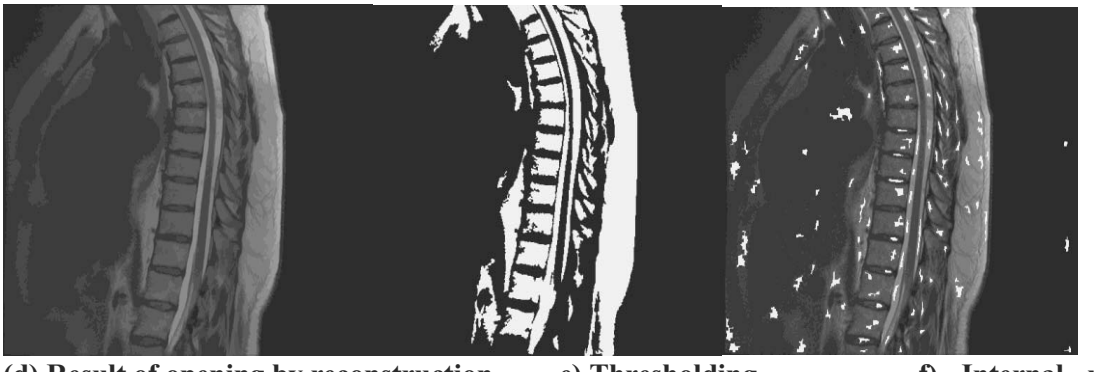
External markers are obtained by applying distance transform example Euclidean distance to internal markers. The watershed algorithm is then applied to the distance transform which result in external marker. Once both markers are obtained, they are imposed as minima on the original gradient image. And thus the modified gradient image is obtained the problem of over segmentation is removed.

III. SIMULATION RESULTS

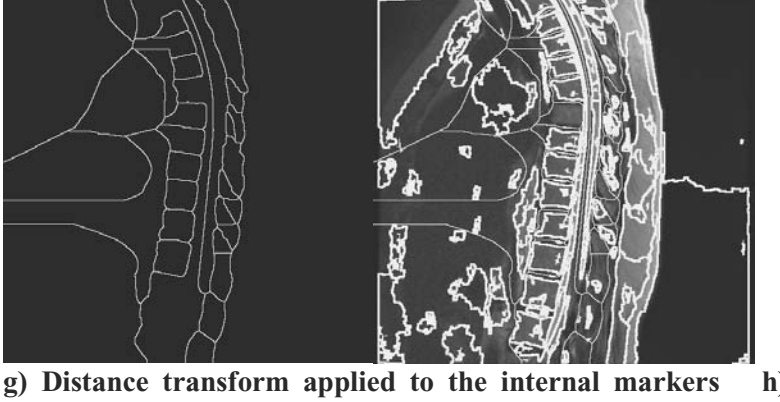
The sagittalT2 sequence of MRI thoracic spine is used as input image. The simulations are carried out in MATLAB 2013. The algorithm to overcome the over segmentation problem is implemented on the gradient image of sagittal T2 sequence of MRI thoracic spinal image. And to show the over segmentation problem watershed transform is directly applied on gradient image. Later, original gradient image is modified according to applied algorithm.



a) Original image. **b) Gradient image.** **c) Result showing over segmentation**.



(d) Result of opening by reconstruction e) Thresholding f) Internal markers in the sagittal plane. with a square structural element.



g) Distance transform applied to the internal markers h) Segmentation result obtained with the modified to obtain the external markers.

gradient image.

Figure 2. Simulation results

Simulation results are shown in fig. 2 is a T-2 normal thoracic MRI image which is used as input image. Then its gradient is computed as shown by fig.2 b). Fig. 2 c) shows the result of over segmentation when direct watershed algorithm is applied. Further, to overcome over segmentation markers are used as result fig. 2 f) and fig. 2 g) shows the internal and external marker respectively. The final result is shown in fig. 2 h).

IV. CONCLUSIONS

In this paper, the algorithm provides the solution to over segmentation problem which is inherent to many existing automatic segmentation methods. Modifying gradient image prior to applying segmentation algorithm results in robust and correct segmentation. The modification is done with help of morphological tools and finding internal and external markers. The reduction in over segmented parts can be clearly seen from the simulation results with using modified gradient image as compared to original gradient image.

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Feature Extraction of Fingerprints for Brain Mapping

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Abstract-Dermatoglyphics alludes to the branch of science in the investigation of the examples of skins (dermal) edges present on the fingers, toes and the soles of human. Deductively it has been demonstrated that no two individuals can have the same fingerprints in this world. Once a human is conceived, its fingerprints are formed and they stay unaltered up till the end of his life. Fingerprints begin creating when the foetus arrives in mother's womb from thirteenth week of gestation period. This is the same period when the cerebrum of the embryo likewise begins developing. In this way, the advancement in formation of fingerprints and the development of mind happens at the same time. This paper gives a brief summary about various features that can be obtained from fingerprints and the detailed procedure for the proposed algorithm to work and detect all the features so that they can be used for further classification, with the help of which brain mapping will be carried out.

Keywords- Biometrics, Image Processing, Fingerprints, Minutiae, Ridge ending, Thinning**.**

I. INTRODUCTION

The investigation of skin examples alludes to the investigation of arrangement of normally happening edges on certain body parts, to be specific palms, fingers, soles and toes. The fingerprints of both hands are not the same. They don't change pattern or shape throughout a man's life, aside from in instances of genuine wounds that scar the dermis. The uniqueness of a man's fingerprints have been connected to a man's identity and inclinations by solving down mapping of brain through fingerprints. The investigation of fingerprints has turned out to be more regular, subsequently, a few guardians started to examine their children prints; with the expectation to recognize their potential early, and give direction appropriately to extend their potential. The distinctive areas of our mind are reflected by our ten fingerprints. The elements extricated are essential for the goal of brain mapping.

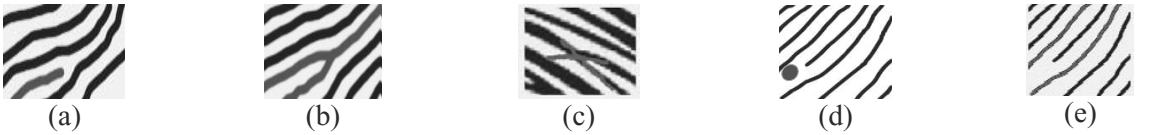

Figure 1. Types of minutiae observed: (a) Ridge Ending (b) Bifurcation (c) Crossover (d) Isolated Point (e) Continuing Ridge

Distinctiveness of fingerprints makes them a very alluring biometric identifier. Fingerprint recognition depicts the oldest method of biometric identification. Its history is backpedaling similarly as no less than 2200 BC [3]. A unique mark comprises of (as appeared in Figure.1)ridge endings, bifurcations (single point diverging on two sides), crossover (two ridges intersecting each other), dot (isolated point) and ridge continuing (does not terminate). The pattern of the ridges and valleys is unique for each individual. The probability of finding two fingerprints similar is of $1.9x10^{15}$ [1], [2].In this paper, first the previous work is illustrated in section II, then the proposed approach is discussed in section III. Thereafter the results are illustrated in section IV and the conclusions are drawn on the basis of results in section V.

II. PREVIOUS WORK

Not much of the work is done on brain mapping but a significant amount of relative work is done on fingerprints. Hence all the essential details required for the process of classification of fingerprint can easily be retrieved from the previous work pursued in this field from relevant papers. Byong Ho Cho et al. [3] presented a novel method on core analysis. For the classification purpose, till now the methods used were all based on singularity and minutiae but due to small size of image, the delta focuses are as often as possible barred. The calculation recognizes core point's rough approximation generally from directional image and investigates the nearby region of every core competitor. In this core detection, false core points claimed by noise are detected and sorted for recognition purpose. Xeujun Tan et al. [10] in his paper presented a new feature learning algorithm which unlike the conventional methods, uses combination of feature extraction and genetic programming thus learning composite features that have been adopted from amalgamation of the older primitive image processing operators. One of the best algorithms for the enhancement of fingerprints is Gabor Filter. Dingri Wan and Jie Zhou [11] in this paper showed the importance of fingerprints in the form of biometrics and for the process of identification as well as the task of verification. He has also pointed regarding the necessity of database to be of a certain kind and how when the database present if it is small, reliable and accurate results are obtained. A novel plan is proposed to advance investigate to what great a recreated unique mark can be like the first finger impression.

III. PROPOSEDALGORITHM

Here the proposed algorithm computes the five listed features useful for further stages. The main aim is to make sure that the features and their count is correctly detected by the machine and should be similar to that done by human eye.In implementation, proper identification and recognition of the fingerprints is essential. In order for their classification to correctly occur, proper knowledge of the appropriate algorithm to be implemented is essential. Thus fingerprint classification is the crucial step and the algorithm to be designed should be precise. An optimum method of a basic preliminary work of minutiae detection using a simple algorithm is illustrated. Instead of using the available database, fingerprints are acquired from an optical scanner. Optical imaging includes acquiring a computerized picture of the print utilizing noticeable light. This sort of sensor is, basically, a particular advanced camera. The top layer of the sensor, where the finger is put, is known as the touch surface. Underneath this layer is a light-radiating phosphor layer which enlightens the surface of the finger. The sensor utilized for this calculation is The Secugen® Hamster Plus scanner. The image obtained from this sensor is not directly used but following are the stages it goes through:

A. Image Acquisition
B. Image Enhancement
C. Binarization
D. Segmentation and Thinning
E. Feature Extraction

A. Image Acquisition

The images obtained from the sensor is of .bmp (bitmap) format and is taken from the sensor Secugen® Hamster Plus and it a very useful, convenient, and cost effective USB scanner. Compatible with all versions of Windows operating system including Windows 7 and operating system used is Windows 7. A database of 250 fingerprints has been created by taking from a total of 50 people.

B. Image Enhancement

Gaussian smoothing channel obscures a picture practically equivalent to the average filter. The level of smoothing is dictated by the standard deviation of the Gaussian. (Bigger standard deviation Gaussians, obviously, require bigger convolution portions so as to be precisely spoken to.).The Gaussian yields a `weighted normal' of every pixel's neighborhood, with the normal weighted more towards the estimation of

the focal pixels. This is rather than the average channels consistently weighted normal. On account of this, a Gaussian gives gentler smoothing and safeguards edges superior to a comparably estimated mean channel.

$$G(x,y) = \frac{1}{2\pi\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}} \quad (1)$$

C. Binarization

Finger trait picture binarization is to change the 8-bit gray finger impression picture to a 1-bit picture with 0-value for ridges and 1-value for creases. On completion of the operation, ridges in the fingerprint impression are highlighted with dark shading while other is white. This procedure registers a global threshold level that can be utilized to change over an image to a normalized image with a value that lies in the reach [0, 1]. The graythresh capacity utilizes Otsu's technique, which picks the threshold to minimize the intraclass difference of the high contrast pixels.

D. Segmentation and Thinning

Image is segmented in order to extract the required portion on which the processing and extraction is to be done.Edge Thinning is to dispense with the repetitive pixels of ridges till the ridges are only one pixel wide. The calculation utilizes an iterative, parallel diminishing procedure. In every sweep of the full unique finger impression picture, the calculation discounts repetitive pixels in every little picture window lastly uproots each one of those stamped pixels after a few outputs. Thinning utilizes Hit or Miss Transform.The definition of the "hit-miss" operation is:

$$A \otimes B = \{ \mathbf{x} \in E^n \mid B^1_{\mathbf{x}} \subseteq A \text{ and } B^2_{\mathbf{x}} \subseteq A^c \} \quad (2)$$

It can be shown that:

$$A \otimes B = (A \ominus B^1) \cap (A^c \ominus B^2) = (A \ominus B^1) - (A \ominus B^2) \quad (3)$$

where \ denotes the set-theoretical difference, $\otimes$ denotes the hit-or-miss transform and Θ denotes erosion.

E. Feature Extraction

A fingerprint impression is the generation of replicated portion a fingertip epidermis, created when a finger's impression is taken against a smooth surface. The basic normal peculiarity for a unique mark is an example of interleaved ridges and valleys; in a finger impression picture, ridges (additionally called sharp lines) are black though valleys are white. At the basic level, other vital components, called minutiae can be found in the unique finger impression designs. Minutia alludes to different ways that the ridges can be discontinuous. [8]

Minutiae Determination

The minute details and their relative positions to one another are then utilized for correlations. It is consequently apparent that the more exact the procedure of extraction of details, the more precise and solid the whole computerized fingerprint acknowledgment framework gets to be. The pixels relating to particulars minute details are described and separated by a crossing number. The crossing number (CN), CN (p) of a pixel p in a binary image is characterized as half the sum of the differences between pairs of adjoining pixels in the 8-neighborhood of p:

The CN value is then registered, which is characterized as half the sum of the differences between pairs of neighbouring pixels pi and pi-1[8]

$$CN(p)_{(x,y)} = \frac{1}{2}\sum_{i=1}^{8} \left| val(p_{i \bmod 8}) - val(p_{i-1}) \right| \quad (0)$$

where p0, p1 ...p7 are the pixels having a place with a requested arrangement of pixels characterizing the eight neighborhood of p and Val (p) $\in$ {0, 1} is the pixel value. Utilizing the properties of the CN, the edge pixel can be then named as ridge ending, bifurcation or non minutiae point from the estimated CN value.

Different features of minutiae can be determined by following pixel locations and patterns formed by them when using a 3*3 window:

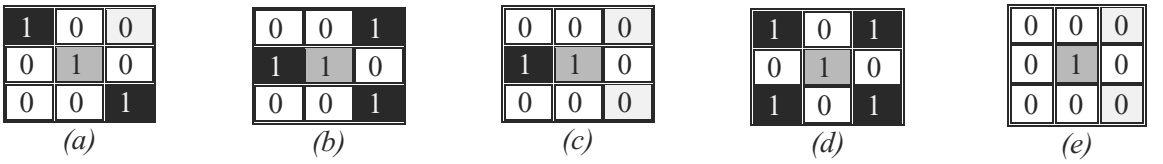

Figure 2. Types of minutiae pattern observed: (a) Continuing Ridge (b) Bifurcation (c) Ridge Ending (d) Crossover (e) Isolated Point

IV. RESULTS

In this section, by using the proposed algorithm the steps are done and the results are obtained. Five results from four different fingerprints are obtained and illustrated. The result obtained do contain false minutiae and have to eliminated. Below are examples for the implementation along with a table indicating the frequency of the features. Also displaying the frequency of occurrence of features illustrated.

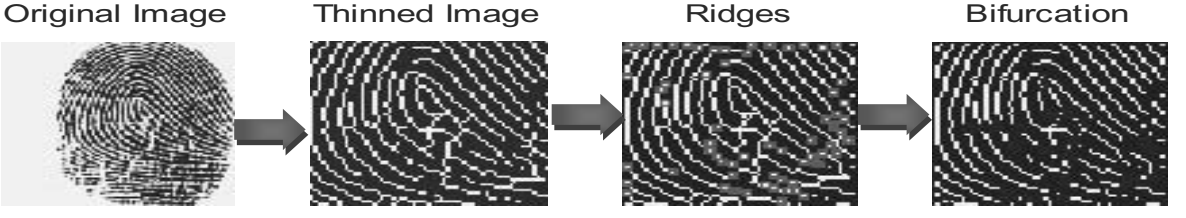

Figure3. Result of algorithm on Case 1

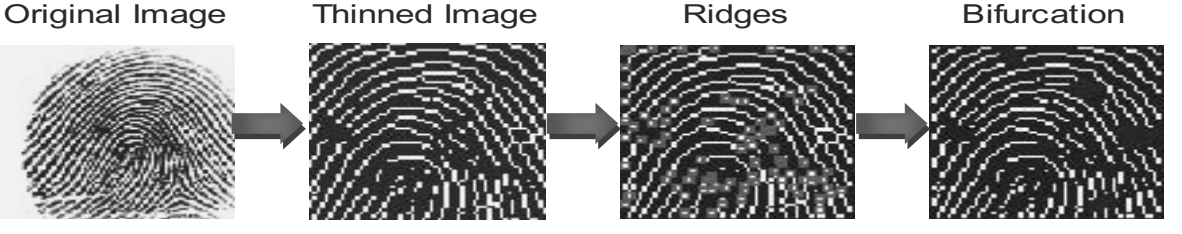

Figure 4.Result of algorithm on Case 2

Table 2. Frequency of Occurrence of Features

Count Number	Features extracted	Count of Features	
		Case 1	Case 2
0	**Isolated Point**	8	4
1	**Ridge Endings**	95	85
2	**Continuing Ridge**	757	637
3	**Bifurcation**	34	49
4	**Crossing**	2	4

V. CONCLUSION

Here, in this algorithm a minutia detection process has been described. A minutiae-based fingerprint feature extraction is a crucial basic step, where the main problem in feature extraction section is quality of fingerprint image. Most important factor in detection of minutiae stage would be detection of features like bifurcation and ridge endings so that when processed, false features are not generated. As observed in the result, it can be deduced that along with minutiae i.e. ridge ending and bifurcation, other significant features like the isolated point, crossing as well as continued ridges can also be extracted. Their frequency of occurrence can also be decided from the crossing number.Thus crossing number and its algorithm is successful in determination of features and can be improved by eliminating the false points and further taking the features extracted for determining the singularities which would further lead to proper classification.

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For Fiber-to-the-home (FTTH) Architecture using Passive Optical Network (PON): A Review

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Abstract- For continuous Fiber-to-the-Home (FTTH) Architecture to perform the different the sort of building design to engender to the number of nodes for the every client are to be expanded velocity designation or the quantity of administrations are to be making a number of client's are to provide.Fiber utilize numerous entrance systems can convey execution that can match the expanding demand for fast connections.One of the most recent advancements that have given out lately is Gigabit Passive Optical Systems.To take on future data transmission needs and existing Fiber-to-the-home (FTTH) access systems must be maintained.This transmission permits the on the other hand conveyance of administration (custom data, custom voice and live video).It is exhibited that as we build the data charge per unit, then number of clients to be suited reductions because of expansions in BER in custom information sign.Moreover, it is shown that as we increase the separation of TX and Rx for transmission the estimation of bit mistake rate expands which is impossible.On the off chance that the most recent few year to accommodate the optical fiber are two enormous issues is to first time suit continuously after being less upkeep charge.
Keywords- Passive Optical Network (PON); Fiber-to-the-Home (FTTH); BER; Optical Network Unit (ONU); Optical Line Terminator (ONT)etc.

I. INTRODUCTION

The optical access system is otherwise addressed the "First-Mile-Network," to interfaces the every client administration supplier through focal workplaces (COs) to individual supporters for higher pace request and benefits [1]. This structural planning is additionally alluded to in the writing as the endorser optical access system with the nearby circle for client access. The transfer speed require in the various access system has been expanding rapidly in the course of recent years in wired correspondence [2]. Private supporters request first-mile structural engineering, optical numerous entrance arrangements that have high transfer speed what's more, piece rate and other media rich administrations [2].

Additionally, for corporate clients request fast broadband foundation through which they can tie in their neighborhood (LAN) to the Internet spine utilizing fiber link.The divider can be housed in an optical focal office or a platform in the every area close to the homes served for wired connections [3]. Here every home joined through the optical fiber for a number of splitter and the optical fiber through achieving the every client administrations. The top side of the detached optical system (PON) is that this platform is latent it doesn't involve any force as would a switch or hub for fiber to the house or any sort of the visual scheme [2]

II. DEVELOPMENT OF OPTICAL NETWORK

With the promotion in the correspondence frameworks, there is an interest for huge transfer speed to post more data at higher velocity. Private supporters request fast system for every administrations [2]. This requests the systems of higher mental capacities at lower prices.Our present "Period of Technology" is the outcome of numerous splendid advancements and disclosures, yet it is our capacity to send data for

the media we used to do it for that is maybe generally dependable for its improvement [3].Optical correspondence innovation gives the answer for higher transmission capacity [2].

III. LITERATURE REVIEW

A. Evolution of the Point-to-Point, Curb-to-Switch and Passive Optical Network required the Transceiver:

Optical fiber is capable of delivering large bandwidth intensive, integrated, voice, data, and video services at distances beyond 20 km in the subscriber access network [4].A logical way to deploy optical fiber in the local access network is using a point-to-point (P2P) topology and Point-to-multipoint (P2M) with dedicated fiber runs from the local exchange to each end-user subscriber as well as connector termination space in the local exchange [4]. Considering N subscribers at an average distance L km from the fiber central office and P2P and P2M design requires 2N transceivers and N * L total fiber length (on single fiber is used for bidirectional transmission) [4].

B. According to the speed of in Access Network for the various Passive Optical Network:

Movement patterns in access arrangements have created from voice furthermore, message situated administrations to video and picture based administration [5]. A TDM-PON (Time Division Multiple Passive Optical System) imparts a solitary transmission channel to various endorsers in time area. At that level, there exists a nearby coupling between subscribers [5].A WDM-PON (Wavelength Division Multiple Access-Passive Optical Network) gives point-to-point optical network using a dedicated pair of wavelengths per client [5].

C. Ultra Low Banding Loss using the Nano-engineeringRing for Higher Speed:

A novel ultra-low twisting misfortune single-mode fiber with ring including nanometer measured elements is composed and developed. Twisting misfortune under 0.1 dB/turn at 1550 NM what's more, a twist sweep of 5 mm is exhibited [6].

They are following characteristics to Nano-engineering Ring [6]:

- Fiber design, which consists of a German-doped core and a Nano-engineered ring in the cladding.
- The band consists of nanometer-sized gas filled voids that are integrated in the ice during the fiber processing.
- These videos are non-periodically distributed in the hoop Cross-section.
- The cross-segments of the voids are circular and have diameters ranging from several lots to several hundreds of nanometers. The void fill fraction can be planned to be between 1 to 10 percent, depending on the ring dimension [6].

D. Number of Services for various Passive Optical Network (PON):

These numbers of governments will incorporate investigation and repairs, for example, IPTV (Internet Protocol TV), TV on request (VoD), training on interest (EoD), HDTV (High Definition Television), television conferencing, top notch intuitive video play, and video observations [7]. With the late presentation of HD quality camcorders, it is getting to be less demanding for purchasers to produce high-transfer speed signals for upstream transmission [7]. In that regard are a few general methods for putting crosswise over with various supporters sharing a solitary PON structural planning, too, we tended to a few of these suggestions, such as TDM (Time Division Multiplexing), WDM (Wavelength Division Multiplexing), SCM (Space Division Multiplexing), what's more, CDM (Code Division Multiplexing) [7].

F. Ladder and Grid Architecture for Short Distance:

Step and framework systems having fixed link courses can be created with less optical strands when contrasted with straightforward duplication with TDM by boosting the utilization of the existing

optical strands [8].In accession, systems made out of universally useful WDM gadgets have a basic self-assurance component worked with shifting the OLT and ONU wavelengths at both ends of the system [8].This construction design to most involvement is to acquire one of the matrix is to block at a period other are no impacts in correspondence and same as the Ladder system [8].

G. Long Distance for Gigabit Ethernet PON for 56 Optical Network Units:

FTTH (Fiber to the Home) utilizing GEPON (Gigabit Ethernet Passive Optical Network) join plan for 56 Optical Network Units at 20 km reach at 2 Gbps bit rate to transmission for every client same velocity [9]. A 1:56 splitter is utilized as a PON (Passive Optical Network) component are used to correspondence between a Central Office to various clients end with splitter proportions [9]. This usage reproduced an improved for GE-PON based FTTH numerous entrance system to give home employments supporters with triple play administrations [9]. We distinguished the necessities of GE-PON various access system with contemplations of greatest administrations and PON particular layered capacities. To meet those requests would we be able to reenacted an enhanced construction modeling and key out the natty gritty parts of real parts [9]. This building design are to the greater part of the correspondence between the Optical Line Terminator (OLT) to Optical Network Units (ONUs) [9].

H. Comparison of BER verses User Access:

Passive Optical Network (PON) gives a viable conclusion for the future optical access systems because of its expansive transmission capacity and vitality sparing.Creator demonstrated that with just 10 Gbps of information rate with less mistakes in implementation can be an expert for a symmetrical PON are a bidirectional for 50 km feeder utilizing 64 clients to benefits paid [10].These operations and reliable results are adequate for high information rate PON applications [10].In this construction plan or act of client access than the BER are expansions and less number of customers at once BER are high [10].

H. Cost Economy of Various Network for Fiber-to-the-Home Architecture:

The peak of this instruction is to investigate monetary parts of a co-venture plan for present and future degree FTTH utilizing PON architectures [11Accountants in the mental process of characterizing the kind of speculation they will gather to give fast broadband administrations are thoroughly looked at the budgetary ramifications of the charging of various different access arrangements [11].This article examines the fiscal complications of co-investing resources into FTTH utilizing PON architectures for each user's.Current and cutting edge PON innovations have been researched in the field [11].

The venture per home passed and the speculation per home associated, have given applicable data with regard to the cost per client's ramifications of a co-venture plan. Further request can offer experiences into different viewpoints of a system sharing understanding [11]. These advancements are investigated and evaluated for the carrying out of the premise of parameters such as Bit Error Rate (BER), Quality variable (Q element), Signal to Noise Ratio (SNR) and information yield powers at each client to shifts separation. For the examination of PON advances, distinctive split proportions like 1:8, 1:16, 1:32, 1:64 and 1:128 are likewise considered [10]. FTTH PON architectures have been investigated and they achieve extendibility has been studied.The PON structural engineering has been expected to provide clients with full triple play administrations like voice, TV, and information at bigger distances.Parameters, for example, BER, Q variable, SNR and information yield powers for various numbers of clients have been believed to examine the EPON (Ethernet Passive Optical Network), GPON (Gigabit Passive Optical Network) and XGPON (Next Era Passive Optical Network) innovations at the most extreme conceivable separations [11].

IV. CONCLUSIONS

From summarized analysis of a few architectures of latent optical system (PON) system for Fiber-to-the-Home (FTTH) and they have offered the administrations to end clients. And

every one of the administrations are to be a few parameters are to minimize and augment for each client fulfillment. After all accessible innovation to outline the new system for future reason for proficient approaches to each client's fulfillment from the present and past technique. In FTTH utilizing PON for the improvement of development optoelectronics advancements and the colossal volume in yield of optical modules will likewise accelerate the reduction in cost.

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A Smart Sensor Interface for Industrial IOT Environment

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Abstract- Internet of Things (IoT) could be a world network of "smart devices" which will sense and act with their atmosphere victimization the net for his or her communication and interaction with users and alternative systems [1]. The options of a "smart device" that contact as a member of IoT network area unit, collect and transmit information, actuate devices supported triggers and receive information(from network or internet). Presently in our country, the water analysis is completed manually by taking the samples from the water sources (lake) and sent to the research lab (TWAD) for investigation. so as to make sure the safe offer of the potable the standard must be monitor in real time. during this project we tend to gift a coffee value system for real time watching of the water quality in IOT(internet of things)[3].The system include many sensors is employed to mensuration physical and chemical parameters of the water. The parameters like temperature, PH, turbidity, of the water may be measured. The measured values from the sensors may be processed by the core controller. The ARM7 (LPC2148) may be used as a core controller. Finally, the sensing element information may be viewed on web.
Keywords-Internet Of Thing (IOT), Sensor Data Acquisition, water Quality monitoring zigbee technology.

I. INTRODUCTION

Internet of Things (IoT) is associate degree integrated a part of future net and will be outlined as a dynamic international network infrastructure with self-configuring capabilities supported customary and practical communication protocols wherever physical and virtual „things" have identities, physical attributes and virtual personalities and use intelligent interfaces that are seamlessly integrated into the knowledge network[1]-[3]. In the IoT, „things" are expected to become active participants in business, info and social processes wherever they're enabled to act and communicate among themselves and with the atmosphere by exchanging knowledge and knowledge sensed concerning the atmosphere, whereas reacting autonomously to the „real/physical world events and influencing it by running processes that trigger actions and build services with or while not direct human intervention[4]-[5] .Interfaces within the type of services facilitate interactions with these smart things" over the web, question and alter their state and any info related to them, taking into consideration security and privacy problems .The water quality watching is that the essential would like for the human life. There are numbers of diseases that cause through the impure drinkable. The water are going to be impure by the individual, animals, natural disasters and seasonal changes. So, folks got to awake to their own neighbor hood water bodies conditions [6]. To modify this, an image is planned to watch water quality in IoT atmosphere.

Water could be a restricted resource and is crucial for agriculture, business and for creatures existence on earth together with citizenry [8]. Water quality watching is crucial to regulate the physical, chemical and biological characteristics of water. It provides info concerning the present health of the water body, whether or not the water body meets the selected use and the way it's modified over time. Info gathered is wont to counsel that the water body needs improvement to fulfil its selected use and result in actions to safeguard and restore the health of the water body [9]. As an example, drinkable mustn't contain any chemical materials that would be harmful to health; water for agricultural irrigation ought to have low atomic number 11 content water for industrial uses ought to be low in bound inorganic chemicals. Additionally, water quality watching will facilitate with pollution detection, discharge of deadly chemicals and contamination in water [10]-[11]. Temperature, pH and turbines are the standard parameters collected in river/lake water quality watching systems.

II.ARCHITECTURE

We design a smart sensor interface in IOT environment that integrates data collection, data processing and wired or wireless transmission together .The device can be widely used in many application areas of the IOT.

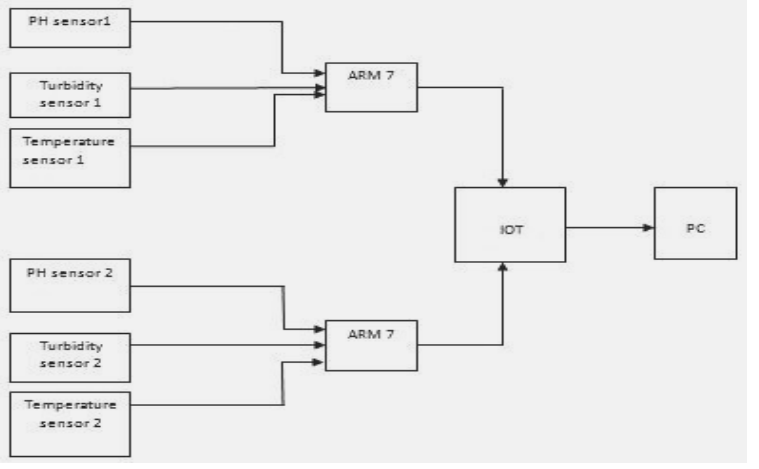

Figure 1. Architecture of A Smart Sensor Interface for Industrial IOT Environment

Figure 1. is the application and working diagram of the smart sensor interface and wireless communication through zigbee module Temperature Sensor (DS18B20)1-Wire interface needs only 1 port pin for communication, Multi drop capability simplifies distributed temperature sensing applications needs no external parts are often high-powered from knowledge line. Power provide vary is three.0V to 5.5V Zero standby power need Measures temperatures from -55°C to+125°C. physicist equivalent is -67°F to +257°F zero.5^{0}C accuracy from -10°C to +85°C measuring device resolution is programmable from nine to twelve bits Converts 12-bit temperature to digital word in 750 ms (max.) User-definable, non-volatile temperature alarm Settings Alarm search command identifies and addresses devices whose temperature is outside of programmed limits (temperature alarm condition) Applications embody regulator controls, industrial systems, shopper product, thermometers, or any thermally sensitive system.

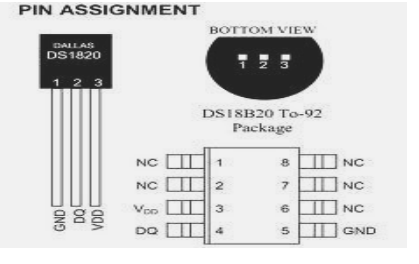

Figure 2. A Pin Description for Temperature Sensor

Figure 2. is pin description of the pH Sensor WQ201Global Water‟s pH Sensor is a rugged and reliable water pH measuring device. The pH transmitter is mounted on 25 ft of marine grade cable, with lengths up to 500 ft available upon request. The sensor‟s output is 4-20 mA with a three-wire configuration. The WQ201‟s electronics are completely encapsulated in marine grade epoxy within a stainless steel housing. The unit also uses a removable shield and replaceable pH sensor element for easy maintenance. As with all of Global Water‟s 4-20 mA output sensors, you can add recording and control capabilities to the

WQ201 with the GL500 Data logger and the PC320 Controller. The GL500 connects to the pH sensor‟s 4-20 mA output to record data, and the PC320 Controller connects to the sensor‟s output to control pumps or alarms.

Figure 3. pH Sensor

Figure 3.is the Turbidity Sensor is highly sensitive system supported array of high gain infrared optics provides glorious accuracy at low murkiness. Exceptional close light-weight rejection is achieved with infrared transmission modulation .Advanced compound coating of optical system resists fouling and minimizes field maintenance needs. Digital temperature compensation technology ensures stable performance over a large temperature varies. The murkiness device style relies upon Associate in nursing infrared electrode Associate in Nursing receiver module and an electronic detection and activity unit. The optical system transmits Associate in nursing infrared beam of 860nm and detects the break up intensity to work out murkiness

We design a smart sensor interface device that used LPC2148 Microcontroller It acts as chief of whole structure and it's totally assembled with 16-bit ARM7TDMI-S microcontroller, eight to forty K of on-chip static RAM, thirty two to 512 K of on-chip flash program memory, 2 10-bit A/D converters deliver a complete of 6/14 analog inputs, Single 10-bit DAC provides versatile analog output, Multiple serial interfaces as well as 2-UARTs, 2 quick I2C-bus, 60 MHz max. Mainframe clock on the market from programmable on-chip and outcome of the Zigbee receiver can connect with computer Desktop by RS232.

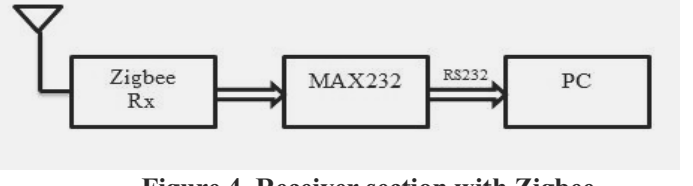

Figure 4. Receiver section with Zigbee

Figure 4.is the diagram of receiver section with Zigbee. The focus of network applications underneath the IEEE802.15.4 / ZigBee commonplace embrace the options of low power consumption, required for under 2 major modes (Tx/Rx or Sleep), high density of nodes per network, low prices and easy implementation.2.4GHz and 868/915 Mc twin PHY modes [14].This represents 3 license-free bands, Low power consumption, most information rates, High output and low latency for low duty cycle applications (0.1%), Channel access victimisation Carrier Sense Multiple Access with Collision rejection (CSMA - CA), Addressing area of up to sixty four bit IEEE address devices, 65,535 networks, 50m typical vary, totally reliable "hand-shake" information transfer protocol, totally different topologies as illustrated below: star, peer-to-peer, mesh [16].

III. CONCLUSION

In this proposed system, the look and development of the real- time watching of the water quality parameters in IoT atmosphere is bestowed. The projected system consists of many water quality parameter sensors, ARM7 (LPC2148) as a core controller. These devices area unit low value, additional economical. This implementation appropriate for atmosphere watching, scheme watching, etc. and therefore the information will be viewed anyplace within the world. Within the future, we tend to attempt to implement biological parameter of the water and install the system in many location of pool and additionally in water distribution network to gather water quality information and send to water board.

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Power Factor Improvement Using ARM11 Microcontroller

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Abstract- The purpose of this proposed system is to implement a power factor improvement technique that compensates unwanted effect of reactive load which gives power factor less than unity. The technique used in this proposed system is simple and cost effective power factor measurement and improvement technique by using Arm 11 microcontroller .The proposed system is applicable to domestic area as well as to industrial area. As inductive loads gives low power factor also home appliances has low power factor so there is need of power factor improvement. The proposed system has ability to sense power factor and by proper algorithm capacitor bank is switch on to compensate power factor. The lead-lag of power factor shows on LCD display [1].

Keywords-Power factor, ARM , ZCD, Reactive Power ,KVA,KW

I. INTRODUCTION

Most of the appliances consumed the electricity are of inductive type. The inductive load has a lagging power factor, due to lagging power factor the power losses in the power system increases. The capacitor plays the important role in compensating the reactive power. This improvement in power factor helps to avoid the heavy penalties and also offer incentives to the consumer.

1.1 Methods of Power factor improvement:

1.1.1 Static Capacitor:

Most of industrial and power system loads are inductive type that takes the lagging current which decreases the power factor of the system. For improving Power factor, Static capacitors are connected in parallel with those devices which work on low power factor. The static capacitors provide leading current which neutralizes the lagging inductive component of the load current (i.e. leading component neutralize or eliminate the lagging component of the load current) hence the power factor of the load circuit is improved. These capacitors are installed in the large inductive load for e.g. Induction motors and transformers etc. and improve the load circuit power factor for improving the system or devices efficiency. Power Factor improvement by static capacitor phase advancer and synchronous-condenser. Suppose a single phase inductive load which is taking lagging current (I) and the load power factor is Cosθ. A Capacitor (C) has been connected in parallel with load. Now a current (Ic) is flowing through the Capacitor which lead by 90° from the supply voltage (Capacitor provides leading Current i.e., In a purely capacitive circuit, Current leading by 90° from the supply Voltage, in other words, Voltage are 90° lagging by the Current). The load current is (I) and the Vectors combination of (I) and (Ic) is (I') which is lagging from voltage at θ2.

It can be seen that angle of θ2 < θ1 i.e. angle of θ2 is less than from angle of θ2. Therefore Cosθ2 is less than from Cosθ1 (Cosθ2> Cosθ1). Hence the load power factor is improved by capacitor [9].

1.1.2 Synchronous Condenser:

A Synchronous motor when operates on No-Load and over-excited then it is called as synchronous Condenser. Whenever a Synchronous motor is over-excited then it starts providing a leading current and works like a capacitor. When a synchronous condenser is connected across the supply (in parallel) then it starts drawing leading current and partially eliminates the re-active component in this way power factor is improved by synchronous motor. Generally the synchronous condensers are used to improve the power factor in large industries [2].

1.1.3 Phase Advancer:

It is a simple AC exciter which is connected on the main shaft of the motor and operates with the motor's rotor circuit for power factor improvement. It is used to improve the power factor of induction motor in industries. As the stator windings of induction motor takes lagging current 90° out of phase with Voltage, therefore the power factor of induction motor is low. If the exciting ampere-turns are excited by external AC source, then there would be no effect of exciting current on stator windings. Therefore the power factor of induction motor will be improved. This process is done by Phase advancer [9].

1.2 Need of concept :

Power factor is ratio of KW and KVA drawn from electrical load where KW is actual load power and KVA is apparent power. It is measure of the efficiency of power being used so a power factor of 1 of the supply is being efficiently used [7].

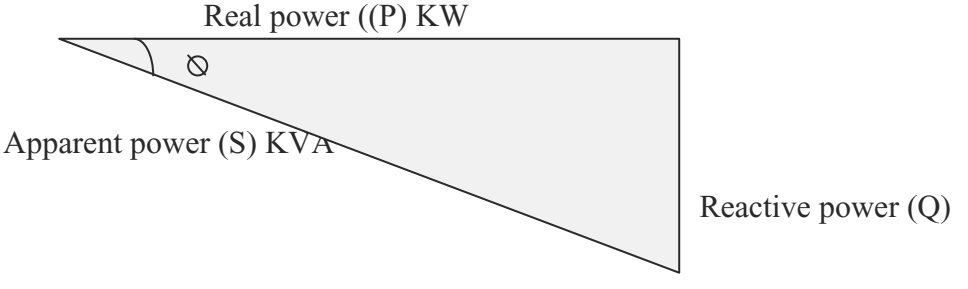

Fig.1. Power triangle

The different components of AC power are relate using the power triangle. Real power shown horizontally in the direction of î as it is a pure real component of AC power. Reactive power shown in the direction of ĵ as it is a pure imaginary component of AC power. Apparent power represents a combination of both real and reactive power, so this can be calculated by using the vector sum of these two components. So the mathematical relationship between these components is: $\mathbf{P^2 + Q^2 = S^2}$

Increased in power factor, increases ratio of real power to apparent power and reaches near unity while the angle θ decreases and the reactive power decreases. If the power factor decreases then the ratio of real power to apparent power also the angle θ increases and therefore reactive power increases. So there is need to improve power factor [10].A load with a power factor of 1.0 result in the most efficient loading of the supply and if a load with a 0.5 power factor, will result in much higher losses in the supply system. A poor power factor is the result of either a significant phase difference between the voltage and current at the load terminals, or it can be due to the high harmonic content or it can be distorted/discontinuous current waveform [11]. Poor load current phase angle is generally the result of an inductive load such as an induction motor,

power transformer, lighting ballasts, welder or induction furnace. A distorted current waveform can be the result of a rectifier, variable speed drive, switched mode power supply, discharge lighting or other electronic load [11].Most of inverters are quoted by having a power factor of greater than 0.95 when in reality, and the true power factor is between 0.5 and 0.75. The power factor of 0.95 is based on the Cosine of the angle between the voltage and current but does not take apparent power, Active power, Reactive Power into account that the current waveform is discontinuous and therefore contributing to increased losses on the supply. The proposed system uses arm 11 microcontroller which calculate the power factor of given load according to its sensed signal and add capacitor bank to it if power factor is low .capacitor gives reactive current required for reactive power into supply, so total amount of apparent power supplied to load will be less . Power factor improvement capacitor reduces current drawn from supply and increasing power factor of load.

II.BLOCK DIAGRAM

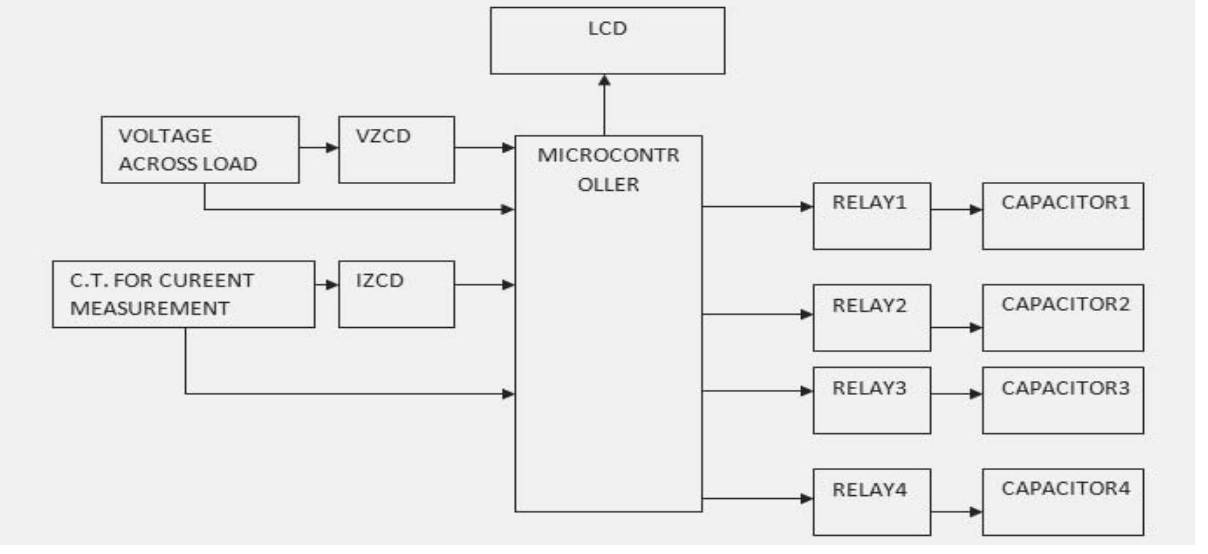

Fig.2 Block diagram

Given above is the block diagram of automatic power factor improvement system. The input to the circuit is applied from the regulated power supply. The AC input 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output of the rectifier is a pulsating DC voltage. So in order to get a pure DC voltage, the output voltage from the rectifier is given to a filter to remove any AC components (ripple content) present even after rectification.

The supplied voltage and current signals are taken by a potential transformer and a current transformer. The two sinusoidal waveforms are changed in to square waves by two zero-crossing detectors. These digital square waves are used by ARM microcontroller to calculate phase difference and thus power factor. A capacitive load bank is used for developing an electric load, applied to an electrical power source and converts or dissipates the resultant power output of the source and it will help to improve power factor. The status of APFC system is shown on the LCD such as lagging or leading, calculated power Factor etc. ARM Microcontroller used is LPC 1768 which is heart and brain of the entire APFC system. It takes input from user and zero crossings of current, voltage waveforms. It controls the capacitor bank which will compensate for leading or lagging power factor.

III. FLOW CHART

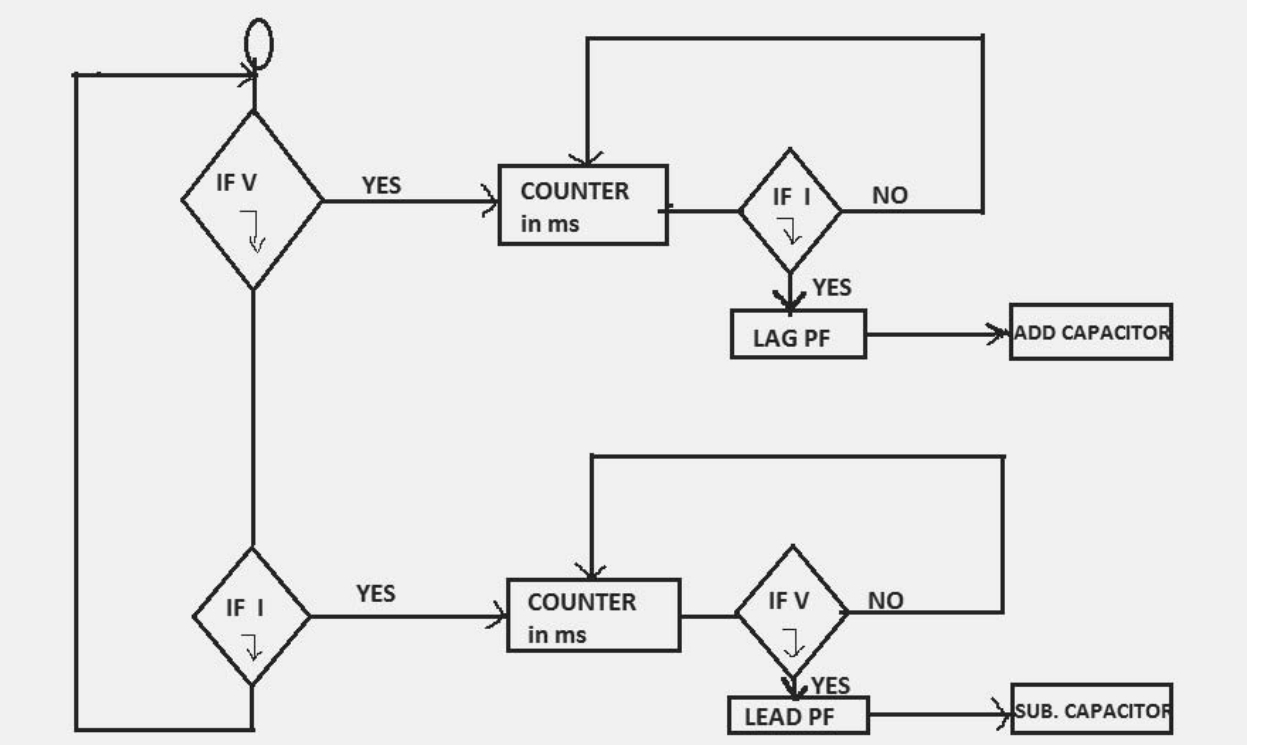

Fig .3 Flow chart

Microcontroller detects whether the first voltage edge is falling down or current edge. Depending upon this logic it detects whether power factor is lagging or leading, accordingly it switches on or off number of capacitors in order to improve power factor [4].

IV.CONCLUSION

The proposed system shows efficient technique to improve the power factor of inductive load by economical way. The static capacitors are used to improve the power factor industries and in some home appliances. The proposed system calculate power factor based on algorithm then uses capacitors when power factor is low otherwise it cut off from line because switching is done automatically. It improves power factor as well as increases capacitor life.

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Implementation of Sketch Based and Content Based Image Retrieval

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Abstract- In this paper we propose a novel approach to combine Sketch Based and Content Based Image retrieval. The database of the images is growing rapidly and there is huge demand in the enhancement of the retrieval of the images. Color, shape, texture, spatial layout are the main attributes to represent as well index the images. These features of images are extracted to check similarity between the images. Generation of special query is the chief trouble of content based image retrieval. By using different algorithms the similarity between the extracted features from the images are checked. Sketch based image retrieval is efficient and main method which are not necessarily having a high skill to draw the query sketch. To overcome these disadvantages we proposed combination of Sketch Based and Content Based Image retrieval. Experimental results show that proposed system is much better than the single systems.
Keywords- Sketch based image retrieval; Content based image retrieval, Feature extraction.

I. INTRODUCTION

Sketch Based Image Retrieval (SBIR) and Content Based Image Retrieval (CBIR) problems are discuss by many researchers in different ways and numbers of techniques are proposed to retrieve images effectively from the databases. All the existing systems are independent like some retrieve the content based images and some retrieve sketch based images. To improvise the search efficiency we come up with a effective way by combining the sketch and content based techniques. An image retrieval system provides an effective way to access, browse, and retrieve a set of like images in the real-time applications. We can easily recognize objects from other people's sketches, and this form of expression is arguably the most common interaction tool for people who speak different languages. Compared with keywords, a sketch is generally more descriptive, breaking down the language barrier. Content-based image retrieval (CBIR) is the application of computer sight to the image retrieval trouble, so as to the hard of searching for digital image in big databases. "Content-based" means with the purpose of explore will examine the literal contents of the image. Here the term content in this context might submit to shade, figure, surface, or some other information that can be derived from the image itself [1].

Implementing SBIR and CBIR together will increase the searching efficiency of the system. Several approaches for SBIR have been proposed. However, to attain interactive query reply, it is impossible to compare the sketch to all images in the database right away. Instead, descriptors are extracted in a preprocess and stored in a data structure for fast access. Very commonly, the descriptors are interpreted as points in a high-dimensional space and finding close matches means searching for nearest neighbors in this space. Researchers have developed many offline as well as online CBIR systems using a combination of two or more image features and some have been successful in retrieving similar images with good precision and recall values. Several CBIR systems such as VIR image engine from Virage Inc., IBM's QBIC and Excalibur from Excalibur technologies are available as commercial packages. Many systems such as Visual SEEK, Surf image, Photo book, Chabot, Netra and MARS have been developed on experimental basis by academic institutions and researchers to demonstrate the feasibility of new techniques. Working demonstrations of many of these are available on the web.

II. LITERATURE SURVEY

Many research attempts have been committed in addressing the Content Based Image Retrieval (CBIR) problem [2] ans Sketch Based Image Retrieval (SBIR). Various methods have been proposed in the literature for sketch-based and content based Retrieval. The main aspect of image retrieval system is to offer an efficient way to access, browse, and find similar images in the real-time applications.

2.1 Content Based Image Retrieval (CBIR)

(CBIR) is a method that is used to look at image features like (color, shape, texture) to find a query image from database. The difficulties of CBIR lie in reducing the differences of contents based feature and the semantic based features. This problem in giving effective retrieval images and channelize the researchers to use (CBIR) system ,to take global color and texture features to achieve, the good retrieval, where others used local color and texture features[3].The method in [4] presented the holistic representation of spatial envelop with a very low dimensionality for making the incident image. This approach presented an outstanding result in the scene categorization. The method in [5] proposed a modern approach for image classification with the open field design and the concept of over-completeness methodology to achieve a preferable result. As reported in [5], this method achieved the best classification performance with much lower feature spatiality compared to that of the former schemes in image classification task.

Tiwari et al developed a CBIR system [PATSEEK] for US based patent database as a patent always consists of an image along with textual information. For similarity search [6] the user need to enter keywords along with the query image that might appear in the text of patents. Krishnan et al developed CBIR based on color, based on the rife colors in the foreground image which gives only the semantics of the image. Dominant color identification by using foreground objects alone is able to retrieve number of similar images considering the foreground color irrespective of size. Higher average precision and recall rates compared to the traditional Dominant Color method were obtained successfully [7].In another system the image is represented by a Fuzzy Attributed Relational Graph (FARG) that describes each object in the image, its attributes and spatial relation. The texture and color attributes are computed in a way that model the Human Vision System (HSV) [8].

2.2 Sketch Based Image Retrieval (SBIR)

Sketch-based image retrieval (SBIR) is a relevant means of querying large image databases. All of researches focus on how to solve the gap between sketch and image matching problem. The Sketch-based image retrieval (SBIR) was introduced in QBIC [20] and Visual SEEK [9] systems. In these systems the user draws color sketches and blobs on the drawing area. The images were divided into grids, and the color and texture features were determined in these grids. The applications of grids were also used in other algorithms, for example in the edge histogram descriptor (EHD) method [10]. The disadvantage of these methods is that they are not invariant opposite rotation, scaling and translation. Lately the development of difficult and robust descriptors was emphasized. Another research approach is the application of fuzzy logic or neural networks. In these cases the purpose of the investment is the determination of suitable weights of image features [11].Early sketch based image retrieval systems were typically driven by queries comprising blobs of color or predefined texture [12] [13]. Later systems explored shape descriptors [14] and spectral descriptors such as wavelets [15]. Eitz et al. [16] introduced a grid based approach to shape retrieval, dividing the image into regular grids and locate photos using sketched depiction of object shape. Sciascio et al. [14] investigate extracting shape feature in photo-realistic images using image segmentation.

Ma et al. [17] proposed a Poisson-based HOG and organized the codebook in a hierarchical vocabulary tree. To better measure visual similarity, Shrivastava et al. [18] learned the data-driven uniqueness (weights) for blocks of HOG. Gong et al. [19] combined HOG and MLBP [20] for face image retrieval. In addition to HOG based descriptors, Eitz et al. [21] utilized shape context [22] to perform retrieval.

III. PROPOSED SYSTEM

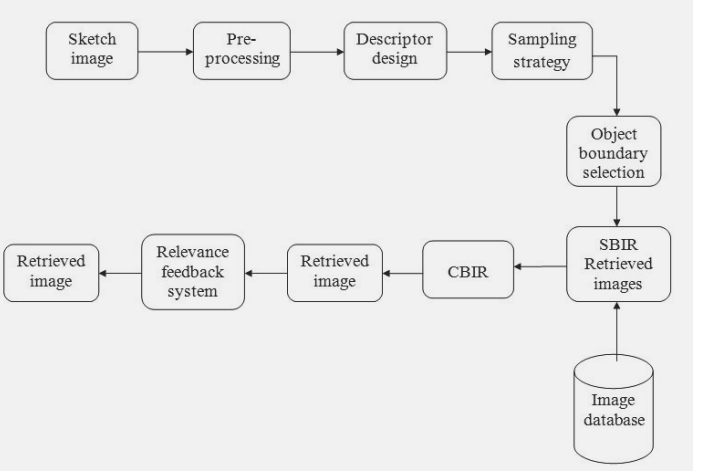

Fig. 1 General Architecture of sketch and content based image retrieval system

Figure shows a typical architecture of a sketch and content based image retrieval system. In this system the query sketch was taken by translating original image into sketch image. Then we propose a new line segment-based descriptor named histogram of line relationship (HLR).our line segment-based descriptor HLR has two advantages. First, it focuses on directly capturing higher level information. Since the object shape is determined by these relationships, our HLR is better able to describe the sketches/object boundaries. Second, since our HLR is a line segment-based descriptor, it is able to selectively capture a subset of neighboring line segments rather than capturing all of them, which makes it quite flexible and serve as the basis for noise impact reduction. The sampling strategy has a significant influence on performance. Noisy edges widen the appearance gap between sketch images and photo-realistic images and subsequently degrade retrieval performance. However, the human visual system is not usually impacted by these noisy edges since humans can differentiate the shaping edges and noisy edges based on their inference ability. Inspired by this observation, we propose a novel object boundary selection algorithm to predict the shaping edges. To the best of our knowledge, this object boundary selection algorithm is the first method to aim to reduce the impact of noisy edges in a SBIR system. Then images are retrieved for SBIR system.

These digital images are given to content based image retrieval system(CBIR).Content based means that search will analyze the actual content of the image. The term content in this context might refer colors, shapes, texture or other information that can be derived from the image itself.

The CBIR system uses ordered-dither block truncation coding (ODBTC) for the generation of image content descriptor. In the encoding step, ODBTC compresses an image block into corresponding quantizers and bitmap image. Two image features are proposed to index an image, namely, color co-occurrence feature (CCF) and bit pattern features (BPF), which are generated directly from the ODBTC encoded data streams without performing the decoding process. Then images are retrieved for CBIR system. CBIR systems can make use of relevance feedback; Relevance feedback retrieval systems prompt the user for feedback on retrieval results and then use this feedback on subsequent retrievals with the goal of increasing retrieval performance.

IV. RESULTS

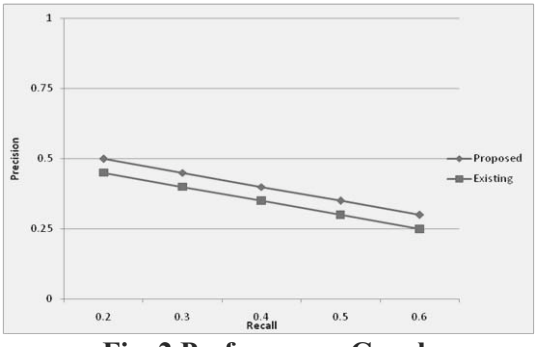

Fig. 2 Performance Graph

4.1 Precision and Recall graph diagram

These are approximately estimated results for precision and recall graph calculated from the formula as follows:-

Precision = No. of relevant images retrieved / Total no. of images retrieved

Recall = No. of relevant images retrieved / Total no. of relevant images retrieved

Table No. 1. Comparison table

Recall	Existing	Proposed
0.2	0.45	0.5
0.3	0.4	0.45
0.4	0.35	0.4
0.5	0.3	0.35
0.6	0.25	0.3

V. CONCLUSION

In the proposed system we have merged Content based and Sketch based techniques. The results shown in the result section shows the comparison of the existing system with the proposed systems. 0.5% of efficiency is increased as per the data table discussion.

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Green Building Automation

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Abstract-A building that uses both technology and process to create a facility that is safe, healthy and comfortable and enables productivity and well-being of its occupants. With lots of energy crisis in today's world now it's important for architects, engineers and construction managers to make buildings which are energy efficient and intelligent by its functions and as well as its usage too. Building automation is the automatic centralized control of a building's heating, ventilation and air conditioning, lighting and other systems through a Building Management System or Building Automation System (BAS). The objectives of building automation are improved occupant comfort, efficient operation of building systems, and reduction in energy consumption and operating costs. We are designing a system for building automation .In which PIC18F4520 microcontroller, different sensors like temperature sensor, light sensor and motor to automate the system.

Keywords-PIC microcontroller 18f4520, Motion Sensors, Temperature Sensor, Light Sensor, Motor Driver IC L293D , DC Motor.

I.INTRODUCTION

Building automation is the automatic centralized control of a building's heating, ventilation and air conditioning, lighting and other systems through a Building Management System or Building Automation System (BAS). The objectives of building automation are improved occupant comfort, efficient operation of building systems, and reduction in energy consumption and operating costs. Technologies applied in intelligent buildings will improve the building environment and functionality for occupants, while reducing operational costs. Smart or clever buildings, perhaps focus on control systems, but intelligent buildings goes far beyond this. An intelligent building has an implicit logic that effectively evolves with changing user requirements and technology.

BAS core functionality keeps building climate within a specified range, provides light to rooms based on an occupancy schedule (in the absence of overt switches to the contrary), monitors performance and device failures in all systems, and provides malfunction alarms to building maintenance staff. A BAS should reduce building energy and maintenance costs compared to a non-controlled building. Most commercial, institutional, and industrial buildings built after 2000 include a building automation system.

An Intelligent Building provides a productive, cost effective environment through the optimization of structure, systems, services and management as well as the interrelationship between them. It integrates various systems (such as lighting, heating, air conditioning, and other building functions) to effectively manage resources in a coordinated mode to maximize occupant performance, investment and operating cost, savings and flexibility. Intelligent buildings transcend integration to achieve interaction, in which the various independent systems work collectively to optimize the building's performance and constantly create an environment that is most conducive to the occupant'sgoals. The tasks that can be efficiently managed by an intelligent building include: power, security, air conditioning and lighting. Nowadays, high quality of the intelligent building enables organizations (institutions) unhindered and efficient operation, growth, organizational restructuring, proper social relations (ease of space arrangement), not to mention a high level of safety, healthy internal environment, long-lasting aesthetic values and cost efficiency. Thus, modern intelligent buildings should fulfil all these requirements.

II. BLOCK DIAGRAM

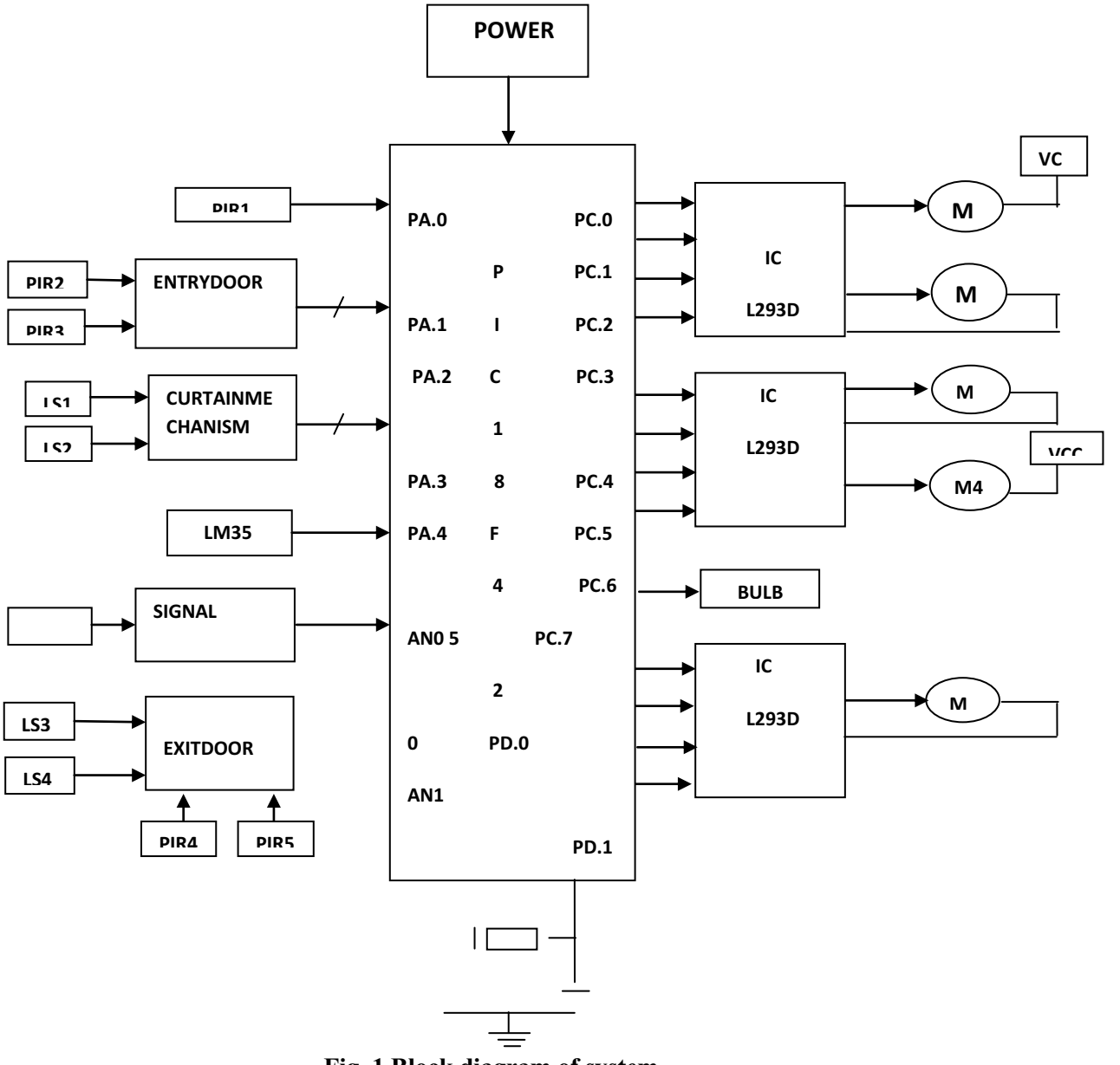

Fig. 1 Block diagram of system

2.1.Motor driver IC:

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V

- **Features of L293D** :-
- 600-mA Output Current Capability Per Driver
- Wide Supply Voltage Range 4.5 V to 36 V
- Separate Input-Logic Supply
- High-Noise-Immunity Inputs

2.2. LM35 IC:

Fig. 2. IC LM35

The LM35 series are precision integrated-circuit devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C, 0.08°C in Still Air over a full −55°C to 150°C temperature range.

2.2 PIR Sensor:

Fig. 3 PIR Sensor

Zilog's PIR™ Motion Detection Zdots® Single Board Computer (SBC) is a complete, compact, and high-performance product specifically designed for the rapid development and deployment of products requiring control based on infrared motion detection. It combines the unique features of the Z8 Encore! XP® MCU with powerful new software detection algorithms and delivers a significant performance improvement over traditional passive infrared (PIR) based solutions.

Features of PIR sensor:

Key features of the ePIR Motion Detection Zdots SBC include:
• Complete, fully functional motion detection SBC including Fresnel lens Comes pre-programmed with motion detection software
• Small form factor—25.5 mm x 16.7 mm

- Wide 5 m x 5 m, 60 degree detection pattern
- Sensitivity control via simple hardware configuration
- Advanced serial (UART) based configuration and interface
- SLEEP mode for low power applications
- No temperature compensation required

2.4. LDR Sensor

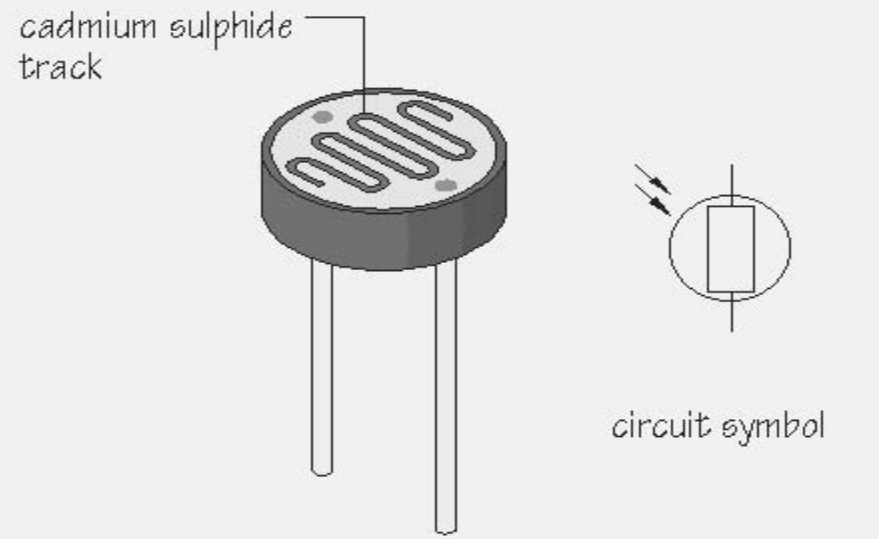

Fig. 4 LDR sensor

Light Dependent Resistor (LDR) or a photo resistor is a device whose resistivity is a function A of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells. They are made up of semiconductor materials having high resistance. There are many different symbols used to indicate a LDR, one of the most commonly used symbol is shown in the figure below. The arrow indicates light falling

III. SYSTEM ARCHITECTURE IN DETAIL

In our project we designing a automated system.in which we use electrical, electronics and mechanical components like sensors, controller and motors. When person is detected by PIR sensor 1 then motor M1 at the entrance will be on and will do the operation of shoe cleaning. At the door site PIR senor 2 and 3 will detect the person then motor 2 will rotate clockwise and anticlockwise respectively to switch the position of door .When person is enters in room then according to environmental parameters fan and lights will be control .at the exit side PIR sensor 4and 5 are use to detect the person an according to that position of door will change

In Green building Automation to control the lights ,fans ,curtains and also the position of door according to climate condition and presence and absence of person in the room. We are designing a system for building automation .In which PIC18F4520 microcontroller, different sensors like temperature sensor, light sensor and motor to automate the system.

Building automation is the automatic centralized control of a building's heating, ventilation and air conditioning, lighting and other systems through a Building Management System or Building Automation System (BAS). The objectives of building automation are improved occupant comfort, efficient operation of building systems, and reduction in energy consumption and operating cost.

IV. CONCLUSION

In conclusion, green building automation has been successfully developed. The developed monitoring by using PIC microcontroller and PIR sensors. In future, energy consumption is done by prototype and energy saving is done.

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Printed Circular Patch Antenna

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Abstract- Designing the UWB antenna can be one of the most challenging of these issues. UWB antennas must cover an extremely wide band, 3.1 GHz to 10.6 GHz for the indoor and handheld UWB applications, have electrically small size, and hold a reasonable impedance match over the band for high efficiency. One of the printed antennas which has large attention recently is Printed monopole antenna. They offer large band width and are more attractive for wireless communication applications. The large ground plane used for the conventional Printed monopole is the main limitation. However, the move towards the truncated ground plane has made the antenna low profile and suitable for integration into circuit board as terminal antennas. This paper focuses on Printed Circular Monopole antenna design and analysis. Studies have been undertaken covering the microstrip antenna theory. All the types of antenna were simulated and analyzed by using IE3D software. The performance of those antenna are further compared on the basis of parameters like return loss, VSWR, gain etc. From experimental demonstration it is clear that, one can improve the bandwidth of Printed Monopole antenna by inserting the transitions in micro-strip feed line and design can be used as UWB antenna.

Keywords: -Micro-strip Antenna, Printed Monopole Antenna, UWB, Transition feed line, IE3D

I. INTRODUCTION

A band of 3.1GHz to 10.6 GHz is covered by the Ultra Wide Bane which is allotted by Federal Communication Commission (FCC). Demand of UWB antennas is increasing since there is rapid growth in the Ultra Wide Band communication. Ultra wide band systems have some fundamental differences from conventional narrow band systems as it has larger bandwidth which offers specific advantages with respect to signal robustness, information content and/or implementation simplicity. [1] An antenna is a very essential element in UWB system because it acts as a band pass filters to reshape the pulse spectra. So antennas should be carefully designed to avoid unnecessary distortions. Designing of an antenna is one of the most important challenges for the designers. Printed antenna has features like low profile, small size, low weight and hence exploited for the compact applications such as mobile phones, other personal communication devices which becoming smaller and low weight day by day. Printed Monopole antenna offers large bandwidth & hence they have large attention among the all type of Printed Antennas recently. Microstrip antenna consists of radiating patch printed on grounded low loss substrate. The printed antenna can be of various shapes but rectangular and circular shapes are mostly used. There is great demand for UWB antennas that offer miniaturized planar structure, so the vertical disc monopole is still not suitable for integration with a PCB. This drawback limits its practical application. For this reason, a printed structure of the UWB disc monopole is well desired, which consist on printed radiator disc on substrate. Printed CDM antennas can be fed simple microstrip line, coplanar waveguide (CPW), or slotted structures. [8] In this paper design of circular monopole antenna is implemented for UWB applications, which consists of ground plane which is etched one & simple rectangular microstrip feed line is used. All the simulations & results are obtained by using IE3D software.

II. GEOMETRY OF PRINTED CIRCULAR PATCH ANTENNA

A circular disc monopole antenna is a planner structure. It consists of a circular patch having radius r and rectangular microstrip feed line both are printed on dielectric substrate. In Fig.1, L & W denotes the length and width of substrate. Wf is width of the microstrip feed line. Lf is length of microstrip feed line. Lg & Wg are the length and width of the partial conducting ground plane respectively. g is the gap between circular disk and ground plane. Ɛr is the dielectric constant for the substrate. h the height or thickness of the substrate.

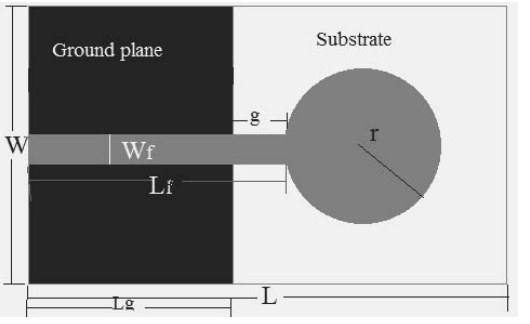

Figure 1. Geometry of circular monopole antenna

III. DESIGNS OF CIRCULAR MONOPOLE ANTENNA FOR UWB APPLICATIONS

By introducing simple microstrip transitions between the 50Ω feed line and the printed circular discs, the impedance BW of the planar monopole can be extended beyond 30GHz. Design C is basic circular monopole antenna having 50Ω microstrip feed line. Design A & Design B are formed by just introducing dual & single microstrip line transitions respectively [1].

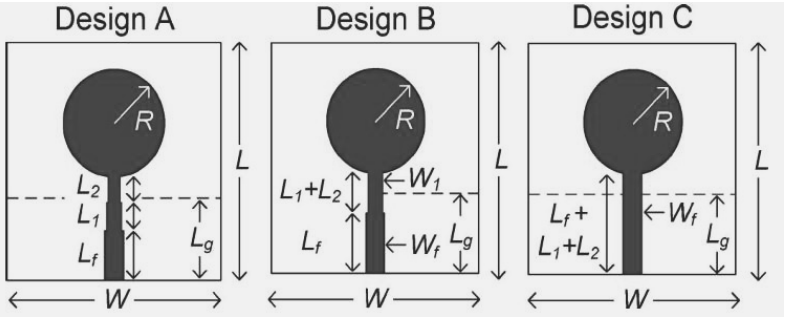

Figure 2. Different 3 designs of circular monopole antennas [1]

IV. SIMULATION AND RESULTS

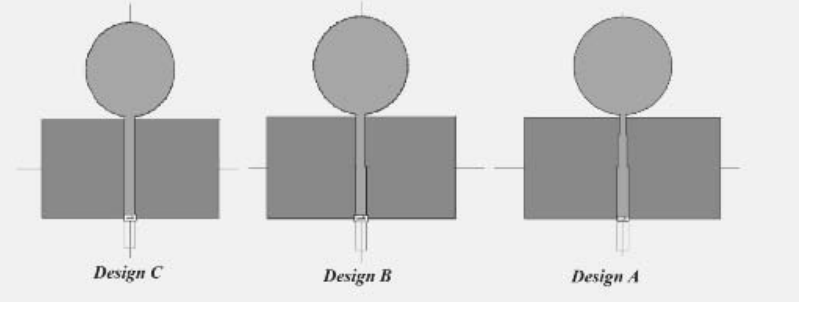

Figure 3. Implemented Designs A, B, C

Simulation is done by using IE3D software. The different three designs are simulated. These designs are design A, design B and Design C as shown in Fig.3 The design C is a simple Printed Circular Monopole antenna with a simple microstrip feed line. Design B is obtained by modifying the microstrip feed line with a single transition, while Design A consists of two transitions in microstrip feed line of Design C.

A. VSWR Characteristics

VSWR stands for voltage standing wave ratio. VSWR is always real & positive number for an antenna. It's ideal value is 1. Practical value of VSWR is 2. From the VSWR characteristics shown in Fig.4, Fig.5, Fig.6. It is clear that Designs have VSWR greater than 1 & less than 2.

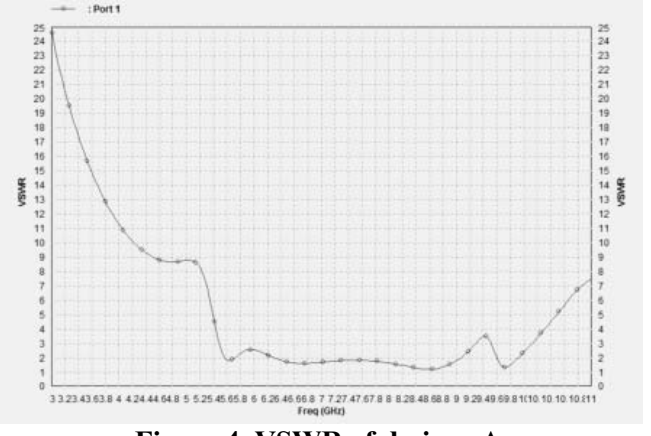

Figure 4. VSWR of designs A

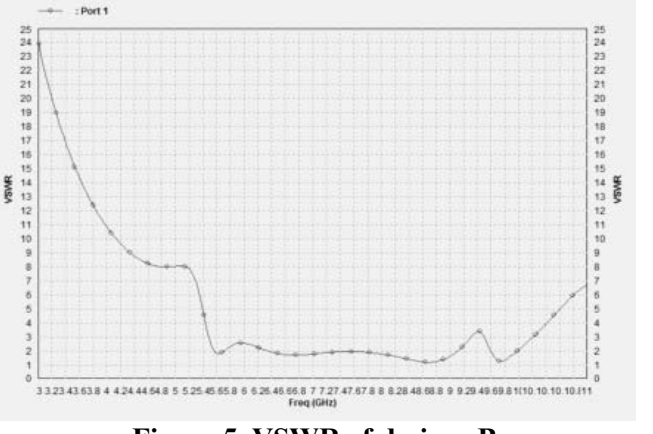

Figure 5. VSWR of designs B

B. S-Parameter

It is considered that antenna having S (1,1) below −10dB can be used for the different applications. If S(1,1) is above −10dB , then there is no use of such antenna. The comparison s-parameter graphs for Design C, Design B & Design C are shown in Fig.7 The simulation of Design A, Design B, Design C gives the graphs for reflection coefficients with S (1,1) below −10dB.

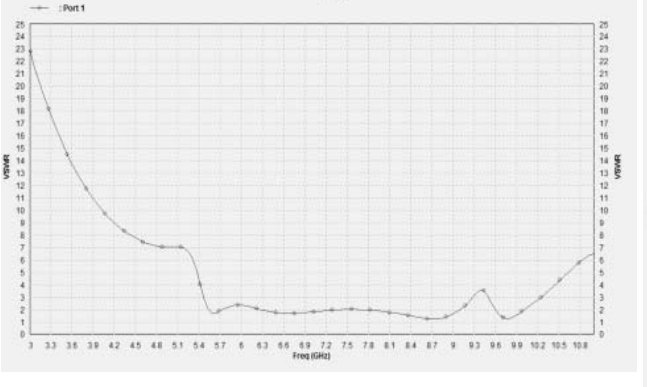

Figure 6. VSWR of designs C

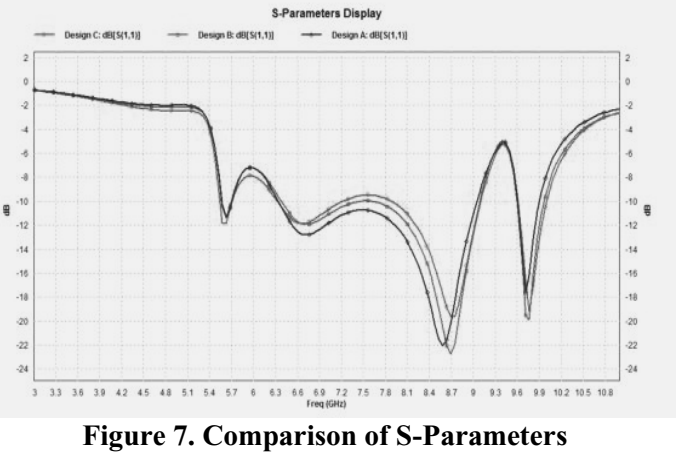

Figure 7. Comparison of S-Parameters

C. Radiation Pattern

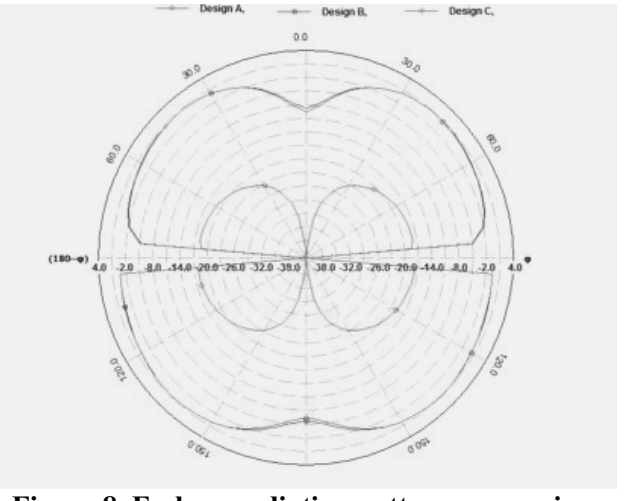

Figure 8. E plane radiation pattern comparison

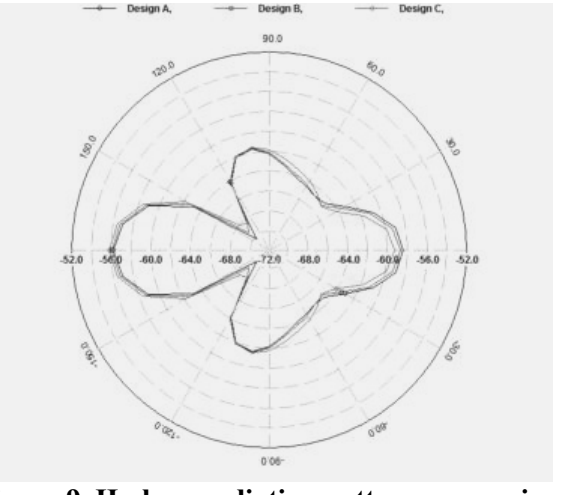

Figure 9. H plane radiation pattern comparison

For linearly polarized antenna performance is described in terms of principal E-plane & H-plane patterns. E-plane is the plane containing the electric field vector & the direction of maximum radiation. While, H-plane is the plane containing the magnetic field. The radiation patterns of these three designs in E-plane & H-plane are shown in Fig.8, Fig.9 respectively. Radiation pattern are taken at frequency of 8.63GHz gives bidirectional pattern in E-plane & omni directional in H-plane.

V. CONCLUSION

Design A have better results than that of Design B & Design C. All the design provides most part of UWB. When all the graphs are taken under consideration, though S parameter of Design B gives maximum value of reflection coefficients, Design A gives more part of UWB as compared to other two designs. From experimental demonstration it is clear that, one can improve the bandwidth of Printed Monopole antenna by inserting the transitions in micro-strip feed line and design can be used as UWB antenna.

Table I Comparison of results of design A, B, C

Reflection coefficient minimums	1st	2nd	3rd	4th
Frequency (GHz)				
Design A	5.60	6.78	8.60	9.78
Design B	5.50	6.70	8.63	9.70
Design C	5.65	6.70	8.59	9.70
S(1,1) (dB)				
Design A	-11.5	-12.8	-22	-17.5
Design B	-11.4	-12	-22.8	-20
Design C	-11.9	-12	-19.8	-19
VSWR				
Design A	1.8	1.7	1.2	1.1
Design B	1.9	1.5	1.1	1.2
Design C	1.9	1.6	1.1	1.2

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Image Enhancement Techniques for Ultrasound Abdominal Images for the Analysis of Kideny

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Abstract- Kidney plays a very important role in the human body. The filtration of blood coming out from heart and removal of the impurities is the main task of kidney. The capacity of a normal human kidney to purify the blood is huge. The operation of a kidney can be affected by the variety of factors. The functioning of kidney gets affected by reasons such as problems with renal, stones present in the way of renal,certain abnormalities such as swelling of limb, blockage of urine, congenital abnormalities and cancerous cells formation etc.
Ultrasound imaging is the most popular and accurate techniques for the investigation of major of the abdominal diseases. Abdominal ultrasonic consists of Gall Bladder, Liver, and Kidney for the analysis. Out of these organs, kidney and liver are very smaller organs. So their ultrasonic investigation could be a critical issue. Another challenge in ultrasonic imaging is the presence of speckle noise.
So it is required to work out for an image enhancement technique for kidney ultrasonic images. This paper introduces different techniques for the image enhancement of kidney ultrasonic images. The results obtained from these techniques are presented and comparedto get conclusion.
Keywords: Kidney; Ultrasound; Median filtering; histogram

I. INTRODUCTION

Kidney plays an important role in the functioning of human body. In the human body heart is the most important organ which provides the blood to remaining body organs. Heart pumps and takes the blood which is circulated among the organs and it gets filtered by using kidney. The kidney has a huge capacity of purification of blood.
Abnormalities in the functioning of kidney can lead to severe adverse effects on the human body. So it is important to detect those abnormalities. In medical field kidney abnormalities can be detected by medical imaging techniques. Although some problems could be detected by using blood and urine examinations. The common techniques of imaging are Ultra-Sound (US), Magnetic Resource Imaging (MRI) and Computed Tomography (CT)[1]

II. GENERALIZED METHODOLOGY

The generalized methodology for the detection of various abnormalities related to renal calculi and kidney is explained below.

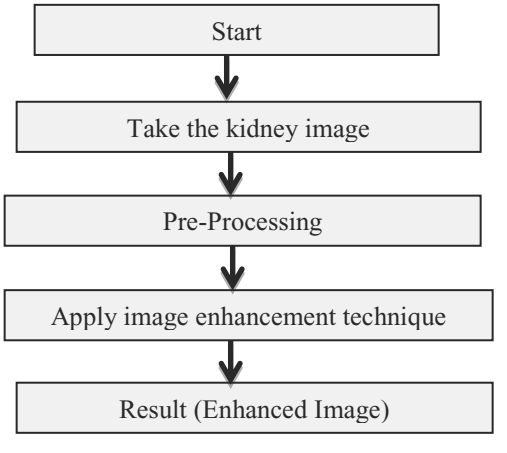

Fig. 1 Flow Diagram for Image Enhancement

Kidney images are taken from medical imaging techniques such as ultrasound. On the basis of which the predication about disease and its severity are to be worked out. Pre-processing can adopt different techniques such as histogram equalization, contrast adjustments, noise removal by median filtering. Segmentation is done afterwards. It is the process of getting the image in the required form so that it can be processed easily.After segmentation, it is necessary to decide the ROI of the image, depending upon the disease to be predicted.Once region of interest is obtained, different features are extracted from the ultrasound kidney image. Different algorithms are adopted for extracting the features such as DCT, Wavelets, Gabor Filtering, SVD calculations and many more.Depending on the different parameters of feature extraction, the disease can be detected.

First the abdominal image consisting of a kidney is taken. It is converted to desired dimensions and converted to desired form such as colour to gray and afterwards converted from image to double type for the analysis.

After this process, the image enhancement technique is applied and result image is used for further analysis.

III. DIFFERENT METHODS FOR IMAGE ENHANCEMENT

Following techniques are used for this purpose.

A) Histogram Equalization, B) Image Negative, C) Thresholding, D) Log transformation, E) Gamma Correction, Fi) Contrast Stretching G) Gray Level Slicing H) Bit Plane Slicing, I) Smoothing Linear Filtering J) Median Filtering and Lapalcian Filtering

IV. RESULTS

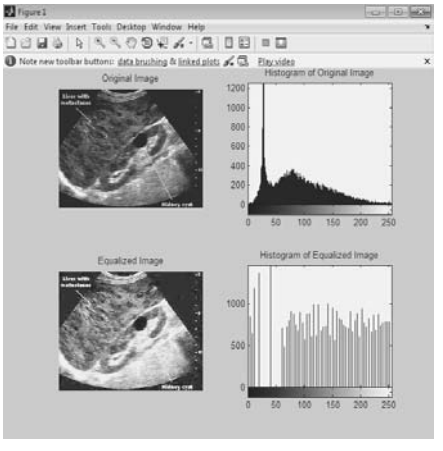

Fig. 2 Result of HistogramEquilization

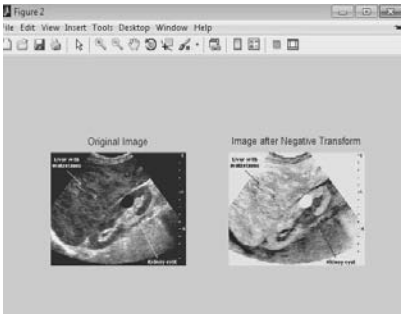

Fig. 3 Result of Negative Transform

Fig. 4 Result of Logrithmic Transform

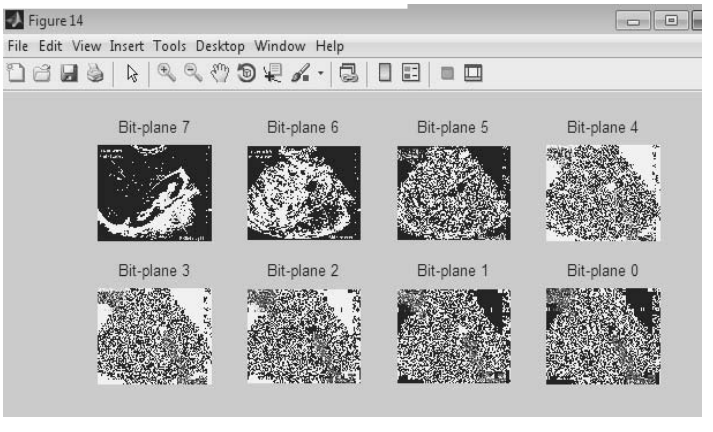

Fig. 5 Result of Bit Plane

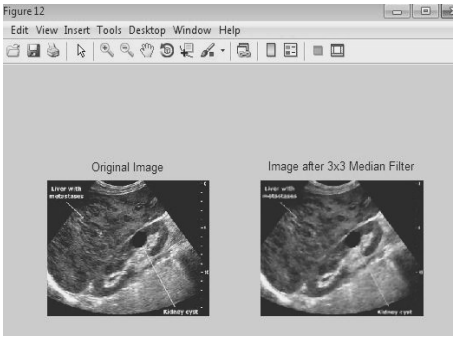

Fig. 6 Result of Median

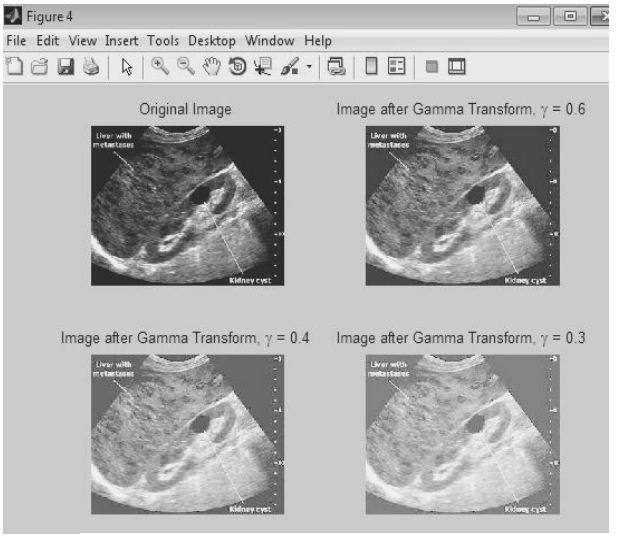

Fig. 7 Result of Gamma

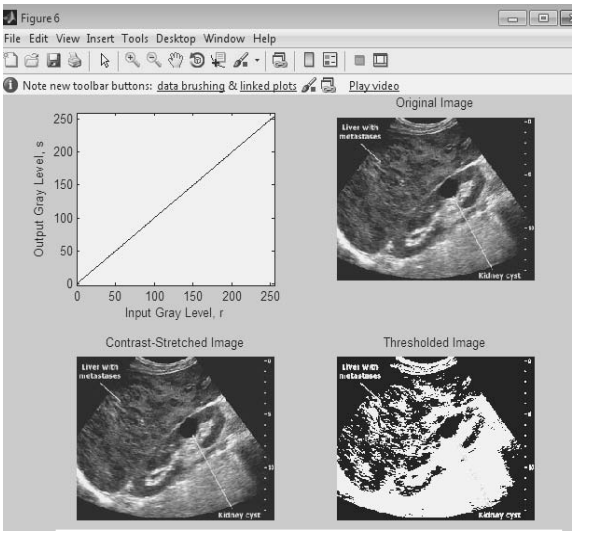

Fig. 8 Result of Contrast Stretching

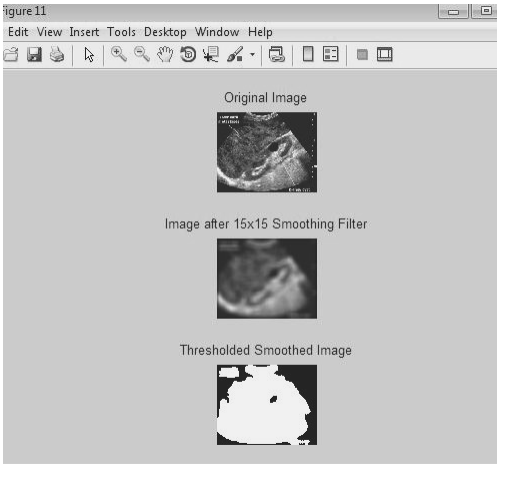

Fig. 9 Result of Smoothing of Image

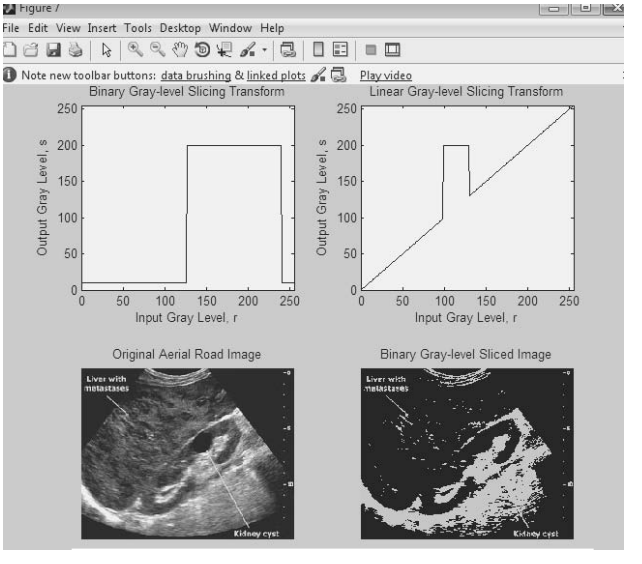

Fig. 10 Result of Gray Level Slicing

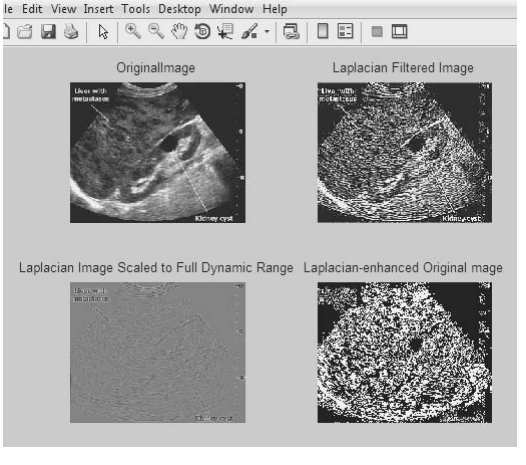

Fig. 11 Result of Laplacian Filtering

Table No. 1. Result of PSNR and MSE for above Techniques

Sr. No.	Image Enhancement Technique	PSNR (dB)	MSE
1.	HistogramEquilization	36.2743721	15.45
2.	Negative Transform	53.3303606	0.30
3.	Logrithmic Transform	55.2707289	0.19
4.	Bit Plane Slicing	52.4573799	0.37
5.	Median Filtering	72.5861021	0.00
6.	Gamma Transformation	64.0671134	0.03
7.	Contrast Stretching	119.5712267	0.00
8.	Smoothing of Image	66.7601946	0.01
9.	Gray Level Slicing	25.1830662	198.69
10.	Laplacian Filtering	58.6123577	0.09

V. CONCLUSION

In biomedical imaging Ultrasonic images plays a vital role for predication of different diseases related to organs such as kidney, liver, brain etc.. The main problem with ultrasonic imaging is that, for liver and kidney the images have speckle noise, as these organs are smaller in size.

Disease prediction could become a critical issue for these organs. Hence an efficient speckle noise removal technique can be employed for efficient predication and treatment. Another challenge in kidney ultrasonic images is the image segmentation and obtaining the region of interest. Different techniques are proposed for image enhancement here. Suitable technique can be used for the enhancement depending upon the disease to be predicted and region of interest.

Hence this can be concluded as Ultrasonic images can be refined by using image enhancement techniques. The parameters PSNR and MSE are used to decide the quality of enhanced images.Different algorithms could be employed to decide the disease of kidney by using Ultrasound images.

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Design of H Shaped Antenna

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Abstract-The aim of this study is to design a Microstrip patch antenna for multiple band and improved impedance bandwidth. Among many available techniques, rectangular patch antenna with edge feeding technique is selected. The theory of slits and slots to increase the surface area is used to enhance the impedance bandwidth.

HFSS is used to simulate and optimize the antenna response. The designed antenna exhibited multiband operation with a wider bandwidth. Overviews of antenna design parameters such as choice of feeding techniques have been presented. Finally, a dual U slot Microstrip antenna with enhanced bandwidth is presented. This antenna is having simple designing as it is just composed of substrate, patch, ground plane and Microstrip feed line. The proposed antenna has good radiation pattern, high gain and directivity, high return loss with large bandwidth.

Keywords: Microstrip antenna, Data Broadcast System (DBS), Wimax, Wi-Fi, HFSS.

I. INTRODUCTION

In order to know how an antenna radiates, let us first consider how radiation occurs. A conducting wire radiates mainly because of time-varying current or an acceleration (or deceleration) of charge. If there is no motion of charges in a wire, no radiation takes place, since no flow of current occurs. Radiation will not occur even if charges are moving with uniform velocity along a straight wire. However, charges moving with uniform velocity along a curved or bent wire will produce radiation. If the charge is oscillating with time, then radiation occurs even along a straight wire [12]. The radiation from an antenna is given in below Figure 1.1

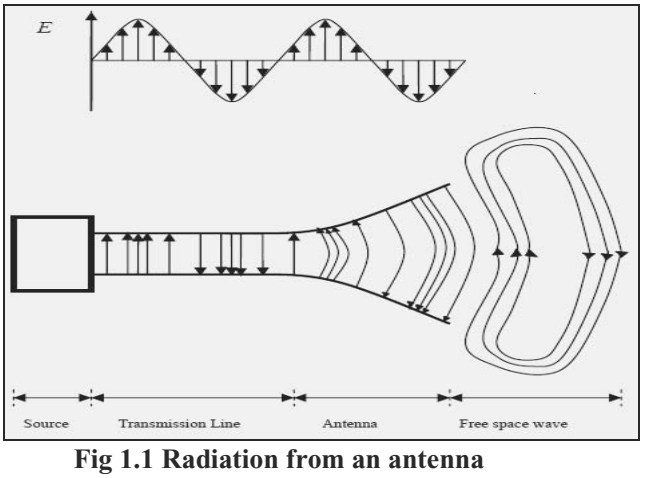

Fig 1.1 Radiation from an antenna

II. DESIGN AND ANALYSIS

Dual - frequency Microstrip antenna could be designed by inserting a pair of embedded spur lines and integrated reactive loading. Both the operating frequencies will have some polarization planes. The embedded slots are patch's non-radiating edges, and integrated reactive loading is obtained by an edge feed Microstrip feed line section and inserted at one of the patches radiating edges [1]. The basic geometry of the patch is given in figure above. Since the step-1 is selection of patch & step-2 is design of shape of antenna. I selected a corner frequency fo of 2.45GHz. This was selected as the average sum of both the resonant frequencies according to the shortest current path and longest current path.

I have got the following terms:

f_o = 2.45GHz

ε_r (Dielectric constant of substrate)= 4.4

Height of the patch: 62mil say 1.6mm.

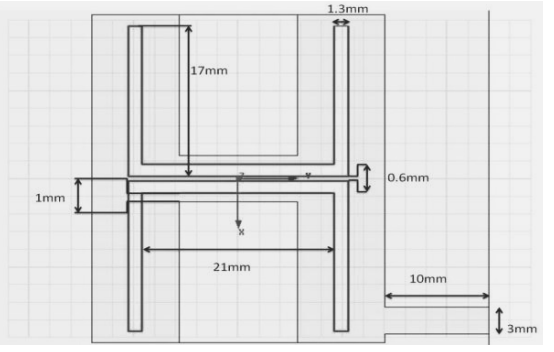

Fig 2.1 Dual U-slot H-shaped Microstrip patch

With the help of these, the size of the substrate can be calculated through the below formula [12]. Width of the patch is calculated by equation

$$W = \frac{C}{2f\sqrt{\varepsilon_r}}.$$

Then it is need to find out $\varepsilon_{reff} = \frac{\varepsilon_r+1}{2} + \frac{\varepsilon_r-1}{2}\left[1 + 12\frac{h}{W}\right]^{-1/2}$ (1)

Now, Length of the patch is calculated by equation $L = \frac{C}{2f\sqrt{\varepsilon_{reff}}} - 2\Delta$

Where ε_{eff} = Effective dielectric const.
Δ= Length Extension.

Where ΔL can be calculated by following formula:

$$\Delta L = 0.412h\frac{(\varepsilon_{reff}+0.3)\left[\frac{W}{h}+0.264\right]}{(\varepsilon_{reff}+0.258)\left[\frac{W}{h}+0.8\right]} \quad (2)$$

The length L and width W of the patch are given by L= 28.83, W= 37.26
The substrate chosen has a dielectric constant ε_r given by: ε_r=4.4, with a loss tangent $\tan\delta = 0.09$
The height *h* of the substrate is chose to be =62 mil.
The slots were inserted in the patch to give it to H-shape. These were two slots of equal geometry on either side of patch's non- radiating edges.
The length of the slot is: 14.6mm; the width of the slot is: 14 mm
The slits were provided in the patch to provide it to Dual U-slot skeleton shape. For this two equal slits were provided on both side of the patch on the non-radiating edge and two slits were provided on both sides at the center of patch in the radiating edge. The distance between the slits at the center is 0.3mm, while the distance between the slits at the non-radiating edge is 21mm. The edge feed Microstrip - line section forms the integrated reactive loading. The dimension of this edge feed 50Ω Microstrip - line section to improve good impedance matching are fixed at l_r =0.3mm and W_r = 3mm. So the values chosen for the length and width of the inset Microstrip - line section are given by: l_r =10 mm, and W_r = 3 mm. Edge/Microstrip - Line feeding is done at the point (x,) given by: x, y = (14.6, 14).

III. SIMULATION RESULTS

I cut dual U-slot in the patch as skeleton. So simulation results with U-Slot:

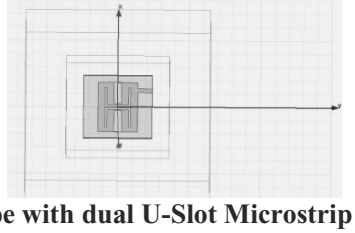

Fig 3.1: H-shape with dual U-Slot Microstrip patch antenna

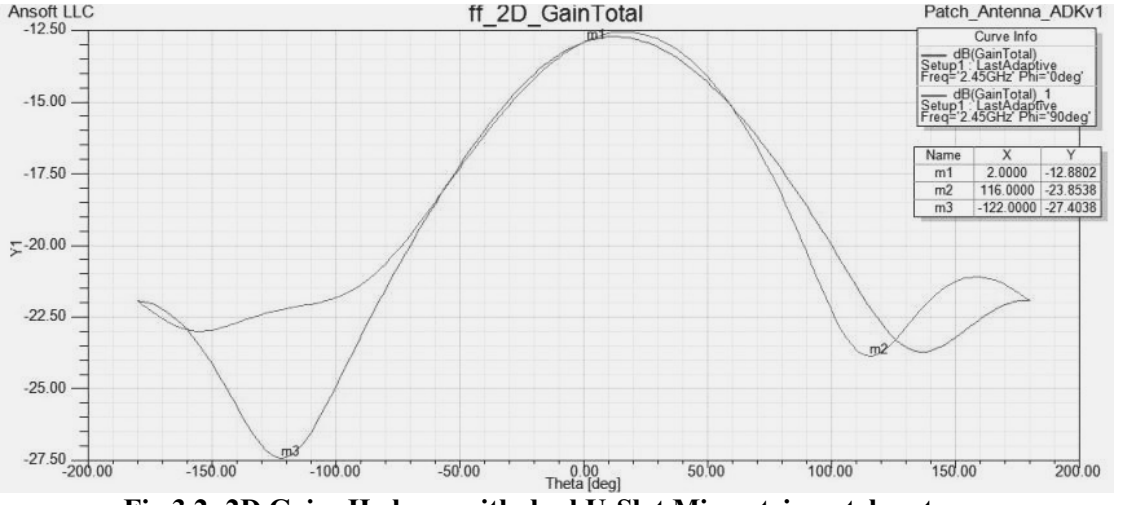

Fig 3.2: 2D Gain: H-shape with dual U-Slot Microstrip patch antenna

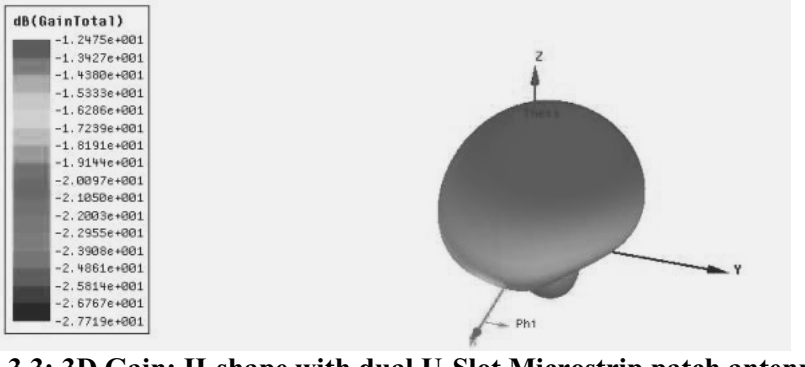

Fig 3.3: 3D Gain: H-shape with dual U-Slot Microstrip patch antenna

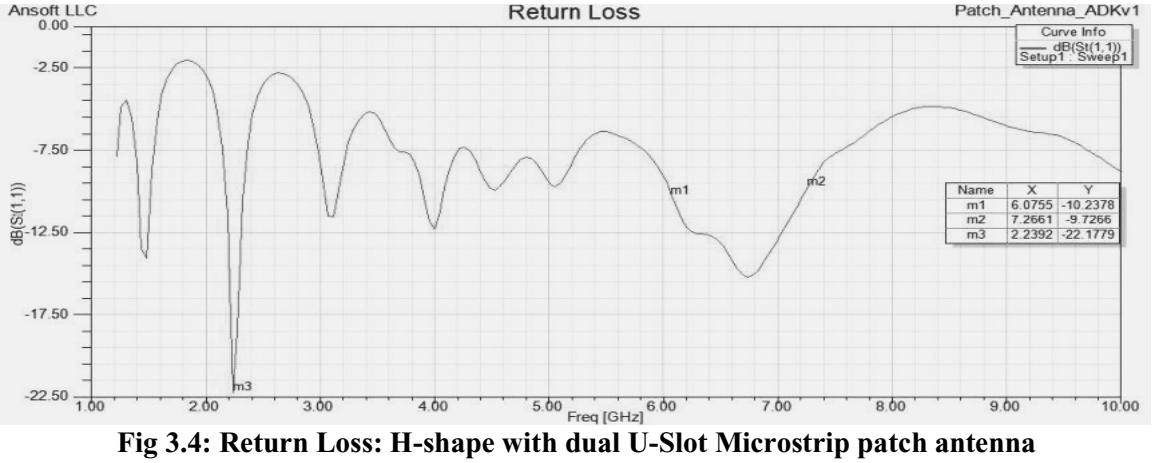

Fig 3.4: Return Loss: H-shape with dual U-Slot Microstrip patch antenna

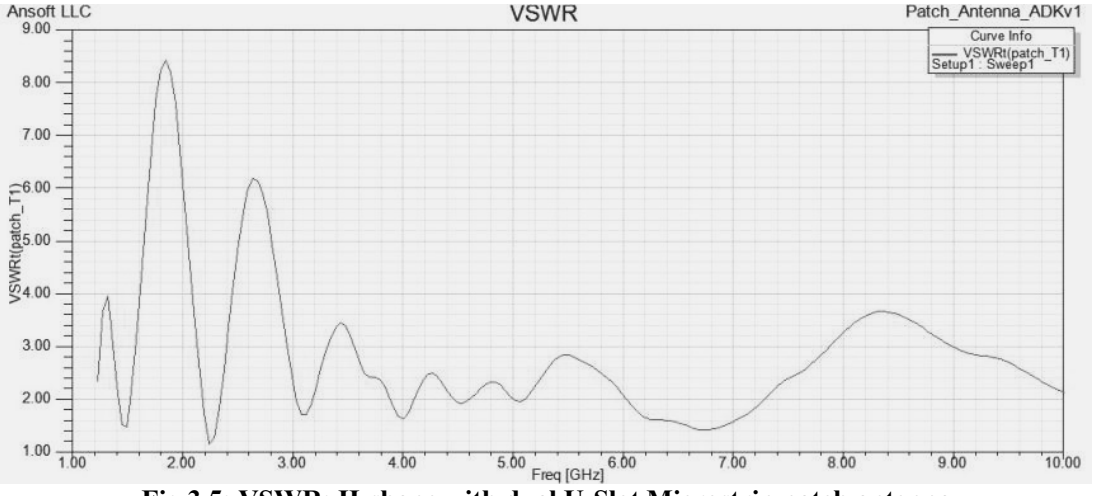

Fig 3.5: VSWR: H-shape with dual U-Slot Microstrip patch antenna

The result of the above design gives the values as: Gain: -12.8dB, VSWR: 6 at 2.45GHz, Bandwidth: 7.25 6.07= 1.18 GHz, Return Loss: -22.17dB. The Bandwidth of the patch antenna is increased to 1.18 GHz and the gain is also improved to -12.8dB. Now to decrease the patch size, we increased the size of cutting slot. The size of the patch is X- 16mm and Y-11.3mm. Now compare the simulation result with H-shape dual U slot, but sizes of slots are increased.

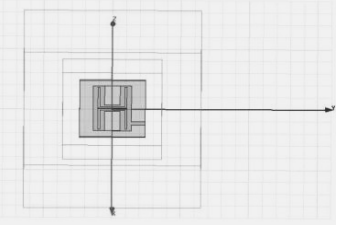

Fig 3.6: H-shape with dual U-Slot Microstrip patch antenna (modified Slot)

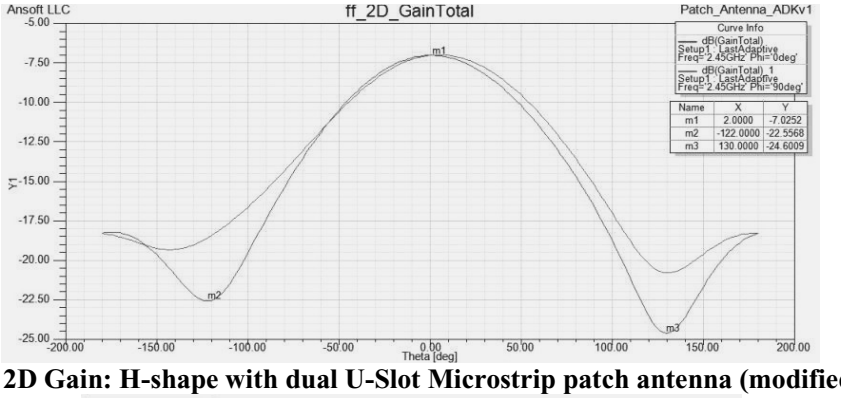

Fig 3.7: 2D Gain: H-shape with dual U-Slot Microstrip patch antenna (modified Slot)

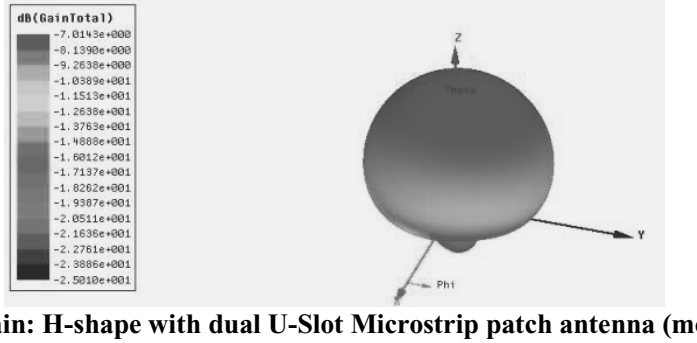

Fig 3.8: 3D Gain: H-shape with dual U-Slot Microstrip patch antenna (modified Slot)

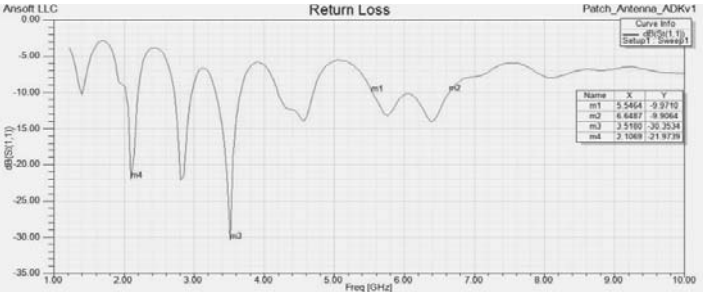

Fig 3.9: Return Loss: H-shape with dual U-Slot Microstrip patch Antenna (modified Slot)

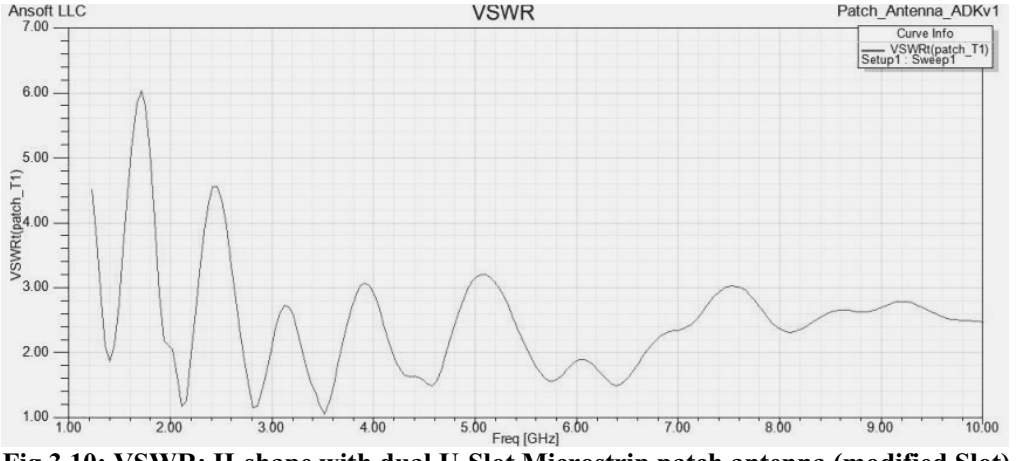

Fig 3.10: VSWR: H-shape with dual U-Slot Microstrip patch antenna (modified Slot)

The result of the above design gives the values: Gain: -7dB, VSWR: 3 at 2.45GHz, Bandwidth: 6.64 5.54= 1 GHz, Return Loss: -30 dB. With these changes, the result went down. I then tried to change the feed location with the hit and trial method. I changed the feed location to X=14.6 and Y= 14mm.With these changes, the simulation result and design is as follows.

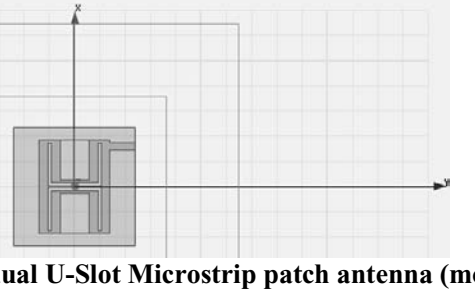

Fig 3.11: H-shape with dual U-Slot Microstrip patch antenna (modified Feed Location)

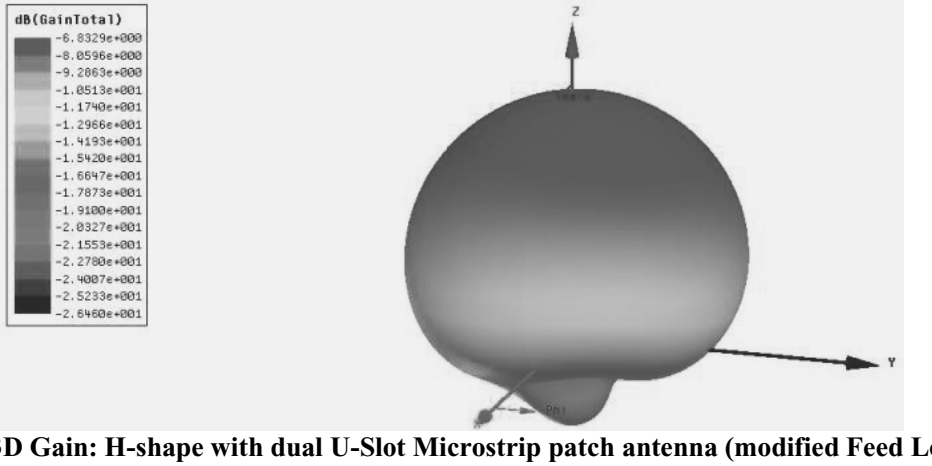

Fig 3.12: 3D Gain: H-shape with dual U-Slot Microstrip patch antenna (modified Feed Location)

The result of the above design gives the values as: Gain: -6.8Db, VSWR: 2 at 2.45GHz, Bandwidth: 9.0 5.5= 3.5 GHz, Return Loss: -41 dB.

With all these result comparison, it is found that with the change in feed location the best result is achieved. As the surface area is increased and reduced the patch charge store, the bandwidth increased. The quality factor of the design decreased a lot. The maximum gain achieved is -25dB at 134deg radiation angle.

IV. CONCLUSION

A new design of broadband micro strip antenna has been designed and studied experimentally. The rectangular patch antenna is presented with H-shape and slits and slots on radiating edge to increase the surface area. The designed antenna achieves bandwidth of 3.5 GHz. It was simulated that with the increase in the Bandwidth, the surface area of the same patch increased from 1 GHz to 3.5GHz and Gain increased from -1dB to -6.5dB. Design and analysis of Dual U slot H-shaped patch antenna is presented. The results shown here is done by HFSS simulation. The designed antenna achieves bandwidth of 3.5 GHz and giving us directivity, high return loss and gain is also simulated by High Frequency Structure Simulator. The result also simulated that the antenna can be used for wide range of frequency. A maximum gain of -25dB is achieved. Thus the designed antenna can be used for various applications such as Wi-Fi, WIMAX, Digital broadcasting, geological & metrological signal, Radar navigation etc. The future works on enhancing the bandwidth can be done by increasing the surface area of the patch, but attention should be given to manage the gain as well.

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Design of ALU Using Reversible Logic Gates

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Abstract- In new world of VLSI design and technology, the reversible logic design appealing more interest due to its benefit of low power consumption. Reversible logic is very important in low-power VLSI circuit design. The main reversible gates used for reversible logic synthesis are Feynman Gate, Fredkin gate, TOFFOLI gate, New Gate SAYEM gate and PERES gate etc. This paper presents a basic reversible gate to build more difficult circuits which can be implemented in Arithmetic Logic Unit, some sequential circuits and also in some combinational circuits. It also gives short-lived idea to form adder circuits using the basic reversible gate like PERES gate and TSG gate.

Keywords- Low-power CMOS design, Low-power VLSI, quantum cost, reversible counters, reversible logic

I. INTRODUCTION

Reversible logic has received great consideration in the recent few years due to their capability to reduce the power dissipation which is the main requirement in low power VLSI design. It has wide applications in low power CMOS and Optical information processing, Quantum computation, DNA computing, and nanotechnology. Irreversible hardware computation results in energy dissipation due to loss of information. According to Landauer's research, the amount of power dissipated for every irreversible 1 bit operation is at least KTln2 joules, where K=1.3806505*10-23m2kg-2K-1 (joule/Kelvin-1) is the Boltzmann's constant and T is the temperature at which operation is done [1]. The heat generated due to the loss of 1 bit of information is very small at room temperature but when the number of bits is large as in the case of high speed computational works the heat dissipated by them will be so large that it disturbs the performance and results in the reduction of lifetime of the components. In 1973, Bennett presented that KTln2 energy would not dissipate from a system as long as the system allows the reproduction of the inputs from observed outputs [2]. Reversible logic supports the process of running the system both forward and reverse. This means that reversible computations can generate inputs from outputs and can stop and go back to any point in the computation history. A circuit is said to be reversible if there is a one-to-one correspondence between its input and output assignments and the input vector can be uniquely recovered from the output vector and, i.e. not only the outputs can be uniquely determined from the inputs, but also the inputs can be recovered from the outputs. So that Energy dissipation can be reduced or even eliminated if computation becomes Information-lossless.

II. DESIGN

2.1 Objective of Design

Reversibility in computing implies that no information about the computational states cannot be lost, so we can recover any earlier stage by computing in reverse or un-computing the results. This is termed as 'logical reversibility'. The profits of logical reversibility can be achieved only after employing physical reversibility. Physical reversibility is a process that dissipates no energy to heat. Absolutely perfect physical reversibility is impractical. Computing systems give off heat when voltage levels change from positive to negative: bits from zero to one. Most of the energy needed to make that change is given off in the form of heat. Rather than changing voltages to other levels, reversible circuit elements will progressively move charge from one node to the next. This way, one can only expect to lose a minute amount of energy on each transition. Reversible computing strongly affects digital logic designs. Elements of reversible logic are needed to recover the state of inputs from the outputs. It will impact

instruction sets and high-level programming languages as well. Ultimately, these will also have to be reversible to provide optimal efficiency.

2.2 Methods

2.2.1 Reversible Logic Gates

As discussed about reversible logic concept, a reversible logic gate is an n-input n-output logic device with one-to-one mapping [5]. This helps to determine the outputs from the inputs and also the inputs can be uniquely recovered from the outputs. Also in the synthesis of reversible circuits direct fan-Out is not allowed as one–to-many concept is not reversible. However fan-out in reversible circuits is achieved using additional gates. A reversible circuit should be designed using minimum number of reversible logic gates. From the point of view of reversible circuit design, there are many parameters for determining the complexity and performance of circuits.

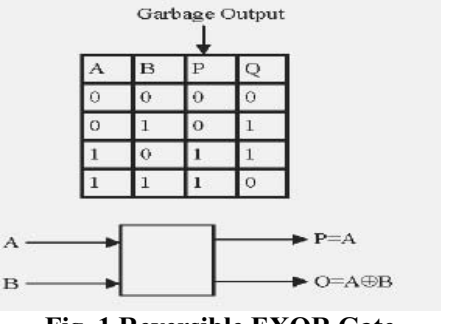


Fig. 1 Reversible EXOR Gate

- The number of Reversible gates (N): The number of reversible gates used in circuit.
- The number of constant inputs (CI): This refers to the number of inputs that are to be maintained constant at either 0 or 1 in order to synthesize the given logical function.
- The number of garbage outputs (GO): This refers to the number of unused outputs present in a reversible logic
  Circuit. One cannot avoid the garbage outputs as these are very essential to achieve reversibility.
- Quantum cost (QC): This refers to the cost of the circuit in terms of the cost of a primitive gate. It is calculated knowing the number of primitive reversible logic gates (1*1 or 2*2) required to realize the circuit.

2.3 Basic Reversible Logic Gates

2.3.1 Feynman Gate (FG)

Feynman gate is a 2*2 one through reversible gate as shown in figure 2. The input vector is I (A, B) and the output vector is O (P, Q). The outputs are defined by P=A, Q=A B. Quantum cost of a Feynman gate is 1. Feynman Gate (FG) can be used as a copying gate. Since a fan-out is not allowed in reversible logic, this gate is useful for duplication of the required outputs

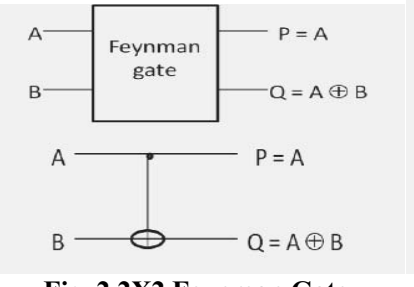


Fig. 2 2X2 Feynman Gate

A	B	P	Q
0	0	0	0
0	1	0	1
1	0	1	1
1	1	1	0

Fig. 3 Truth table of 2X2 Feynman Gate

2.3.2 Double Feynman Gate (FG)

Fig.4 shows a 3*3 Double Feynman gate. The input vector is I (A, B, C) and the output vector is O (P, Q, R). The outputs are defined by P = A, Q=A B, R=AC. Quantum cost of double Feynman gate is 2.

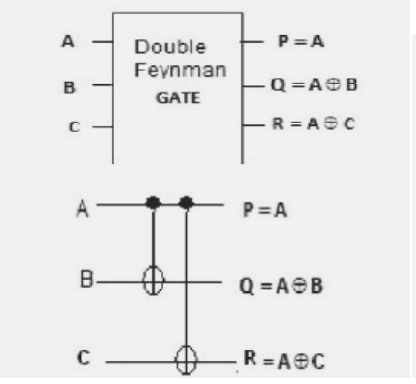


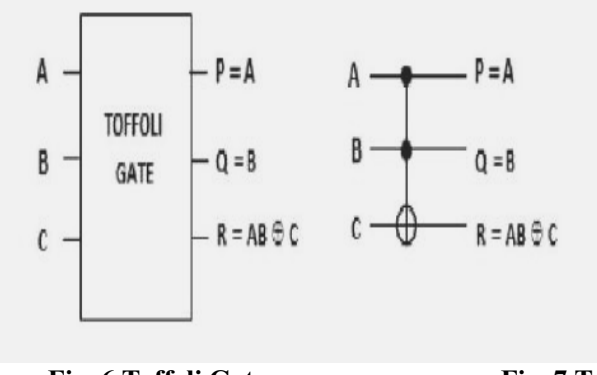
Fig. 4 Double Feynman Gate

A	B	C	P	Q	R
0	0	0	0	0	0
0	0	1	0	0	1
0	1	0	0	1	0
0	1	1	0	1	1
1	0	0	1	1	1
1	0	1	1	1	0
1	1	0	1	0	1
1	1	1	1	0	0

Fig. 5 Truth table of Double Feynman Gate

2.3.3 Toffoli Gate (TG)

Fig 6 shows a 3*3 Toffoli gate. The input vector is I (A, B, C) and the output vector is O (P, Q, and R). The outputs are defined by P=A, Q=B, R=AB XOR C. Quantum cost of a Toffoli gate is 5.



A	B	C	P	Q	R
0	0	0	0	0	0
0	0	1	0	0	1
0	1	0	0	1	0
0	1	1	0	1	1
1	0	0	1	0	0
1	0	1	1	0	1
1	1	0	1	1	1
1	1	1	1	1	0

Fig. 6 Toffoli Gate

Fig. 7 Truth Table of 2*2 Feynman Gate

2.3.4 Fredkin Gate (FG)

Fig 8 shows a 3*3 Fredkin gate. The input vector is I (A, B, C) and the output vector is O (P, Q, R). The output is defined by P=A, Q=A′B **x-or** AC and R=A′C **x-or** AB. Quantum cost of a Fredkin gate is 5.

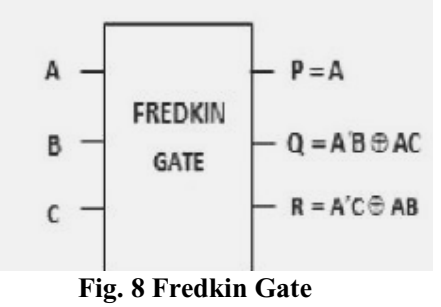


Fig. 8 Fredkin Gate

A	B	C	P	Q	R
0	0	0	0	0	0
0	0	1	0	0	1
0	1	0	0	1	0
0	1	1	0	1	1
1	0	0	1	0	0
1	0	1	1	1	0
1	1	0	1	0	1
1	1	1	1	1	1

Fig. 9 Truth Table of Fredkin Gate

2.3.4 Proposed 4-Bit Asynchronous Up/Down Counter

The reversible design of the asynchronous Up/Down Counter is shown in Fig. The Up/Down operation of this reversible design is determined by the control input UP/DOWN. When this control input is 1 the reversible design operates as an Up counter mode [6]. When this control input is 0 the reversible design operates as a Down Counter mode.

2.3.4 Applications

Reversible computing has many applications in computer security and transaction processing, but the main long-term benefit will be felt very well in those areas which require high energy efficiency, speed and performance. Main areas of applications of reversible gate are listed below

1. Quantum computer.
2. Low power CMOS.
3. Nano-technology
4. Optical computing
5. Design of low power arithmetic and data path for digital signal processing (DSP).
6. Field Programmable Gate Array (FPGAs) in CMOS technology for extremely low power, self-repair and high testability

III. CONCLUSIONS

The reversible logic circuits play an important role in design of low power digital circuits of an upcoming computer. This has led many researchers to take reversible logic very seriously in building complex circuits related to advance computing in the low power CMOS design. In this paper tried to implement some of the reversible logic gates and their application. Also conclude that reversible gates are efficient with respect to their power dissipation.

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Removal of Ocular Artifacts From electro-Encephalogram by Adaptive Filtering and Independent Component Analysis

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Abstract-EEG is brain signal processing technique that allows gaining the understanding of the complex inner mechanisms of the brain and abnormal brain waves have shown tobe associated with particular brain disorders. The analysis of brain waves plays an important role in diagnosis of different brain disorders. MATLAB provides an interactive graphic user interface (GUI) allowing users to flexibly and interactively process their high-density EEG dataset and other brain signal data different techniques such as independent component analysis (ICA) and/or time/frequency analysis (TFA), as well as standard averaging methods[4][5]. We will be showing different brain signals by comparing, analysing and simulating datasets which is already loaded in the MATLAB software to process the EEG signals. Unfortunately, EEG data is commonly contaminated by ocular artifacts which makes the analysis of neuronal data very difficult[2]. The focus of this research is the development of a novel technique that can automatically detect and remove eyeblink artifacts in order to facilitate analysis of EEG recordings. For this project we used EEGLAB matlab toolbox. By using this toolbox we have done the the simulation of our project.
Keywords- electro-encephalogram (EEG), electro-oculogram (EOG), EEGLB toolbox, magnetoencephalography (MEG).

I. INTRODUCTION

The Eye forms an electric dipole, where the cornea is positive and the retina is negative. When the eye moves (saccade, blink or other movements), the electric field around the eye changes, producing an electrical signal known as the electro-oculogram (EOG)[3][7]. As this signal propagates over the scalp, it appears in the recorded electro-encephalogram (EEG) as noise or artifacts that present serious problems in EEG interpretation and analysis.To correct or remove ocular artifacts from EEG, many regression-based techniques have been proposed, including simple time-domain regression, multiple-leg time-domain regression and regression in the frequency domain.

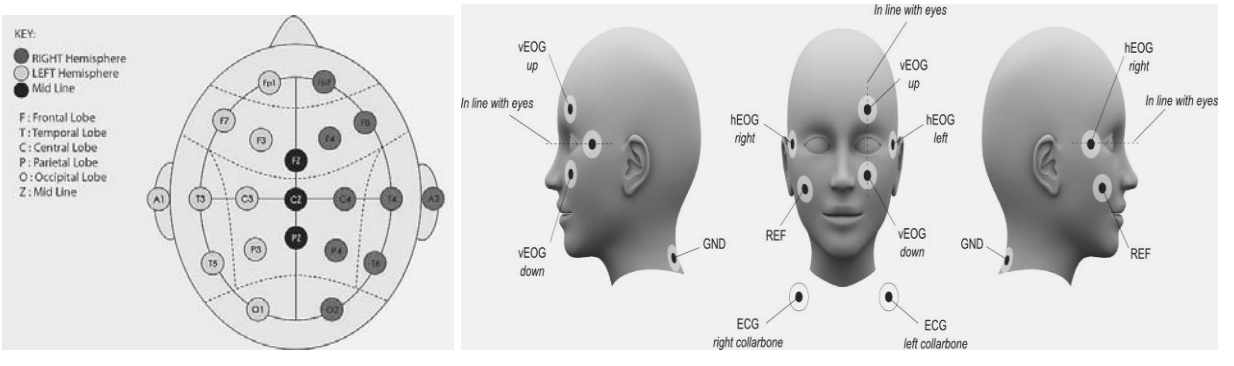


Figure 1.1: EEG electrodes placement and EOG(electro-oculogram) electrodes placement[3][7]

In all these regression-based approaches, calibration trials are first conducted to determine the transfer coefficients between the EOG channels and each of the EEG channels.These coefficients are then used later in the 'correction phase' to estimate the EOG component in the EEG recording for removal by

subtraction. More recently, independent component analysis (ICA) has been proposed to separate the EOG signals from the EEG signals. This method requires off-line analysis and processing of data collected from a sufficiently large number of channels, and its success largely depends on correct identification of the noise components[10]. When the applications require real-time removal of ocular artifacts, or when the calibration trials cannot be conducted owing to various constraints, the methods described above become unsuitable. For example, researchers in our laboratory are developing methods for accessing a pilot's functional state during flight, so that adaptive aid can be provided in the case of mental overload.In one of the approaches currently under investigation, spectral EEG information recorded at several sites over the scalp (e.g. Fz , F7,Pz, etc.) is used by a neural network to perform real-time classification of the pilot's functional state.As the pilot's activity is accompanied by a significant amount of eye movement, either voluntarily or involuntarily, EOG contamination is a serious problem in EEG-based analysis. In this paper, we describe a noise cancellation method based on adaptive filtering to remove ocular artifacts from EEG[1][7]. This method is particularly suitable to our applications because it does not require calibration trials,and the EOG artifacts can be removed on-line. Previous studies have shown that there are at least two kinds of EOG artifact to be removed: those produced by the vertical eye movement (the corresponding EOG is called VEOG) and those produced by the horizontal eye movement (HEOG). Consequently, a noise canceller with two reference inputs is used in this application[3].

II. System and Architecture.

In this section we provide details description about hardware and software of our system. In our system we use different device for sensing, wireless transmission of signal and controlling.

2.1 Principle of removing EOG artifacts by adaptive filtering

In conventional adaptive noise cancellation systems, the primary input signal is a combined signal $x(n)+i(n)$ where $x(n)$ represents the "clean" (unavailable) signal and $i(n)$ is the interference. We assume the availability of a reference signal $r(n)$ assumed to be correlated with $i(n)$. The goal is to obtain an output signal $e(n)$ that is the residual after substracting from $x(n)+i(n)$ the best least squares estimation of $i(n)$, $\hat{\imath}(n)$.The proposed artifact removal method comprises two steps.[1]

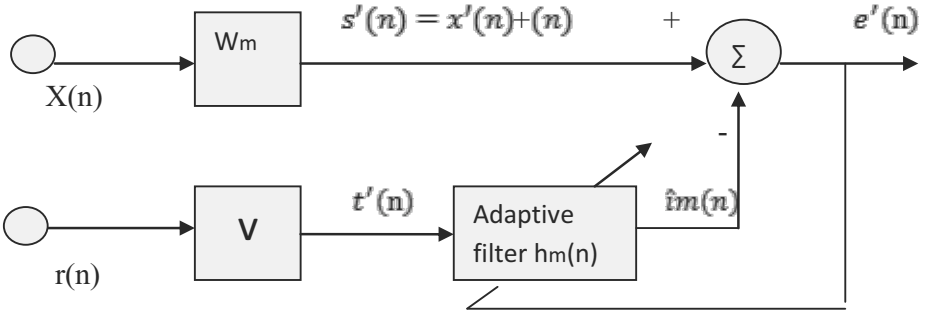


Figure 2.1: General scheme of automatic EOG noise cancellation using adaptive filtering and ICA. Processing of signal from sensor "m" is shown, this scheme has to be run M times in parallel to process all EEG data by Automatic Removal Of Ocular Artifacts From Eeg Data Using Adaptive Filtering And Independent Component Analysis Carlos Guerrero-Mosquera, Angel Navia Vazquez University Carlos III of Madrid, Signal Processing and Communications Department Avda. Universidad, 30 28911 Leganes. Spain[1]

First, ICA projections are obtained for EEG data (**W** matrix in **S′**= **WX**) and for reference data (**V** matrix in **T′** = **VR**), where **R** = [**r**(1),**r**(2), ...,**r**(*N*)] and **r**(*n*) = [*r*1(*n*), *r*2(*n*), *r*3(*n*), *r*4(*n*)]*T* , *rj*(*n*) being signals obtained from electrodes localized close to eyes as Fp1, Fp2, F7 and F8, which register vertical and horizontal eye movements. The second step is the use of every ICA projection data in an adaptive filter scheme, to be run *M* times (possibly in parallel). The adaptive filter with weigths **h***m*(*n*) aims at estimating the interfering component $\hat{\imath}m(n)$ present in the *m*-th ICA channel in a Least Squares sense, from the reference signal **t′**(*n*).

The filter operates in ICA domain, and the residual signal is:

$$e'(n) = s'(n) - \hat{im}(n) \quad (1)$$

Where

$$\hat{im}(n) = h_m^T(n)\, t'(n) \quad (2)$$

The equation (2) represents a transversal filter with four tap weights. We need to estimate the clean EEG ICA components *x′m* (*n*) adjusting the coefficients of the filter by solving:

$$\min_{hm(n)} \{\sum_{i=1}^{n} \lambda^{n-i} (s'(n) - h_m^T(n)\, t'(n))^2\} \quad (3)$$

We expect that *x′m* (*n*) and **t′**(*n*) are incorrelated, and hence the filter only estimates the interference $\hat{im}(n)$. The solution of Eq.(3) is given by the well known Recursive Least Square (RLS) algorithm. The use of the forgetting factor l , where $0 < \lambda \leq 1$, allows to use the algorithm in non-stationary situations . Finally, in this section we present the pseudo code of EEG adaptive filtering using RLS and ICA[1][4][10].

2.2 Procedures

1) First we have to collect different datasets of of EEG signals of different patients.

2) Load the datasets by using MATLAB software and its EEGLAB toolbox[2].

3) Do Process on this datasets

4) Extract and select the specific features for different EEG datasets[2].

5) detect a eyeblink artifacts in order to facilitate analysis of EEG recording

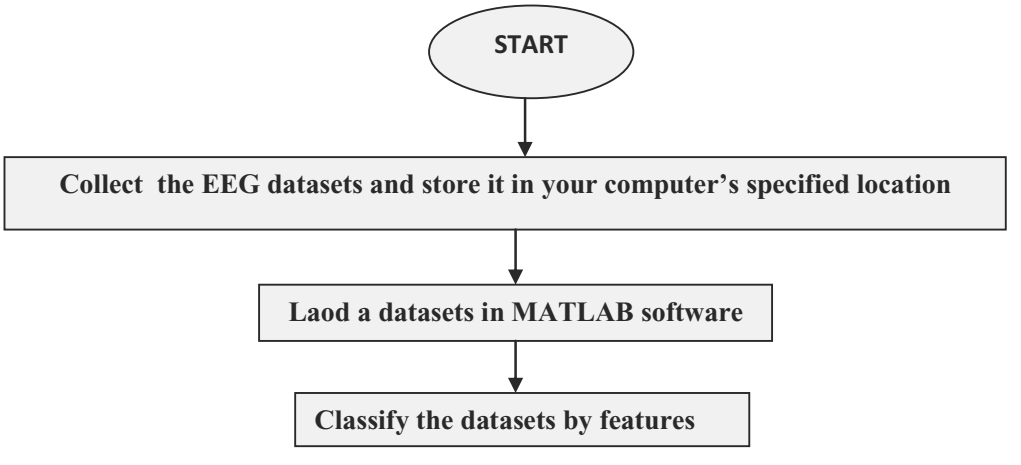
6) If eyeblinck artifacts not present in EEG signls then display the clean signal on computer screen.

7) If eyeblinck artifacts present in EEG signls then it gives to filtering block.

8) After filtering display this signals waveform on computer's screen[2].

9) finally store this clean EEG signals datasets on specified location of computer storage.

2.3 Flowchart



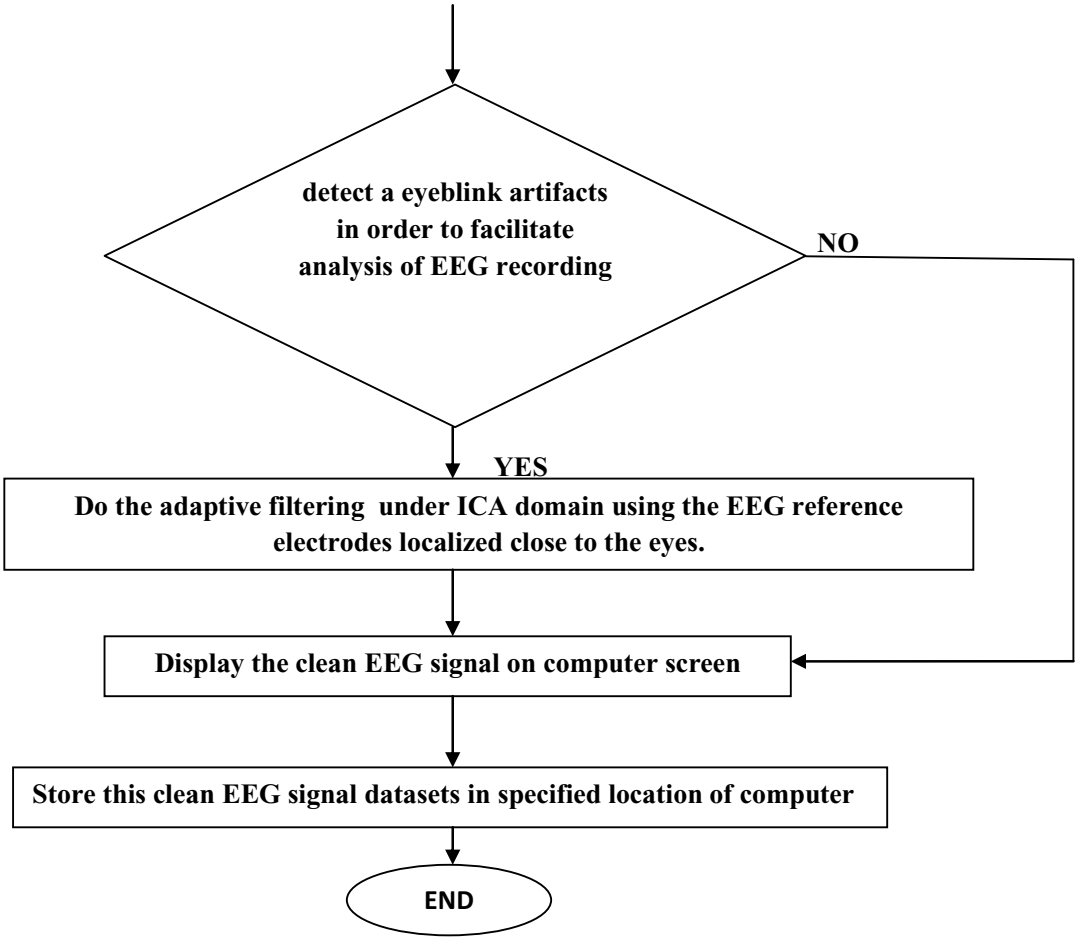


Figure 2.2 : flowchart

2.4 EEGLAB

As of version 7.1.2.10b, EEGLAB now exist as a compiled binary. Although the compiling function (compile_eeglab.m) should allow to compile EEGLAB on any platform, we only make available the Windows OS (32-bit) binary since this is the most popular platform. We have also successfully compiled EEGLAB under Linux 32 and 64 bits. This EEGLAB toolbox available on this http://sccn.ucsd.edu/ webside

III. CONCLUSIONS

An automatic artifact cancellation using EEG data is presented. This method efficiently rejects artifacts produced by eyes movements and it relies on independent component analysis (ICA) and Recursive Least Squares (RLS) adaptive filtering[5]. Futher analysis in distortion or correlation between corrected EEG and original EEG is necessary for fully demonstrating the effectiveness of our method. Such analysis and the extension of the method to pure on-line scenarios is proposed as further work. ICA appears to be a generally applicable and effective method for removing artifacts and independent noise, providing considerable performance improvements. It is commonly supposed that the introduction of a new block in a preprocessing system is not suitable, but the proposed approach gives us a new alternative method for eliminating noise without calibration. Furthermore, it is easy to implement, very stable and presents a fast convergence. As we discussed before, the ICA potential is the availability of removing real noise components without modifying others in standard EEG[4][5][10]. Adaptive filtering based on ICA would be very helpful in long recordings and on-line analysis, and although the approach developed in this paper is oriented to the elimination of EOG signals, it would be possible to apply it in artifacts more difficult to suppress such as muscle or electrodes artifacts.

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Up gradation of Supfina Grinding Machine from Siemens (S5) PLC to Fanuc CNC

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Abstract- The project Aim in designing the "up gradation of Supfina Grinding Machine From Siemen's S5 plc to Fanuc cnc"it can be used for precision grinding machine. In the Development of Automation Controllers the trend has been to move reliability with intelligent diagnostics of machine faults. So Industries have gradually moved from Programmable logic control and then to computerized numeric control. Here we shall deal how a plc works in Automation and control of cnc on plc and Servo drives to provide Automation with accuracy. Because of that this up gradation gives very light cuts, using Abrasive wheel as the cutting device. This Grinding Machine Remove Material from the Workspace by Abrasion. And finishing cut By Changing the Control of Supfina Grinding Machine.
Keywords – Controller FANUC 0iTD; Fanuc servo motors; FANUC servo drives; Air distribution unit; FRL unit; FRC(FR50); TURCK timer; PiLZ relay; Inductive proximity sensor(6 mm).

I. INTRODUCTION

In the Up gradation of supfina grinding machine from Siemens S5 PLC to FANUC CNC (0i-TD), all the upgraded features are resolved in Fanuc CNC such as it has less number of controlling axes, accuracy is more than PLC, as well as area requirement for control module is more than CNC, and very important PLC has less number of drives which results in different manufacturing object and quality control. This grinding is done on injector face, where high accuracy of operation is required so that at the time fuel injection leakage of fuel can be minimized to zero. As well as quality of object also can be improved. In real time this operation could result in fuel efficient vehicles and much amount of fuel can be saved.

II. BLOCK DIAGRAM

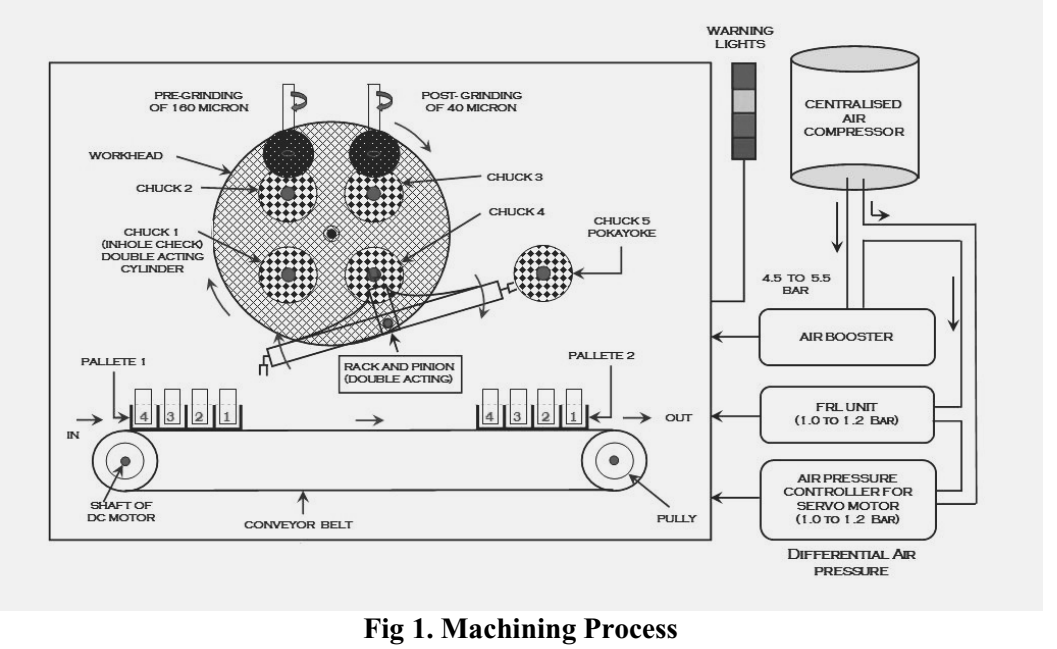


Fig 1. Machining Process

III. MACHINE OPERATION

Above diagram is mechanical structure of our project which shows the grinding process. At the starting of process operator places as injector body in to pallet. Each pallet consist of four objects. This pallet is then loaded in to machine when an operator pushes the push button. When it comes closer to the ARM of gripper it is detected by an inductive proximity sensor and gripper is activated to lift an object to put in chuck one as shown.

Here the rotating work head is set to rotate by 90°. Before rotating a work head the objet on chuck one checked by double acting cylinder in hole and after loading an object to chuck it is detected by proximity then work head rotates by 90° now the chuck position is at chuck 2. Again detection is done by proximity and pre-grinding is started. In the process of pre-grinding, grinding is done up to 160 micron. When the pre-grinding is completed then chuck is rotated by 90°.Then chuck goes for post grinding ,in the post grinding 40 micron of surface grinding is done by a double acting cylinder. Here grinding is completed and object is goes to chuck 4.

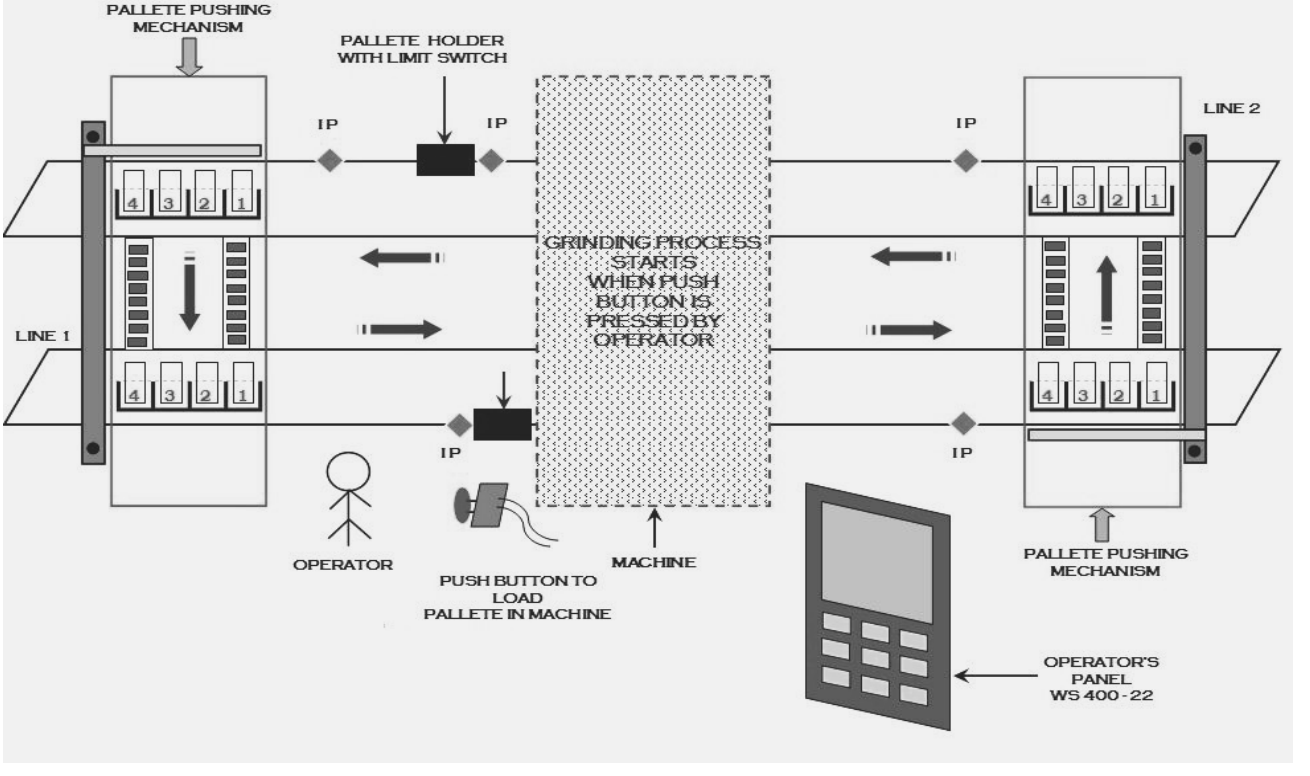


Fig 2. Conveyor Mechanism

When object is reached at chuck 4, IP mounted on rack and pinion detects and object.it takes object from chuck 4 and put in chuck 5.In chuck 5,level is checked. Again rack and pinion activated and put object from chuck 5 to pallet 2.pallet 2 goes out and loaded on conveyor line one gives grinded object, at the end of line one pallet is shifted to line two thenit comes back to operator then object took out by operator. this is the working process of existing supfina grinding machine.

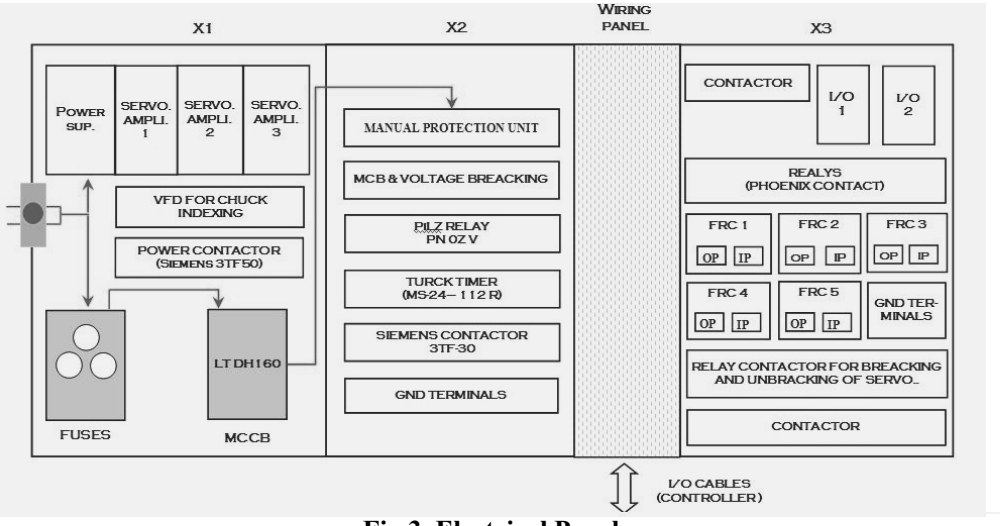


Fig 3. Electrical Panel

2.1 FANUC Controller 0iTD:

This is an important part of the machine which is responsible to process and control whole machining action with the help of PSU and servo drives cascade together. This controller also connected with I/O cards, HMI and servo drives. It works on 24 Vdc at I/P.

- Max controlled axes total/path – 11/8.
- Max feed axes total/path- 9/7.
- LCD panel – 8.4 X 10.4 inch.
- Program memory – 512 kb to 2Mb.
- Max number of I/O – 2048/2048.
- Max steps – 64000.

2.2 Air distribution Unit

FRL is an abbreviation of Filter Regulator Lubricator. It is connected in between centralized air compressor and machine. It is used for filtration of air from water particles. At the bottom of each cylinder one unit is connected which collect filtered water contain.

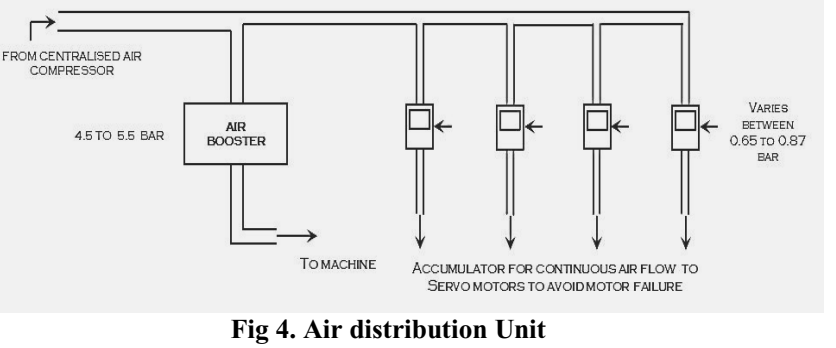


Fig 4. Air distribution Unit

2.3 FRC

FRC is used in electrical panel X3 to connect an input and output in between relay contactors and IO module. We are using total 9 FR50 cards, 50 indicate the number of IO pins each card has. These pins are grouped by input and output pins.

A ribbon cable also knows as multi wire cable. It has many conducting wires running parallel to each other on the same flat plan. Ribbon cables are usually seen for internal peripherals in computers, such as hard drives, cd drivers, on card readers.

2.4 FANUC Servo motors

In our machine we are using total 6 servo motors. They are classified by their work as 2 motors are for chuck indexing that is work head rotation, 2 motors are spindle motors and 2 servos are used for Slide movement through ball screw. Servo motors are self-rotating, It generates feedback. RPM can be controlled by controller as per requirement. Specification is as follow.

- Model number – αif22/3000-B.
- O/P power – 4Kwatt.
- RPM - 3000min^{-1}
- Poles – 8
- Vin – 230 VAc
- Frequency – 200 Hz.

2.5 PiLZ relay

Fig 5. PiLZ relay

Pilz is a solution supplier for all automation functions. Including standard control functions.Developments from Pilz protect man, machine and the environment. That's why all our experience and knowledge goes into individual products as well as consistently sophisticated system solutions.

2.5.1 Features

- Dual-channel operation with detection of shorts across contacts.
- Series connection of two E-STOP pushbuttons.
- Interlinked machines (Master-Slave),galvanic ally isolated.
- Contact expansion through PZE X5Pand positive-guided contactors Feedback circuit to monitor contact expansion.

2.6 FANUC servo drive

Here in our Machine we are using total 6 number of servo motors. They are classified by there working as 2 motors are for chuck indexing, 2 motors are to drive ball screw and slide and two motors are for pre-grinding and finish grinding that is to drive spindle.

Following is specification of servo motors.

- Vin: 283 to 339 Vdc.
- Vout: 240 Vac.
- Iout : L axis - 19 Amp.
- M axis - 19 Amp.

2.7 TURCK timer

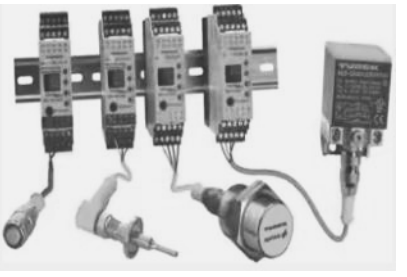
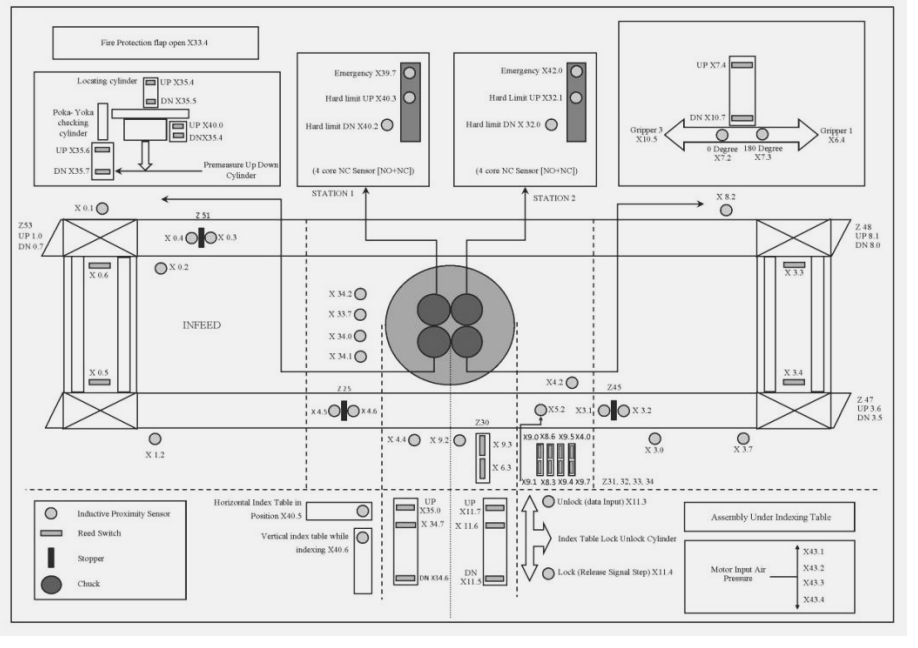


Fig 6. TURCK timer

Turck's IM models may be used to monitor the speed of motors ,shaft and conveyors, the temperature are RTD's and thermocouples and to control and monitors analog signals for linear moments ,temperature ,pressure ,level control or any other device using 4-20mA signals. all modules equipped with a two line trans reflective LCD display making it easy to read even in very bright light. The module also in-corporate a universal supply voltage and removable terminals, making them easy to install new existing system.

IV. SENSOR POSITIONS

V.



VI. CONCLUSION

Up gradation of Supfina grinding machine is successfully completed. The upgraded machine can process machining object in multiple axes up to 4 at a time efficiently. FR50 reduces the complexity and voltage requirement of machine. At the output the quality of machined object is high and accurate as per standard.

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Automated Oiling System For Engine Assembly

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Abstract- In this paper we propose a system using PLC (Programmable Logic controller), Sensor & Solenoid valve which will reduce error in oiling while assembly of engine takes place in automobile industry. Every human makes mistake in work due to his laziness, carelessness or due to the human limitation. In this system sensor which is mounted on Ring Gauge is connected to PLC and via PLC Solenoid valve is controlled which will spray required amount of oil for a specific time. Oil will provide to Solenoid valve from oil tank via FLR filter. Thus, this simple principle can lead reduce the excess wastage of oil.
Keywords- PLC (Programmable Logic controller); Sensor, Solenoid valve; Ring Gauge; FLR filter.

I. INTRODUCTION

Auto oiling system for Piston assembly is machine which is used to lubricating purpose in piston assembly in production line of engine. Currently this, machine oiling in piston assembly is done manually[1], and result of this having some error, data is collected manually and again since our project is based on Automation so it is fed into personal computer this procedure takes less time, reduces wastage of time and man power. So, this project is more effective.

The main objective of this project is to Oil flow should start only when piston inserted. Not with human hand. So, that the inductive sensors is used to detect the only the Metal so that the oil flow will be started. Since if there is some problem in flow of oil so there should be control of flow of oil so that if operator left piston in gauge, just 2 to 3ml oil should flow and then solenoid get turn off until next operation. Since it is totally automated so the Cycle time reduced from 10 sec to 3 sec. In order to deal with outsourcing, companies have found it necessary to decrease costs in production. The solution for this issue is to automate the process to improve efficiency and decrease number of labors. Our aim is

1) To develop error free (reduce error) system for increasing the productivity.
2) To design, implement and test the performance of PLC based system for automatic oiling.

II. SYSTEM MODEL

2.1Basic Architecture

The whole setup can be shown by this system architecture.in this system sensor which is mounted on Ring Gauge is connected to PLC. Sensor used is inductive sensor which will sense only metal. By using PLC solenoid valve is controlled for providing the oil to piston assembly from oil tank.

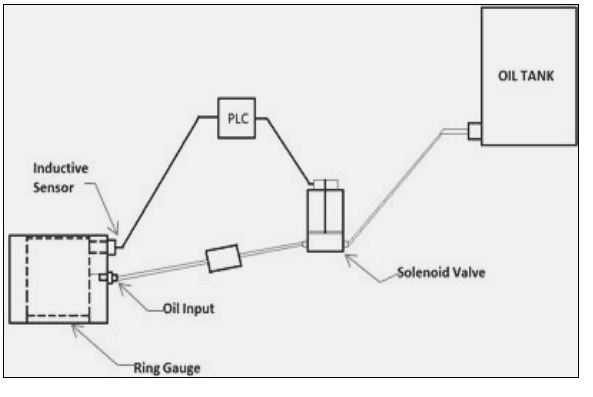

Fig 1. System Architecture

2.2 Data Flow

The data signals in this system flows from sensors to PLC through input-output channel then data in PLC is processed and the output is given through the output channel through PLC to switching relay and then through relay to Solenoid valve. The flow of system is shown in Figure 2

Fig 2. Data Flow

I. Electric Signal flow

The complete system work on 24V dc supply. Figure 3 shows electric signal flow.

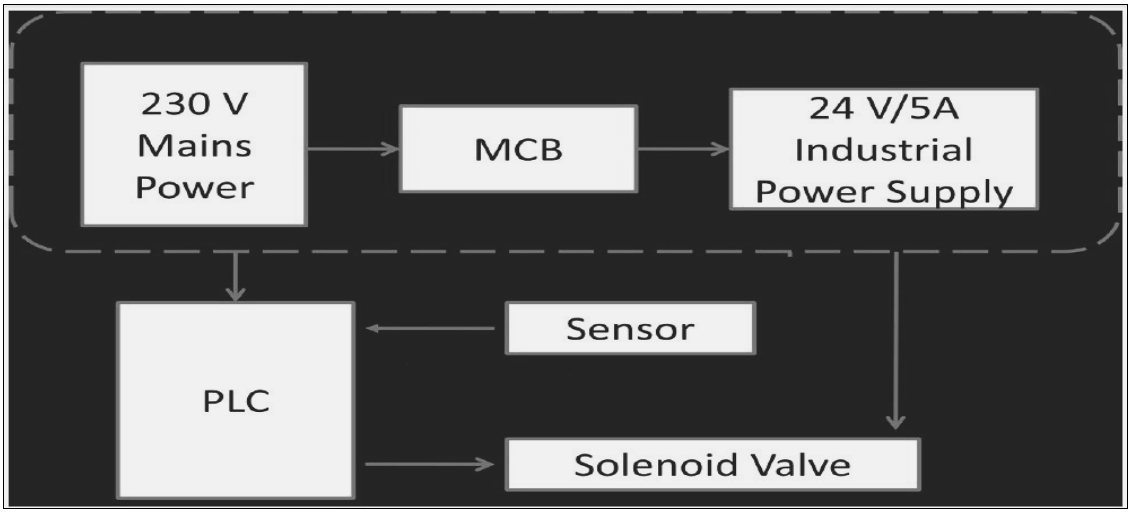

Fig 3. Electric Signal Flow

III. OPERATION SEQUENCE

The sequence of operation which to be perform are as following manner. This sequence is repetitive for quality production.

1. Start of process.
2. Conveyor start rotating
3. Provide piston assembly to ring gauge
4. Inductive sensor will sense piston
5. Solenoid valve will get open for 5 sec.

6. Spray 10 ml oil uniformly to piston.
7. After 5 sec solenoid valve will get closed
8. Conveyor start to rotate
9. Counter will count process.
10. Process repeat.

IV. FLOW CHART

The algorithm for system implemented is as follows:

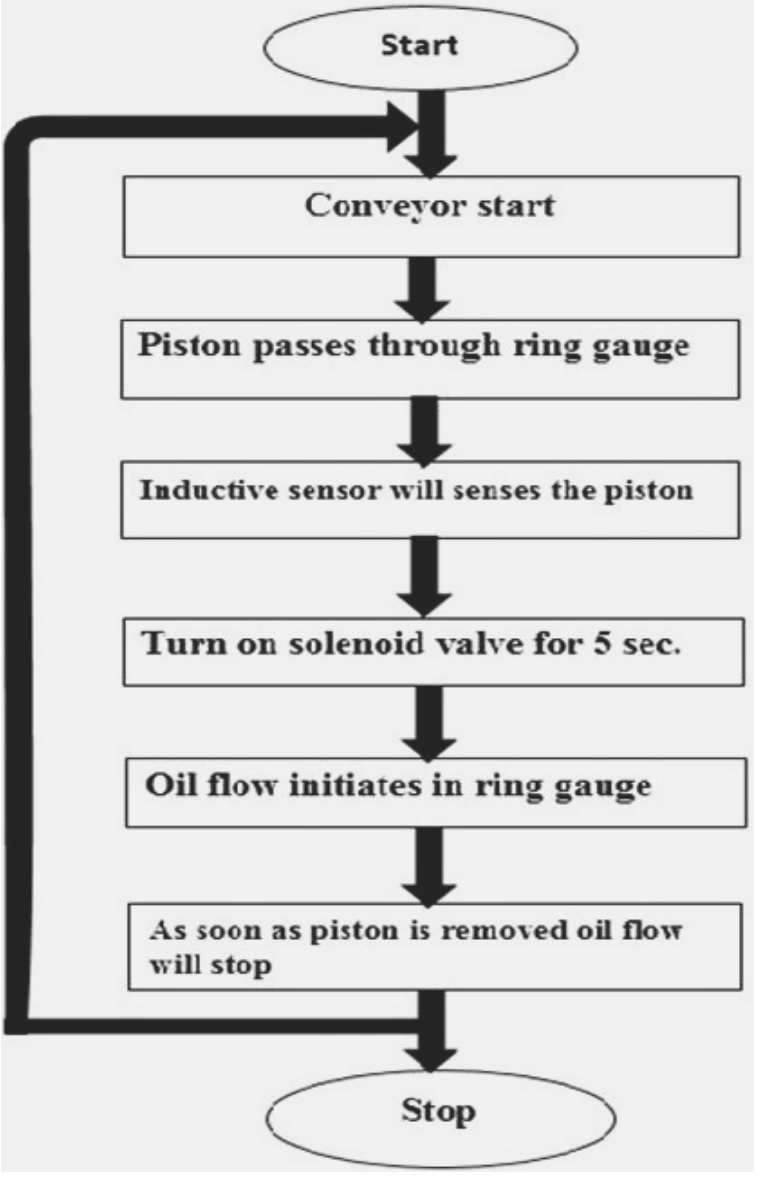

Fig 4. Flow Chart

V. RESULT AND CONCLUSION

Successful results will be obtained from this scheme. Due to this scheme human errors will get reduced thus production will also get increase. The comparison between the traditional system and PLC based system is shown in graph format in Figure 5.

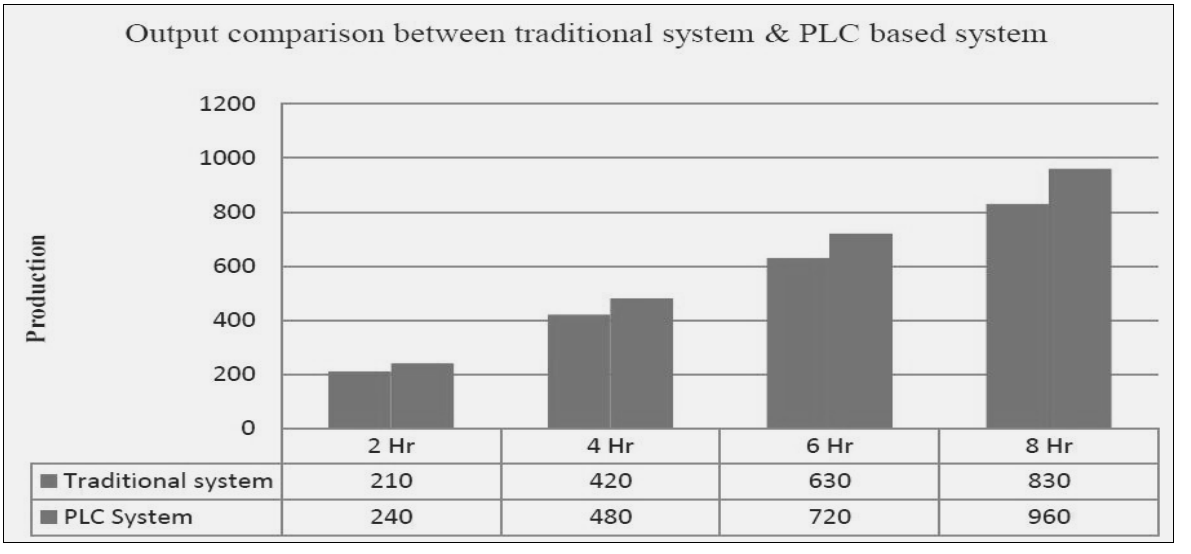

Fig 5.Comparision of Traditional system and PLC based system

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Prototype of Fingerprint Based Licencing System for Driving

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Abstract: To prevent non-licensees from driving and therefore causing accidents, a new system is proposed. Fingerprint identification is most reliable and important method in human identification. Fingerprint identification is one of the most popular and reliable personal biometric identification methods. The proposed system consists of a smart card capable of storing the fingerprint of particular person. The licence issued by a person has stored their fingerprint in the card. Vehicles such as cars, bikes etc. should have a card reader capable of reading the particular license. The same vehicle should have the facility of fingerprint reader device. A person, who wishes to drive the vehicle, should insert the card (license) in the vehicle and then swipe his/her finger. If the finger print stored in the card and fingerprint swiped in the device matches, he/she can proceed for ignition, otherwise ignition system in particular vehicle will not work. Moreover, the seat belt detector verifies and then prompts the user to wear the seat belt before driving. This provide the security of vehicles and also ensures safe driving by preventing accidents.
Keywords- Fingerprint; fingerprint reader; License; Ignition system; Smart Card; safe driving.

I. INTRODUCTION

Unlicensed driving is a matter of concern for several reasons. It is possible that drivers who have not undergone appropriate training and testing may be deficient in some aspect of the knowledge and skills required to drive safely and efficiently. Also, drivers who are unauthorized may have less incentive to comply with road traffic laws in that they would not be influenced by the rewards and penalties set up under the licensing system. On this argument, drivers who do not hold a valid license may disregard the threat of license sanctions or the benefits of reduced insurance premium due to not having made a claim. There appears to be a general flexible in the system of checking the validity of documents and their ownership – for example it is claimed to be straightforward for an unlicensed driver to pass himself off as a friend (with a license) and later present the friend's documents at a police station. According to a survey by the AA Foundation for Road Safety Research it has been estimated that in Sweden approximately half of all drunken driving takes place with drivers who do not have a valid driving license (Goldberg, 1997). Also in Sweden, unlicensed driving has been estimated as the cause of 100 deaths and 2500 injuries per year at a cost of more than one billion US dollars. In the USA, in 1995, more than 10,000 lives were lost in fatal accidents with unlicensed drunk drivers (approximately a quarter of all road deaths in that year). The equivalent figure in Great Britain would therefore be over 900 deaths if this rate prevailed. An in built system in an automobile which prevents such cases has therefore become vital. This paper aims to introduce a hardware architecture which detects the fingerprint as well as the validity of the license of the driver and takes a robust decision to turn on or off the ignition system based on the validity.

II. BLOCK DIAGRAM

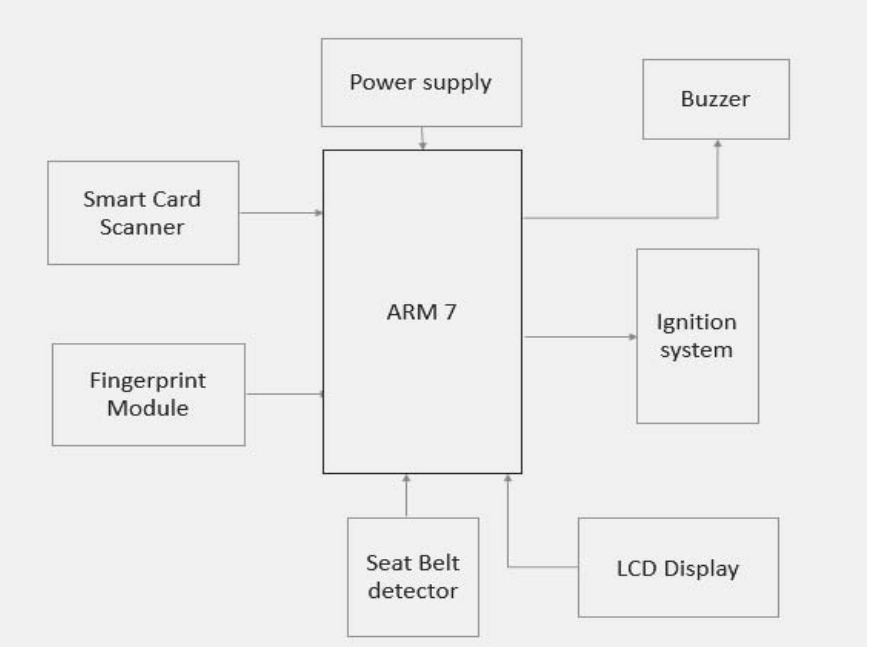

Fig 1.Block diagram of system

2.1. Smart card:

The license issued by the Government is a smart card which stores different fields such as name, license no., date of expiry, fingerprints of 10 fingers, type of license and blocked status of the license as well as fingerprint templates. The biometric fingerprint sensor will sense the digital picture of a fingerprint. The fingerprint scan detects the ridges and valleys of a fingerprint and converts them into ones and zeroes. Complex algorithms analyse this raw biometric scan to identify characteristics of the fingerprint, known as the "minutiae". Minutiae are stored in a fingerprint template. Up to 200 minutiae are stored in a template, but only a subset of these has to match for identification or verification. In most systems, if 10 to 20 minutiae match, the fingerprint is considered a match. In today's smart card systems approximately 40 minutiae are stored, because of space restrictions. This template is stored in the smart card.

2.2. Fingerprint:

A finger prints are the most important part of human finger. It is experienced from the research that all have their different finger prints and these finger prints are permanent for whole life. So fingerprints have been used for the forensic application and identification for a long time. These finger print shows the unique identification of a person. A fingerprint is the composition of many ridges and furrows. Finger prints can't distinguished by their ridges and furrows. It can be distinguished by Minutia, which are some abnormal points on the ridges. Minutia is divided in to two parts such as: termination and bifurcation. Termination is also called ending and bifurcation is also called branch. Again minutia consists of ridges and furrows. valley is also referred as furrow

2.3 Finger print recognition:

The fingerprint recognition problem can be grouped into two sub-domains such as:-
i) Fingerprint verification ii) fingerprint identification (Figure1.2.1).

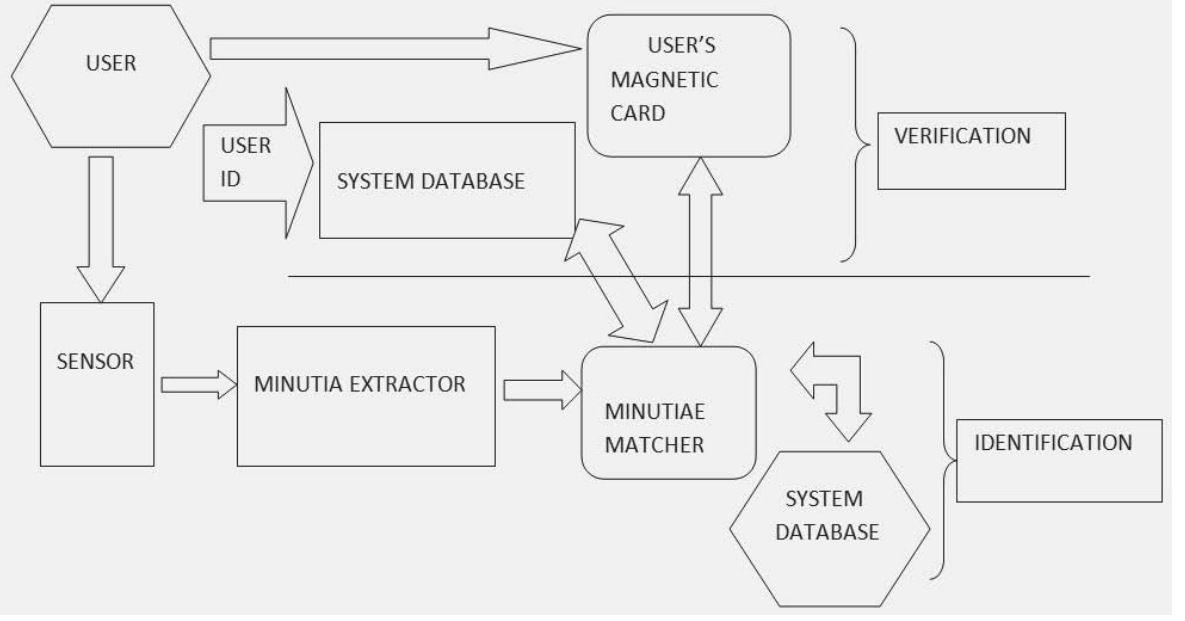

Fig 2. Fingerprint identification system

Fingerprint verification is the method where we compare a claimant fingerprint with an enrolee fingerprint, where our aim is to match both the fingerprints. This method is mainly used to verify a person's authenticity. For verification a person needs to his or her fingerprint in to the fingerprint verification system. Then it is representation is saved in some compress format with the person's identity and his or her name. Then it is applied to the fingerprint verification system so that the person's identity can be easily verified. Fingerprint verification is also called, one-to-one matching.

Fingerprint identification is mainly used to specify any person's identity by his fingerprint. Identification has been used for criminal fingerprint matching. Here the system matches the fingerprint of unknown ownership against the other fingerprints present in the database to associate a crime with identity. This process is also called, one-too many matching. Identification is traditionally used for solve crime and catch thieves.

III. FINGERPRINT MATCHING ALGORITHM

Fingerprint identification is one of the most popular and reliable personal biometric identification methods. This paper describes an on-line fingerprint identification system consisting of image acquisition, edge detection, thinning, feature extractor and classifier. The pre-processing part includes steps to acquire binaries and skeletonized ridges, which are needed for feature point extraction.

Feature points (minutia) such as endpoints, bifurcations, and core point are then extracted, followed by false minutia elimination. Human fingerprints are rich in details called minutiae, which can be used as identification marks for fingerprint verification. The algorithm that was implemented for finger print matching in this research work is discussed below. Anil Jain et al proposed a hybrid matching algorithm for matching. Our algorithm is described in detail below.

Step 1: Histogram Equalization:

Histogram equalization is to expand the pixel value distribution of an image so as to increase the perception information. The original histogram of a fingerprint image has the bimodal type the histogram after the histogram equalization occupies all the range from 0 to 255 and the visualization effect is enhanced.

Step 2: Fourier Transform:

Because the image in the Fourier domain is decomposed into its sinusoidal components, it is easy to examine or process certain frequencies of the image, thus influencing the geometric structure in the spatial domain.

Step 3: Binarization:

A locally adaptive binarization method is performed to binarize the fingerprint image. Such a named method comes from the mechanism of transforming a pixel value to 1 if the value is larger than the mean intensity value of the current block (16x16) to which the pixel belong.

Step 4: Direction:

Field orientation and filtered field orientation map computation, which consists of the calculation of the dominant direction of ridges and valleys in each local region.

Step 5: Region of Interest (ROI):

Two Morphological operations called 'OPEN' and 'CLOSE' are adopted. The 'OPEN' operation can expand images and remove peaks introduced by background noise. The 'CLOSE' operation can shrink images and eliminate small cavities.

Step 6: Thinning:

The built-in Morphological thinning function in MATLAB is used for ridge thinning. The thinned ridge map is then filtered by other three Morphological operations to remove some H breaks, isolated points and spikes.

Step 7: Matching:

A bounding box is placed around each template minutia. If the minutia to be matched is within the rectangle box and the direction discrepancy between them is very small, then the two minutia pair is regarded as a matched minutia pair. Each minutia in the template image either has no matched minutia or has only one corresponding minutia. The number of matched minutia pair is calculated as percentage of matching.

IV.IGNITION SYSTEM OF VEHICLE

The ignition system of an internal-combustion engine is an important part of the overall engine system that provides for the timely burning of the fuel mixture within the engine. All conventional petrol (gasoline) engines require an ignition system. The ignition system is usually switched on/off through a Lock switch, operated with a key or code patch. The ignition system works in perfect concert with the rest of the engine of a vehicle. The goal is to ignite the fuel at exactly the right time so that the expanding gases can do the maximum amount of work that in line with the processes to make the vehicle move. If the ignition system fires at the wrong time, power will fall and gas consumption and emissions can increase. The part of the ignition system that first initiates the process of moving a vehicle is the key system in conjunction with the kick starter. A wire from the battery in the vehicle connects to the kick starter and other wires connect the kick starter to the key system. When the car key in the ignition system is turned once, two wires coming from the kick starter to the key system are bridged. This causes the engine and some other parts of the vehicle to be put in a READY or ON state. Turning the key again makes a third wire to temporarily join the already bridged wires, causing voltage to flow from the battery to the necessary parts vehicle so as to enable the vehicle move.

4.1. Controlling the Ignition System

The mechanism of the ignition system comprises amongst other things, three wires that are connected to the key system and used with the keys to ignite the vehicle. Two of these wires are bridged when the key is turned first, causing current to flow from the car batteries to all parts of the car requiring some form of electricity for operation. When the key is turned again, the third wire bridges momentarily with the two wires already connected. This causes the cranking of the engine, which ignites the vehicle. For the purpose of this research work, the three wires were disconnected from the key system. The first

two wires were connected to the first relay, and the third wire was connected to the second relay. This was done to simulate the action of bridging two of the wires together when the first relay is activated. Activating the second relay for a short time causes a temporary connection between the two relays. This connects all three wires together, thus igniting the vehicle. The relays were activated or deactivated by sending appropriate control signals from the fingerprint recognition software, via the parallel port to the interface circuit. A correctly identified or verified image causes the parallel port control codes in the fingerprint recognition software to send about 5volts to pin 2 of the parallel port. This voltage passes on to the interface control circuit and subsequently activates the first relay. After five seconds, about 5volts is sent again to the pin 3 of the parallel port for three seconds. This activates the second relay for five 170 Omidiora E. O., Fakolujo O. A., Arulogun O. T. and Aborisade D. O. seconds and deactivates it. The continuous activation of the first relay and the momentary activation of the second relay cause the vehicle to be ignited. Conversely, an incorrectly identified image causes the parallel port control codes in the fingerprint recognition software to send about 0volts to pin 2 and pin 3 of the parallel port. Thus, no voltage passes on to the interface control circuit and the two relays remain deactivated. This prevents the vehicle from being ignited.

V. CONCLUSION

From this we implement image-recognition techniques that can provide the important functions required by advanced intelligent Car Security, to avoid vehicle theft and protect the usage of unauthenticated users**.** Secured and safety environment system for automobile users and also key points for the investigators can easily find out the hijackers image. We can predict the theft by using this system in our day to day life. This will help to reduce the complexity and improve security.

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ADAPTIVE TRAFFIC SIGNALLING SYSTEM

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Abstract-Traffic signals are the most convenient method of controlling traffic in a busy junction. Present traffic signals fail to control the traffic effectively when a particular lane has got more traffic than the other lanes. If on first lane 30 vehicles are present at same time on second lane special vehicle is detected by RFID receiver upto 25 meter range that time first lane will closed and second lane will open. This lane open for the duration of number of normal vehicle and number of special vehicle e.g. if on second lane before special 6 normal vehicle are there , that means (6 sec of normal vehicle + 1 sec of special vehicle=7 sec for second lane). This normal vehicle are detected by ultrasonic sensor after that normal operation will continue.

Keywords- PIC microcontroller 18f4520, PLC with 12 I/O, ultrasonic Sensor, RFID Transmitter & receiver, LED.

I.INTRODUCTION

Traffic signals are the most convenient method of controlling traffic in a busy junction. But, we can see that these signals fail to control the traffic effectively when a particular lane has got more traffic than the other lanes. This situation makes that particular lane more crowdy than the other lanes. If the traffic signals can allot different time slots to different lanes according to the traffic present in each lane, then, this problem can be solved easily. We, in this project work, intend to measure the traffic density by counting the number of vehicles in each lane and then allot different time slots to different lanes according to the number of vehicles. Its also difficult for a traffic police to monitor the whole scenario round the clock. So, we use an automated system which counts the number of vehicles in each lane, allots different time slots to different lanes according to the number of vehicles present in each lane. If there is special vehicle in any path like Ambulance or Vehicles of VIP then it is detected and that path will get open and others will remain close. For automation, we have decided to use a Programmable Logic Controller (PLC). Due to its ruggedness and ease of programming and re programming, PLC is the most suitable controller for the above purpose.

II. BLOCK DIAGRAM

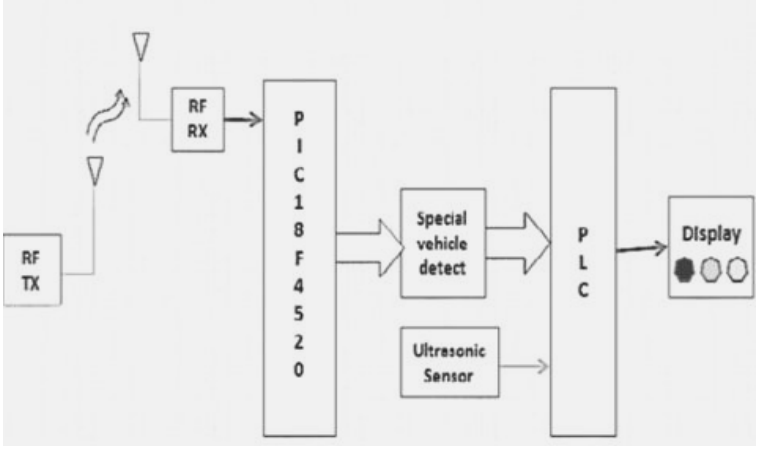

Figure1.Block diagram of system

2.1.PIC18F4520

- Features PIC18F4520

- Operating Frequency:- DC – 40 MHz
- Program Memory (Bytes) :- 32768
- Program Memory(Instructions):- 16384
- Data Memory (Bytes) :- 1536
- Data EEPROM Memory (Bytes) :- 256
- Interrupt Sources :- 20
- I/O Ports Port:- Ports A, B, C, D, E

2.2. Ultrasonic sensor:

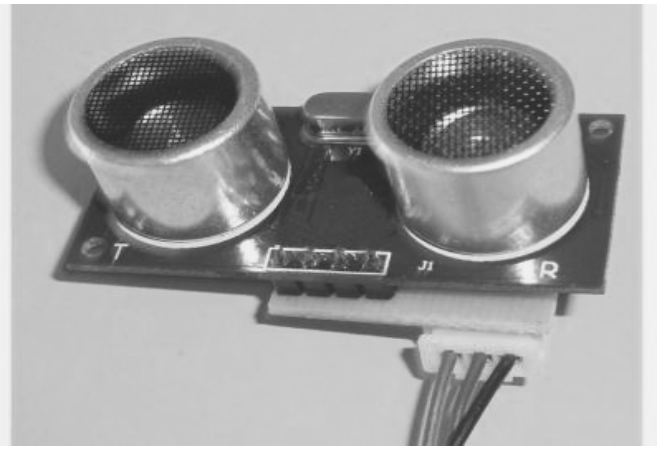

Figure 1.Ultrasonic sensor

Features :

- Measurable distances of 10cm to 400cm(4 Meters)
- 5V DC Supply voltage
- Compact size
- Accuracy of +-1cm
- Modulated at 40 kHz
- Serial data of 9600 bps TTL level output for easy interface with any microcontroller.

2.2PLC(Programmable Logic Controller):

Programmable Logic Controller (PLC) defined by NEMA as a digitally operating electronic apparatus that uses a programmable memory for internal storage of instructions for implementing specific functions such as LOGIC, SEQUENCING, TIMING, COUNTING and ARITHMETIC through digital or analog INPUT/OUTPUTMODULES

Alllen Bradley PLC:

Allen-Bradley control solutions set the standard — from the Programmable Logic Controller (PLC) invented nearly 30 years ago to the more recent technology embodied in the rugged, scalable, highly-functional Programmable Automation Controller (PAC). The reason? You move forward with our control solutions while protecting the control investment you made in the past.

2.3RFID Transmitter and receiver:

An RFID system consists in a set of emitters or tags which, periodically or upon interrogation, transmit a short digital radiofrequency message containing an identification code (unique to each tag) as well as some data stored in the tag's memory. These data can be obtained remotely by a computer equipped with an RFID reader. Besides the tag ID, which confirms the presence of the tag within the detecting range of the reader, the RFID reader measures the received signal strength (RSSI) of the RF signal, which is an indicator of the range from tag to reader.

The main advantage of RFID systems—with respect to other RF technologies, which could be used for infrastructure-to-vehicle (I2V) communications—is its low cost and minimum infrastructure maintenance, which results in a high scalability and easy deployment of the infrastructure. The kind of active RFID tags used in this research are cheap (10–20 euros each), can be easily attached to the traffic signals and last for at least five years.

- Active RFID Transmitter Tag
- Features:
    - Each transmitter tag has unique 16 bit ID, Preprogrammed during manufacturing
    - Upto 25 meters range
    - Built in Antenna and Battery on PCB
    - LED indication for active transmission
    - 3V battery powered CR2032
    - Low Cost and Compact Design
- Active RFID Receiver Tag
    - LED indication on valid data receive
    - Supports Active RFID Transmitter Tags
    - Outputs 9600 bps Serial data
    - PCB built Antenna
    - Upto 64 tags supported automatically in range

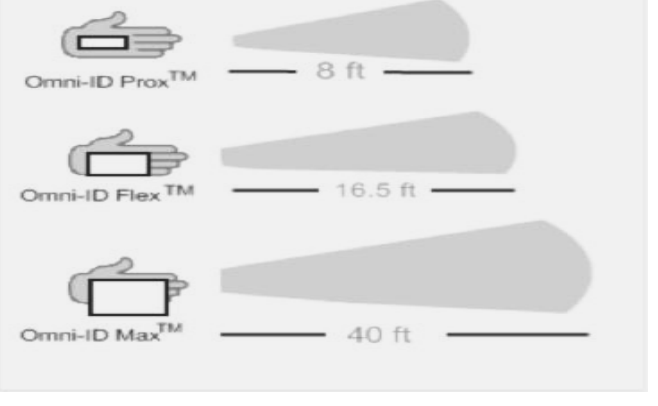

Figure 2.Ranges of RFID sensor

III. SYSTEM ARCHITECTURE IN DETAIL

In our project we designing aadapted system.in which we use electrical, electronics and mechanical components like controller, PLC, ultrasonic sensor.Traffic signals are the most convenient method of controlling traffic in a busy junction. But, we can see that these signals fail to control the traffic effectively when a particular lane has got more traffic than the other lanes. This situation makes that particular lane more crowdie than the other lanes. If the traffic signals can allot different time slots to different lanes according to the traffic present in each lane, then, this problem can be solved easily. We, in this project work, intend to measure the traffic density by counting the number of vehicles in each lane for that purpose we use Ultrasonic sensor which is interfaced with PLC and this sensor senses the vehicles and count vehicles through PLC.

In normal traffic control system first lane will open ,then second and so on. But, in our system if special vehicle is detected in any path then this path will open first and sequence will continue like normal traffic system.We allot different time slots to different lanes according to the number of vehicles. Its also difficult for a traffic police to monitor the whole scenario round the clock. Each special vehicle like ambulance, VIP, etc. have RFID transmitter. If there is special vehicle present in any path then it is detected by RFID receiver and accordingly microcontroller works based on that RFID receiver. After that microcontroller gives that signal i.e. special vehicle is detected to PLC . And based on PLC signal at output Green, Red, Yellow lights will ON or OFF. Then path will get open or close.

IV. CONCLUSION

Adaptive traffic light system has been successfully developed. The system is control by using PLC,PIC microcontroller , ultrasonic sensors, RFID transmitter &receiver.

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Lung Cancer Analysis by Quality Measures

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Abstract- Lung cancer has been and is very sensitive topic in the field of biomedical engineering. Lot of work is carried out to detect lung cancer at initial stages and also even sometimes at later stages because lung cancer symptoms are very much similar to the other lung diseases such as Pneumonia, Emphysema, Interstitial lung diseases. Hence lung cancer detection becomes important. Although lot of work is carried out on lung cancer using image processing. This paper also deals with the same using quality measures. The quality measures used are normalized cross correlation, structural contents and normalized absolute error, which helps for lung cancer analysis. The quality measures are applied on both healthy and cancerous lung images and then compared to take decision
Keywords- Lung cancer**,** normalized cross correlation, structural contents, normalized absolute error

I. INTRODUCTION

Today the lung cancer analysis is done through number of imaging techniques[8] such as Xray, CT (Computer Tomography), HRCT (High Resolution Tomography), MRI (Magnetic Resonance imaging), PET (Positron Emission Tomography) and the latest biopsy technique[12] in which a piece of lung is cut and is analyzed through electron microscope. Physicians and radiologist [5][10] use these imaging techniques for lung cancer analysis but still they also have to rely on many other factors besides these techniques such as patient's symptoms and family history. A physician starts the treatment on their experience and judgment, which is followed by the one of the imaging techniques. Most of the times the tests are repeated, hence the patient has to suffer. Time is also very important factor for diseases diagnosis. The aim of this paper is to provide an algorithm in image processing to the physicians which will help to take firm decision regarding lung cancer. Here both microscopic healthy and lung disease images are used shown in figure 1 and figure 2. The analysis is done on 50 microscopic lung images of size 51*512. The software tool for the algorithm is MATLAB 2013. There are number of lung diseases [4] but this work concentrates on lung cancer only. The lung cancer is analyzed with the help of 03 quality measures normalized cross correlation, structural contents and normalized absolute error.

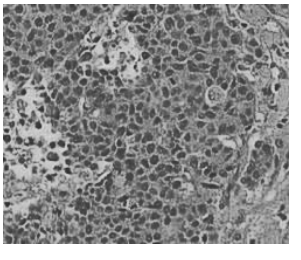


Fig.1 Microscopic Lung Cancer Image

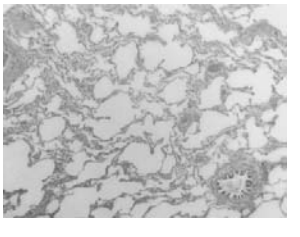


Fig.2 Microscopic Healthy Lung Image

The quality measures are applied on both microscopic healthy and cancer images [10]. Results from both the images are compared and then obtained values help to take decision, whether the lung images are healthy or cancerous.

1.1 Quality measures

The existing quality measures[2] used for the analysis are MSE (Mean Square Error), PSNR (Peak signal Noise Ratio), AD (Average Difference, MD (Maximum Difference), MAE (Mean Absolute Error), NK (Normalized Cross Correlation),NAE(Normalized Absolute Error), SC (Structural Content), IF (Image Fidelity), PMSE (Peak Mean Square Error) and SSIM (Structural Similarity Index Metrics). Depending on various applications, these measures can be used. The evaluation of image quality measure is very important in biomedical image processing systems, such as those for compression, enhancement, transmission and reproduction. In this paper lung diseases analysis is done with three parameters NK, SC and NAE. Although the selection of quality measures depends on how good the results are.

1.1.1NK (Normalized Cross Correlation)

In biomedical image processing, correlation is often used to search for similar signals that are repeated in a time series which is also known as matched filtering. As the correlation of two high amplitude signals will tend to give large values, because the similarity of two signals cannot be determined just by comparing the amplitude of their cross correlation [7]

In practical approach, when one applies this normalization to real discrete signals or images, then results shows that a correlation coefficient is greater than about 0.7 or 0.8 which indicates a pretty good match.

$$NK = \frac{\sum_{i=1}^{M}\sum_{j=1}^{N}(x(i,j)\times y(i,j))}{\sum_{i=1}^{M}\sum_{j=1}^{N}(x(i,j))^2} \quad (2)$$

1.1.2. SC (Structural contents)

Natural images are highly structured. The most fundamental principle to image quality assessment is to extract structural information from the visual scene by highly adapting HVS, and therefore a measurement of structural similarity (or distortion) is possible [1] which provides a good approximation to perceptual image quality. There may be different ways to develop image quality assessment algorithms, depending on how structural information and structural distortion are defined. SC measures the similarity between two images as it is correlation based measure and is given by the equation [6]

$$SC = \frac{\sum_{i=1}^{M}\sum_{j=1}^{N}(y(i,j))^2}{\sum_{i=1}^{M}\sum_{j=1}^{N}(x(i,j))^2} \quad (3)$$

For both NK and SC, x(i,j) indicates reference image that is microscopic healthy lung image and y(i.j) is the distorted image, which in this case is microscopic lung cancer image

1.1.3. NAE (Normalized Absolute Error)

Normalized absolute error is a measure of how far is the distorted image from the original image with the value of zero being the perfect fit. The Normalized Absolute Error is defined as

$$NAE = \sum_{m=1}^{M}\sum_{n=1}^{N} | x(m,n) - x\hat{}(m,n) | / \sum_{m=1}^{M}\sum_{n=1}^{N} | x(m,n) | \quad (4)$$

II. ALGORITHM WITH RESULTS

2.1 Algorithm

The algorithmic steps that are applied with the help of image processing using MATLAB 2013 are

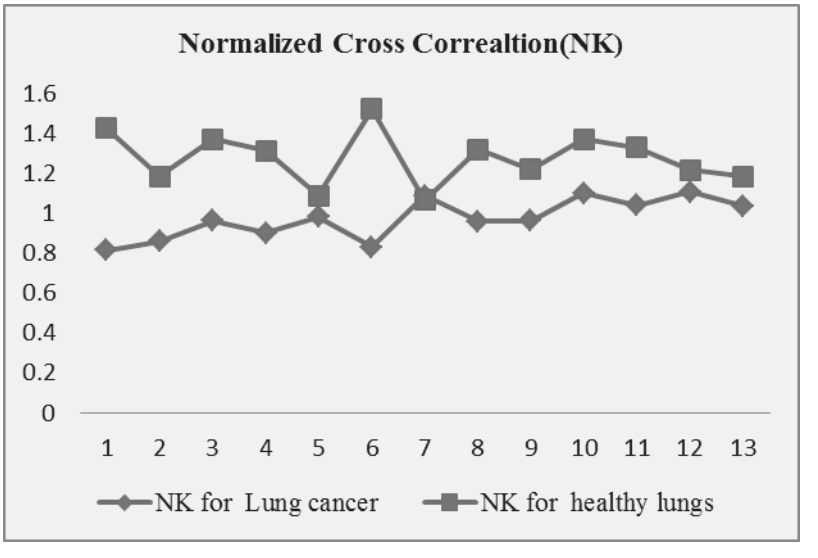
- Microscopic Lung images (healthy lungs and cancerous lungs)
- Resizing to 512*512
- Gray scale image
- Preprocessing
- Testing the healthy lung images and cancer lung images through quality measures such as NK,SC and NAE
- Results are compared for the lung cancer analysis

2.2 Performance Analysis

The performance analysis for microscopic lung cancer image is carried out by applying 03 quality measures one by one on lung cancer image and then on healthy lung images. 20 images of both lung cancer and healthy lungs are taken for the analysis. The efficiency of the algorithm depends on how accurately all values of images ranges and also increasing the lung image database. Here three parameters are taken for analysis because if the values of one of the quality measure overlaps, the other two parameters help to decide, whether lung cancer exists.

Table 1.Normalized Cross Correlation of Microscopic Lung Images

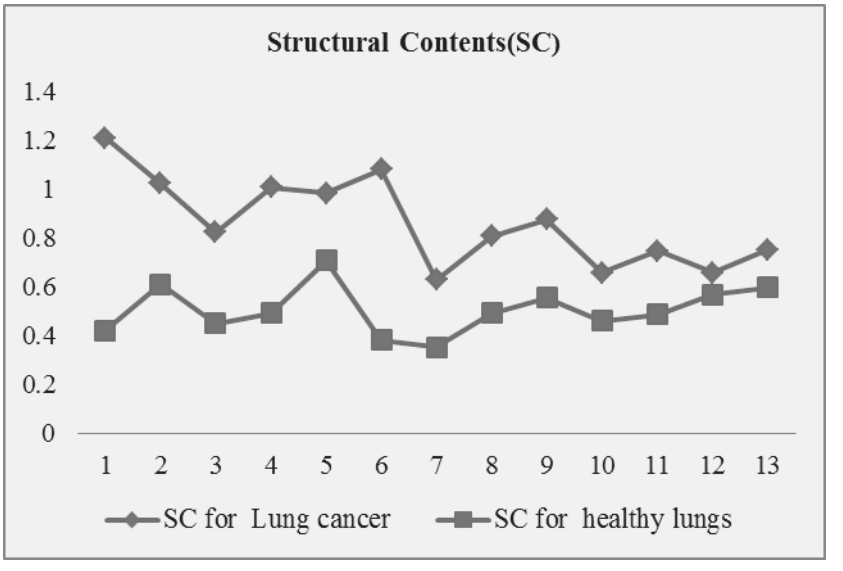
Normalized Cross Correlation (NK) for microscopic Lung cancer images	Normalized Cross Correlation (NK) for microscopic healthy Lung images
0.8136	1.4284
0.8591	1.1861
0.9646	1.372
0.9012	1.315
0.9818	1.0893
0.8327	1.5224
1.0883	1.0678
0.9589	1.3217
0.9633	1.2207
1.1015	1.3734
1.0392	1.3289
1.1083	1.2188
1.0376	1.1859



Graph 1.Comparative Analysis of NK for Microscopic Lung Images

Table 2.Structure Contents of Microscopic Lung Images

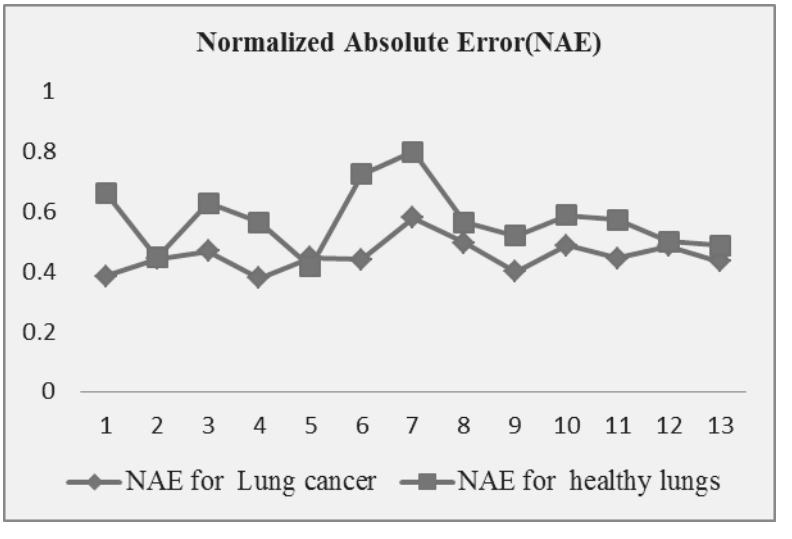
Structure contents (SC) for microscopic Lung cancer images	Structure contents (SC) for microscopic healthy Lung images
1.2084	0.4209
1.021	0.6094
0.8213	0.4502
1.0055	0.4923
0.9818	0.7066
1.0789	0.3809
0.6282	0.3525
0.8076	0.491
0.8753	0.5557
0.6572	0.4596
0.745	0.4853
0.6564	0.5668
0.7523	0.5958



Graph 2.Comparative Analysis of SC for Microscopic Lung Images

Table 3.Normalized Absolute Error of Microscopic Lung Image

Normalized Absolute Error (NAE) for microscopic Lung cancer images	Normalized Absolute Error (NAE) for microscopic healthy Lung images
0.3832	0.6625
0.4419	0.4462
0.467	0.6279
0.3779	0.5639
0.446	0.4166
0.4397	0.7245
0.578	0.7983
0.4954	0.5627
0.3995	0.5189
0.4857	0.5871
0.4433	0.5721
0.4846	0.4996
0.4342	0.4865



Graph 3.Comparative Analysis of NAE for Microscopic Lung Images

The reference image is standard image, which is preprocessed and used for comparison.Table1 shows the application of normalized cross correlation and graph1 is the comparative analysis of lung cancer and healthy lung microscopic images for NK .Similarly the results of SC and NAE are shown in table 2,3and graph 2, 3 respectively.

III. CONCLUSIONS

Lung cancer analysis is done using three quality measures. NK, SC and NAE are applied on both lung cancer microscopic and healthy lung images. The comparative analysis shows that larger the value of Normalized Absolute Error (NAE) poorer the quality of image, larger the value of Structural Content (SC) means poorer the quality of image and smaller the value of Normalized cross correlation (NK) means poorer the quality of image. The values of NAE and SC for lung cancer microscopic images are high, whereas values of NK for lung cancer microscopic images are small. Hence the result can help for lung cancer diagnosis

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[12]http://www.webmd.com/lung/lung-biopsy

ZIGBEE Based Wireless Sensor Node Design using FPGA for Fire Monitoring and Control

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Abstract- The aim of this paper is to design a wireless sensor node using FPGA for fire monitoring and control. FPGA is used in the wireless sensor node design in order to enhance the processing capabilities of the system to meet the target applications. The sensor nodes in a wireless sensor network are normally microcontroller based which are having inadequate computational capacity related to various applications. This paper describes the selection, specification and comprehension of a wireless sensor node using the field programmable gate array (FPGA) based architecture for an early detection of hazards (e.g. smoke and fire). The FPGAs in it's place are more proficient for complex computations in compare to microcontrollers. Another benefit of using FPGA is also due to it's reconfigurable characteristic without changing the hardware itself. The node is implemented using Spartan 3A FPGA board from Xilinx. A design of simple hardware circuit with different type of fire sensors enables every user to use this wireless fire security system. The FPGA will constantly supervise all the sensors and if it senses any security trouble then the FPGA will send the information to the PC central monitoring station wirelessly using Zigbee technology. The system is based on the Lab VIEW software.
Keywords- FPGA; Wireless Sensor Network (WSN); Temperature sensor; Smoke sensor; Fire sensor; Zigbee; Lab VIEW.

I. INTRODUCTION

The wireless sensor nodes are the fundamental constituent in a wireless sensor network (WSN)[1].These nodes are used in variety of applications such as environment monitoring, pipeline (water, oil, gas) monitoring, target tracking, structural health monitoring, health care, precision agriculture, supply chain management, transportation, active volcano monitoring, underground mining and human activity monitoring. A wireless sensor node is a device in Wireless Sensor Network, which consists of integral sensors for monitoring various physical as well as environmental conditions. These devices are able to sensing information, processing the sensed information and transfer the processed data to neighbor nodes or some distant station(s). Wireless sensor node consists of five significant subsystems as shown in the Fig.1. Sensing subsystem consists of sensors, which are usually small devices which are capable of producing some computable response (often a change in voltage). These responses are generally fed to an Analog to Digital Converter (ADC). The digitized signal is then sent to the processor unit for further processing. Processor subsystem is the heart of the wireless sensor node. It is also recognized as the controlling unit and the choice of a processor determines the tradeoff between efficiency and flexibility in terms of both energy and performance. There are numerous processors as options: microcontrollers, application-specific integrated circuits, digital signal processors, and field programmable gate arrays. FPGA's are chosen as the control unit in the wireless sensor node because of its unique features of reprogramming and reconfiguration. Communication subsystem consists of a wireless antenna. It makes use of RF (Radio Frequency), Infrared waves or Optical Communication as the communication media. The wireless radio unit operates in the ISM band. Memory requirements are reliant on applications. There are two categories of memory based on the intention. User memory is intended for storing application related or personal data. Program memory is designed for programming the device. Batteries are the key source of power supply for a wireless sensor node. Due to the constraint in size, batteries used to have to be in small size, which implies that the life span of a wireless sensor node will be relatively low.

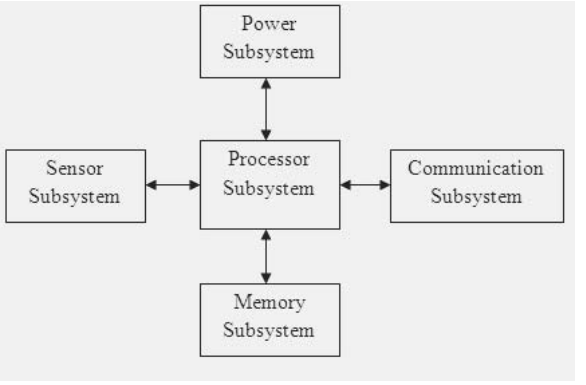

Fig. 1 General Sensor Node Architecture

In this paper, I have used the FPGA based sensor node architecture, featuring the acquirement of information related to fire (i.e. temperature) and smoke and transmission of information by routing over wireless networks such as Zigbee [2]. In data acquisition system, it is a rising challenge to obtain the data at a requisite rate and to accumulate the data in an on chip memory processor. There are devices like microcontrollers, microprocessors and DSP are available which can be programmed as a data acquisition system[7]. The major drawback of using these devices is their slower data acquisition speed, no availability of adequate on-chip memory. Apart from this, the inflexibility in the hardware configuration of these devices does not allow flexibility for the user in configuring these devices along with the requirement. To overcome these drawbacks this research work proposes a new method of design and develop a data acquisition system using FPGA which offers flexibility in configuring the device according to the user requirement. The most important defining characteristic of the FPGA is that it can be reprogrammed. Programming an FPGA is very different from a DSP processor or a microprocessor. Microprocessor is a stored program computer. A computer organism contains both a CPU and a separate memory that keeps the instruction and data. The FPGA program is combined into the structure of FPGA. An FPGA doesn't fetch instructions. The FPGA's programming honestly implements the interconnections and logic functions. In the FPGA's there is no linger for completing the design to gain a working chip. The design can be programmed into the chip and can be tested instantly. When an FPGA is used in final design, the jump from prototype to product is much lesser and easier. They are having a huge number of input and output lines compared to microcontrollers, microprocessors and DSP's. FPGA's are having a superior processing speed compared to microprocessors and microcontrollers. With FPGA devices, it is possible to modify the design to fit the requirements of applications.

Fire security at home or at industry is the most vital one[8]. For everyone either in an individual house or an apartment or industry or any place, safety is required and they must ensure that their home or industry is installed with the perfect and inclusive fire security monitoring system to defend their own life and assets. This system can be used to offer fire security for all types of domestic, residential, commercial and industrial purposes using Zigbee technique wirelessly[9].

II. RELATED WORKS

Natheswaran S, Athisha G., discussed about the Remote Reconfigurable Wireless Sensor Node Design for Wireless Sensor Network[1]. Suneel Mudunuru, V. Narasimha Nayak, G. Madhusudhana Rao, K. Sreenivasa Ravi, discussed about the Real Time Security Control System for Smoke and Fire Detection Using ZigBee[2]. Manoranjan Das, Banoj Kumar Panda, discussed about the Prototyping a Wireless Sensor Node using FPGA for Mines Safety Application[3]. Basil Hamed, discussed about the Design &

Implementation of Smart House Control Using Lab VIEW[4]. P.S. Jadhav, V.U. Deshmukh, discussed about the Forest Fire Monitoring System Based on ZIG-BEE Wireless Sensor Network[5]. The Zujue Chen et al. discussed about the design of wireless sensor network node for carbon monoxide monitoring[6]. Shibi Fathima.A, discussed about the Implementation of Data Acquisition System for fire Detection in Mines Area Using FPGA[7]. N. Muthu Prabhu, S. Sai Mithun discussed about A Remote Home Security System Based on Wireless Sensor Network and GSM Technology[8].

III. SYSTEM ARCHITECTURE AND WORKING PRINCIPLE

The system structure is given in fig. 2 and fig. 3. The temperature sensor, smoke sensor and fire sensor are connected to the FPGA unit. The signals sensed by these sensors are sent to the FPGA unit. Then FPGA sends the information to the PC central monitoring and controlling station, through Zigbee module (transceiver).Computer device that provided with Lab VIEW software is the main controller unit for all system[4]. It receives data from remote wireless sensor node, process information and updates data for the system when received data crosses the threshold values, it transmit controlling signal to remote wireless sensor node. In turn after processing data, FPGA activates the actuators such as alarm circuit, water sprinklers relay, during anomalous condition. In addition, Lab VIEW make the capability to monitor the important operations in the system to the users in order to be informed of the changes in the system. Since the system is not only monitoring but controlling also.

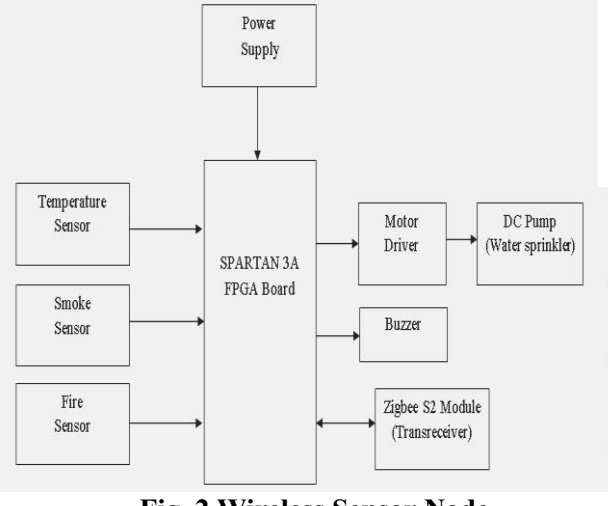

Fig. 2 Wireless Sensor Node

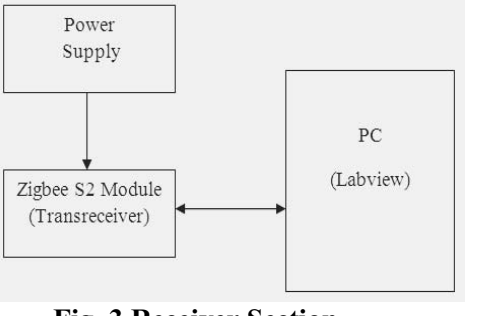

Fig. 3 Receiver Section

IV. CONCLUSIONS

It is a real-time monitoring and remotely controlled system. Here different types of sensors such as temperature sensor, fire sensor and smoke sensor are interfaced successfully with single FPGA. So that different fire sources which causes fire accidents could be detected easily by the node. In future many other gas sensors can be interfaced with the fire node and the algorithms are also customized to find fire accident and to reduce power. In this fire security sensor node, the challenges of interfacing different type of sensors are analyzed and accomplished. The node consumes low power and battery operated. This system runs for elongated time.

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IoT Based Water Quality Monitoring

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Abstract-Internet of Things (IoT) is global network of "smart device" that can sense and interrelate with their environment using the internet for their communication and interaction with users and other systems. The main conception behind every IoT technology and implementation is "Device is integrated with the virtual world of internet and interacts with it by following, sensing and monitoring object and their environment". The structures of a "smart device" that can act as a member of IoT network are, collect and transmit data , actuate device based on activates and receive information (from network and internet). Currently in our country, the water analysis is done manually by taking the samples from the water sources (river) and send to the lab (TWAD) for study. To mechanize this process, water quality monitoring sensors, ARM7, ZIGBEE module and data concentrator module are physically placed in each and every water sources (river). The water quality monitoring sensors gather data from water. The ARM7 forward that data to concentrator module through ZIGBEE module for remote transfer of data to the lab. The data concentrator which is located in each and every lake, send that data to the cloud configured server which is situated in the TWAD testing laboratory. The TWAD department workers monitor this data remotely and securely provide this data to the requested users which are stored in the cloud. Water quality parameter data is stored in the cloud, will be strongly provided to requested users using the cryptographic techniques.
Keywords- Internet Of Thing(IOT); PH monitoring; Sensor Data Acquisition; Temperature; Turbidity Monitoring; Water Quality monitoring ZIGBEE technology

I. INTRODUCTION

To necessary idea of the Internet of Things (IoT) has been around by nearly two periods and has attracted many researchers and industries because of its great likely impact improving our daily lives and society. When thing like domestic appliances are related to a network, they can work together in support to provide the ideal service as a whole, not as a collection of individually working devices. This is useful for many of the real word application and services, and ne would for example apply it to shape a smart residence; windows can be closed automatically when the air conditioner is turned on, or can be opened for oxygen when the gas oven is turned on. The idea of IoT is especially valuable for persons with incapacities, as IoT technologies can support human activities at larger scale like building or society, as the device can mutually cooperate to act as a total system. So far, much work has been done on realizing the IoT into practice. Due to the efforts made earlier, the state of the art IoT technology has matured to certain extent, and several de jure and de facto standards have already been established. Under these conditions, it is becoming more important than ever to build up a practical system design and implementation the IoT technologies based on the successes of these present efforts. Although the IoT technologies have evolved over recent years, most of the prior work aimed at adopting the IoT technologies for particularly resource constrained nodes, like sensor network node that simply send collected data to base station. On the other hand little work has been done on applying IoT technologies into embedded devices around us including consumer appliances.

However, as the purposes, complexities, and the fundamental architecture are different between sensor nodes and consumer appliances, the present frameworks designed solely for sensor nodes are not suitable for usual embedded devices. For example the design of IoT middleware on event driven operating system like tiny OS and Contiki and real operating systems with multiple-threading support like T-kernel shall apparently be different. We propose the uID database. This semantic data base is essential for the embedded appliances node to know how they can work together in cooperation. For simple sensor network nodes, simply sending data or to compliant requests from base stations would become more complex.

The internet of thing is computing concept that describes a future where every day physical object will be connected to the internet and be able to identify themselves to other devices. The term is closely recognized with RFID as the method of communication, although it also may include other sensor technologies, wireless technology. The IoT is significant because of an object that can denote itself digitally become something greater than the object by itself. No longer does the object relate just to you, but is now connected to nearby object and data base data. The internet of things is a difficult concept to define precisely. In fact, there are many different groups that have defined the term, although its initial use has been qualified to Kevin Ashton an expert on digital innovation. Just as cloud computing and big data were the up and coming trends at the start of this decade, the internet of thing in the limelight. While the cloud and big data are well underway in terms of creativity adoption, the IoT is just starting to gain serious traction. The Internet of Things (IoT) is what happens when everyday ordinary objects have inter-connected microchips inside them. These microchips help not only keep track of other objects, but many of these devices sense their adjacent and report it to other machines as well as to the humans. Also called M2M, standing for Machine to Machine, Machine to Man, Man to Machine or Machine to Mobile, the IoT logically connects humans, devices and systems, (Internet of Things in 2020, 2008). Analysts describe two distinct modes of communication in the IoT: thing to person and thing-to-thing communication (Reunion, 2009). Thing-to-person and person-to-thing communications encompass a number of technologies and applications, wherein people interrelate with things and vice versa, including remote access to objects by humans, and objects that continuously report their status, whereabouts and sensor data. Internet of things (IoT) is an iterated part of future internet and could be defined as a dynamic global network arrangement with self-configuring experiences based on standard and interoperable communication protocols where physical and virtual 'things' have identities, physical attributes and virtual personalities and use intelligent interfaces which are seamlessly integrated into the information network. In the IoT, 'things' are expected to become active participant in business, information and social processes where they are enabled to interact and communicate among themselves and with the environment, while reacting separately to the 'real world' event and manipulating it by running processes that trigger action and create services with or without direct human intervention. Borders in the form of services with or without direct human intervention. Interfaces in the form of services facilitate interaction with these 'smart things' over the internet, query and change their state and any information associated with them, taking into account security and privacy subjects. The water quality monitoring is the essential need for the human life. There are huge numbers of diseases which causes through the polluted drinking water. The water will be polluted by the human being, animal, natural disasters and seasonal changes. So, people have to aware of their own locality water bodies' condition. To qualify this, a prototype is proposed to monitor water quality in the IoT environment.

II.SYSEM DESIGN

2.1 Block Diagram

Currently in our country, the water analysis is done manually by taking the samples from the lake and sent to the lab for investigation. The proposed work reduces human intervention by using IoT and is presented in fig. The shell consist ARM7, sensor arranged in bread board and Zigbee module. The ARM7 is connected to the data concentrator using USB cable. The ARM7 send the water quality parameter data which is read from the sensors to the concentrator through the Zigbee module. The data concentrator which is located in the TWAD testing laboratory. The TWAD department staffs monitor this data remotely and securely provided this data to the requested users which are stored in the cloud. After the water quality parameter data is stored in the cloud, it will be securely provided to invitation users using the cryptographic techniques.

Obviously, the physical work of TWAD employees physically go to each and every river and water bodies will be avoided and thus human interference is reduced.

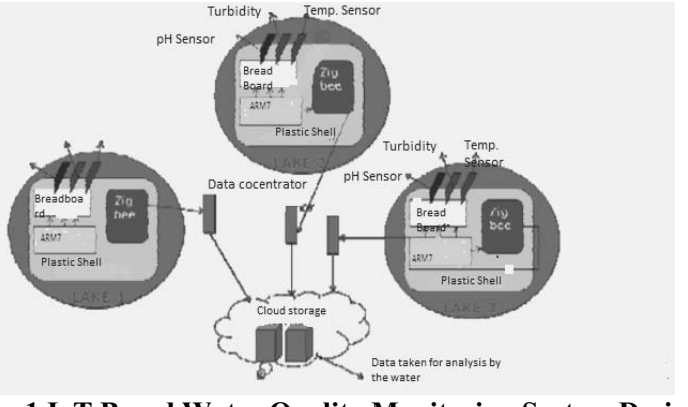

Fig. 1 IoT Based Water Quality Monitoring System Design

2.2.1 Temperature Sensor

Water Temperature is a controlling factor for river life: it controls the rate of metabolic activities, generative activities and therefore, life cycles. If river temperatures increase, decrease or fluctuate too widely, metabolic activities may speed up, slow down, malfunction, or stop all to get. There are many factors that can influence the stream temperature. Water temperatures can fluctuate seasonally, daily, and even hourly, especially in smaller sized streams. Spring discharges and overhanging canopy of stream vegetation provides shade and helps buffer the effects of temperature ranges on request, measuring current: max. 1mA (no self-heating), Circuit: standard: 2-wire, on request: 3-wire or 4-wire circuit, Insulation strength: 2.5 kV, on request up to 8 Temperature sensor interfacing. Changes. Its Nominal resistance: 100 _ at 0°C (Pt. 100), Measuring range: -50°C to +230°C, other ranges on invitation, Measuring current: max. 1mA (no self-heating), Circuit: standard: 2-wire, on request: 3-wire or 4-wire circuit, Insulation strength: 2.5 kV, on request up to 8 Temperature sensor interfacing.

Fig. 2 Temperature Sensor

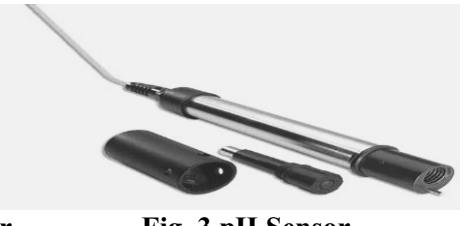

Fig. 3 pH Sensor

2.2.2 pH Sensor

Global Water's WQ201 pH Sensor is a rough and dependable water pH measuring device. The pH spreader is mounted on 25 ft. of marine grade cable, with lengths up to 500 ft. available upon request. The sensor's output is 4-20 mA with a three-wire configuration. The WQ201's electronics are completely summarized in marine grade epoxy within stainless steel housing. The unit also uses a removable shield and replaceable pH sensor element for easy maintenance. As with all of Global Water's 4-20 mA output sensors, you can add recording and control capabilities to the WQ201 with the GL500 Data logger and the PC320 Controller. The GL500 connects to the pH device's 4-20 mA output to record data, and the PC320 Organizer connects to the sensor's output to control pumps or alarms

2.2.3 Turbidity Sensor

Turbidity is a measure of the cloudiness of water. Cloudiness is affected by suspended solids (mainly soil particles) and plankton (microscopic plants and animals) that are suspended in the water column.

Moderately low levels of turbidity may indicate a healthy, well-functioning ecosystem, with moderate amounts of plankton present to fuel the fuel the food chain. However, higher levels of turbidity position several problems for stream systems. Turbidity blocks out the light needed by underwater aquatic vegetation. It also can raise surface water temperatures above normal because suspended particles near the surface facilitate the absorption of heat from sunlight.

2.2 LPC 2148

It acts as chief of whole construction and it is fully assembled with 16-bit ARM7TDMI-S microcontroller, 8 to 40 kB of on-chip static RAM, 32 to 512 kB of on-chip ash program memory, two 10-bit A/D converters send an entire of 6/14 analog inputs, Single 10-bit DAC provides flexible analog output, Multiple serial interfaces including 2-UARTs, two Fast I2C-bus, 60 MHz max. CPU clock available from programmable on-chip and outcome of the Zigbee receiver will connect to PC Desktop by RS232.

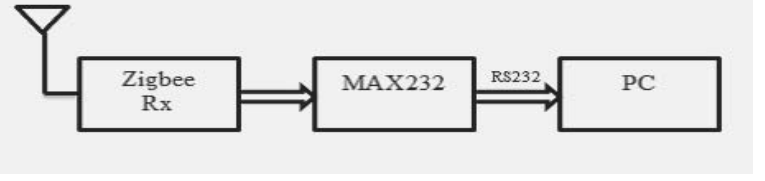

Fig. 4 Receiver section with Zigbee

2.3 Zigbee

The focus of network uses under the IEEE802.15.4 / Zigbee standard include the features of low power consumption, required for only two major modes (TX/Rx or Sleep), high density of nodes per system, low costs and simple implementation.2.4GHz and 868/915 MHz dual PHY modes .This represents three license-free bands, Low power consumption, Maximum data rates, High throughput and low latency for low duty cycle applications (<0.1%), Channel access using Carrier Sense Multiple Access with Collision Avoidance (CSMA - CA), Addressing space of up to 64 bit IEEE address devices, 65,535 networks, 50m typical range, Completely reliable "hand-shake" data transfer protocol, Dissimilar topologies as illustrated below: star, peer-to-peer, mesh.

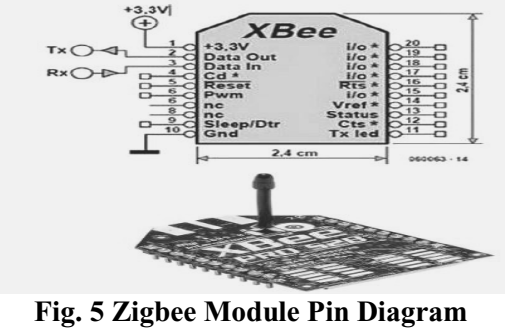

Fig. 5 Zigbee Module Pin Diagram

III.CONCLUSION

In this system, the proposal and development of the real- time monitoring of the water quality parameters in IoT environment is presented. The proposed system consists of some water quality parameter sensors, ARM7 (LPC2148) as a core controller. These devices are low cost, more effective. This can implement is suitable for environment observing, ecosystem monitoring, etc. and the data can be viewed anywhere in the world. In the future, we plan to device biological parameter of the water and install the system in several location of pool and also in water distribution network to collect water quality data and send to water board.

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Data Transmission Through Visible Light

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Abstract— VLC stands for Visible light through communication. The technology is very new and was proposed by the German physicist Harald Haas in 2011. VLC provides transmission of data through illumination by sending data through an LED light bulb that differs in intensity faster than human eye can monitor. The term Li-Fi refers to visible light communication (VLC) technology that usages as medium to transport high-speed communication in a manner similar to Wi-Fi. Li-Fi provides better bandwidth, efficiency, availability and safety than Wi-Fi and has already achieved high speeds in the lab. Visible light communication organization using white light emitting diode (LED) has been planned and demonstrated using High memory ATMEGA- 16 Microcontroller, LED panel as light source and PHOTODIODE as light sensing element. The purpose of the system is to provide higher data rates to the people with high security and low power consumption.

Keywords:-LED; Dlight; Photodiode; Li-Fi; VLC.

I. INTRODUCTION

Nowadays, a lot of researchers are working on the improvement of light-emitting diode (LED) lighting system. The LED lighting system can accomplish lower power utilization and has a longer life-time compared to the fluorescent lamp system. The Visible Light Communication (VLC) is a fast-rising technology to provide data communication using low-cost and universal LEDs and photodiodes. In the present rapid paced life, there is a strong urgency for the development in the means of communication. A Wireless network using Visible Light Communication (VLC) is a newly emerging trend that can easily pave the method for a relaxed wire-free future. The custom of light a source of communication is an original and not-yet commercialized technology. In Visible Light Communication (VLC), LEDs used for illumination purpose are simultaneously used for wireless files transmission. It proposals frequent rewards such as high data rates, unlicensed large bandwidth and better data security leading to smart spaces .Different solutions have been proposed in literature for VLC system architecture, its performance analysis, better data transmission rates and brightness control, to name a few. However, VLC has allowed great data-rate (10Mbps), reasonable distance (100m), underwater communication as the visible spectrum is subjected to lesser attenuation Thus VLC emerges as a suitable exchange where RF fails to deliver due to bandwidth constraints or physical confines. In this paper, we were conferred about the transmitting of an data using LED light.

II. LITERATURE SURVEY

The D-Light plan at Edinburgh's Institute for Digital Communications was funded from January 2010 to January 2012. Haas encouraged this equipment in his 2011 TED Global conversation and helped start a company to market it. Pure LiFi, formerly unalloyed VLC, is an original equipment manufacturer (OEM) secure set up to commercialize Li-Fi products for integration with prevailing LED-lighting structures.

In October 2011, corporations and industry groups formed the Li-Fi Consortium, to promote high-speed optical wireless systems and to overcome the limited amount of radio-based wireless spectrum available by manipulating a completely diverse part of the electromagnetic variety. A number of companies offer uni-directional VLC merchandises which is not the identical as Li-Fi.

VLC expertise was exhibited in 2012 using Li-Fi. By August 2013, data amounts of over 1.6 G bit/s were established over a single color LED. In September 2013, a press release said that Li-Fi, or VLC organisms in general, do not assist line-of-sight conditions.

In April 2014, the Russian company Stins Coman declared the improvement of a VLC wireless local network called Beam Caster. Their current module transfers data at 1.25 gigabytes per second but predict increasing speeds up to 5 GB/second in the near future.

III. PROPOSED SYSTEM FOR THE PROJECT

3.1. Scope of Project

This equipment doesn't contract with radio waves, so it can simply be used in the places where Bluetooth, infrared, WIFI and Internet are excluded. In this way, it will be most supportive transferring medium for us. It includes other benefits like:

- A very inclusive spectrum over noticeable wave length range.
- Extremely high color fidelity &Instant start time.
- Easy fatal Management.
- Dynamic shady i.e. illumination Modulation of lamp output to enhance video contrast.
- Trouble-free integration into existing light engine platform.

In recent years use of LED is growing at very high rate so we can use LED source a Light emitting device in our implementation

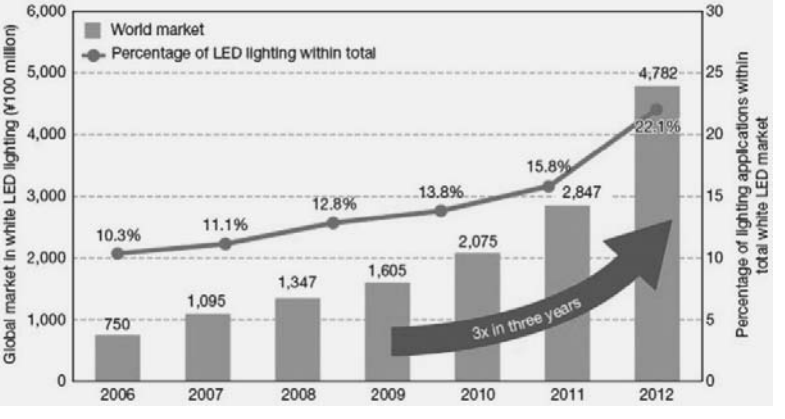

Fig 1. Scope of LED in future

3.2 Proposed System

Following figure shows block diagram for proposed system. AVR Microcontroller is the main and essential component of the proposed system. The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By performing authoritative commands in a single clock cycle, the ATmega16 achieves throughputs approaching 1 MIPS per MHz agreeing the system planned to improve power feasting versus processing speed. Both the Rx as well as Tx has the same system for Full duplex transmission.

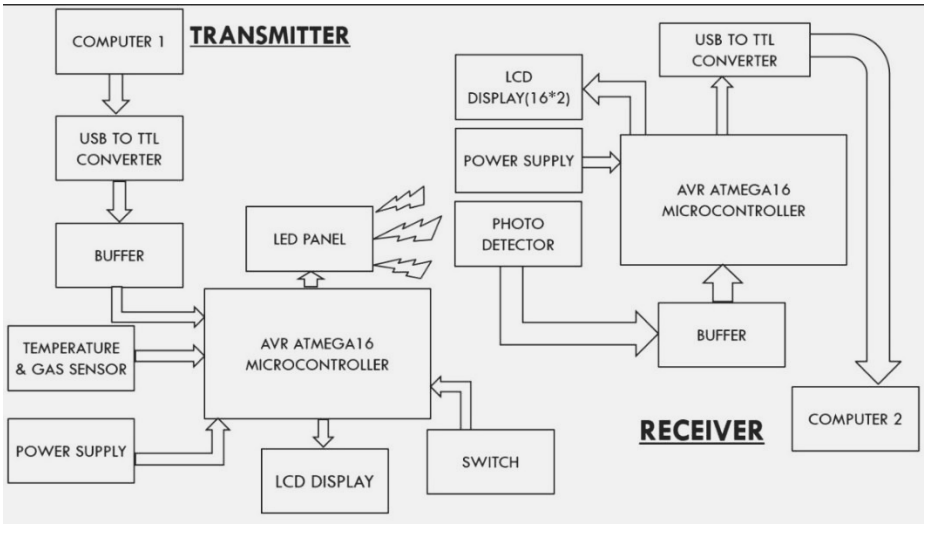

Fig 2. Block Diagram

3.2.1 Working

Light emitting diodes (LEDs) can be transferred on and off faster than the human eye can detect since the operating speed of LEDs is less than 1μs, thereby causing the light source to appear to be continuously on. This invisible on-off movement permits data broadcast using binary codes. Swapping on an LED is binary '1', switching it off is binary '0'. It is thinkable to encode data in light by fluctuating the degree at which LEDs flicker on and off to give different strings of 1s and 0s. Modulation is so rapid that humans cannot notice it. A light sensitive device (photo detector) then obtains the signal and alters it back into unique data.

This method of using rapid pulses of light to transmit information wirelessly is officially referred to as Visible Light Communication (VLC).The term Li-Fi has been inspired due to its potential to contest with conservative Wi-Fi. The VLC uses observable light between 400 THz (780 nm) and 800 THz (375 nm) as the photosensitive mover for data broadcast and for lighting.

Data rates of greater than 100 Mbps can be achieved by using great swiftness LEDs with suitable multiplexing. Corresponding data transmission using arrays of LEDs where each LED transmits a distinct stream of data can be used to growth the VLC data rate. Though the lights have to be kept on in order to communicate data, they can be reduced to the point that they are not visible to humans but still be capable of transmitting data.

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Design of Automated Tablet Filling and Counting Machine

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Abstract-The project includes implementation of commercial tablet counting and filling machine for pharmaceutical companies, controlled using Programmable Logic Controller (PLC). Conventional ways of tablet filling and counting process is observed to be complex, expensive, time consuming and inefficient too. Our system aims to make this process simple, accurate, as well as cost effective. With a proper user-defined selection input, the desired quantity of tablets can be counted to be filled in the bottles. The entire system is much more flexible and time saving to meet the industrial requirement by continuously moving conveyor. Once bottles are loaded on the conveyor no human intervention is required during the tablet filling process. With high efficiency and reliability our systems meets the user friendly requirements of user friendly systems.

Keywords- Automation, Programmable logic control (PLC), Filling, Counting, Through Beam Sensor and Tablet.

I. INTRODUCTION

The current industrial scenario, deals with stringent regulations, rising costs of commodities and energy and consumers with rapidly changing requirements .To fulfill their demands and to increase their flexibility and operate with maximum efficiency. Automation plays a vital role in meeting their needs. There are various ways of filling machines used for materials like powder filling, water filling but our project deals with designing of counting the tablets and then accurately filling tablets into bottles. This project is an example where all elements of automation system have been integrated to develop the system .The system is entirely controlled by PLC. The counting and filling operations are controlled by using a Programmable Logic Controllers. Since PLC's are very flexible, cost effective, space efficient and reduces complexity.

The project is divided into three main parts as follows transferring system, interrupt system filling system and feeding (hopper) system. System includes mechanical, electrical, electronics and control system (using PLC). Initially as the transfer system starts bottles are aligned in a line towards the filling station, sensor near the filling station placed at distance before the filling station arrives senses the arrival of bottle .Then the interrupt is made to stop bottle at filling station (while conveyor is ON), simultaneously it initiates the counting/filling module to fill the arrived bottle in station. Then conveyor starts and carries the filled bottle. Arrangements are made to feed the bottles to conveyor and to store the filled bottles taking off the conveyor. The process is completely automated by using PLC with a programmable language .The quantity of tablets can be varied by increasing the rotations of the discs.

I. BLOCK DIAGRAM OF SYSTEM

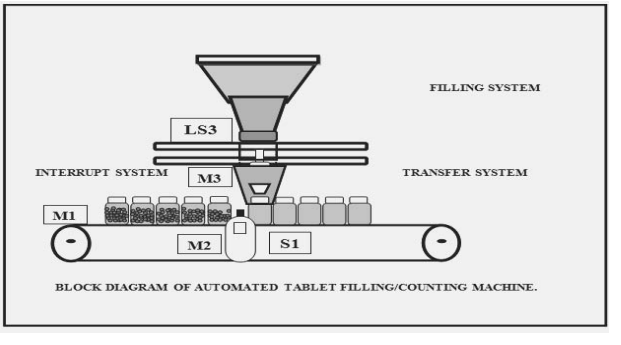

Figure 1. Block Diagram of automated tablet filling and counting system.

II. WORKING METHODOLOGY

By pressing the push button the bottles are loaded in the filling line, approaching towards filling station .Interrupt is created at the filling station by pressing the limit switch ON and conveyor motor is ON and starts rotating .Sensor near filling station are placed at distance before the filling station, senses the arrival of bottles. The sensor used for this purpose is through beam sensor .A beam of light is continuously transmitted from transmitter while a receiver at a distance is place to that receives the beam, as any bottle arrives at the filling station the filling begins . The rotating disc rotates simultaneously by completing a rotation a limit switch is pressed that indicates the .As the hopper and disc are aligned it takes the tablet from the hopper (feeding system) and then is further transferred through a narrow passage to the bottles .The desired count of tablets as per the requirements, just by making minute changes. Note the thing that for the efficient, time saving system .The conveyor of system continuously remains ON. After filling the bottle in few seconds the interrupt is removed, moving conveyor and carries the filled bottle. Arrangements are made to feed the bottles to conveyor and to store the filled bottles taking off the conveyor.

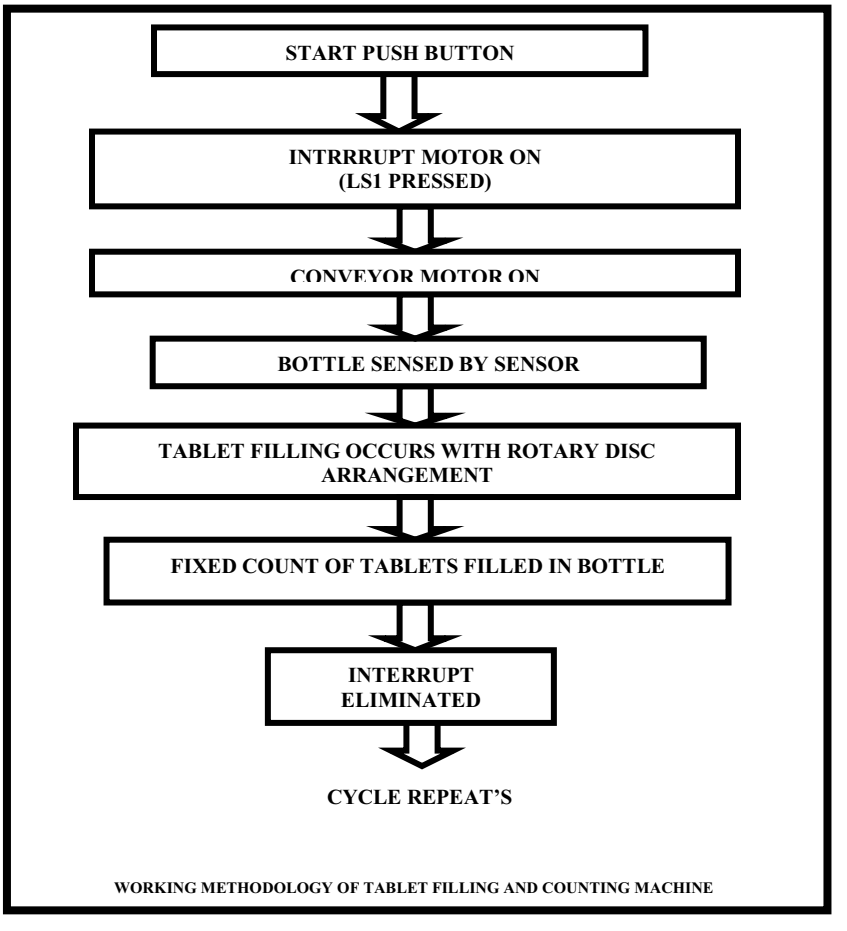

Figure 2. Block Diagram of automated tablet filling and counting system.

III. TRANSFER SYSEM

The transfer system is one of the initial stage at which the system comes into action. The bottles of plastic/glass are aligned in a line with help of guide provided along the length of conveyor to support the in line system a slipping material is used for conveyor belt as per application to fulfill the condition of continuously moving system. Selection of 24VDC motor (with high rpm) is done as per the length of conveyor with proper arrangements. Frame of conveyor is done with help of light weighted material. Motor is placed at one end of conveyor at other end rollers are been placed.

IV. INTERRUPT SYSTEM

Interrupt mechanism consists of motor and a limit switches arrangement and a beam through sensor that senses the presence of bottle. Initially interrupt is ON by pressing limit switch LS1, at this stage the bottle occurs at the filling station. The presence of bottle is detected as the beam from the transmitter and the receiver is cut off and remains in the same state. After filling the tablets at the filling station, the interrupt that occurs at the way of filling system interrupt is eliminated, here limit switch LS2is pressed. Thus the process cycle repeat for each bottle .The sensor use for this system is having a quick response time. This makes the system more effective to work quickly. one in fixed position just below the Feeding system .The other disc is just above the fixed disc supported with help of bearing for proper movement. The above disc is a rotating disc attached with a shaft of motor that passes through fixed disc. A motor with a 12VDC is selected .Both the discs has an arrangement such that as the bottom end of the hopper, the rotating disc and fixed disc are aligned to each other fixed quantity of tablets are been passed through system at bottom to fill the tablets . A limit switch is places at its end to detect the rotation of tablets. After completion of single rotation fixed count of tablets are gathered and filled in bottles .The quantity of tablets can be varied by increasing the rotations of the discs

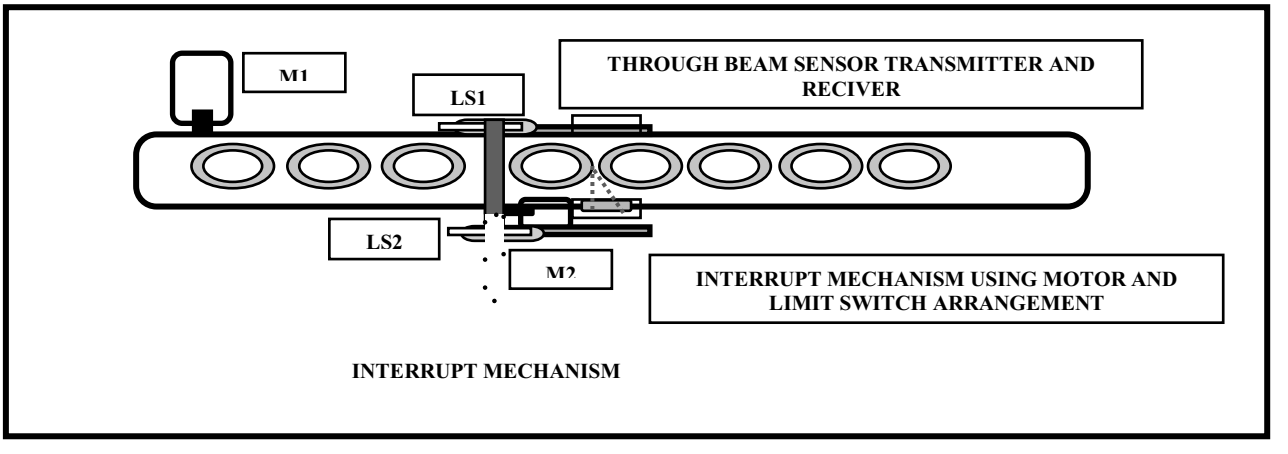

Figure 3.Interrupt mechanism

V. FILLING SYSTEM

This module is one of the important part of the system as proper counting of the tablets is to be done. Module includes rotary disc arrangements that has two rotating discs (of same dimension are taken)

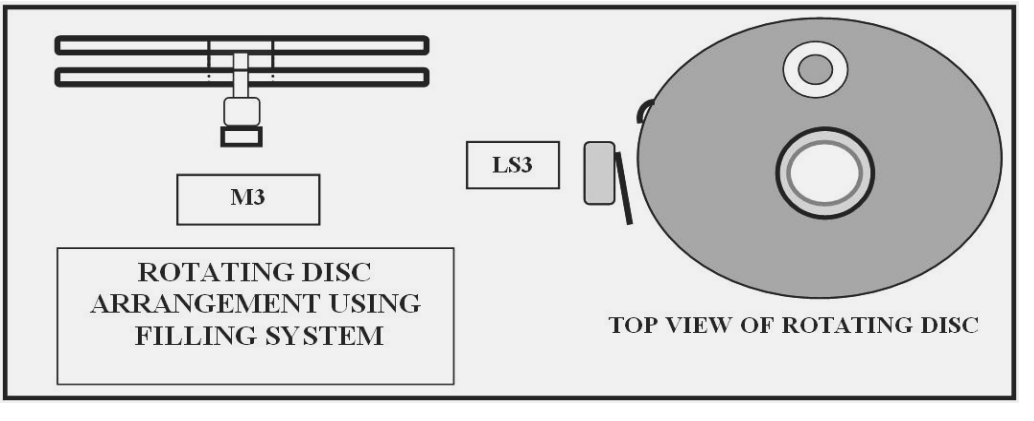

Figure 3.Tablet filling system using Rotary disc arrangement.

VI. CONNECTIONS WITH PLC

As all the necessary operations are to be performed in sequential manner connections of systems are to be properly ensured by checking the number of inputs and outputs to PLC. The number of input and outputs are to be connected in proper way. The sequence of arrival, counting, interrupt filling are to be maintained. PLC used in our project is ALLEN BRADLEY with MICROLOGIX 1200 that works on 24 VDC. The required power supplies for the system also designed.

VII. RESULT AND CONCLUSION

As desired, the Design of Automated Tablet Filling and Counting System Using PLC is successfully completed that meets the needs of Pharmaceutical industries. The accurate counting and quick filling of tablets/capsules in bottles is done .The number of counting tablets can also be varied by changing the number of rotation. Along with a time efficient system, by using continuous moving conveyor.

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PIC Microcontroller based Efficient Baby Incubator

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Abstract-Today, technology is advancing in all possible directions,especially in the field of health and care products especially where the requirements are supporting life.Additional care is taken when it comes to babies.A design of a Baby Incubator System based on the PIC Microcontroller is a prototype which is developed which gives a reliable and efficient baby monitoring system that can play a vital role in providing better infant care .This system is monitor and control vital parameter such as Temperature, Humidity, Heartbeat, and Sound of incubator for the continuous controlling and monitoring the clinical condition. All these parameters are continuously monitored by system& will display the status on LCDs or gives alarm.

Keywords – Baby Incubator, PIC Microcontroller, Heartbeats ,Temperature, Humidity, Infants,LCD.

I. INTRODUCTION

In the efficient baby Incubator system, an incubator is an infant-stimulating system used for intensive care of the newborn, premature or sick baby. It provides a safe and clean environment, which has fresh air, clean and sterile ambient conditions for the babies. There are four million babies worldwide who die in the first month of life, one million die on their first day. New -born are at the greatest risk. This paper helps to prevent the death of such babies. Everyone which belongs to economical backward also use of it.

1.1-literature survey:-

Smart Jacket Design for Neonatal Monitoring with Wearable Sensors[1].
Sibrecht Bouwstra, Wei Chen, Loe Feijs Sidarto Bambang Oetomo has designed the smart Jacket which aims for providing reliable health monitoring as well as a comfortable clinical environment. for neonatal care and parent-child interaction. In this paper explore a new solution for skin-contact challenges. different sensors stitched in patches .this patches are mounted on jacket. Whenever smart jacket ware by baby body signal collected and makes signal conditioning.
Drawback of this system is that in this module different sensors are mounted on the jacket for that the jacket must be in contact with the body.

- NEONATAL INTENSIVE CARE UNIT[2]

Karthik Hiremath has designed a Neonatal Intensive Care Unit**;** is designed to provide an atmosphere that limits stress on the infant and meetsbasic needs of warmth, nutrition, care and protection to assure proper growth and development. This paper's focus is on presenting a completely automated version of the same, using the PIC 18F4520 and Zig Bee technology.
Drawback of this system is that it only counts the pulse rate and sense the temperature of infant and incubator.
Development of Wireless Monitoring System for Neonatal Intensive Care Unit [3]
N.S. Joshi, R.K. Kamat , P.K. Gaikwad has designed a system which shows Development of a Wireless Monitoring System for NICU.This system is maintaining a stable body temperature is essential to ensure optimal growth of premature and weak infants. The system deploys a set of suitable sensors for the system development.and information is collected using PIC microcontroller ,GSM module and AT commands.
Drawback of this system is that it uses the GSM module,if there is no range the information cannot be send to the parents which can be dangerous.Cost also increases.

Design of Embedded Device for Incubator for the Monitoring of Infants[4]
Prof. Kranti Dive*, Prof. Gitanjali Kulkarni has designed a system which shows design of embedded device for real time monitoring of infants. The Embedded device includes sensors for Door Security, Light Intensity, Voice detection of incubator for the continuous monitoring of infants under clinical and home conditions. It will allow the early detection of potential life threatening events. The device would involve DSPIC microcontroller.

Drawback of this system is that it only concentrates on the security of the room and does not provide sufficient parameters related to the baby health.

Intelligent Baby Monitoring System [5]
Savita P.Patil, 2Manisha R. Mhetre has designed an Intelligent Baby Monitoring System is designed to gives a reliable and efficient baby monitoring system that can play a vital role in providing better infant care. This system monitor vital parameters such as body temperature, pulse rate, moisture condition, movement of an infant and using PIC microcontroller and GSM network this information is transferred to their parent.
Drawback of this system it does'nt log the history of baby health.

PIC Microcontroller based BabyIncubator[6]
Harshad Joshi, Dattu Shinde has designed a microcontroller based baby incubator which control and monitor vital parameters like oxygen, temperature, humidity,heartbeat using microcontroller and GSM module.

1.2 Proposed System:

This system monitor vital parameters such as body temperature, heartbeats, humidity, sound of an infant and using PIC Microcontroller. This information is transferred to their doctors.Measurements of this vital parameters can be done and under risk situation conveyed to the doctors with alarm triggering and serial communication system to initiate the proper control actions. As the electronic part is separated from the Baby's compartment baby can be assured safe.

II. BLOCK DIAGRAM

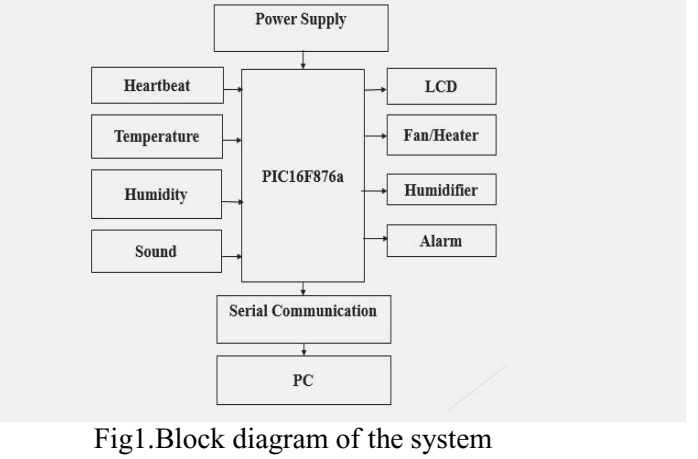

Fig1.Block diagram of the system

III. SYSTEM ARCHITECTURE IN DETAIL

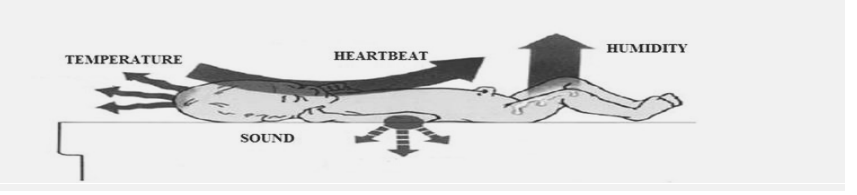

Fig.2.Conditions in Incubator

In this project we are using PIC 16F876a controller.It operates on dc-20Mhz.To this PIC we have connected different sensors which will allow us to measure different types of conditions which we need to measure. In this system we need to calculate many parameters likes temperature, humidity, heartbeats,sound[6]and they are being calculated with different sensors. The sensors are connected as a input to the controller and at the output side we have different devices to display the readings of the same. Each sensor has different device to show tithe output of the temperature sensor, humidity sensor is displayed on LCD screen.[2]RS232 cable is used to send the data of the sensors to the doctors computer.
Heart beat sensor is designed to give digital output of heart beat,when a finger is placed on it.The LED flashes in unison with each heartbeat.It works on the principle of light modulation by blood flow through finger at each pulse.The sensor calculates the average value of the heart beat and displayed on the LCD.Temperature and humidity sensor module is used to control the relative humidity and temperature inside the incubator and that of baby.and we are controlling the proper action using different output module such as humidifier(bulb),fan if humidity or temeperature are not as their set points.And keeping the baby under proper clinical environment.

IV.RESULT

SR NO	YEAR	SYSTEM NAME	TECHNIQUE USED	CONTROL PARAMETERS
1	2009	Smart Jacket Design for Neonatal Monitoring with Wearable Sensors	Microcontroller,smart jacket with sensors	Any 6 type of clinical conditions.
2	2012	Neonatal Intensive Care Unit	PIC 18F4520 and Zig Bee technology	Temperature, Pulse rate
3	2013	Development of Wireless Monitoring System for Neonatal Intensive Care Unit	PIC microcontroller GSM module and AT commands.	Temperature,Humidity
4	2013	Design of Embedded Device for Incubator for the Monitoring of Infants	DSPIC microcontroller	Door Security, Light Intensity, Voice detection
5	2014	Intelligent Baby Monitoring System	PIC microcontroller and GSM network	Body temperature, pulse rate, moisture condition
6	2015	PIC Microcontroller based Baby Incubator	PIC microcontroller GSM module	oxygen, temperature, humidity,heartbeat
7	2016	Proposed system	PIC microcontroller, Visual Basics	temperature,sound humidity,heartbeat

As observed from the above result table we have concluded that in all the systems listed above has certain disadvantages like some can only measure Heartbeats,Temperature and some use GSM module to report there data. Working on these system disadvantages we are designing a system in which

Heartbeat,Temperature,Humidity,Sound are controlled in one system and the data is logged on the doctors PC using visual basic software,due to this the care of baby is taken properly.

CONCLUSION

The project is designed keeping in mind the medical conditions available in rural areas. This Equipment can be effectively used by technicians in a small health care center. It can be a lifesaving machine for low birth weight infants. The components can be easily fixed. The chamber is sufficient enough to accommodate the baby comfortably. And it is design at low cost.

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An Effective Wind Energy System based on Buck-boost Controller

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Abstract-In Domestic Wind Machines, if the wind speed is low, the output voltage is not sufficient to charge the battery as it is lower than the rated charging voltage of the battery. This limits the overall efficiency of the Wind Machine to 20%. This study proposed to design and develop a Buck Boost Controller for the effective utilization of the wind machine. By implementing a controller based Buck Boost converter, the voltage produced at the lower wind speeds can also be utilized effectively by boosting it to the rated charging voltage of the battery. Also if the wind speed is high (>14 m/s), the DC output voltage will increase to more than 65 V. The converter bucks this high voltage to the nominal battery charging voltage (52 V), thereby protecting the battery from over charging voltage. Thus the effective utilization of the wind machine has been achieved by the use of the proposed Buck Boost Controller.

Keywords- Buck boost converter, Continuous Current Mode (CCM), control circuit, Pulse Width Modulation (PWM), wind machines.

I.INTRODUCTION

The demand for energy has increased tremendously in the past few decades. As a result, the use of renewable energy sources like solar energy, wind energy etc., is gaining popularity. Thus the Domestic Wind Machines (<10 kW) are extensively used in both rural and urban areas to generate electric power from wind energy (Tan *et al*., 2006). In Domestic Wind Machines, if the wind speed is low, the output voltage of the Wind Machine after rectified into DC is less. The battery will not charge as it is lower than the rated charging voltage. This happens most of the time in a day, since the wind speed in domestic regions is in the range of 0 to 4 m/s. This limits the efficiency of a conventional domestic Wind Machine to 20%. Therefore, an efficient control mechanism is needed, so as to utilize the wind power effectively (Zhang et al., 2011).

The rectified DC output from the Wind Machine (1.8 kW) varies from 0 V to 60 V depending upon the wind speed. The rated charging voltage of the battery (4×12 V, 4×100 Ah) is 52 V. When the wind speed is low (i.e., ranging from 2.5 m/s to 4 m/s), the output voltage varies from 30 V to 50 V. During this period, the battery is not charging even though considerable output is available from the Wind Machine (Jiao and Patterson, 1999). By implementing a controller based Buck Boost converter, the voltage produced at the lower wind speeds can also be utilized effectively by boosting it to the rated charging voltage of the battery. Also if the wind speed is high (>14 m/s), the DC output voltage will increase to more than 65 V. The converter bucks this high voltage to the nominal battery charging voltage (52 V), thereby protecting the battery from over charging voltage.

The controller produces the Pulse Width Modulation (PWM) signal that is used to control the operation of MOSFET in the power circuit of the Buck Boost Converter. ATmega8L Microcontroller, with an inbuilt ADC and PWM generator, has been used for PWM generation. The Microcontroller generates a PWM signal at a frequency of 8 kHz, and the MOSFET is switched using this PWM signal to regulate the output voltage. The input and output voltages are measured dynamically and converted to digital values by the Voltage Sensor Circuit and ADC (Mechi and Funabiki, 1993). The PWM duty cycle is varied in accordance to this feedback and the output voltage is either bucked or boosted, thereby ensuring that the battery is charged effectively. Thus effective utilization of the wind machine has been achieved by the use

of Buck Boost Controller (Stihi and Ooi, 1988; Eno and Thompson, 2006). The Exiting system block diagram is shown in Fig. 1.

In the existing system, the rectified output of the Wind Machine is used to charge the battery directly. If the output voltage is less than the rated battery charging voltage, the battery will not charge even when considerable output is available. Almost 30% of the total output is in this range and thus the overall efficiency of the conventional Wind Machine system is limited to 20%.

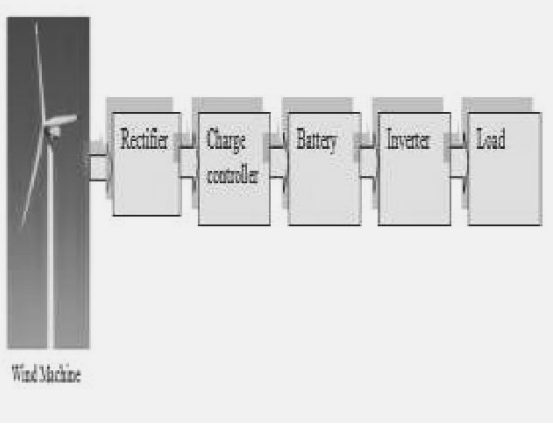

Fig. 1 Existing wind machine system

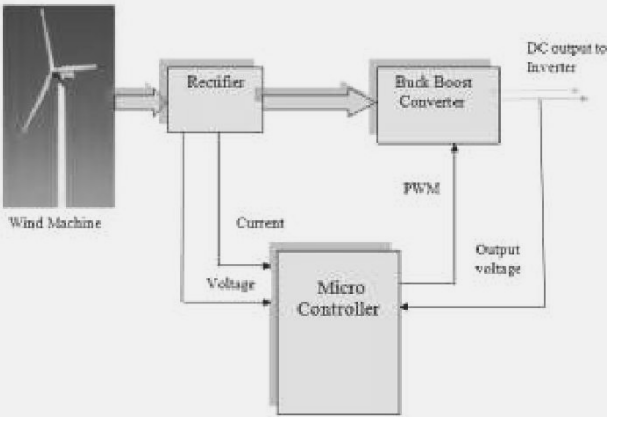

Fig. 2. Block diagram of the proposed system

II.PROPOSED SYSTEM

In this study we have proposed a controller based Buck Boost converter, so that the voltage produced at the lower wind speeds can also be utilized effectively by boosting it to the rated charging voltage of the battery. The controller constantly monitors the output voltage from the Wind Machine. Corresponding to the magnitude of the DC output from the rectifier, the controller calculates and changes the width of the pulse given to the converted, to boost it to the rated voltage of the battery. Thus the battery is charged even when the wind machine rotates at lower speed (0-4 M/S) .If the wind speed is high (>14 m/s), the DC output voltage is also high. The converter bucks this high voltage to the battery charging voltage thereby protecting the battery from over voltage. Figure 2 shows the block diagram of the proposed system.

Buck boost converter: A Buck Boost Converter is a DC-DC regulator which provides an output voltage that may be less than or greater than the input voltage - hence the name "Buck-Boost". As the polarity of the output voltage is opposite to that of the input voltage, the regulator is also known as an inverting regulator (Farhangi and Farhangi, 2005; Wang et al., 2008). Among all the topologies that are used to Buck as well as Boost the voltage, Buck Boost converter has wider acceptance as it provides a significant improvement in performance and efficiency by eliminating the transition region between buck and boost modes (Mitchell, 1988; Mohan et al., 1995). The circuit arrangement of the Buck Boost converter is shown in Fig. 3.

2.1.Operation modes:

The circuit operation can be divided into two modes:

Mode 1: Let D be the duty cycle and TS be the time period of the PWM signal. During mode 1, the transistor is turned ON by the PWM signal for a period (DTS) and the diode is reverse biased. The input current flows through the inductor L and the transistor. Figure 4 shows the mode 1 operation of Buck Boost Converter.

Mode 2: During the mode 2, the transistor is switched off by the PWM switching for the period (1-DTS). The current, which was flowing through the inductor L during mode 1, would now flow through the inductor L, capacitor C, Diode and the load. The energy stored in the inductor L would be transferred to the load and the inductor current would fall until the transistor is switched on again in the next cycle. The amount of energy stored in the inductor is determined by the duty cycle of the PWM signal. The greater

the duty cycle, higher will be the energy stored in the inductor. If the duty cycle of PWM is below 50%, the circuit bucks the output voltage as the amount of energy stored is less and if it is above 50%, the output voltage will be boosted to the nominal battery charging voltage. Operation of Buck Boost converter may be in Continuous Current Mode (CCM) or Discontinuous Current Mode (DCM) of operation depending on the Wind Machine output. The converter should be operated in CCM to charge the battery which depends on the value of the inductor and the load. Figure 5 shows the mode 2 operation of Buck Boost Converter.

DC conversion ratio:

The DC conversion ratio M (D) is the ratio of output voltage to the input voltage of the converter. Figure 6 shows the DC conversion ratio of the buck boost converter. The curve is in the fourth quadrant as the output voltage polarity is opposite to that of the input voltage: M (D) = Vo/Vin where, Vo-output voltage of the Buck Booster converter and Vin-is a input voltage.

For the duty cycle below 0.5, the DC conversion ratio is less than 1 indicating that the converter will be operating in buck mode. Also for the duty cycle above 0.5, the ratio rises exponentially indicating that the converter boosts the output voltage several times of that of the input even if there is a small increase in the duty cycle. For normal operation of the converter in the boost mode, the duty cycle should be only in the range of 0.58- 0.67.

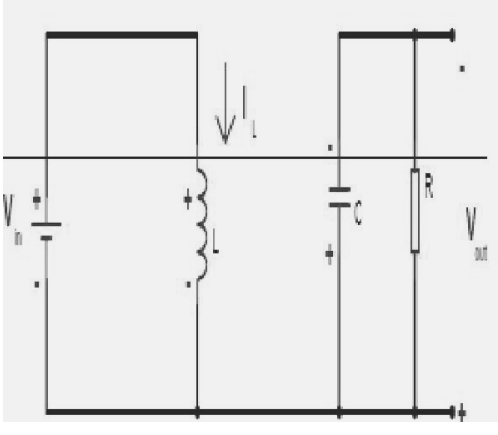

Fig. 3. Circuit arrangement of buck boost converter

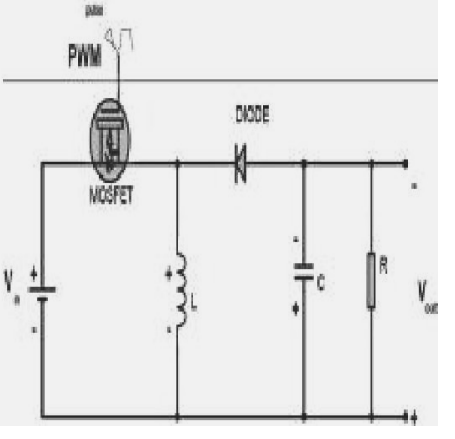

Fig. 4. Operation of buck boost-mode 1

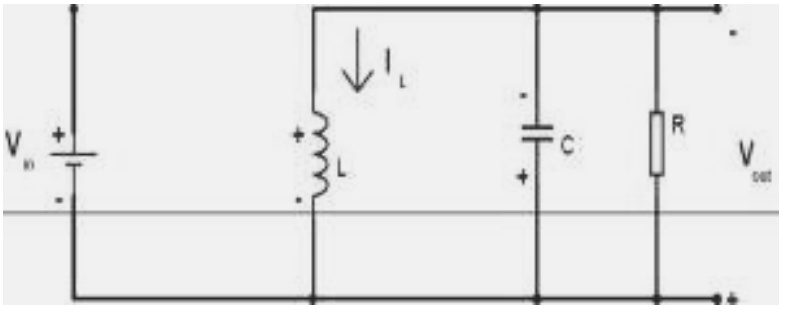

Fig. 5. Operation of buck boost-mode 2

II. SIMULATION RESULTS

The simulation tools help in testing the validity of the design and also save costs by reducing the chances of error. Any defect in design can be easily identified and rectified well before the implementation thus saving cost and time. Orchard and Proteus are two main simulation tools used in this system. Proteus 7.5 ISIS (Intelligent Schematic Input System) professional simulation software has been used to simulate the PWM using ATmega8L controller. This software provides an integrated environment and allows the virtual burning of embedded program coding in the controller and simulates the output for various conditions. The Proteus Design Suite comprises a fully integrated package with the following modules.

- ISIS for schematic capture
- PROSPICE for circuit simulation
- ARES for PCB layout and
- VSM for embedded co-simulation

The simulation functions take place entirely within the schematic editor whilst ISIS and ARES share a common, easy to use, Windows user interface. All of which reduces the time it will take to master the software. The Buck Boost Converter circuit was designed and then its validity was tested using the Orcad Capture PSpice 9.2 simulation software. Orcad capture PSpice comprises of three main applications:

• Capture CIS-used to draw a circuit on the screen, known formally as schematic capture. It offers greater flexibility compared with a traditional pencil and paper drawing, as design changes can be incorporated and errors can be corrected quickly and easily.

• PSpice-simulates the captured circuit and its behavior can be analyzed in many ways and confirm that it performs as specified.

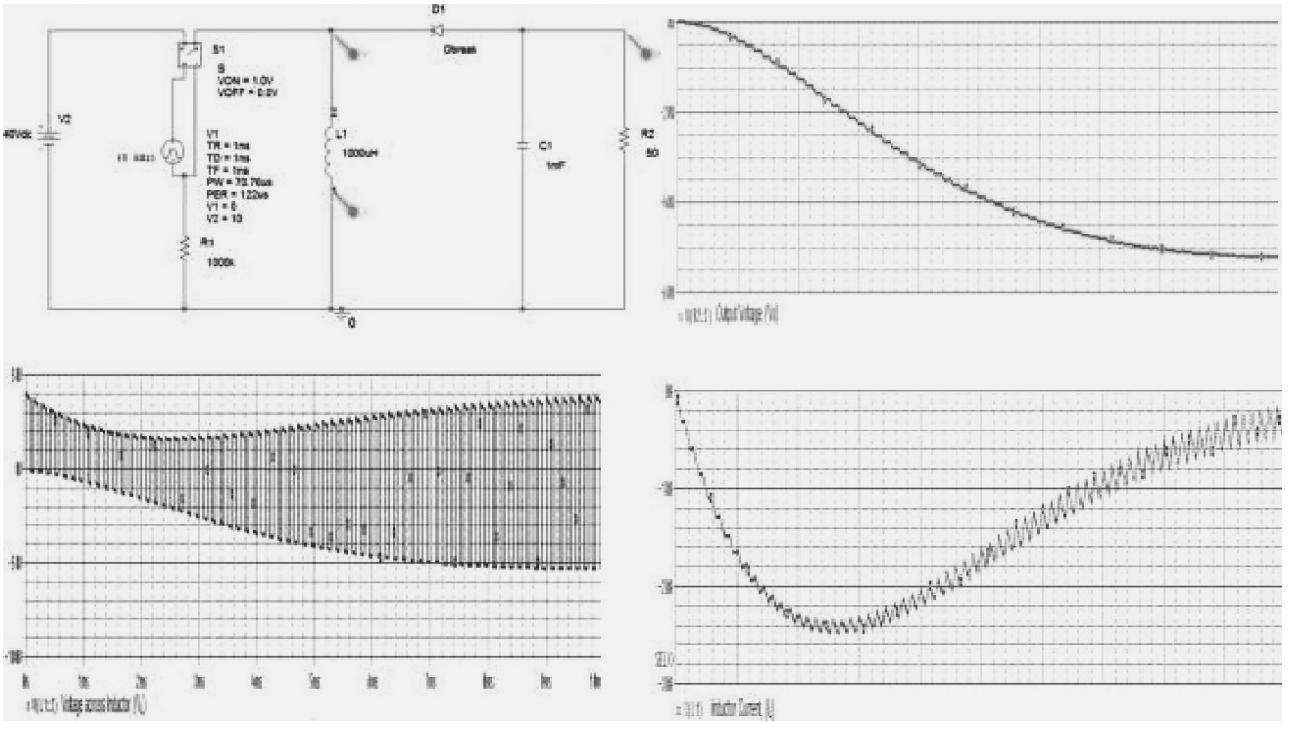

fig. 6 Simulation output of power circuit

PCB Editor-for the design of Printed Circuit Boards. The output is a set of files that can be sent to a manufacturer. The following Fig. 10 illustrates the simulation result of Power Circuit uses Orcad Capture (PSpice 9.2) software.

Simulation output of power circuit:

The Buck Boost Converter with the above mentioned values was simulated using Orcad Capture (PSpice 9.2) software and the following results were obtained. The results were +found to be in accordance with the expected outcome.

In Fig.6, Trace 1 represents the output voltage of the Buck Boost converter. It is clear from the plot that the output voltage attains 54 V at steady state. The current ripple shown in the Trace 2 swings between 1 A and 4 A thereby indicating that the converter is operating in continuous current mode. In Trace 3, the voltage across inductor swings equally in both positive and negative directions. Thus the average voltage across the inductor is zero indicating that the Volt-Sec balance is maintained.

Hardware testing of control circuit:

The Control Circuit developed is tested in the laboratory to check the correctness of the design. Optocoupler output is given as gate signal input to the MOSFET in the power circuit. The output of the circuit is as expected and program logic is also correct. When the input given to the ADC of the Microcontroller is varied the duty cycle of the PWM signal also varies. Figure 6 shows the test setup for the control circuit of the Buck Boost Controller

Simulation output of power circuit:

The Buck Boost Converter with the above mentioned values was simulated using Orcad Capture (PSpice 9.2) software and the following results were obtained. The results were found to be in accordance with the expected outcome. In Fig. 11, Trace 1 represents the output voltage of the Buck Boost converter. It is clear from the plot that the output voltage attains 54 V at steady state. The current ripple shown in the Trace 2 swings between 1 A and 4 A thereby indicating that the converter is operating in continuous current mode. In Trace 3, the voltage across inductor swings equally in both positive and negative directions. Thus the average voltage across the inductor is zero indicating that the Volt-Sec balance is maintained.

Hardware testing of control circuit:

The Control Circuit developed is tested in the laboratory to check the correctness of the design. The DVM is shown in measures the average value of the Optocoupler output which has to be given as gate signal input to the MOSFET in the power circuit. The output of the circuit is as expected and program logic is also correct. When the input given to the ADC of the Microcontroller is varied the duty cycle of the PWM signal also varies. Figure 6 shows the test setup for the control circuit of the Buck Boost Controller

Power circuit: The integral part of development of Power circuit is the development of the inductor. For the inductor development, the type of the core, current density and the diameter of the conductor must be decided first.

IV. CONCLUSION

The proposed system of controller based Buck Boost converter is found to be more compact, user friendly and more efficient. The inbuilt ADC and PWM channels in the ATmega8L Microcontroller make the control module of the converter very compact. The Buck Boost controller with ATmega8L as its integral part senses the output voltage and varies the PWM duty ratio so that the output voltage at lower wind speeds is also maintained above the battery charging voltage (54 V). Hence the voltage produced at lower wind speeds is also effectively utilized and the efficiency of the proposed system is 15% higher than the existing system.

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Design of FPGA's High Speed Configurable Logic Units

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Abstract— This paper presents the research and design of FPGA's high speed configurable logic unit under 22nm technology. The keystone is the design of FPGA's two basic elements – look-up table (LUT) and configurable register.CMOS TG and designed control circuit is used to implement the complex function of FPGA's configurable register to reduce the critical path's delay. Experimental result shows the achieved speed is comparable and even faster than Xilinx's Virtex4 & 65nm tech while retaining small leakage power and area.
Keywords-Microwind, 22 nano technology, clb design, Lookup table, Configurable register structure.

I. INTRODUCTION

FPGAs have recently benefited from process advances to become significant alternatives to ASICs.In the interior of the CLB there are number of LUT, configurable resistor, multiplexers. In the interior of a CLB, there are several basic units, such as LUTs, configurable registers, multiplexers and some other logics. FPGA's area, speed and power characteristics are mainly affected by CLB's LUTs and configurable registers. Although FPGA is a kind of mature commercial device with wide application, there aren't many open literatures on the research and design of FPGA's internal logic units. The main development of CLB is the increase of LUTs' and configurable registers' number and LUTs' size with the shrink of technology's feature size. The goal of this work is to design and evaluate programmable logic using 22nm.

II. CIRCUIT DESIGN

Fig.1 shows the basic structure of FPGA's CLB [1-4], which is mainly uses a couple of 4 input LUTs, registers and some multiplexers. CLBs perform user specified logic functions and interconnect resource carry signals among the blocks. The main differences between FPGAs of different vendors or different series are the number of LUTs and registers and the size of LUT [1-3].

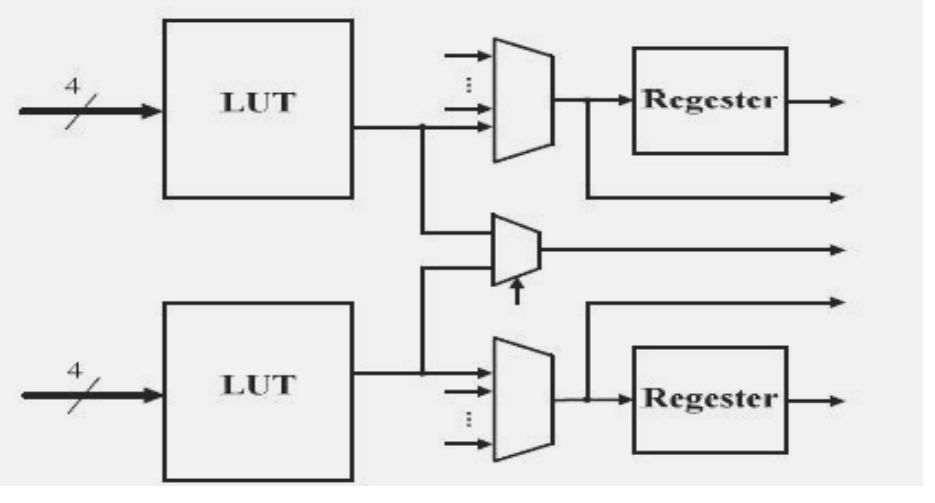

FIG.1 BASIC STRUCTURE OF CLB

III. DESIGN OF LUT

To avoid the problem due to the impact of threshold voltage loss, a possible method is increasing the NMOS TG's gate voltage. However, it will increase the circuit's complexity and decrease the transistors' lifetime. Another feasible solution is using CMOS TG to replace NMOS TG, but it doubles the layout area. To solve these problems, a new LUT's structure is proposed and shown in Fig.3

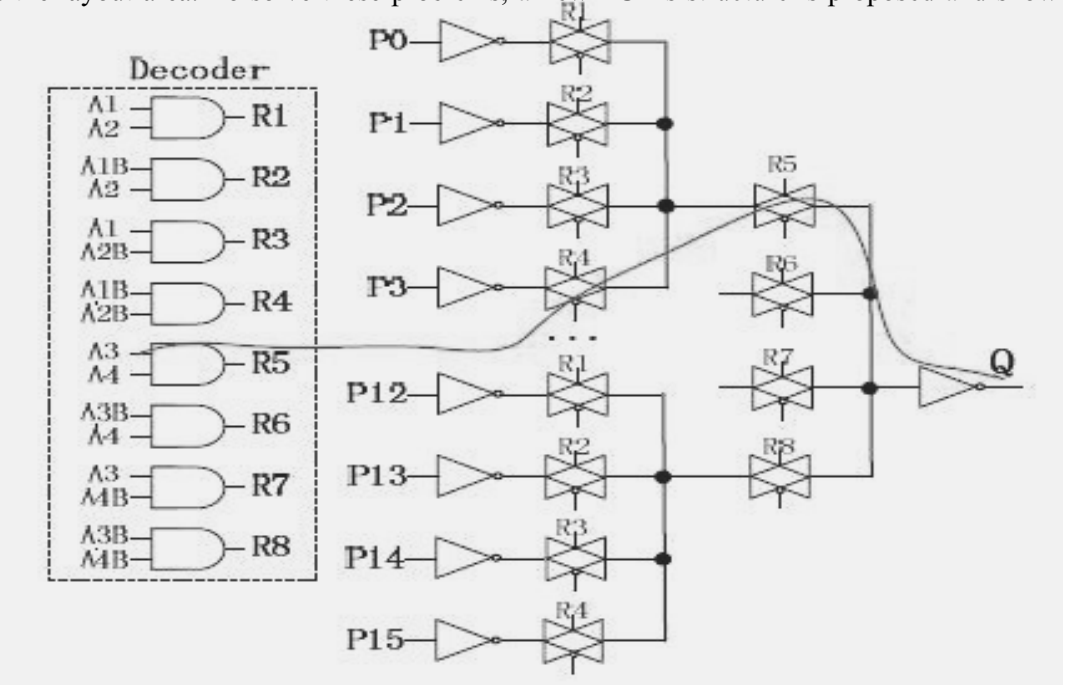

FIG.3 PROPOSED LUT STRUCTURE

In Fig.3, A1, A2, A3, A4 are the four input p o r t s of the 4-input LUT while *A1B, A2B, A3B, A4B* are the inverted signals respectively. P0 to P15 are the 16 outputs of LUT's 16 SRAM programmable points. *A1, A2, A3, A4* select an SRAM's output to Q through the two-level CMOS TGs. Every state of {*A1, A2, A3, A4*} will select one SRAM's output to Q. There are 24 states of {*A1, A2, A3, and A4*} in total, perfectly matching the 16 SRAMs of an LUT. In this way, it can act as a 4-input look-up table. In Fig.3, the critical path for any input state is virtually the same. One of the critical path is shown in Fig.3 by the red line, which contains an AND gate, 2 level CMOS TGs and an inverter merely, so the LUT's speed can be very fast. In addition, the use of CMOS TGs to replace NMOS TGs can avoid the problems brought by threshold voltage loss. Decoding circuit is used instead of TG tree to shorten the critical path and lower the required number of transistors, thus smaller layout area can be achieved. As a rule, to get symmetrical rise and fall delay.

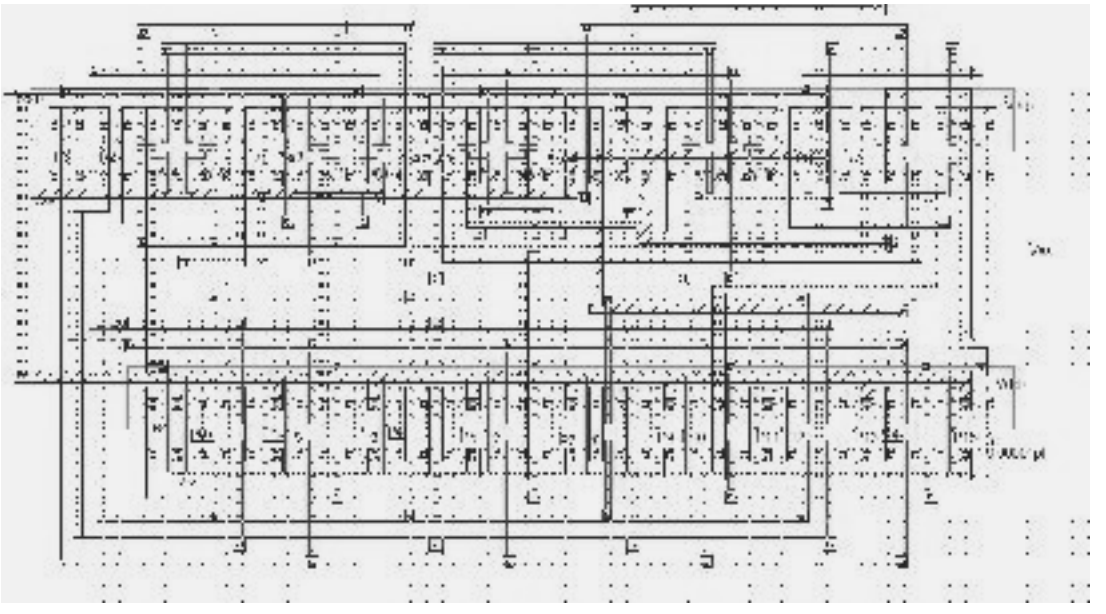

Fig.4 Simulation of LUT

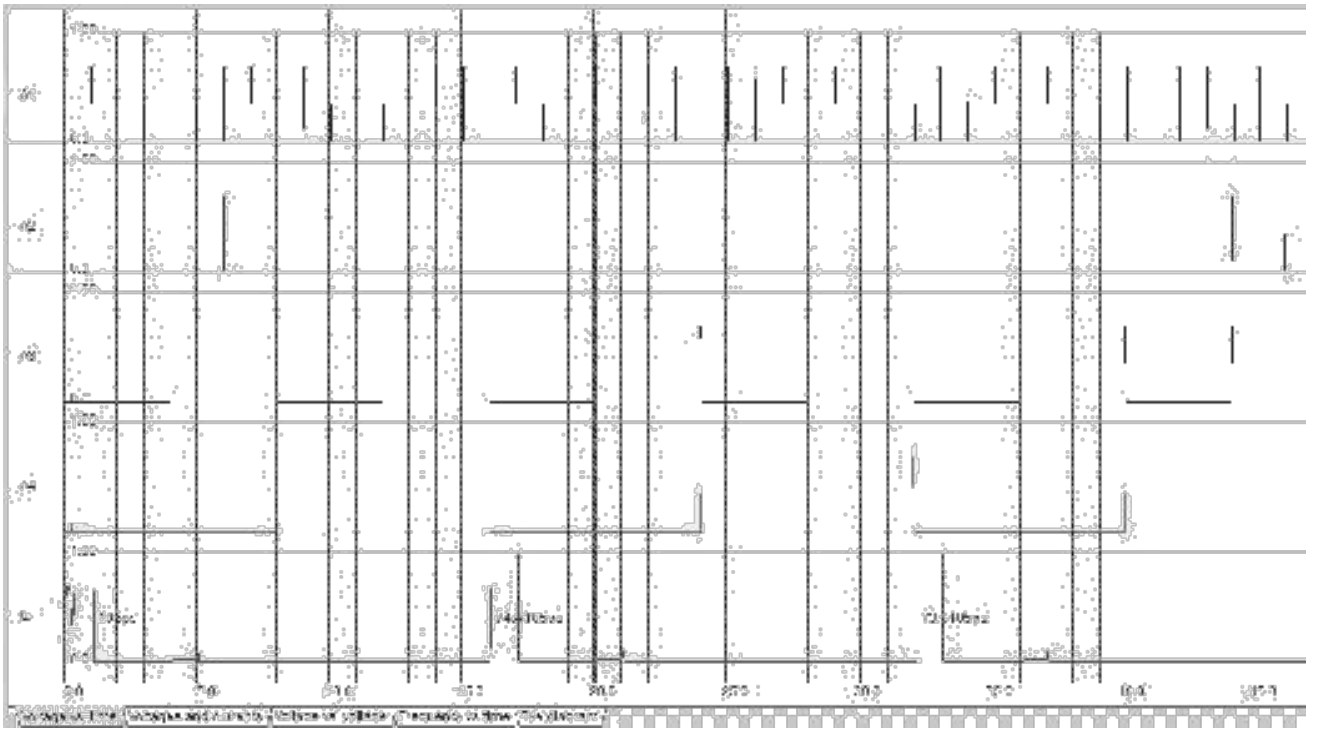

Fig.5 Simulation Results of LUT

IV. RESULT ANALYSIS

Parameters	VDSM (65nm)	VDSM (22nm)
Propogation Delay	LUT – 0.17ns Config. Register – 0.15ns	0.089ns
Area	14.4*7.2μm²	4.5*2.2 μm²
Leakage Power	LUT – 26 nW Config. Register - 11Nw	0.7 nW
Technology Used	65nm	22nm

V. FOOTNOTES

A novel LUT for FPGAs is designed using a 22nm, 0.7V low leakage technology. Great speed performance is achieved while retaining small layout area and leakage power.

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AUTOMATIC AMBULANCE RESCUE SYSTEM

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Abstract—As the population increases, the transport network becomes complicated and massive. In case of the hospitals sometimes it is difficult to find the specialized hospital and its shortest path to reach hence takes more time to reach it. In this study, we tried to solve this problem by representing the shortest path facility for finding the nearest location of the hospitals from user's location. To design accident rescue system such that if elsewhere an accident occur then message send to near hospital through shortest path algorithm for ambulance to reach at accident spot.

Keywords-Two microcontroller (PIC18F4520); Power Supply; Accelerometer(ADXL335); Temperature Sensor(LM35); GSM; GPS; RS MAX232.

I.
II. INTRODUCTION

Finding desired location is becomes difficult task. After finding a location people gets confused to reach that location because of the routes comprised a different mode. This problem is even more important for people who may need to visit unfamiliar parts of the metropolis**.**When an auto crash occurs suddenly; the reaction of the emergency services now becomes a race life and death. Today wireless innovation has tilted the odds in favour of success like never before. This paper details about accident of automobile emergency alert situation. In this we are trying to program a GPS / GSM module incorporating an accelerometer to occurrences of accident automatically via the GSM communication platform to the nearest agencies such as hospital.

The vehicle accident observed using temperature, accelerometer sensors. Accident is detected by these sensors.GPS is used to get latitude and longitude of the accident spot location. In this system, if a vehicle has met accidents, alert message with the location coordinates is sent to the server section. There is push button. When the accident is minor then user have to press button so that counter resets and there is no message to the server section. If the push button is not pressed by user then message is send to server unit.

From the server section, server compares the location of accident with the location of hospitals in database of microcontroller. After that availability of ambulance is checked. If there is no ambulance available in hospital then next near hospital is searched and message is sent to the nearby ambulance. Ambulance has GSM and GPS. GSM gets message of accident spot and GPS guides ambulance to go towards accident spot.

LITERATURE REVIEW

In 2012- Abid khan, Ravi Mishra :-They was designed a tracking unit that uses the global positioning system to determine the precise location of a object, person or other asset to which it is attached and using GSM modem this information can be transmit to remote user. It can provide tele-monitoring system for inter-cities transportation vehicles such as taxis and buses. This system contains single-board embedded system that is equipped with GPS and GSM modems along with ARM processor that is installed in the vehicle.

Disadvantage:-In this system shortest path is not used and it does not detect accident.

In June 2013- Pankaj Verma, J.S Bhatia works on GPS. It is one of the technologies that are used in a huge number of applications today. One of the applications is tracking your vehicle and keeps regular monitoring on them. This tracking system can inform you the location and route travelled by vehicle, and that information can be observed from any other remote location. Disadvantage:-In this system shortest path is not used and it does not detect accident.

In September 2014- M. Abinaya, R. Uthira Devi they Invented Intelligent Vehicle Control Using Wireless Embedded System in Transportation System Based On GSM and GPS Technology. Currently almost of the public having an own vehicle, theft is happening on parking and sometimes driving insecurity places. The safe of vehicles is extremely essential for public vehicles. Vehicle security and

accident revention is more challenging. So in order to bring a solution for this problem this system can be implemented.
Disadvantage: - In this system shortest path is not use.

III. PROPOSED SYSTEM

This proposed work is an attempt to design a tracking vehicle unit that uses the global positioning system(GPS)[2] to determine the precise location of accident spot. By using GSM modem this information can be transmit to remote user. For finding nearest hospital from accident spot we are using Dijkstra's algorithm (Shortest path algorithm)[4]. To design accident rescues system such that if elsewhere an accident occurs then ambulance will reach to that point without calling for ambulance**.**

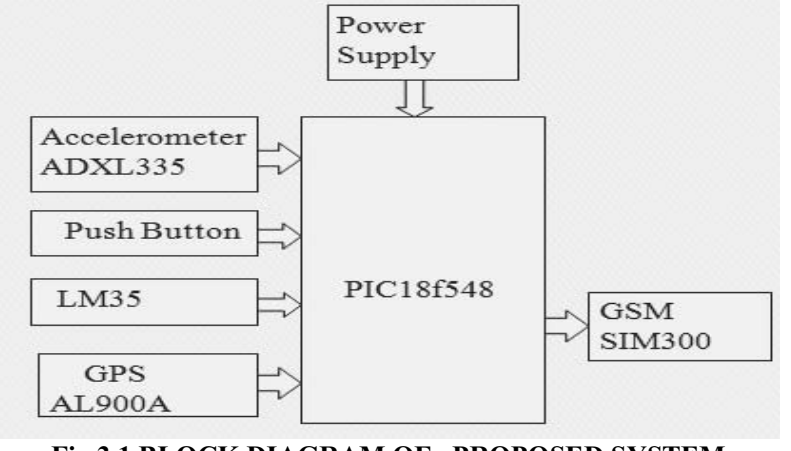


Fig.3.1 BLOCK DIAGRAM OF PROPOSED SYSTEM

IV.
V. WORKING SYSTEM

In this system we are using PIC microcontroller. It has 40 pins And it has 5 I/O ports, i.e. A,B,C,D,E. It operates on DC 40 Mhz. In this system we are connected different sensors to the PIC microcontroller which continuously sense the vibration, temperature and mechanical damage.
Our System consist of Accelerometer ADXL335[7] as a vibration detection, The accelerometer sensor has three axis X, Y, Z. Accelerometer has a digital output and it is directly connected to PIC microcontroller pin. It will continuously sense for position of the vehicle if found large deviation from normal value then accelerometer sensor is activated.

Temperature Sensor LM35[8] for sensing temperature inside the vehicle, Temperature Sensor has a Analog output. If the temperature rises above the 55degree Celsius then sensor is activated.
For mechanical damage we are using simple push button. If there is any mechanical damage push button is short circuited and gives high output i.e. push button is connected to the 5v DC supply.
If out of these three sensors any one gets activated, GPS[2] sense the location of vehicle. The PIC microcontroller compares it with a threshold value which is an empirical value (for an accident) and if it equals or exceeds that, then the microcontroller automatically scan GPS value And GPS also compare this value with available hospitals and give the nearest hospital location to GSM[2].
Here GSM Module is used as output. The GSM modem sends this data to the Main Server unit whose GSM number is already there in the module. Message contains vehicle number, accident spot location and sensors output value.

When an accident occurs, it immediately sends its GPS location to the Main server. The server maintains a database of the ambulances available. Database contains the details of free and busy ambulances at that point of time. The communication between main server section and ambulance section is achieved using manually. Hence in this way ambulance rescue accident vehicle minimum time.

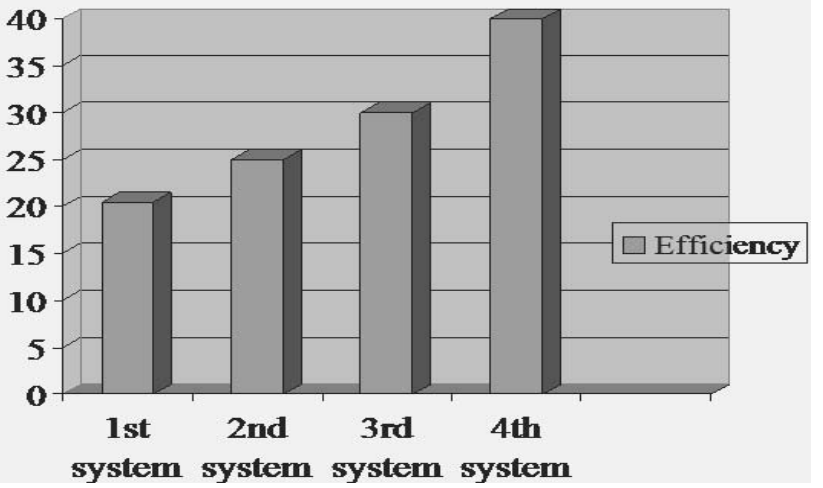
Table 4.1 Comparison between systems

System name / Parameter	GPS-GSM based tracking system (2012)	GPS-GSM based tracking system with google map based monitoring (2013)	Intelligent Vehicle Control Using Wireless Embedded System Based On GSM and GPS Technology (2014)	Proposed system
Concept	Tracking the object by using GPS & GSM	Tracking the object by using GPS & GSM, Showing the location on the google map.	To provide security to the vehicles by engine locking system which Prevents the vehicle from unauthorised access.	Detect the accident. Tracking the accident spot by using GPS – GSM & message to near hospital for ambulance at accident spot.
Shortest Path	Not used	Not used	Not used	Used
Component	GSM, GPS, ARM Microcontroller.	GPS, GSM, ATmega16 Microcontroller.	GSM, GPS, PIC Microcontroller.	GPS, GSM, PIC Microcontroller.
Sensors	Not used	Not used	Ultrasonic,Fuel, Lane detection, Heartbeat.	Accelerometer,Temperature.Mechanical button
Algorithm	Not used	Not used	Not used	Dijkstra's Algorithm
Applicable	For tracking purpose	For tracking purpose	For tracking purpose	Tracking & For Finding Shortest path

Our system is more efficient because system detect accident and use the shortest path for sending message to near hospital for calling ambulance to accident spot.

VI. COMPARISON BETWEEN SYSTEMS

From this table first three systems does not detect accident,for accident detection we use Accelerometer,Temperature sensors & push button.Also other three systems only applicable for tracking purpose but our system applicable for tracking and finding shortest path for nearest hospital for calling ambulance by using Dijkstra's algorithm.



Graph 4.1 Efficiency graph of systems

VII. CONCLUSION

This study finds the shortest path from the user location to hospitals selected. It uses the Dijkstra's algorithm for implementation. This will help the user to find the shortest path from their location to the health center. Also the user can able to find all the closest present within their area dynamically, which is helpful in terms of reducing their travel time and finding appropriate hospital immediately.

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An Embedded System Based Agricultural Spraying Robotic System

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Abstract- This paper presents a system, specially designed for the grape spraying through a robotic system. Agricultural Robotics is the logical proliferation of automation technology into bio systems such as agriculture, forestry, green house, horticulture etc. Presently a number of researches are being done to increase their applications. Some of the scientist contributions are mobile robot, flying robot, forester robot, Demeter which are exclusively used for agriculture. Humans are force to work in risky environment while spraying chemicals and pesticides on the crops for bug control. The tractors compress the soil, as they are heavier in weight. They cannot move in terrain environment. These techniques cannot recognize the crop and soil in close propinquity. Main aim is to avoid manual spraying of pesticides at actual farm, which will apparently reduce the impact of harmful chemicals on humans due to direction interaction of chemicals in manual spraying, and also increase the productivity of grapes. It will achieve by replacing human by a robotic system which will do the task of pesticides spraying over.
Keywords: Agriculture Robot, Spraying, Grapes, Pesticides, ARM LPC-2148.

I. INTRODUCTION

Nashik (Maharashtra) is the largest producer and exporter of grapes in India. Farmers cultivate grapes from their grapes with manual farming technologies. But obviously, the pesticide spraying is also manual. Farmers use a tractor spraying method which involves direct interaction of them with the chemicals. The inhalation of pesticides can, in some cases, be fatal or cause permanent damage to the lung tissues. Even relatively small amounts of exposure to many chemicals over long periods of time can be damaging to the worker. Due to the hazards of such exposure, protective clothing and equipment must be used. However, research has showed that protective clothing does reduce the possible amount of exposure but does not stop it. Many pesticides have been found to be able to penetrate clothing and even rubber gloves within half an hour and a manual spraying task can take several hours depending on the size of the grape. An experienced worker will attempt to coat the surface of the plants with the appropriate calculated dosage. This manual application of pesticides is, as mentioned above, a time consuming, tedious and dangerous task, requiring the worker to wear protective clothing and breathing apparatus. Hence, this manual application technique is largely open for error.

It is often difficult to know exactly how much pesticide it really being applied to each plant. In this harsh environment, it is possible that the worker may also apply an inappropriate amount of spray to the plants through either fatigue or haste, resulting in the inefficient application of pesticide. The alternative method to manual spraying is Fog spraying. This involves using a fogging sprayer to spray the whole greenhouse with a fine mist that covers every surface. More often the fog sprays are mounted on tractors. Many of agriculture researchers had designed spraying robots which are either mounted on tractors or has a separate chassis to be roll on. The use of ground robots or tractors compresses the soil, as they are heavier in weight. They cannot move in terrain environment. Due to this, soil quality alters to a poor one. Grape farmers use tractors to be roll off in between the lanes of vineries. So the space for rolling of the tractor remains unused. Many engineers have developed driverless tractors in the past but they have not been successful as they did not have the ability to embrace the complexity of the real world. Most of them assumed an industrial style of farming where everything was known before hand and the machines could work entirely in predefined ways – much like a production line. The approach here is to develop smarter system that is intelligent enough to work in an unmodified or semi natural environment. This

paper aims to design an uplifted spraying robot for the spraying purpose. The process starting from mixing of chemicals and pesticides to final spraying will be fully automated.

II. PROPOSED SYSTEM

- To design a unit in which pesticides to be sprayed should be mixed according to the given ratio.
- Filling of preparation on robot.
- Routing of robot in lanes of Grapes.

III. DESIGN CRITERIA

Following are the design criteria for the autonomous sprayer

- Sprayer must be able to navigate through lanes of existing field.
- Sprayer time should be one hour per acre or less.
- Sprayer should be able to function at night without lights.
- Sprayer should be useable in multiple farms or greenhouses (where the field width could be different and field floor can range from concrete to sand) and easily transportable.
- Sprayer should be an economically viable solution, in terms of labor and chemical savings.

IV. OBJECTIVES OF SYSTEM

- To reduce the vital effects of pesticides on human body.
- Increase the production by utilizing the space.
- Reduce the time and efforts behind the manual spraying methods.

V. BLOCK SCHEMATIC

System would work in two different sections viz. base station consist of pesticide mixer, second will be of substation which will actually work as spraying robot. Driving and spraying will be executed by this system. In mixing process, system will take required ratio of pesticide and base (q.s.) from user. After taking out ratio, the system will start pump actions and fill the main tank with the mixture. Next step is to drive the robot through a rail. Routing of robot will be programmed according to the field structure. This process will run in parallel to the spraying process. High torque low speed DC motors will be used to drive the robot. Robot will have a mini tank for carrying the pesticides. Filling of which will be done at base station whenever the robot will return to his pre-defined space in the field through remotely operated pipelines and valves. As the robot enters a lane of field, the spray guns will start in both directions. At the end of lane, gun will be stopped and processed will be repeated for next lane. All of this process will be handled by a LPC 2148 controller which has an ARM-7 based architecture. The software programming will be based on μCOS II RTOS.

Following figure 1 illustrates the base station system and figure 2 shows the sub system.

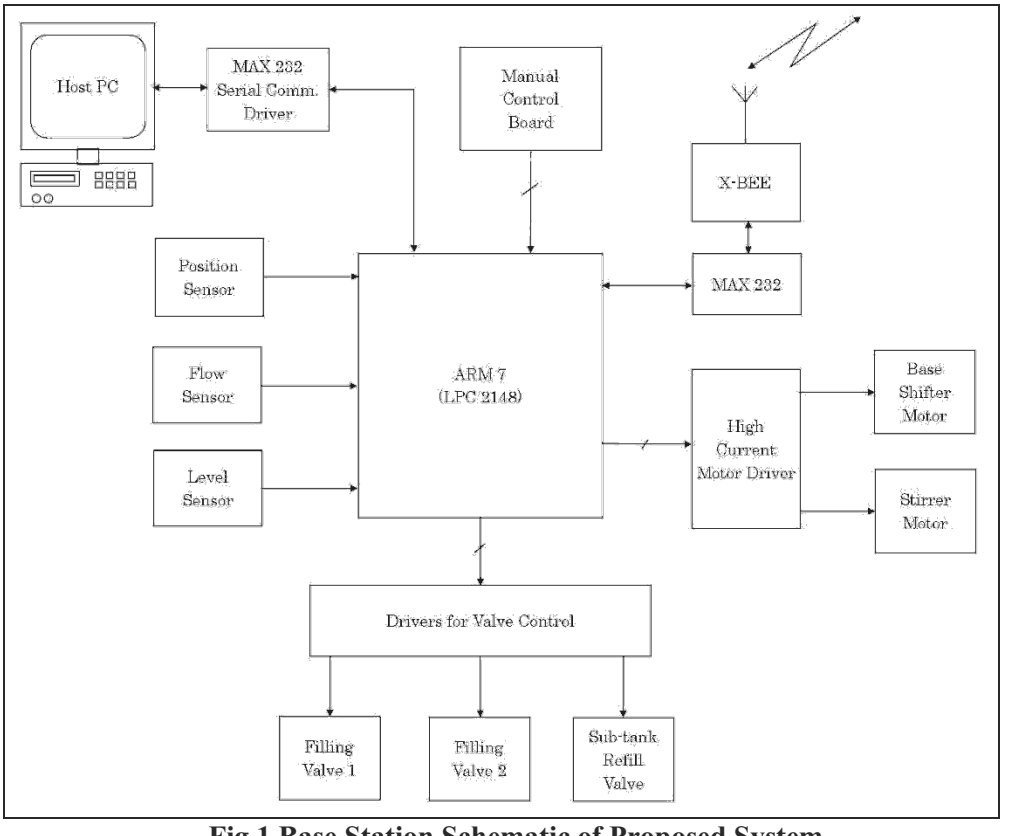

Fig 1 Base Station Schematic of Proposed System

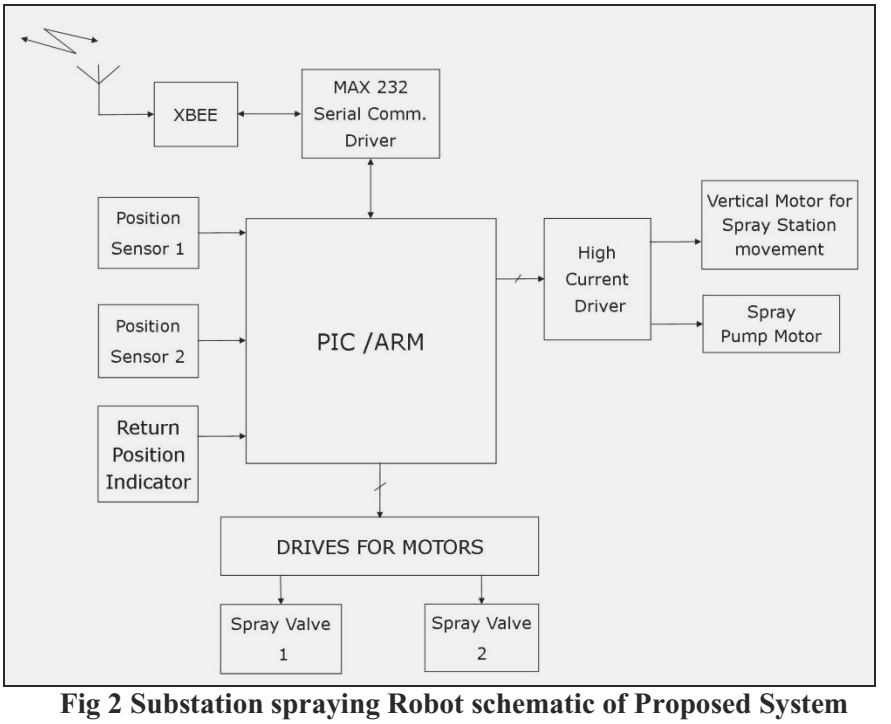

Fig 2 Substation spraying Robot schematic of Proposed System

VI. Conclusion

This system will prove an efficient system for grape farming. Using this system, the harmful impacts of chemicals and pesticides on human bodies due to manual spraying techniques will be reduces to a great extent. It will also help to reduce skin diseases in humans. Another advantage of this system is that, avoiding the usage of tractors at field will maintain the quality of soil and plant's roots. The area between the lanes of vineries can be reduced and hence number of plants will increase will increase the production rate of grapes. Due to automation, the time required for spraying could be less and with precision.

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Matlab Controlling Colour Sensing Robot

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Abstract- Design an electronic system for direction control of robot through motion sensing object .This direction control would be kernelled by GUI / sequential program of matlab. The application of the colour detection technique using MATLAB algorithms, to control the state of the output pins of an PIC 18F4520 microcontroller and also to control the movements of an 'ROBOT'. Presented here is a MATLAB-based project where images taken by the camera are processed for colours and the position of a red-coloured object is extracted out of the image. Based on the position of the red coloured object in the image, different data are sent via 'RF' module. The serial data are received by the robot and corresponding movement is done.
Keywords- PIC microcontroller 18f4520; Max RS 232; Motor Driver IC L293D; DC Motor; Encoding IC (HT12E); RF transmitter and receiver Module; Matlab software.

I.INTRODUCTION

Design an electronic system for direction control of robot through motion sensing object .This direction control would be kernelled by GUI / sequential program of matlab. The application of the colour detection technique using MATLAB algorithms, to control the state of the output pins of ansPIC 18F4520 microcontroller and also to control the movements of an 'ROBOT'

A camera is one of the most powerful and accurate sensors if you know how to process the images taken by it for the information you want. You can process subsequent images and extract a variety of information using image-processing techniques. MATLAB is a very powerful tool and plays an important role in image processing. Image processing is converting an image into digital form and performing some mathematical operations on it, in order to get an enhanced image or to extract some useful information out of it.

Presented here is a MATLAB-based project where images taken by the camera are processed for colours and the position of a red-coloured object is extracted out of the image. Based on the position of the red coloured object in the image, different data are sent via 'RF' module. The serial data are received by the robot and corresponding movement is done. You can change the code for any colour that you find suitable. This project is just an example and you can use this for various industrial applications such as controlling heavy load-lifting machines with some object of a specific colour in your hand

present in image processing tool box, to detect the centroid of a particular coloured image, and the change of the centroid co-ordinates will be detected, which will be applied to generate different commands. These commands would be fed to an PIC microcontroller to change the states of its output pins, and, to control the movement of an ROBOT in a particular direction. The main algorithm that is implemented is very simple and robust.

A camera takes continuous snapshots and a particular coloured region (predefined by user) of the images are bounded by a box. Then an algorithm is written that will sense the movement of the coloured box and generate different commands, each command corresponds to movements in a particular direction of an ROBOT (that is fed wirelessly to the robot) or state change of certain output pins of an PIC microcontroller.

II. BLOCK DIAGRAM

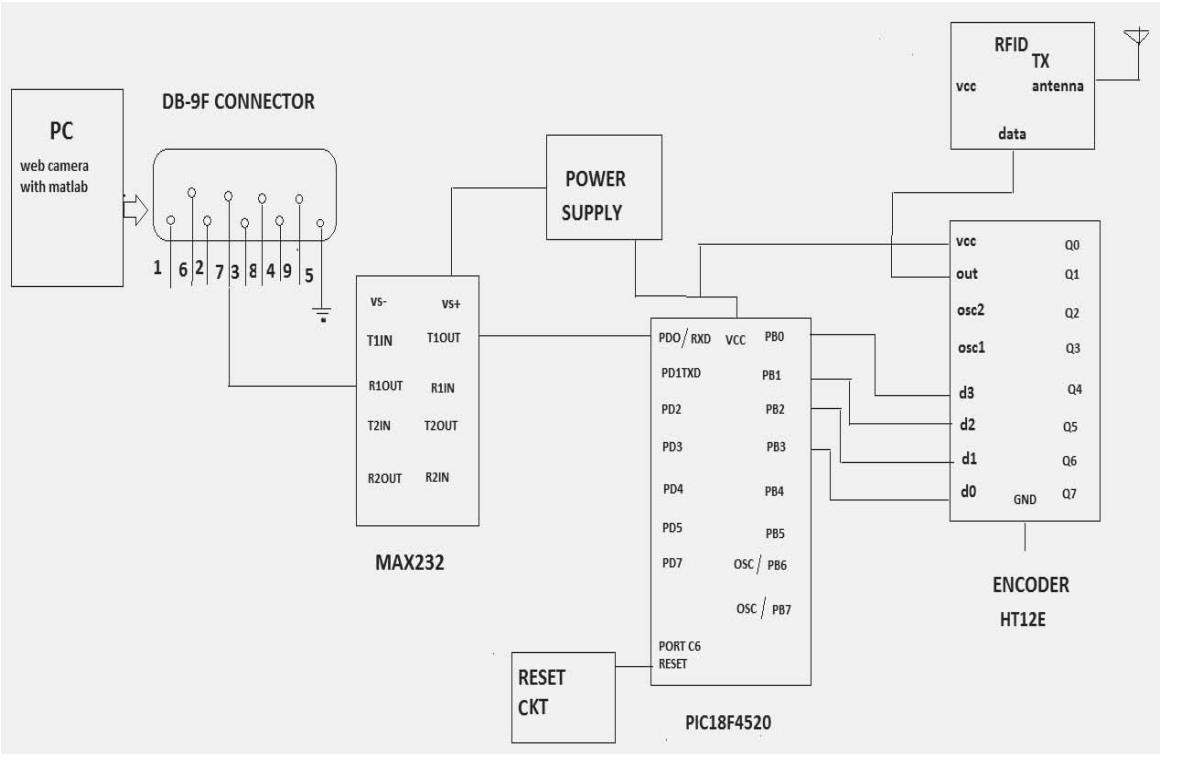

Fig. 1 block diagram of transmitter side

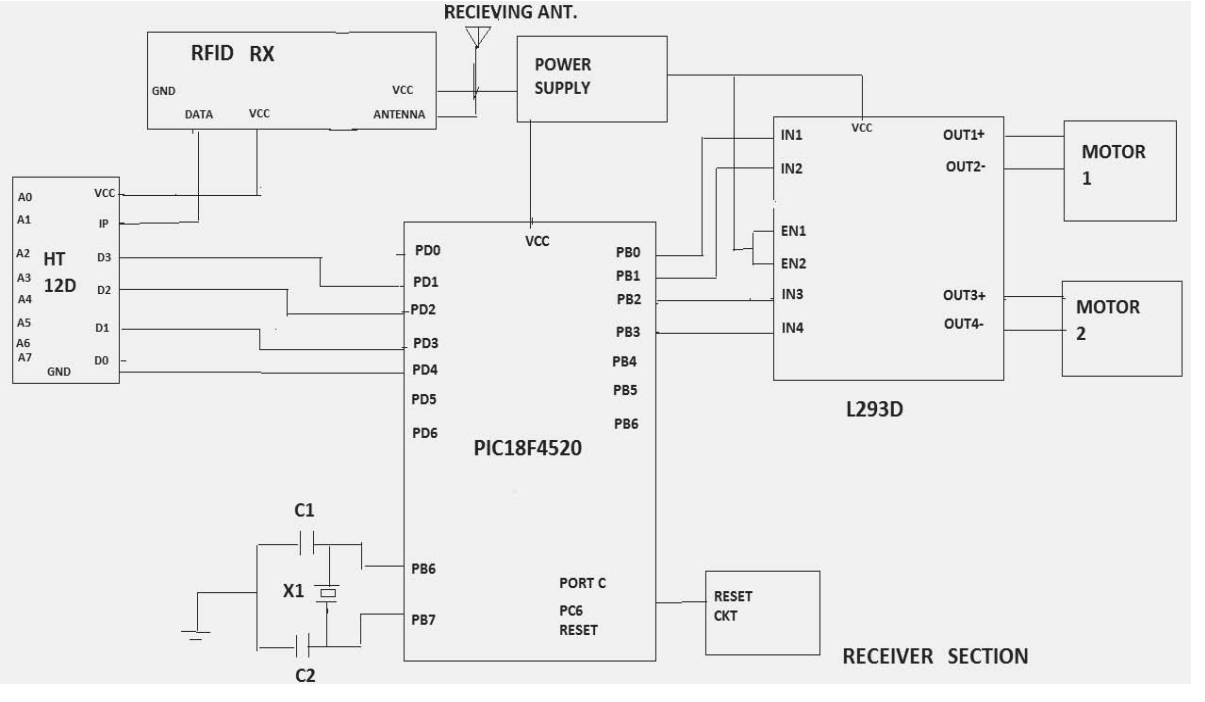

Fig. 2 block diagram of receiver section

2.1. PIC microcontroller (18f4520):-

- **New Core Features**

• **Alternate Run Modes:** By clocking the controller from the Timer1 source or the internal oscillator block, power consumption during code execution can be reduced by as much as 90%.
• **Multiple Idle Modes:** The controller can also run with its CPU core disabled but the peripherals still active. In these states, power consumption can be reduced even further, to as little as 4% of normal operation requirements.
• **Self-programmability:** These devices can write to their own program memory spaces under internal software control. By using a boot loader routine located in the protected Boot Block at the top of program memory, it becomes possible to create an application that can update itself in the field.
10-bit A/D Converter: This module incorporates programmable acquisition time, allowing for a channel to be selected and a conversion to be initiated without waiting for a sampling period and thus, reduce code overhead.

2.2.Motor driver IC:

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V

- **Features of L293D** :-
- 600-mA Output Current Capability Per Driver
- Wide Supply Voltage Range 4.5 V to 36 V
- Separate Input-Logic Supply
- High-Noise-Immunity Inputs

2.3 RF transmitter and receiver module:-

An RF module (radio frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radio frequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and/or receiver.

RF modules are widely used in electronic design owing to the difficulty of designing radio circuitry. Good electronic radio design is notoriously complex because of the sensitivity of radio circuits and the accuracy of components and layouts required to achieve operation on a specific frequency. In addition, reliable RF communication circuit requires careful monitoring of the manufacturing process to ensure that the RF performance is not adversely affected. Finally, radio circuits are usually subject to limits on radiated emissions, and require Conformance testing and certification by a standardization organization such as ETSI or the U.S. Federal Communications Commission (FCC).

2.4 Encoder And Decoder ic (HT12e&d):-

The 212 encoders are a series of CMOS LSIs forremote control system applications. They arecapable of encoding information which consistsof N address bits and 12_N data bits. Each address/data input can be set to one of the twologic states. The programmed addresses/dataare transmitted together with the header bitsvia an RF or an infrared transmission mediumupon receipt of a trigger signal. The capabilityto select a TE trigger on the HT12E or a DATAtrigger on the HT12A further enhances the applicationflexibility of the 212 series of encoders.The HT12A additionally provides a 38kHz carrierfor infrared systems.

III.UTILITIES

1.In industrial automation
2.For object sorting
3.In military application

IV.CONCLUSION

The project is designed, implemented and tested successfully. The response of system to different object movementswas satisfactory. Still some advancement can be included to for system to improve performance. Obstacle avoidancemechanisms can be included. This can be done by sensing the back ground images and processing it properly. Differentactive sensors such as infrared sensors and supersonic sensors are employed to measure the range in real time betweenthe obstacles and robot. A mobile robot with various types on sensors via ubiquitous networks can be introduced. Amobile robot composed on TCP/IP network, wireless camera and several sensors in an environment can be constructed,and show obstacle avoidance and object tracking methods necessary with providing diverse services desired by thepeople.

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Resolving Vehicle Emissions in Cities by maximum spanning Tree Algorithm based on Internet of Things

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Abstract- The proportion of air pollution which is caused by the cars is increasing. In order to solve this serious problem, many countries and regions have already presented a series of emissions standards, meanwhile some methods has been developed, include update motor engine or improve the quality of the gasoline. However, these actions have not brought about a striking effect as we expect. There are also some situations to fail implement these emissions standards. In this project, a wireless inspection and notification system (WINS) through the concept of Internet of Things (IoT) is proposed. By applying the system, it is possible to smoothly realize a green traffic network. In this system, Radio frequency identification (RFID) technology as a low-cost and mature wireless communication method is adopted to collect and transmit emissions information of vehicles. Moreover, The RFID devices need to be installed on the traffic lights so that reliable reading of emissions signals from a vehicle can be interrogated when the vehicles stop in front of the red light. Taken into consideration the real environment, an efficient and innovative maximum spanning tree algorithm (MXAST) is also presented to select suitable traffic lights aim to reduce the number of RFID devices (more economy) and guaranteed the whole urban cars can be monitored (simple & safety).

Keywords- Internet of things(IoT), maximum spanning trees, Radio frequency identification, vehicle emissions inspection.

I. INTRODUCTION

With the increasing of automobile quantity, especially in some metropolis, it is very impending to resolve the problem of air pollution resulting from automobile exhaust gas. Due to incomplete combustion in the engine of a vehicle the pollution through vehicle increases. So to control the pollution the monitoring system needs to develop. In metro cities like Pune, Mumbai and Delhi, air pollution has reached levels judged as hazardous to human health. To fight this problem, the motor emissions standards have been established and promoted in many developed countries for many years [1].

Furthermore, some improved measures in vehicle engines or the quality of gasoline have also been developed by researchers. However, these methods seem not to solve radically the emissions pollution problems [2]. The motor emissions standard is very difficult to implement in real-life. Although government forces all cars for testing or examining periodically as the local standard, the actual vehicle on- road emissions are usually much higher than those which are measured during the emission inspections.

As a result, a new system is proposed to deal with the thorny issues. Along with continually updated wireless communication and signal acquisition technologies through the concept of IoT, an effectively wireless inspection and notification system (WINS) has been developed in this project. It can realize real-time monitor all cars emissions information in a city. In the system, the cars need to be tagged with a unique identity (ID), their emissions information will be transferred with the ID to backend system. Then, the authorities can smoothly judge which car fail to this test (exceed the standard) and give a Notice (message & email) to ask drivers to repair their cars. RFID as a low-cost and mature wireless communication technology is employed in WINS [3]. It is mainly responsible for collecting and transmitting emissions information of vehicles.

To specially mention, traffic light is also a critical role in the whole system. It is a central component in the traffic system that no car could avoid it to drive in a city. In order to achieve the goal that monitoring closely all the motor vehicles, RFID reader will be installed on the traffic light. It is well known that every car must stop in front of the red light for a long time. The stopping time is also the best timing for RFID reader to collect the emissions information from cars. With the innovative idea of applying IoT to collect Vehicle emissions data, it is possible to smoothly realize a green traffic network.

However, in order to practically implement WINS, an important issues need to be considered. The 'infinity' number of RFID readers will be required as there are 'countless' traffic lights in the traffic network of a city, especially in international urban and metropolitan areas worldwide. To overcome this drawback, a maximum spanning trees (MAXST) algorithm with the Google Map is also proposed in this project.

By the algorithm, the amount of traffic lights needed for installing RFID readers can be reduced while at the same time the inspection of all vehicles in the city can be guaranteed. As a result, the vehicle emissions in whole urban can be controlled more effectively via WINS.

A spanning tree is a sub-graph or a tree of an undirected graph that connects all the vertices together without simple cycle. Theoretically, there are many spanning trees for a single graph. Therefore, in practice the idea of spanning tree is often used to determine the shortest path or the simplest structure, resulting in minimum spanning trees (MST) problems [4]. To obtain the MST, each of the edges (line connecting two vertices) of the graph is assigned with a weight, which is a value showing how important that edge is. Then, by comparing the sum of weights of every spanning tree, the one with the minimum sum of weights would be the MST.

II. BLOCK DIAGRAM

2.1. Wireless Inspection and Notification System (WINS) Design

The whole system can be split into two sub-systems: inspection system and control (notification) system. In the real road situation, all data of vehicle emissions firstly collected in the inspection system, with effect of adding some information such as time, date and location. Then, these update data will be transmitted to the control system, as well as notification system. Based on the local emissions standard, a message or e-mail of repairing car will automatically send to car owners. The overview of how the emissions data collects and transmit among the vehicle emissions system, RFID devices and the control system is shown in Figure.

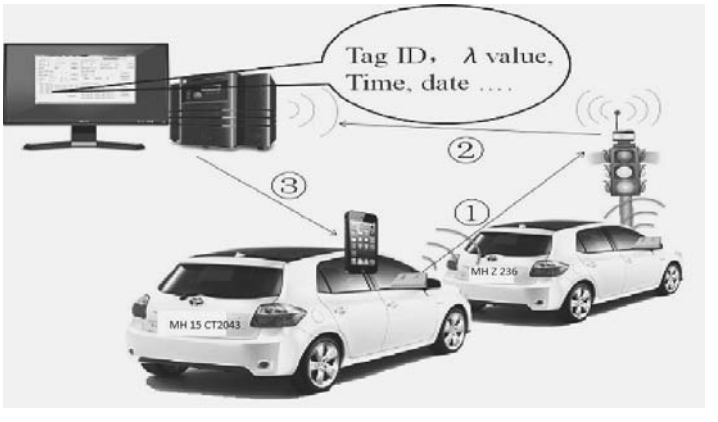

Figure 1. Road situation of data communication

III. PROPOSED INSPECTION SYSTEM DESIGN

3.1. Data collection

The active RFID tags are designed to collect the emissions data from the vehicle exhaust system. Although active RFID tag has a lifetime which is limited by the on-board power source, it is not an issue for WINS because there is already a power supply in every vehicle. However, emissions data collection is also a problem worthy of study here: In a typical vehicle exhaust system, there are usually two built-in lambda sensors installed on the exhaust pipe that are used to measure the engine air ratio (λ). When λ is higher than its stoichiometric value (normally is 1), more nitrogen oxides would be produced; when λ is

lower than its stoichiometric value, carbon monoxide and hydrocarbon emissions would increase significantly. This implies that the exhaust emissions can be reflected by λ. Therefore, the λ value is collected as the emissions data in WINS. In particular, the two lambda sensor in the exhaust system of an automobile, the one is settled before the catalytic converter and the other one after it to evaluate if the catalytic converter works well. To reflect the actual on-road engine emissions, only the λ values from the lambda sensor in the downstream position of the converter were collected in the experiments as shown in Figure.

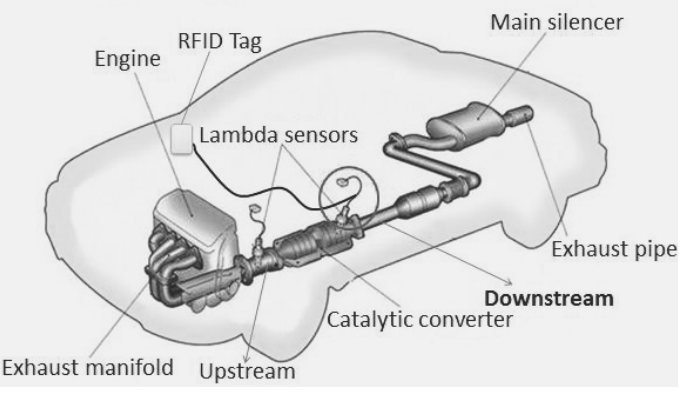

Figure 2. The vehicle emissions system

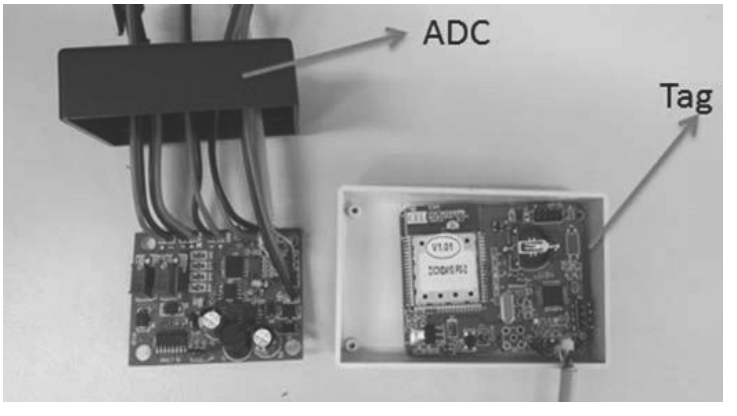

Figure 3. Prototype of the RFID tag

3.2. Data transmission

RFID reader will receive emissions data when the vehicles which are installed on RFID tag drive into inspect range. However, most traffic lights in a city are just connected and controlled for shifting signals which do not provide the capability of data transmission. Therefore, another wireless communication technology need be introduced into RFID reader. Once the RFID reader receives the data from the tags, the most cost-effective way for data transmission is 3G. It can steadily transmit these data to the control system. In many cities, 3G data transmission is more popular compare to other wireless communication technologies and the price for 3G transmission is also inexpensive. Therefore, based on these technologies, the RFID interrogator is designed and provided in Figure.

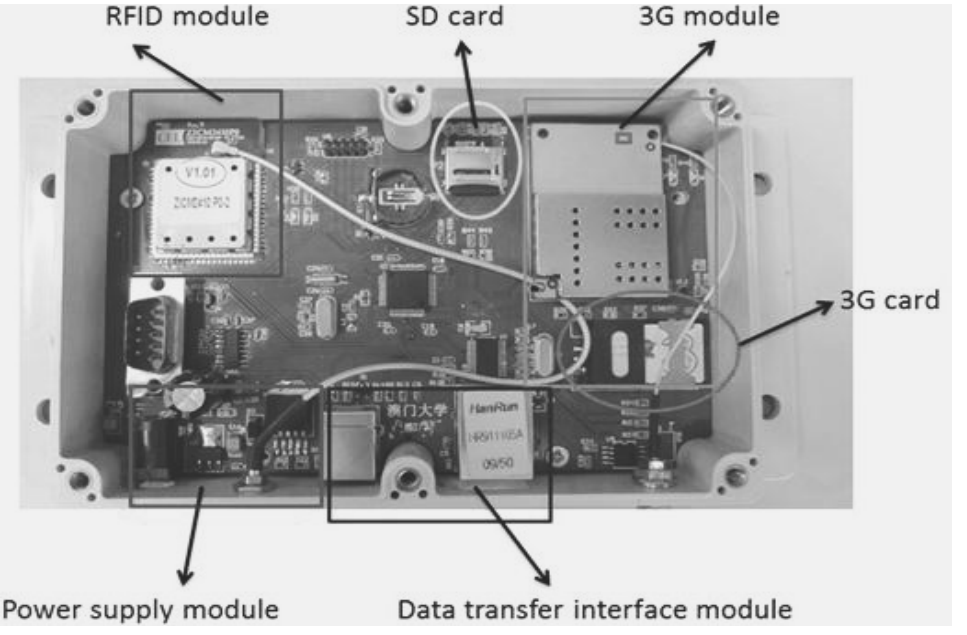

Figure 4. Prototype of the RFID interrogator

3.3. Control system design

The control system as a vehicle notification centre, its chief role is to notify drivers with SMS or e-mail to repair their cars as soon as possible until detected qualified when their vehicle emissions exceed the allowed figure. Meanwhile, the drivers also can check their cars detail emissions information (e.g. when, where, how) via the control system. They can login the website and input their account such as mobile number, vehicle Licenses or Tag ID to inquiry.

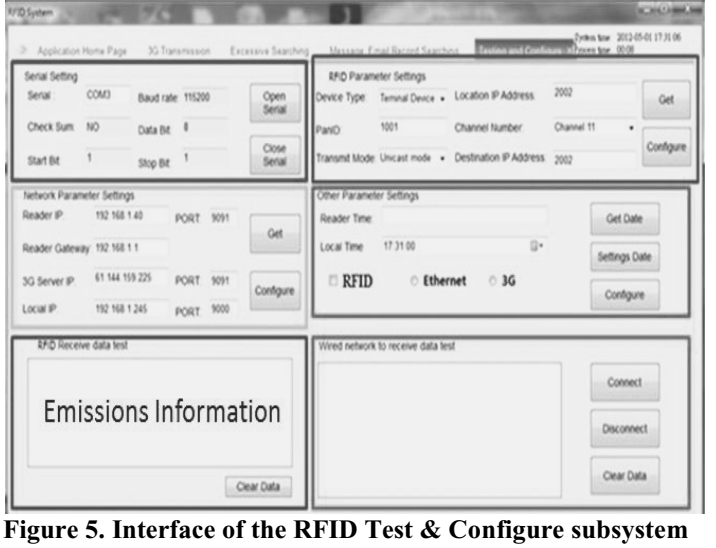

Figure 5. Interface of the RFID Test & Configure subsystem

Figure 6. A mobile message sent by the system as an engine maintenance reminder

As mention above, a 3G platform has been established to receive data from RFID readers. The emissions information will be displayed in a table as shown in Figure 5. The information includes tag ID, date, time, and emissions data. Then, the system will pick out the vehicle which fails the test and a SMS or e-mail also sent to the car owner as shown in Figure6.

VI. CONCLUSIONS

In this paper, WINS under the concept of IoT for mandatory vehicle emissions inspection is proposed. IoT is an emerging networking concept within the pervasive or ambient things or objects are connected to provide a smart or intelligent service to make human life easier and happier. RFID technology, as one of the enabling technologies of IoT, is employed to develop the information system. With RFID, the vehicle emission indicator, reading, can be interrogated along with the corresponding tag ID through a wireless connection among traffic lights and vehicles. By monitoring the emissions data, the engine health can be easily inspected and examined. Experimental results show that the proposed system is effective and reliable for vehicle emissions inspection.

Meanwhile, a MAXST algorithm is also proposed to determine the amount of traffic lights on which the RFID readers should be installed. Simulated result shows that the number of traffic light can be reduced by at least 40%. With the proposed information system, the core idea of "Green IoT" can be realized. It not only effectively takes an advance the environmental quality, but also helps vehicle owners to save a lot of unnecessary troubles compared to the traditional emissions inspection test. Furthermore, since WINS may be provided to the governmental authorities for vehicle emissions control, some implementation issues are analyzed.

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Temperaments in the Design of Low-voltage Low-power Double Tail Comparator

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Abstract— The circuit of a conventional double-tail comparator is modified for low-power and fast operation even in small supply voltages. Without complicating the design and by adding few transistors, the positive feedback during the regeneration is strengthened, which results in remarkably reduced delay time. Post-layout simulation results in a 0.18-μm CMOS technology confirm the analysis results. It is shown that in the proposed dynamic comparator both the power consumption and delay time are significantly reduced. The maximum clock frequency of the proposed comparator can be increased to 2.5 and 1.1 GHz at supply voltages of 1.2 and 0.6 V, while consuming 1.4 mW and 153 μW, respectively. The standard deviation of the input-referred offset is 7.8 mV at 1.2 V supply.

Keywords- Double-tail comparator; Dynamic Clocked comparators; High-speed analog-to-digital comparators; Low power analog design

I. INTRODUCTION

Comparator is one of the fundamental building blocks in most analog-to-digital converters (ADCs). Many high speed ADCs, such as flash ADCs, require high-speed, low power comparators with small chip area. High-speed comparators in ultra-deep sub-micrometer (UDSM) CMOS technologies suffer from low supply voltages especially when considering the fact that threshold voltages of the devices have not been scaled at the same pace as the supply voltages of the modern CMOS processes [3].Hence, designing high-speed comparators is more challenging when the supply voltage is smaller. In other words, in a given technology, to achieve high speed, larger transistors are required to compensate the reduction of supply voltage, which also means that more die area and power is needed. Besides, low-voltage operation results in limited common-mode input range, which is important in many high-speed ADC architectures, such as flash ADCs. Many techniques, such as supply boosting methods [1], [2], techniques employing body-driven transistors [7], [8], current-mode design [5] and those using dual-oxide processes, which can handle higher supply voltages have been developed to meet the low-voltage design challenges. Here, a comprehensive analysis about the delay of dynamic comparators has been presented for various architectures. Furthermore, based on the double-tail structure proposed in [5], a new dynamic comparator is presented, which does not require boosted voltage or stacking of too many transistors. Merely by adding a few minimum-size transistors to the conventional double-tail dynamic comparator, latch delay time is profoundly reduced. This modification also results in considerable power savings when compared to the conventional dynamic comparator and double-tail comparator.

II. DESIGN

Fig. 1 demonstrates the schematic diagram of the proposed dynamic double-tail comparator. Due to the better performance of double-tail architecture in low-voltage applications, the proposed comparator is designed based on the double-tail structure. The main idea of the proposed comparator is to increase $\Delta Vfn/fp$ in order to increase the latch regeneration speed. For this purpose, two control transistors (M_{c1} andM_{c2}) have been added to the first stage in parallel to M_3/M_4transistors but in a cross-coupled manner.

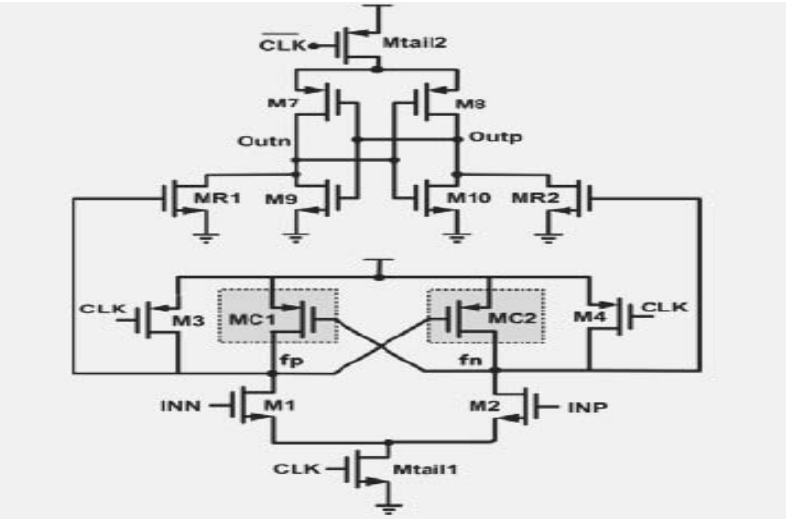

Fig.1:-Schematic diagram of proposed system

During operation, in the reset phase (CLK = 0, M_{tail1} and M_{tail2} are off, avoiding static power), M_3 and M_4 pulls both f_n and f_p nodes to V_{DD}, hence transistor M_{c1} and M_{c2} are cut off. Intermediate stage transistors, M_{R1} and M_{R2}, reset both latch outputs to ground.

During decision-making phase (CLK = V_{DD}, M_{tail1}, and M_{tail2} are on), transistors M_3 and M_4 turn off. Furthermore, at the beginning of this phase, the control transistors are still off (since f_n and f_p are about V_{DD}). Thus, f_n and f_p start to drop with different rates according to the input voltages. Suppose $V_{INP} > V_{INN}$, thus f_n drops faster than f_p, (since M_2 provides more current than M_1).

As long as f_n continues falling, the corresponding pMOS control transistor (M_{c1} in this case) starts to turn on, pulling f_p node back to the V_{DD}; so another control transistor (M_{c2}) remains off, allowing fn to be discharged completely. In other words, unlike conventional double-tail dynamic comparator, in which $\Delta V_{fn/fp}$ is just a function of input transistor transconductance and input voltage difference, in the proposed structure as soon as the comparator detects that for instance node fn discharges faster, a pMOS transistor(M_{c1}) turns on, pulling the other node fp back to the V_{DD}.

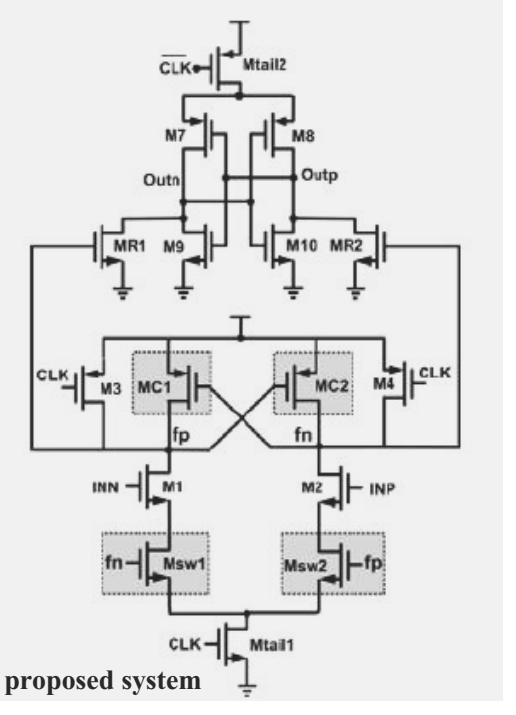

Fig.2:-Final Circuit diagram of proposed system

Therefore by the time passing, the difference between f_n and f_p (ΔVfn/fp) increases in an exponential manner, leading to the reduction of latch regeneration time. Despite the effectiveness of the proposed idea, one of the points which should be considered is that in this circuit, when one of the control transistors (e.g., M_{c1}) turns on, a current from V_{DD} is drawn to the ground via input and tail-transistor (e.g., M_{c1}, M_1, and M_{tail1}), resulting in static power consumption. To overcome this issue, two nMOS switches are used below the input transistors [M_{sw1} and M_{sw2}, as shown in Fig. 2].

2.2 Delay Analysis

2.2.1 Enhancing ΔV_0

We define t_0, as a time after which latch regeneration starts. In other words, t_0 is considered to be the time it takes (while both latch outputs are rising with different rates) until the first nMOS transistor of the back-to-back inverters turns on, so that it will pull down one of the outputs and regeneration will commence. According to (2), the latch output voltage difference at time t_0, (ΔV_0) has a considerable impact on the latch regeneration time, such that bigger ΔV_0 results in less regeneration time.

2.2.2 Effects of enhancing latch effective transconductances

In conventional double-tail comparator, both f_n and f_p nodes will be finally discharged completely. In our proposed comparator, however, the fact that one of the first stage output nodes (fn/fp) will charge up back to the V_{DD} at the beginning of the decision making phase, will turn on one of the intermediate stage transistors, thus the effective.

2.2.3 Reducing the energy per comparison

It is not only the delay parameter which is improved in the modified proposed comparator, but the energy per conversion is reduced as well. Earlier in conventional double-tail topology, both f_n and f_p nodes discharge to the ground during the decision making phase and each time during the reset phase they should be pulled up back to the V_{DD}. However, in our proposed comparator, only one of the mentioned nodes (fn/fp) has to be charged during the reset phase.

1.3 Design Considerations

In designing the proposed comparator, some design issues must be considered. When determining the size of tail transistors (*M*tail1 and *M*tail2), it is necessary to ensure that the time it takes that one of the control transistors turns on must be smaller than *t*0 (start of regeneration).

$$ton, Mc1(2) \rightarrow \frac{|VThp.CL.fn(p)|}{In1,2} < \frac{VThnCLout}{IB1}$$

$$\rightarrow \frac{|VThp.CL.fn(p)|}{\frac{Itail1}{2}} < \frac{VThnCLout}{\frac{Itail2}{2}}$$

CONCLUSIONS

In this paper, we presented a comprehensive delay analysis for clocked dynamic comparators and expressions were derived. Two common structures of conventional dynamic comparator and conventional double-tail dynamic comparators were analyzed. Also, based on theoretical analyses, a new dynamic comparator with low-voltage low-power capability was proposed in order to improve the performance of the comparator. Post-layout simulation results in 0.18-µm CMOS technology confirmed that the delay and energy per conversion of the proposed comparator is reduced to a great extent in comparison with the conventional dynamic comparator and double-tail comparator.

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ULTRA WIDEBAND SLOTTED ANTENNA ANALYSIS WITH DIFFERENT PARAMETER

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Abstract— The investigations and developments taking place in the Ultra Wide Band (UWB) area led to the development of a number of antennas working in this band. This paper suggests new coplanar waveguide fed antenna for UWB applications. The bandwidth of operation is 7.5 GHz. The proposed antenna is based on triangular shaped patch. The edges of the ground are trimmed off for the purpose of compact and ultra-wide band performance. Radiation pattern of the antenna is omni directional characteristics. This antenna has the advantages of simple, reduced structure, which is easiness of fabrication and integration. The investigations and developments taking place in the Ultra Wide Band (UWB) area led to the development of a number of antennas working in this band. This paper suggests new coplanar waveguide fed antenna for UWB applications. The bandwidth of operation is 7.5 GHz. The proposed antenna is based on triangular shaped patch. The edges of the ground are trimmed off for the purpose of compact and ultra-wide band performance. Radiation pattern of the antenna is omni directional characteristics. This antenna has the advantages of simple, reduced structure, which is easiness of fabrication and integration. The investigations and developments taking place in the Ultra Wide Band (UWB) area led to the development of a number of antennas working in this band. This paper suggests new coplanar waveguide fed antenna for UWB applications. The bandwidth of operation is 7.5 GHz. The proposed antenna is based on triangular shaped patch. The edges of the ground are trimmed off for the purpose of compact and ultra-wide band performance. Radiation pattern of the antenna is omni directional characteristics. This antenna has the advantages of simple, reduced structure, which is easiness of fabrication and integration.
Keywords- Printed Slot Antenna, Coplanar Waveguide (CPW), Return Loss, Ultra Wideband (UWB).

I.INTRODUCTION

The mild and rapid development of wireless industry in the early year, there is a need of compact, low profile microstrip antenna with high gain and bandwidth. The wireless industries are engaged in designing of UWB antennas with characteristics of high data rate transfer in interference free environment to satisfy the need of consumer electronics. Key component of UWB communication system for the study of UWB antennas electrical characteristics for domestic and commercial application is reported by many researchers. Federal Communication Commission has approved spectrum from 3.1GHz to 10.6 GHz of bandwidth of 7.5 GHz for UWB communication system. Planar antenna is studied for wide band operation with various shaped tuning stub like cone, semi-circular, ellipse, U, triangular, square and rectangular round cornered. All the articles have well reported the advantages of planar antenna geometry such as wide impedance bandwidth and all directional radiation patterns.

In this paper, a triangular patch is frequently used in microstrip antennas, which provide radiation characteristics similar to rectangular patch with smaller area. The proposed antenna is designed with a compact rectangular slot and a triangular feed structure at the interior portion of the feed. A novel CPW-fed UWB rectangular aperture antenna with simple geometry is presented. The compact rectangular shaped aperture antenna is fed by a 50Ω impedance of CPW transmission line, where the end is terminated by a semicircular tuning stub. The feeding structure look like a mushroom shape, which has a simpler geometry structure and fewer parameters. Detail of the antenna design is discussed, FR4 substrate with dielectric constant of 4.3.

II. ANTENNA DESIGN-I

The modified antenna design-I is further analyzed on the basis of parametric variation. Figure 1. Shows the parametric Variation of antenna design-I. It is observed that, with the variation in the width of vertical slots the results are varying from non-radiating to radiating part. Figure 2 illustrate the VSWR parametric variation of Antenna design-I. Here, width of the slot at 0.5 mm is VSWR > 2, as width increases the VSWR decreases and gives the upper bandwidth of 12.85GHz.Frequency band at slot width 1.5mm and 2mm is same. So, 1.5mm width of slot is optimized value.

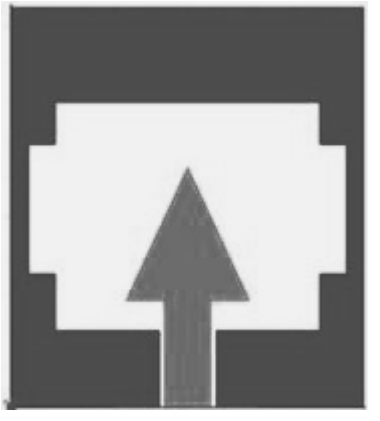

Figure 1.Parametric Variation of antenna design-I

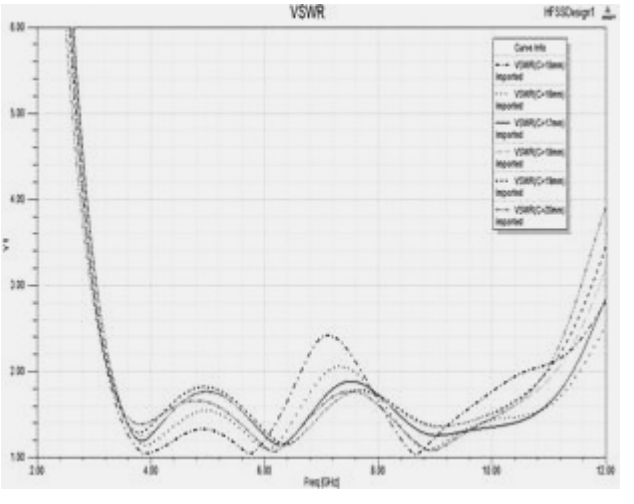

Figure 2. The VSWR parametric variation of Antenna design-I

III. ANTENNA DESIGN-II

The modified antenna design-II is further analyzed on the basis of feed offset method. Figure 1.shows the Feed offset of Antenna design-II. It is observed that, variation in the center position of feed provide the amazing results. Figure 4.illustrate the S-parameter of feed offset of Antenna design-II. Here, at center of feed position 15mm and 16mm is > -10db, as feed center shifted to 18mm,19 and 20mm the band width will decrease. The best performance is observed at center position of feed at 17mm optimized value, which gives the band of 3.33GHz to 11.32GHz.

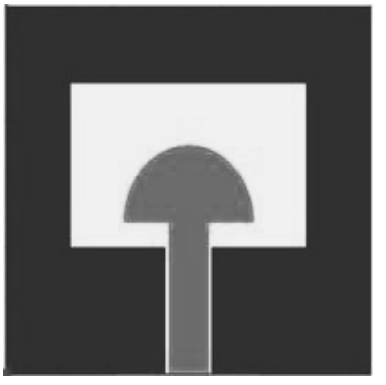

Figure 3.Feed offset of Antenna design-II

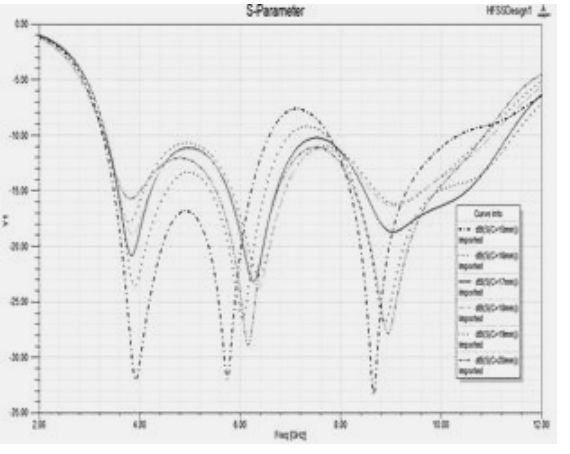

Figure 4. The S-parameter of feed offset of Antenna design-II

IV. CONCLUSION

Thus by observing the output of both design i have conclude that the design of slotted antenna with modified semi-circular tuning stub gives complete utilization of Ultra wide band frequency range (3.1GHz-10.6GHz). The design of slot antenna with semi-circular tuning stub gives 96.92% utilization of Ultra wide band frequency range (3.33GHz to 10.6GHz). In this paper we discussed the two designs of printed slot antenna with their respective size and shape with creating two vertical slots. When it is considered for the UWB applications and the low profile shape, the antenna with Triangular tuning patch promises small size configuration (21mm×20mm×1.6mm) as compare to the antenna with Semicircular tuning stub (29mm×34mm×1.5mm). The result include in this report are based on simulations by using HFSS software for validating results antenna fabrication & measurement of various performance parameters can be done. In future optimization can be carried out to enhance the antenna performance by adjusting all different parameters of antenna like slot width and feed position etc.

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Estimation of Shelf Life Of Mango and Automatic Separation

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Abstract The Project Features a Computer vision based system for automatic segregation and grading of mango (magnifera indica L.) based on mainly three factors which are weight, color and color maturity. the main purpose behind implementing this computer vision based system is to replace human efforts by automation. The manual inspection creates problem in maintaining consistency and uniformity in grading and sorting. hence to increase the speed of the process as well as to maintain the consistency, uniformity, accuracy and efficiency, a prototype computer vision based automatic mango grading and sorting system is developed. this automated system captures the images from CCD camera placed on the top of conveyor belt carrying mangoes, then it processes the images in order to collect several relevant features which are sensitive to weight color and color maturity of the mango. Finally parameters of the individual classes are estimated using MATLAB software.

For fulfillment of export requirements s essential to determine fruit features such Color and brightness, level of maturity and weight. A methodology to estimate these characteristics from a set of images of Mango samples is presented in this project. The methods used to determine level of Brightness and level of maturity resulted an overall accuracy of 90% and for weight estimation method, error margin did not exceed 7 grams

Keywords*:* Mango; Shelf life; Conveyor; MATLAB; Maturity Level

I. INTRODUCTION

India has emerged as the largest producer of fruits in the world, with an annual production of 57.60 million tones over an area of 5.2 million hectares, as against world production of 300 million tones. India produces around 50% of the world's mangoes. India is the largest producer of mango, with an annual production of about 10 million tones. More than 1000 varieties are grown in India, of which only 20 are commercially cultivated. Even though India is the largest producer of the choicest varieties of mango, the country is not a major player in the export market for either fresh mango or processed mango products. Out of 10 million tones, around 40,000 tons of mangos are exported as fresh fruit, accounting for about 40% of production. The main Objective of Project is to estimate Shelf life of Mangoes by using nondestructive Methods. Application of Machine vision based system, aimed to replace manual based technique for grading and sorting of Mango. For the fresh market the main factor affecting consumer preference is physical appearance to maximize return, great effort is expended ensuring that the appearance best matches a particular market. In the past years the technology was not much advanced which involved the parameters such as current and voltage were measured one after the other with the help of voltmeter, ammeter, etc. So, this type of measurement of parameters was waste of time or did not much accurate results.

Parameters to be measured:

1. Color.
2. Weight.
3. Skin color brightness.

Load cell is used for weight measurement, as this load cells will measure the weight of mango which will be placed on conveyor belt. Camera is used for capturing the images of mango and for measuring the skin brightness and color. These operations are performed with help of MATLAB simulator. Then with help of some calculations mangoes are separated into basic categories and separation

is carried out with the help of conveyor belt. Finally we get separated mangoes which can be distributed in various areas across countries and across the world as per their shelf life.

II. SYSTEM DEVELOPMENT

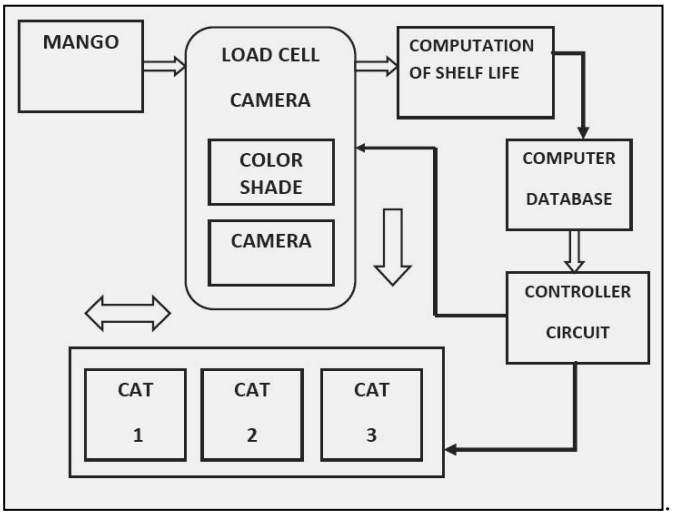

Fig. 1 Block Diagram for estimation of specifications and separation

2.1 Mango

Input to System is Mango fruit of which we have to separate into different categories as shown in block diagram. These samples are feed at Beginning of Conveyor 1 which have Load Cell as a beginning Platform.

2.2 Conveyer 1

Conveyor 1 consists of Instruments such as Load cell, Camera. Load cell is used to calculate weight of sample mango. Camera is used to capture images of sample mangoes. Controller circuit have control on camera. Camera captures images only if mango is present beneath camera. We are estimating three parameters on conveyor 1 that are:

- Color shade
- Weight
- Color Maturity

2.3 Computation of shelf life

This process is mainly carried out by MATLAB software with help of PC. This block includes calculations that give annual value determining shelf life of sample mango. This calculation uses results given by other three parameter estimation methods which are weight estimation, color shade measurement and color maturity estimation.

2.4 Computer Database

Computer database consists of following database:

1. Images of Standard Sample mangoes at different level of maturity.
2. Standard Values Of color components taken from standard samples at different level of maturity
3. Values of weight of mangoes of various volumes and various ages.

2.5 Controller Circuit

Controller circuit is used to control various sections of project such as Camera, Conveyor 2. Two IR pairs

are interfaced with controller circuit. IR pair 1 is used to detect presence of mango on load cell to control pushing shaft. IR pair 2 is used to detect presence of mangoes beneath camera in image acquisition chamber. It also controls conveyor 2 which is used to segregate mango samples as per their shelf life.

2.6 Conveyer 2

Conveyor 2 is used to separate mango samples as per their shelf life. It consists of three containers, each on to carry separate categorized mangoes. Conveyor 2 moves on command of controller circuit.

III. OBJECTIVES OF SYSTEM

3.1 Image Acquisition

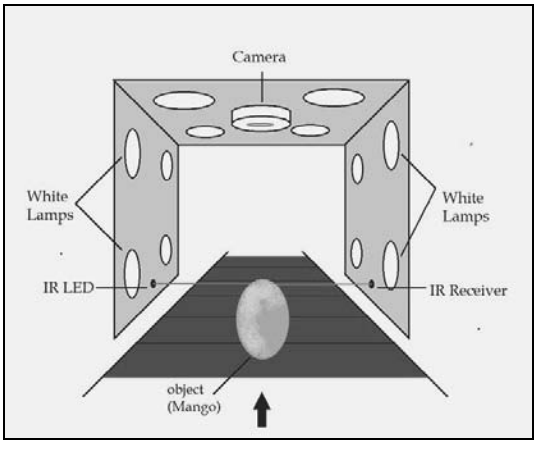

Fig. 2 Image acquisition chamber

The proposed methods begin with a set of acquired images of the fruit. For image acquisition, the camera uses video adapters connected to the computer. This connection uses the serial port with transfer standard IEEE 1394. High resolution allows for better detail analysis, but since increasing the resolution also increases processing loads, we decided to set the image resolution at 480x352 pixels. For image acquisition, a diffuse front lighting system with four white-light 6-watt lamps is used as shown in gig below. In order to determine the main characteristics of the fruit from the images, we followed a series of steps: pre-processing, weight estimation, degree of maturation, and spots measurement. In each of the steps, the procedures used MATLAB 2010a software functions, and Image Acquisition Toolbox functions.

figure shows structural view of image acquisition chamber consisting of camera . We are using IR LED as a Transmitter and IR sensor as a Receiver to detect presence of mango beneath camera. As conveyor belt is continuously moving, but we need to capture only the images of mango, so we used IR pair for the same. IR pair detects presence of mango and sends signal to MATLAB through PC.

IV. MATHEMATICAL MODEL

4.1 Pre-Processing

We applied traditional methods for image enhancement, de-noising and edge detection. This stage seeks to separate the fruit from the image background. To achieve this separation we performed color segmentation. In order to design a more accurate method to achieve this objective, we studied different color spaces, especially those in which color information is distinguishable from the intensity component, such as HSI (Hue, Saturation and Intensity) or YCbCr (Luminance and Chroma components) color spaces.

We chose the YCbCr color space because it allows for more effective segmentation than other color spaces, resulting in a clear distinction between fruit and background colors. Colors in a mango fruit are usually in the green to red color spectrum. In the YCbCr color space, this spectrum range is in the second and third quadrants as shown in fig. 3, in the negative value segment [-1, 0] of the Cb channel. This means that by analyzing this region separation between fruit and background is straightforward. Due to the fact that only the Cb channel information is relevant, it is not necessary to make a complete transformation from an RBG image. For efficiency, the following function obtains the Cb channel information from an RGB image:

$$b(x,y)=1/255\times(-37.979(x,y)-74.203(x,y)+112(x,y))+128$$

where, R(x,y), G(x,y) and B(x,y) are in the integer range of [0,255].

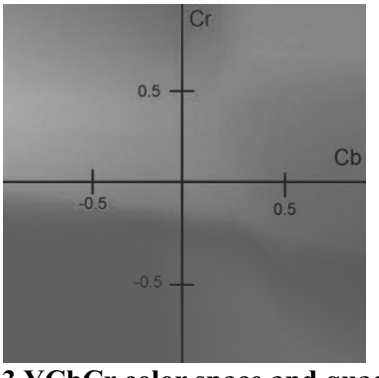

Fig. 3 YCbCr color space and quadrants

4.2 Weight Estimation

We can derive the weight of fruit from volume estimation. The analysis of spatial geometry is the basis for volume estimation, from which the total volume is the sum of the volumes of all sections formed by a transverse cut along the length of the fruit as shown in figure 4 Then, if we take a small enough h value (height of each cross section), it is possible to approximate the volume of each section to the elliptic cylinder volume, thus:

$$V_c = \pi \times a \times b \times h$$

$$V_{total} = \sum V\, c(i) \ldots\ldots\ldots \text{for } i = 1 \text{ to } k$$

$$V_{total} = \sum \pi aibih = \pi h \sum aibi \ldots\ldots\ldots\ldots \text{ for } i = 1 \text{ to } k$$

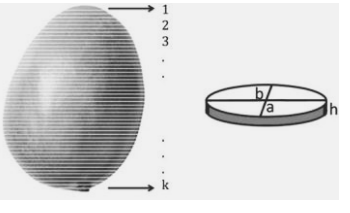

Fig. 4 Cross section of the fruit.

4.3 Maturity Level Estimation

The level of maturity is a decisive factor in fruit classification for export and a key factor to determine conservation policies. We propose a non-invasive method to determine the maturity level by analyzing the

color of the surface of a fruit. This analysis provides a criterion for classification according to the specifications for classification by color described in NTC 5139. For color treatment, we selected the HSI color space because it allows for better discrimination between the color information of the first two channels: the Hue-Saturation and the intensity channels. The following function permits the transformation of RGB to HSI space:

$$H=\cos^{-1}\frac{0.5[(R-G)+(R+B)]}{\sqrt{(R-G)^2+(R-B)(G-B)}}$$

$$S = 1-[3Min(R,G,B) / R+G+B]$$

$$I = (1/3)(R+G+B)$$

Once we get the transformation to HSI, we analyzed distribution variations by histogram analysis in a set of images. This analysis showed that the mean value of channels H and S is sensitive to changes in the color states. The training set had 15 fruits, each one with two features, hue and saturation mean, that were estimated by using a set of 5 images for each fruit, and the classes were defined by expert concept. The prior probabilities for classes were estimated from the relative frequencies of the classes in the training data. Finally, the category to which the fruit belongs according to the input parameters of hue and saturation can be defined by means of the Predict method.

V. CONCLUSION

In this Paper, we have proposed a method for detecting the shelf life of mango and automatic separation. Firstly, we surveyed all the information about alphonso mangoes and its various characteristics. Then using MATLAB coding, we converted the images into gray and binary images. We collected mathematical formulae to calculate various parameters of mango. We applied these formulae on tomatoes so as to check if correct results are obtained.

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SMART BLIND WALKING STICK

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ABSTRACT-Blind stick is an innovative stick designed for visually disabled people for improved navigation. We here propose an advanced blind stick that allows visually challenged people to navigate with ease using advanced technology. The blind stick is integrated with ultrasonic sensor along with water sensing using moisture sensor. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound a buzzer. It also detects and sounds a different buzzer if it detects water and alerts the blind. The system has one more advanced feature integrated to help the blind find their stick if they forget where they kept it. A wireless rf based remote is used for this purpose. Pressing the remote button sounds a buzzer on the stick which helps the blind person to find their stick. Thus this system allows for obstacle detection as well as finding stick if misplaced by visually disabled people. [1]

Keywords:Ultrasonic sensor,Moisture Sensor,Microcontroller,buzzer

I. INTRODUCTION

Blindness is a very common disability among the peoples throughout the world. According to the World Health Organization (WHO) 285 million people are visually impaired worldwide, 39 million are blind and 246 have low vision. About 90% of the world's visually impaired live in developing countries. For the indigents blindness is a curse. They need help to walk outside and all other daily essential works. So the paper glows a system that tries to remove the curse of blindness and make them self- dependent to do their daily chores. It is a walking stick, normally used by the blinds. But it is fully automated, easy to maintain, cheap and it is very comfortable to use. The power consumption is low and can be operated easily. Above all the stick is very economic over the conventional one. The walking stick mentioned above is a stick that consists of a circuit board that contains a PIC micro controller, different sensors, and buzzer. The entire project is designed using micro-controller based upon its reliability. The micro-controller is code protected so its security bridge cannot be override except the vendor or owner. Here one micro-controller is used, that is PIC16F876a. All sensors data are taken by the micro-controller and it produces the sensors of output. [1]

II. SYSTEM INFORMATION

The block diagram depicts the proposed design of a smart stick. The system elements consist of various subsystems. The sensor based circuitry consisting of sensors such as ultrasonic sensors, Moisture sensors. The feedback system has auditory interface. The microcontroller, control buttons and power circuitry (preferably battery-based) are the crucial systems. The proposed system can be designed to take of form of a detachable and portable device, which can be unconditionally mounted on a simple white cane or blind stick. This requires a clear vision of the desired system goals. Various system parameters are thus needed to be evaluated based on the design to be practically implementable. [6]

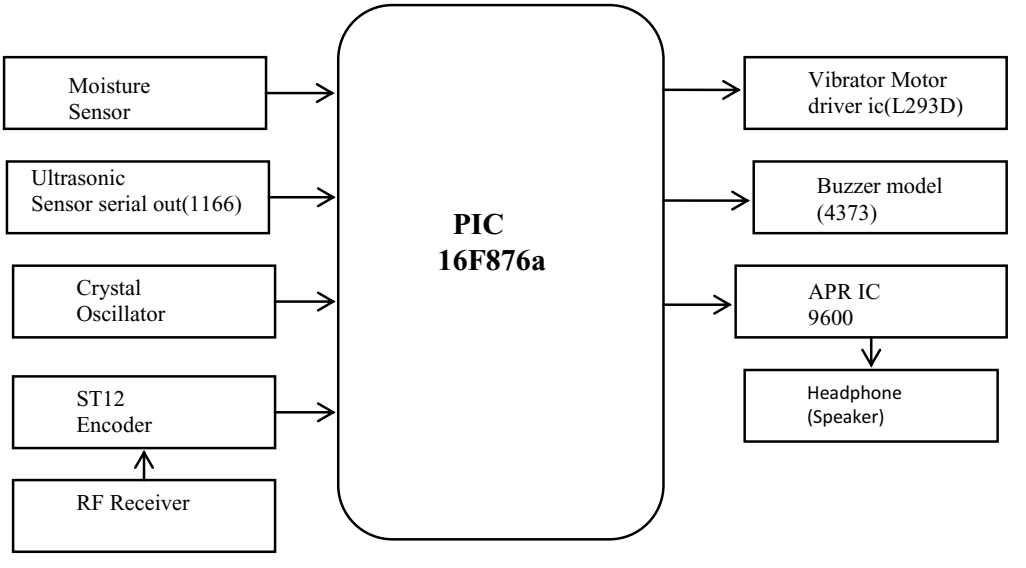
III. LITERATURE SURVEY

1. Smart walking stick - an electronic approach to assist visually disabled persons by Mohammad Hazzaz Mahmud, RanaSaha, and Sayemul Islam in this paper the sensor based circuitry consisting of sensors Ultrasonic Sensor is used to detect obstacles, A PIC16F690

microcontroller reads these sensors and drives a buzzer, a LED and a motor with PWM. An audio output is designated by a buzzer alarm.

2. Arm7 Based Electronic Travel Aid System for Blind People Navigation and Monitoring V. S. M. Madulika S #1, M. S. Madhan Mohan#2, CH.Sridevi#3, T. V. Janardhana rao#4 .This paper aims at the development of an Electronic Travelling Aid (ETA) kit to help the blind people to find obstacle free path. This ETA is fixed to the stick of the blind people. When the object is detected near to the blinds' stick it alerts them with the help of vibratory circuit (speakers or head phones). The system consists of ultrasonic sensor, GPS Module, GSM Module and vibratory circuit (speakers or head phones). The location of the blind is found using Global System for Mobile communications (GSM) and Global Position System (GPS).

IV. BLOCK DIAGRAM



V. WORKING OF SYSTEM

Blind stick is an innovative stick designed for visually disabled people for improved navigation. We here propose an advanced blind stick that allows visually challenged people to navigate with ease using advanced technology. The blind stick is integrated with ultrasonic sensor along with water sensing. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound a speaker. It also detects and sounds a different buzzer if it detects water and alerts the blind. The system has one more advanced feature integrated to help the blind find their stick if they forget where they kept it. A wireless RF based remote is used for this purpose. Pressing the remote button sounds a buzzer on the stick which helps the blind person to find their stick. Thus this system allows for obstacle detection as well as finding stick if misplaced by visually disabled people. We have also used vibrator for producing the vibrations in the stick.

VI. CONCLUSION

Smart blind walking stick using PIC16F876 can be successfully developed.This paper proposed the design and architecture of a new concept of Smart Stick for blind people. The advantage of the system lies in the fact that it can prove to be a very low cost solution to millions of

blind person worldwide.

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[6] Shruti Dambhare M.E 3rd SEM (ESC) G.H.R.C.E. Nagpur, Prof. A. Sakhare M.Tech (ESC) G.H.R.C.E.Nagpur Smart stick for Blind: Obstacle Detection, Artificial vision and Real-time assistance via GPS.

Wireless Smart Metering System

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Abstract: In this paper an energy calculation through wireless smart meter using Zigbee is proposed for automatic meter data collection, give intimation through messages displayed on LCD and energy auditing. In this paper, we discuss different hardware techniques for tripping, indicating, intimating the consumers and power monitoring. It is the ARM7 Processor based system which continuously records the readings and automatically takes the responsibility of calculating the bill with the data received from the energy meter, and the tariff provided by the operator and displays the same. The design presents a novice method of combined Zigbee and Global System for Mobile communication (GSM) technology to monitor the power consumption and controlling of the meters remotely. This system avoids the human intervention in power management.
Keywords: GSM(Global System for Mobile communication), ARM-7, Smart Meter.

I. INTRODUCTION

The traditional metering systems has many disadvantages as manual reading has shortcomings such as errors in taking reading, inaccuracy, external conditions affecting readings ,delayed work .These techniques also requires huge manpower. Automatic meter reading system is one way to avoid these shortcomings. There are three key elements in an automatic meter reading (AMR) system: consumption measurement, meter reading, transmission of measured data, and data processing and billing. An AMR system has to be Cost-effective i.e. costs of implementation, maintenance should be reduced while providing robust and reliable performance. And one very important thing is the relationship between the customer and the supplier must be considered [1].

Problem associates with traditional meter reading have been increased day by day, due to various reasons such as rapid growth in population, tedious location, environmental conditions etc. But with new developments of microcontroller, there are many improvements in automating various industrial aspects for reducing manual efforts. In traditional meter reading system in which utility usages are written on paper by workers, there is lot of chances of human errors. These will cost more to the utility company. Also there are chances that of unavailability of consumers during utility worker's visit for meter reading. In such cases, billing process will be pending & utility workers again require visiting to consumer. Going to each & every consumer's house & generating the bills is very labouries task & require lot of time. It becomes very much difficult in natural calamities especially in rainy season. Moreover it is also difficult for utility workers to find out unauthorized connections or malpractices carried out by consumers manually. This all will result in loss of revenue generation for utility company. AMR is a process of automatically collecting consumption, diagnostic, and status data from energy metering devices and transferring that data to a central database for billing, troubleshooting, and analyzing [2]. This technology mainly saves power supply providers to reduce the expenses of periodic trips to each physical location to read a meter. Another advantage as mentioned is that billing can be based on near real-time consumption rather than on estimates based on past or predicted consumption. AMR technologies include handheld, mobile and network technologies based on telephony platforms [3] (wired and wireless), RF (Radio Frequency) [4], [5] or power line transmission. Various AMR methods and technologies are developed using SCADA (Supervisory Control and Data Acquisition), Zigbee, GPRS and GPS [6], [7] etc.

Choosing an appropriate Wireless Communication System is one of main task in this work. At present, most AMR systems are generally based on media such as RF (Radio Frequency) [4], [5], PLCC (Power Line Carrier Communication) [4], GPRS (General Packet Radio Service) [6], [7], HFC (Hybrid Fiber-Coaxial) and

so on, to transfer data between power meters and manage center. All the above communication media have both merits and shortcomings as well in many aspects like short transmission distance, high transmission & communication cost [6], maintenance difficulty and unsafe data transmission. By considering zigbee module, it is recently developed two-way wireless communication protocol system. Zigbee is designed for low power consumption and at low cost. Zigbee Alliance group defined the higher protocol layers while lower layers of the stack (MAC, PHY) are being defined by the IEEE 802.15 working group 4 (802.15.4)[8]. This can achieve the data of 250kbps in the 2.4GHz bands. . Zigbee has been developed to meet the growing demand for capable wireless networking between numerous low-power devices. So by considering all these points, we can apply Zigbee Wireless communication system, which is popularly used in the world, to transmit power data [9]. In developed system, Zigbee based wireless communication subsystem is responsible for receiving and transferring data & GSM modem is used for sending SMS. The generated bill can be send to consumer in the form ofE-mail by using GSM modem [10].

II. LITERATURE SURVEY

For this work existing meter reading techniques in India are analyzed and conducted an extensive study on different energy measuring instruments available now. In existing system either an electronic energy meter or an electro-mechanical meter is fixed in the premise for measuring the usage. The meters currently in use are only capable of recording kWh units. The kWh units used then still have to be recorded by meter readers monthly, on foot. The recorded data need to be processed by a meter reading company. For processing the meter reading, company needs to firstly link each recorded power usage datum to an account holder and then determine the amount owed by means of the specific tariff in use.

Md. Wasi-ur-Rahman, Mohammad TanvirRahman, TareqHasan Khan and S.M. LutfulKabira[11] proposed technique for remotely reading electricity meter readings using Short Message Service(SMS) has been illustrated. Existing Global System for Mobile communications (GSM) networks have been used for sending and receiving SMS.Dr. MohdYunus B Nayan1, AryoHandoko Primicanta2 [12] propose hybrid Automated Metering Reading (AMR) system which is a combination of ZigBee and GSM technology. In this propose system ZigBee module is attached to the electric meter by using interface board and the data collector will be connected to the central computer by using GSM.Gordan Štruklec1, VedranBilas[1] propose a wireless automatic water-meter reading system founded on ZigBee technology . The wireless automatic water-meter reading system presented here uses ZigBee networking to avoid difficulties and problems inherent to other meter reading techniquesLi Quan-Xi1, Li Gang [13] propose household metering system design based on Zigbee and GPRS technologies, using PIC18LF4620 as the core processor and CC2430 chip as close communication function, using SIM300 chip as communication function in distance.

III. BLOCK DIAGRAM OF SYSTEM

In this paper we uses two power supplies, one is regulated 5V for modules and other one is3.3V for ARM 7 microcontroller.7805 three terminal voltage regulator is used for voltage eregulation. Bridge type full Wave rectifier is used to rectify the ac output of secondary of 230/9V step down transformer. ZigBee is a low-cost, low-power, wireless mesh network standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications. Low power-usage allows longer life with smaller batteries. Mesh networking provides high reliability and more extensive. Digital energy metering system as an alternative for the electromechanical system has been proposed and developed with the Peripheral Interface into Controller (ARM7) and necessary software. Due to the low cost of microcontrollers, Prepaid Energy Meter has been developed using a microcontroller from the Microchip Technology Inc. ARM7LPC2138 family .In this Paper ,we have proposed a microcontroller based single phase digital Prepaid Energy Meter using two microcontrollers from the Atmel AVR family because of its performance, power efficiency and design flexibility and an Energy Meter IC. In this paper a credit card is used which is capable of communicating with both the distributor unit from where the credit card have to be recharged and the energy meter to which the number of recharged units to be laoded. An electronic circuit called USB burner circuit is used to load the recharged units both in energy meter and smart card.

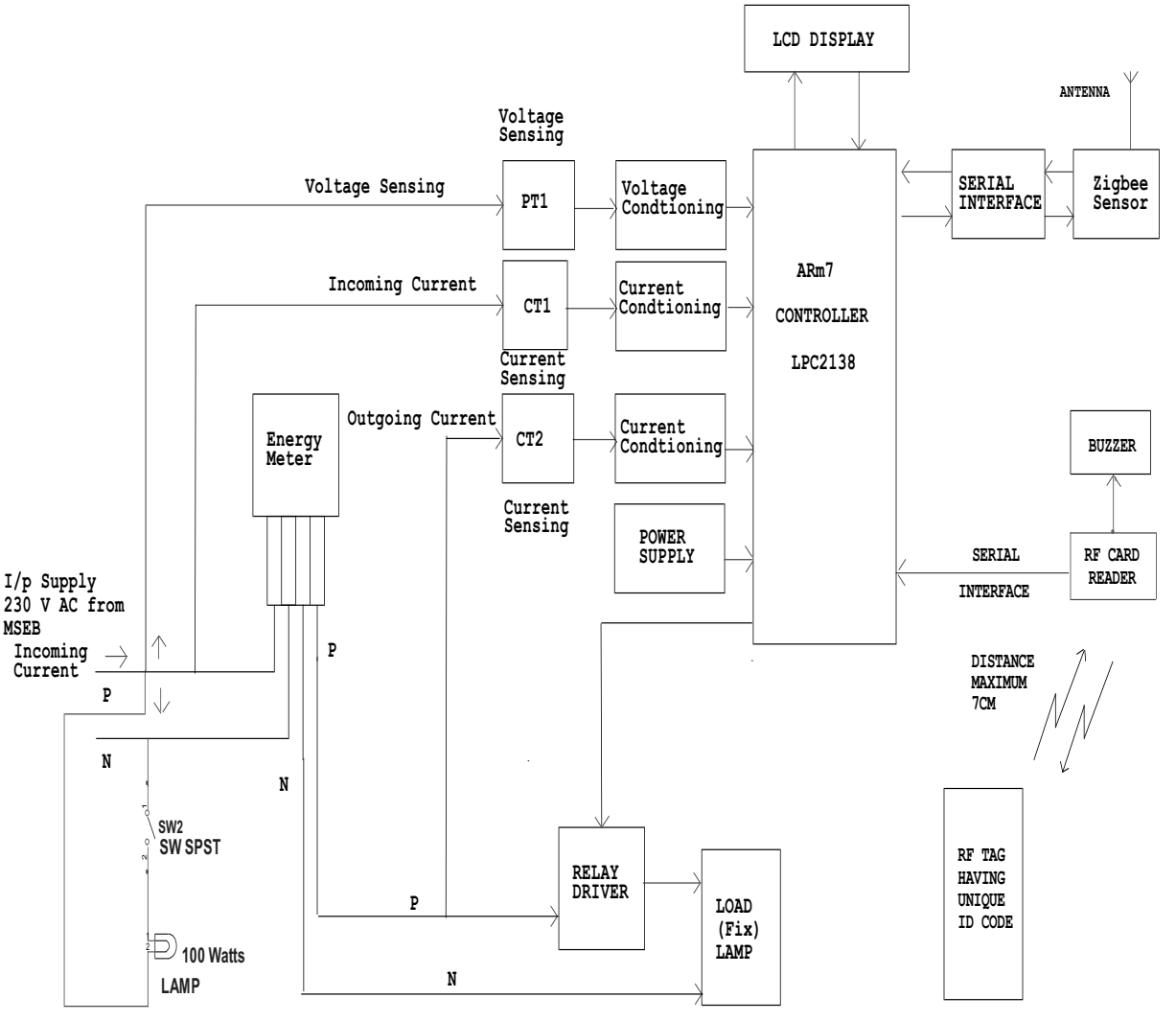

Fig.1 Block Diagram of Smart Power Meter Using ZigBee Technology

2.1 Advantages of System:

1.Smart automated process instead of manual work.
2.Better and faster customer service.
3.Paper work reduces.
4.Low power consumption and also the low cost of ZIGBEE module.

2.2Application of System:

1.Dynamic Update of Meter reading on PC.
2.Energy Theft Monitoiring & Control Mechanism.
3.Reduce Man power & Paper work for Sending Energy Bill Manually.
4.Paying of Energy Bill Using RFID at Customers Meter side.
5.Complete Automation of Sending & Paying of Energy bill.

IV. FUTURE SCOPE

The struggle between global warming and human beings is well recognized by the international society. Scientists devoted their effort into the development of renewable energies while governors/administrators audit and control energy consumption based on regulation. In view of the compulsory energy consumption control in near future, researchers have developed energy aware technology such as ZigBee.

• Exact Location of theft cannot be determined.

So we overcome this problem using GPS Device to find Exact Location.

• Communication Range of zigbee creates issue in long range application.

We can Overcome these problem using nodding Concept

V. CONCLUSION

An automatic energy calculation through wireless smart meter using Zigbee communication has been designed, fabricated and tested successfully. This reduces the work of the office person to a great extend. It also reduces the difficulty faced by the people when readings are taken manually. It simplifies the work of the electricity board in tripping the supply to a particular customer in case bill is not paid.

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Review on Efficiency Improvement in Bufferless NOC

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Abstract— Equally further complex SoCs begin to appear, the job of communicating in between the subsystems of a SoC can't be tolerably controlled by bus based communication architectures. Network on Chip's (NoCs) are projected to be possible alternative to bus based architectures for communication inside SoCs. Succeeding the hasty technological growth, the complexity turns out to be one of the best compelling features in the plan of embedded systems. Timing and cost issues chaperon to increase to the difficulties in understanding of network-on-chip , NoC applications, where many Intellectual Property (IPs) such as memories, processor cores, peripheral devices and DSP processors are sited together ,on a solo die. These modules communicate, a lot, by way of a shared resource, the NOC's Congestion is central concern in networks and ominously distresses network performance. The Scheduler turns as the central switch arbiter. The important components in systems which have shared resources are arbiters and a centralized arbiter is a strongly assimilated design for its input needs. In this paper, we study a new centralized arbiter, which may be used in arbitration of a crossbar switch in NoC routers concluding different papers. We discuss Islip arbiter for NoC.
Keywords-NOC, Flit, I-Slip, Buffer less, Routing, Scheduling, SOC

I. INTRODUCTION

One of the most main trends in computer architecture in recent years is the move forward towards multiple CPU cores on a single chip. Common chip multiprocessor (CMP) sizes today range from 2 to 8 cores, and chips with hundreds or thousands of cores are likely to be common place in the future. While this trend has helped address several key roadblocks in computer architecture (e.g. power dissipation and single-core complexity), it has created many possible new ones. One particular new challenge is the design of the interconnection between cores. Since this interconnects carries all inter-cache and memory traffic, it plays a critical role in both CMP performance and efficiency. As more complex SoCs begin to emerge, the task of communication between the subsystems of an SoC cannot be adequately handled by bus based communication architectures. NoCs are proposed to be a viable alternative to bus based architectures for communication within SoCs. As more complex SoCs begin to emerge, the task of communication between the subsystems of an SoC cannot be adequately handled by bus based communication architectures. NoCs are proposed to be a viable alternative to bus based architectures for communication within SoCs. In traditional System-on-Chip (SoC) design, shared buses are used for data transfer among various subsystems. As SoC design involves a larger number of subsystems, so that it becomes more complex and traditional bus-based architecture gives rise to new paradigm for on-chip communication. This paradigm is called Network-on-Chip (NOC). The most constraining aspects in the design of embedded system is the complexity, following the rapid technological evolution. The issues of cost and timing add the difficulties in realization of network-on-chip, NoC, applications, where many IPs (Intellectual Property) such as processor cores, memories, DSP processors and peripheral devices are placed together, on a single die. Most often, these modules communicate by means of a shared resource, the on-chip network. The increasing demand for higher bandwidth on the network lines, the increasing complexity of the individual devices and an operating frequency hitting new limits with almost every new design, place the communication and/or computation resources arbitration being the performance bottleneck of the NoC system. To avoid large latencies between the cores on the chip the arbitration is desired to be completed within one clock cycle (e.g., between a processing element (PE) and a memory block). The overall delay introduced by the arbitration should be low so that it will not impact the overall system clock frequency to achieve the arbitration in one clock cycle, which introduces new challenges for the design of the arbiters. The key research problems in the design of NoC include but are not limited to topology, channel width, buffer size, floor plan, routing, switching,

scheduling, and IP mapping. The components of the NoC include the network adapter, the routing node, and the network links. The routing node in turn consists of four major components: the input ports, the scheduler, the crossbar switch, and the output ports.

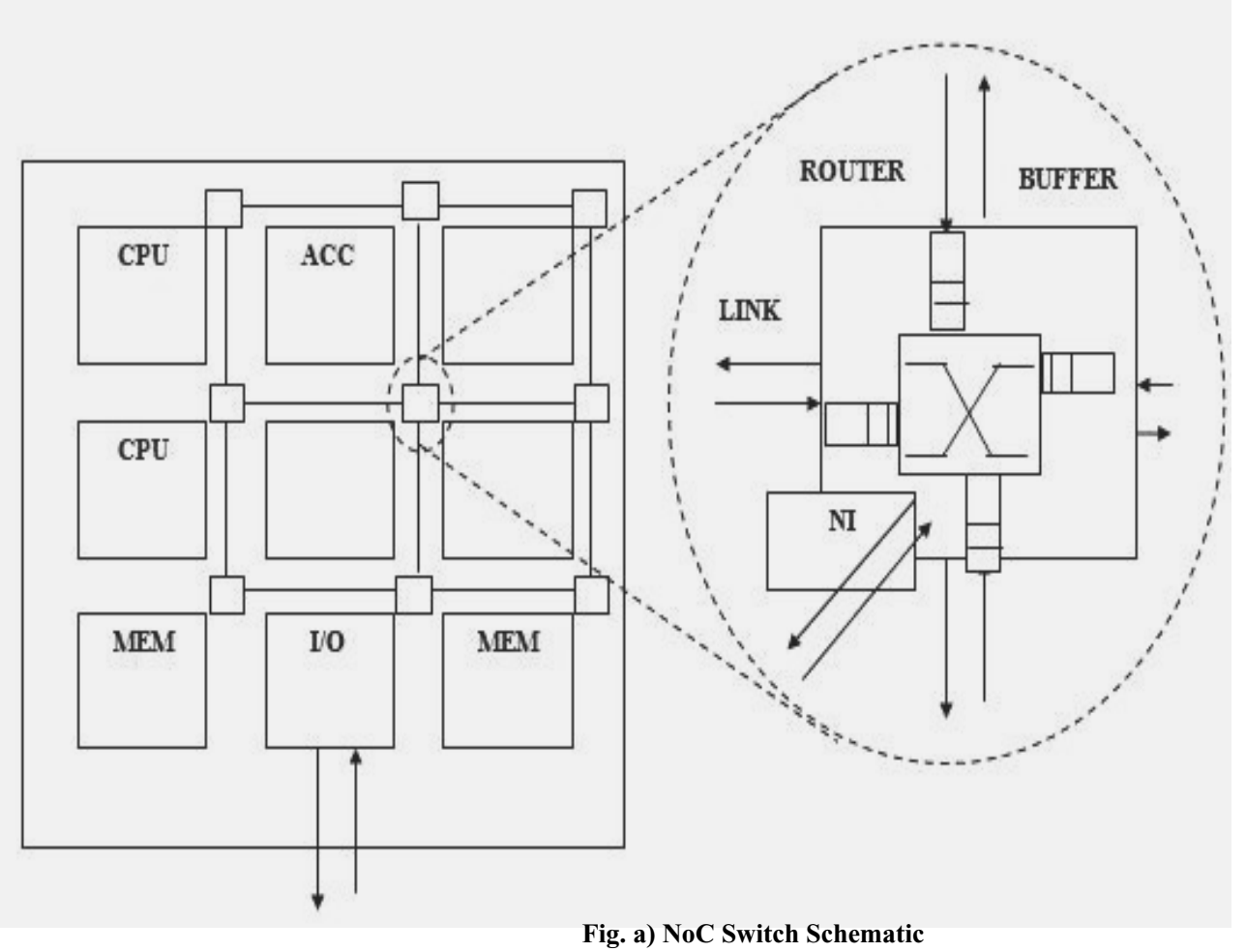

Fig. a) NoC Switch Schematic

II. LITERATURE SURVEY

a)Network-on-Chip: A New SoC Communication Infrastructure Paradigm by*Naveen Choudhary* published in International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-1, Issue-6, January 2012Network-on-Chip (NoC) communication architectures have emerged as a promising alternative to address the problems associated with on-chip buses by employing a packet-based micro-network for inter-IP communication. Network-on-Chip (NoC) architecture as a viable solution to the complex on-chip communication problems The greatest advantage for 3D NoC is that it can greatly help in reducing the diameter of the topology of NoC leading to reduction in packet transfer time and latency. increasing the adaptivity for information routing can also help in achieving the desired throughput.

b)Congestion Control for Scalability in Bufferless On-Chip Networks *by George Nychis, Chris Fallin, Thomas Moscibroda, Srinivasan Seshan, Onur Mutlu* published SAFARI Technical Report No. 2011-003 July 20, 2011Common chip multiprocessor (CMP) sizes today range from 2 to 8 cores, and chips with hundreds or thousands of cores are likely to be common place in the future One particular new challenge is the design of the interconnect between cores. Since this interconnect carries all inter-cache and memory traffic, it plays a critical role in both CMP performance and efficiency. congestion control in on-chip bufferless networks performance under both high application load and as the network scales, and find congestion to be the fundamental bottleneck in both cases. Develop an application aware congestion control algorithm and

significant improvement in application level system throughput on a wide variety of real workloads for on-chip networks from 16 to 4096 nodes providing congestion control or prioritization in buffered NoCs. The majority of these proposals focus on buffered NoC s and work with packets that have already entered the network, rather than control traffic at the injection point. The problems they solve are thus different in nature. However, there is potential to combine prioritization with admission-based congestion control.

c)A case for bufferless routing in on-chip networks *by T. Moscibroda and O. Mutlu* published in ISCA-36, 2009New approach to designing on-chip interconnection networks that eliminates the need for buffers for routing or flow control algorithms for routing without using buffers in router input/output ports. We analyze the advantages and disadvantages of bufferless routing and discuss how router latency can be reduced by taking advantage of the fact that input/output buffers do not exist Bufferless routing can also enable lower router latency, which can result in increased performance. We believe that bufferless routing algorithms, which also simplify network and router design by eliminating complex buffer management/allocation techniques, The different versions of BLESS (both flit-level and worm-based) routing is compared to three different baseline routing algorithms in terms of average/maximum packet delivery latency, saturation throughput, buffering requirements at the receiver, and network energy consumption

d)CHIPPER: A low-complexity bufferless deflection router *by C. Fallin, C. Craik, and O. Mutlu* published in HPCA-17, 2011Bufferless deflection routing First, a long critical path in port allocation arises because every flit must leave the router at the end of the pipeline deflection is accomplished by considering flits sequentially. Second, livelock freedom requires a priority scheme that is often more complex than in buffered designs in Oldest-First arbitration, every packet carries a timestamp, and a router must sort flits by timestamps. Finally, packet fragmentation requires reassembly buffers, and without additional mechanisms, worst-case sizing is necessary to avoid deadlock a new bufferless router architecture, CHIPPER, that solves these problems through three key insights. First, we eliminate the expensive port allocator and the crossbar, and replace both with a permutation network we propose a simple flow control mechanism for correctness with reasonable reassembly buffer sizes, and propose using cache miss buffers (MSHRs) as reassembly buffers

e)Area Efficient Design Of Routing Node For Network-On-Chip *by Vilas N. Nitnaware*, *Rehan Maroofi1, Shyam S. Limaye* published in IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 4, No 1, July 2011an area efficient design for the routing node component of an NoC. The area efficiency is obtained by applying the concept of a pipelined design as well as the use of custom IP (intellectual property) cores. the four components of the routing node, the input block and the scheduler have been modified to save area requirements Folding of the scheduler resulted in an area saving of approximately 20%. However, more clock cycles were required per matching. This is because the same set of arbiters performed two separate functions in a time division multiplexed fashion.

f)Time Efficient Arbiter In The Design Of Scheduler Embodying Islip Algorithm For On-Chip Interconnection *by Vilas N. Nitnaware, Shyam S. Limaye* published in International Journal of Advanced Science and Technology Vol. 21, August, 2010The design and optimization of fast round- robin arbiters and the design of a On-Chip Scheduler embodying I-SLIP ,the algorithm iSLIP can achieve 100% throughput for uniform traffic It becomes the most efficient scheduler in an on chip interconnect compared to earlier implemented. Design Compiler performed minimal area optimization as no area constraint was set. Iterative and non-iterative versions of the algorithms are presented, along with modified versions for prioritized traffic. The i-SLIP algorithm uses multiple iterations to find paths to utilize as many input and output ports as possible (pseudo-maxsize matching) until it converges to finding no more possible matches. The single iteration SLIP algorithm is a specialization of i-SLIP and may be characterized as iSLIP with only a single iteration, or 1-SLIP scheduler also contains 8 Grant Arbiters and 8 Accept Arbiters. The Grant and Accept Arbiters each consist of programmable priority encoders and a state pointer to record which input should have the highest priority on the next arbitration cycle. The 8-bit feedback signal from the Decision registers to the Grant arbiters is an enable vector, which enables arbitration only for unmatched ports on each successive iterations.

g)Designing of efficient I-slip arbiter using I-slip scheduling algorithm for NoC*by Deepali Mahobiya* published in International Journal Of Scientific And Research Publications, Volume 3, Issue 12, December

2013Networks-on-Chip (NoC) introduced new challenges for switches/routers for NoC. iSLIP arbiters, crucial building blocks for switches/routers, are required to complete an arbitration within one short clock cycle to provide low-latency links between processing elements and memory blocks. iSLIP scheduling algorithm for on-chip mesh router , a high-speed, high throughput, starvation free and easy to implement solution for arbitration in NoC. The arbiter trap the source and destination address from the output 0f buffer and generate the control signal so that input data from source side sending to the output port

III. PROPOSED METHODOLOGY

I-Slip Algorithm with Array:

This module implements a scheduler using the ISLIP scheduling algorithm. The scheduler attempts to find a solution from 8 input ports to 8 output ports**.** In the proposed system, we have used four location array for each five ports namely South, East, West, North and Local port. In this study, it is named as i-slip-array-s, i-slip-array-e, i-slip-array-w, i-slip-array-n. Incoming packets are first stored in the related i-slip-array according to the destination port of that packet and then it is forwarded to the next node as per the routing path**.**

IV.CONCIUSION

The I-SLIP algorithm is intended to meet goals. I-SLIP is an iterative algorithm during every time slot , multiple reiterations are performed to select a crossbar configuration, matching inputs to outputs. Four location array lessens the congestion of packets. The I-SLIP algorithm uses rotating priority ("round-robin") arbitration to schedule each active input and output in turn. The main feature of I-SLIP is its simplicity; it is willingly implemented in hardware and can operate at high speed. Controlling congestion in the network improves system performance. This mechanism helps to regulate the congestion in the network using I-slip scheduling algorithm.

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[7] Deepali Mahobiya ,"Designing of efficient I-slip arbiter using I-slip scheduling algorithm for NoC" published in International Journal Of Scientific And Research Publications, Volume 3, Issue 12, December 2013.

IMPLEMENTATION OF MULTIPLICATION ALGORITHM USING VEDIC MULTIPLICATION: A REVIEW

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ABSTRACT: At present, it has been necessary to increase the speed of multiplier as the need of high speed processors is increasing. Multiplier is an important basic function in most fast processing system. Conventional processors need great hardware resources and take more time in multiplication operation. This paper presents high speed multiplier depending on vertical & crosswise method of Vedic mathematics. Implementation is carried on digital hardware. Vedic multiplication needs same number of addition and multiplication operations of normal multiplier using digital hardware; wherein mental calculation is the only case where it differs. Few VHDL codes have been programmed for the same. An efficient implementation of high speed multiplier using the Vedic multiplication method. In this we compare the working of the three multiplier by implementing each of them on FPGA Spartan3 board. As far as comparison is concerned, all multipliers have been tested for 8, 16 and 32 bits multiplications.In our project when we compare the path delay of all the multipliers we find that 8 bit and 16bit Urdhva algorithm gives 50% better delay than that of Nikhilam whereas 100% than that of Binary multiplier.The result of work helps us to choose a better option between methods of vedic multiplier in fabricating different systems. Multipliers form one of the most important component of many systems. So by analyzing the working of different multipliers helps to frame a better system with less path delay.

Keywords- *VHDL, FPGA, Urdhva Tiryagbhyam sutra, Nikhilam Navats'caramam dasatah.*

I.INTRODUCTION

Multiplication is one of the silicon intensive functions, especially when implemented in programmable logic. Multipliers are key components of many high performance systems such as FIR filters, microprocessors, digital signal processors etc. A systems performance is generally determined by performance of the multipliers, because the multiplier is generally the slowest element in the system. Furthermore, it is usually the most area consuming. Hence optimizing the speed and area of the multiplier is major design issue [1].Therefore there are two possible ways to speed up the multiplication reduce the number of partial products or accelerate their accumulation. A smaller number of partial products also reduces the complexity, and as a result reduces the time needed to accumulate the partial products.

Multipliers are key components of many high performance systems such as FIR filters, microprocessors, digital signal processors, etc. A system's performance is generally determined by the performance of the multiplier because the multiplier is generally the slowest element in the system. Furthermore, it is generally the most area consuming .Hence, optimizing the speed and area of the multiplier is a major design issue. However, area and speed are usually conflicting constraints so that improving speed results mostly in larger areas.

The multiplier is a fairly large block of a computing system. The amount of circuitry involved is directly proportional to the square of its resolution i.e. A multiplier of size n bits has n2 gates. For multiplication algorithms performed in DSP applications latency and throughput are the two major concerns from delay perspective. Latency is the real delay of computing a function, a measure of how long the inputs to a device are stable is the final result available on outputs. Throughput is the measure of how many multiplications can be performed in a given period of time; multiplier is not only a high delay block but

also a major source of power dissipation. That's why if one also aims to minimize power consumption, it is of great interest to reduce the delay by using various delay optimizations.
Vedic Mathematics hails from the ancient Indian scriptures called "Vedas" or the source of knowledge. This makes it the Easiest and fastest way to perform any mathematical calculation mentally. Vedic Mathematics is believed to be created around 1500 BC and was rediscovered between 1911 to 1918 by Sri Bharti Krishna Tirthaji (1884-1960) who was a Sanskrit scholar, mathematician and a philosopher. In this work, Urdhva tiryakbhyam Sutra is first applied to the binary number system and is used to develop digital multiplier architecture. This Sutra also shows the effectiveness of to reduce the NXN multiplier structure into an efficient 4X4 multiplier structures[6]. Nikhilam Sutra is then discussed and is shown to be much more efficient in the multiplication of large numbers as it reduces the multiplication of two large numbers to that of two smaller ones. The proposed multiplication algorithm is then illustrated to show its computational efficiency by taking an example of reducing a 4X4-bit multiplication to a single 2X2-bit multiplication operation[5].

II.BINARY MULTIPLIER

A Binary multiplier is an electronic hardware device used in digital electronics or a computer or other electronic device to perform rapid multiplication of two numbers in binary representation.

```
    1011   (this is 11 in decimal)
  x 1110   (this is 14 in decimal)
           ======
 0000 (this is 1011 x 0)
  1011  (this is 1011 x 1)
   1011     (this is 1011 x 1)
+ 1011      (this is 1011 x 1)
           =======
 10011010   (this is 154 in decimal)
```

Fig1.4x4 bit multiplication in Binary number system

III.NIKHILAM NAVATS'CARAMAM DASATAH

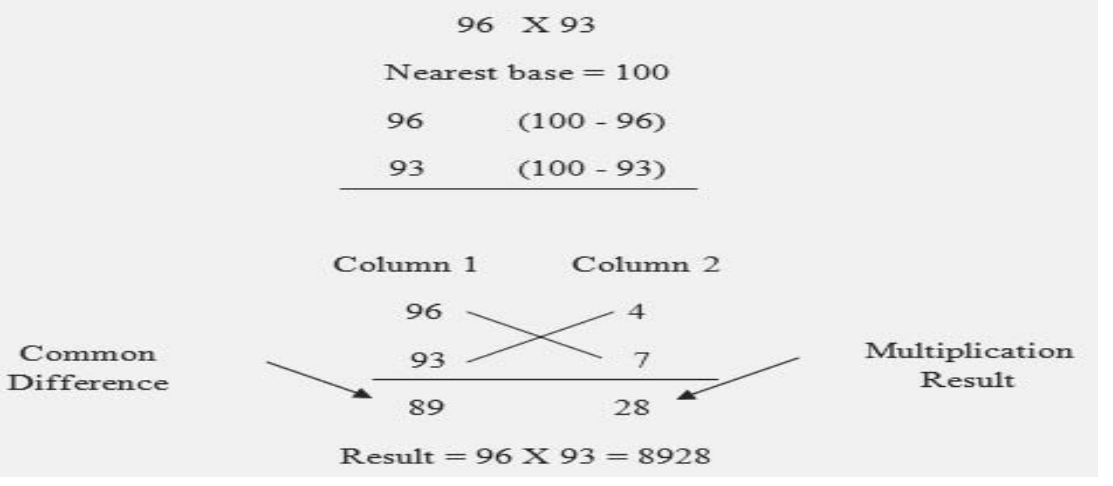
The formula simply means " All from 9 and the last from 10"The formula can be very effectively applied in multiplication or numbers, which are nearer to bases like 10,100,1000 i.e. to the power of 10' The procedure of multiplication using the Nikhilam involves minimum number of steps, space, time saving, and only mental calculation. The numbers taken can be either less or more than the base considered. The difference between the number and the base is termed as deviation. Deviation may be positive or negative [1].

TableNo 1. Number, Base and Deviation

Number	Base	Number-base	Deviation
13	10	13-10	3
6	10	6-10	-4
97	100	97-100	-3

- The formula simply means : "all from 9 and the last from 10".

- The formula can be very effectively applied in multiplication of numbers, which are nearer to bases like 10, 100, 1000 i.e., to the powers of 10 . The procedure of multiplication using the Nikhilam involves minimum number of steps, space, time saving and only mental calculation.
- The difference between the number and the base is termed as deviation. Deviation may be positive or negative. Positive deviation is written without the positive sign and the negative deviation, is written using Rekhank (a bar on the number). this Sutra is explained by doing the multiplication of two decimal numbers



IV.URDHVA TIRYAGBHYAM SUTRA

The multiplier is based on an algorithm Urdhva Tiryakbhyam (Vertical & Crosswise) of ancient Indian Vedic Mathematics. Urdhva Tiryakbhyam Sutra is a general multiplication formula applicable to all cases of multiplication. It literally means "Vertically and crosswise". It is based on a novel concept through which the generation of all partial products can be done with the concurrent addition of these partial products. The parallelism in generation of partial products and their summation is obtained using Urdhava Triyakbhyam explained in fig 1. The algorithm can be generalized for n x n bit number. Since the partial products and their sums are calculated in parallel, the multiplier is independent of the clock frequency of the processor. Thus the multiplier will require the same amount of time to calculate the product and hence is independent of the clock frequency [1]. The processing power of multiplier can easily be increased by increasing the input and output data bus widths since it has a quite a regular structure. Due to its regular structure, it can be easily layout in a silicon chip. The Multiplier has the advantage that as the number of bits increases, gate delay and area increases very slowly as compared to other multipliers. Therefore it is time, space and power efficient. It is demonstrated that this architecture is quite efficient in terms of silicon area/speed [3][6][11].

Symbolically we can represent the whole process as follows:-

1 4
1 2

1(1*1)6(1*2+1*4)8(4*2) =168

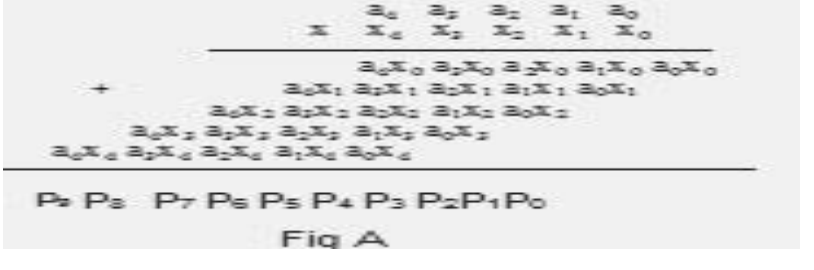


Fig.2 Multiplication scheme using conventional method (B) Multiplication scheme using Urdhva – Tiryagbhyam sutra with line diagram.

Looking at figure 2, one can easily realize that Vedic method probably makes difference for mental calculations only. For mental calculations it can be proved more convenient; as we can easily visualize Vedic multiplication line diagram. [3].

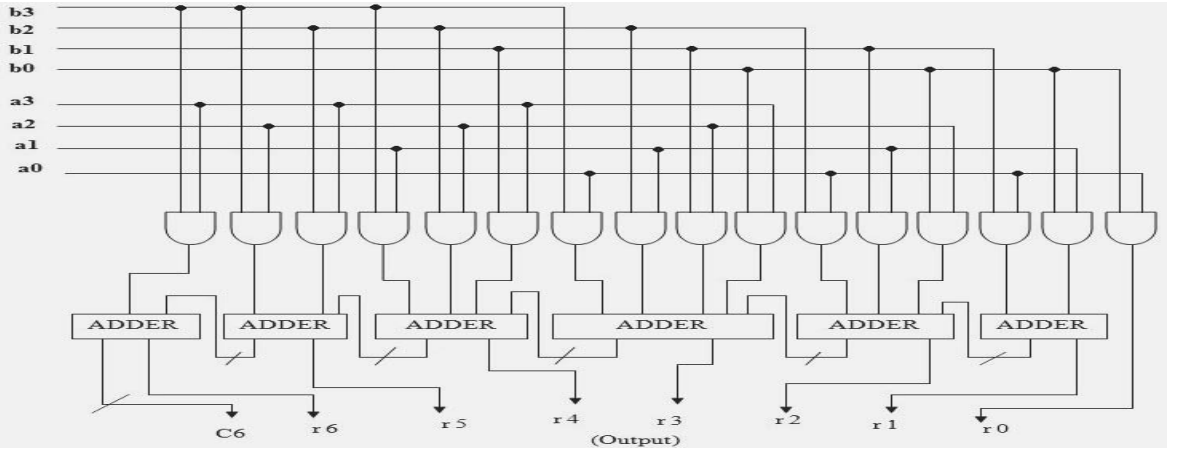


Fig3. Hardware implementation of 4x4 Bit Vedic Urdhva Tiryakbhyam Multiplier
With c6r6r5r4r3r2r1r0 being the final product [3] [4] [8].

V. Proposed system

Conventional multiplier takes more time to execute, hence delay is increases. Reducing the delay of multiplier can increases the speed of multiplier which is essential requirement in many applications. Also conventional processor requires substantially more hardware resources in the multiplication operation, rather than addition and subtraction. Vedic multiplier is excellent solution to solve the problem of maximum delay. The proposed method focuses on using the advantages of minimum delay of Vedic Multiplier(VM) based on Vertically & Crosswise method for the multiplier application. This process has been seen to be large optimization of speed. Vedic mathematics is general multiplication formulae equally applicable to all cases of multiplication. It is based on generating all partial products and their sum in one step. demand for high speed processing has been increasing as a result of expanding computer and signal processing applications. Higher throughput arithmetic operations are important to achieve the desired performance in many real-time signal and image processing applications [2].
The designing of Vedic Multiplier is different from conventional multiplier like array multipliers. Even though both multiplier have the same number of multiplications, the array multiplier use some small blocks like shift and add for designing higher order multipliers. Vedic Multiplier is designed in VHDL, as it is more effective in structural way of coding. The individual block is implemented using VHDL language. The performance of each multiplier is determined using the software ModelSim6.7 and the timing report is obtained by synthesis in Spartan3[3].As number of bits increases in input, a small modification is required. Divide the total number of bits of each input into two equal parts [8].

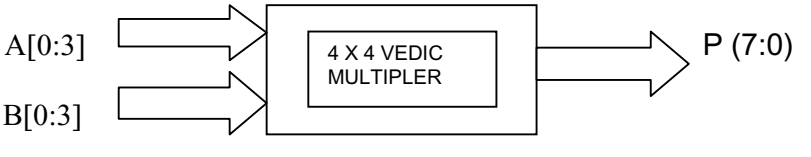


Fig.4: Block representation of 4x4 Vedic Multiplier

VI.CONCLUSION

In many real-time DSP applications number of complex multiplications are involved, in which high performance is a prime target. However, achieving this may be done at the expense of area, power dissipation and accuracy. The performance in terms of throughput of the processor is limited by the multiplication. So efforts have to be made to decrease the number of multipliers and to increase their speed. A high speed complex number multiplier design using Vedic Mathematics (Urdhva Tiryakbhyam sutra) is implemented using VHDL. This sutra is applicable to all cases of multiplication. The results show that Urdhva Tiryakbhyam sutra with less number of bits may be used to implement high speed complex multiplier efficiently in digital signal processing algorithms.

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HYBRID DRIVER SAFETY, VIGILANCE AND SECURITY SYSTEM FOR VEHICLE

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Abstract- Mainly accidents occur due to driver's carelessness. The main aim is to provide awareness and safety mechanism for the driver. Main reason of an accident is due to laziness, alcohol consumption and abnormal pulse rate of driving person. In addition to this crime detection, security system and person level identification is determined. In this paper alcohol detection and heart rate control system, person level identification system, eye blink that is laziness level, crime detection and mobile free auto reply method is used to avoid an accident. Password authentication, calls divert method, pulse level and eye blink checking system is processed. Each method is used to rectify the carelessness of the driver and immediate declaration technique is developed by use of GSM technology. Their simulation output is viewed by MATLAB and the hardware module is obtained.

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KEYWORD- MQ3 sensor, IR sensor, Heart rate control system, Passive infrared sensor, Password authentication and auto reply SMS GSM.

I. INTRODUCTION

Road accidents and collisions occur many times. Every hour, 40 people under the age of 25 die in road accidents. Most of the city accidents are due to sloppiness of driver but outside the city, accidents occur due to drunken driving only. Due to situation accident may occur, that is if there is a less pulse level then person may lead to unconscious stage. more than people is loss due to heart attack, drunken driving only so this can be reduced by using different techniques .Heart rate monitoring system ,Alcohol detection method, Human level identification methods are used to minimize the level of an accident. Away from this due to driver alertness within a fraction of second accident may occur. The accidents occur most of time, if person attends a phone call while driving. To avoid this problem many technique have been used. For Heart rate heartbeats are typically expressed as beats per minute. Sensor is a device that detects changes or events in quantities and provides an output corresponding to the input the signal generally is in optical or electrical signal. Sensors obey certain condition and rules. It is sensitive to the measured property only. It is insensitive to any other property likely in it application. An individual PIR sensor detects changes in the amount of infrared radiation. Their value varies on the temperature and surface characteristics of the objects in front of the sensor. The sensor converts the resulting change in the incoming infrared radiation into a change in the output voltage, and this triggers the detection. For counting the eye blink and detecting the drowsiness level by use of IR sensor. Every year nearly 1.4 million people have been killed because of the wireless customers. There is a highly efficient automatic system for early detection of incoming and outgoing call. Detecting the causes such as alcohol consumption, range pulse level, person and drowsiness level identification, theft detection and security systems are handled in the hybrid driver safety awareness method.

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II. HYBRID MEHODS

Generally Hybrid word is used for gathering more number of components in a single system. Likewise there are drowsiness detection pulse level monitoring process are present. Different

process combined together to provide an awareness for the driving person. Hybrid driver safety method consist of separate methods. Vigilance method is nothing but drowsiness detection method. Safety method is based on theft detection system this is identified by use of the password authentication process.

III. ACCIDENT AVOIDANCE SYSTEM

In accident avoidance system: Drunken driver prevention, human level detection and heart rate measurement method is used. These preventive methods are mainly used for avoiding accident. If a driving person consumes any alcohol or drug this made the person to become an unconscious stage due to this accident occurs. Accidents occur due to loss of health conditions or without the knowledge of owner that is due to less oxygen level inside the vehicle is reduced then person die. Three methods namely drunken driver prevention, human level In accident avoidance system: human level detection, drunken driven prevention and heart rate measurement method is used. These protective methods are mainly used for avoiding accident. If a driving person consumes any alcohol or drug this made the person to become an unaware stage due to this accident occurs. Accidents occur due to loss of health conditions or without the information of owner that is due to less oxygen level inside the vehicle is reduced then person die. Three methods namely drunken driver prevention, human detection and heart rate measurement methods are used. These three methods are mainly used to avoid the accident.

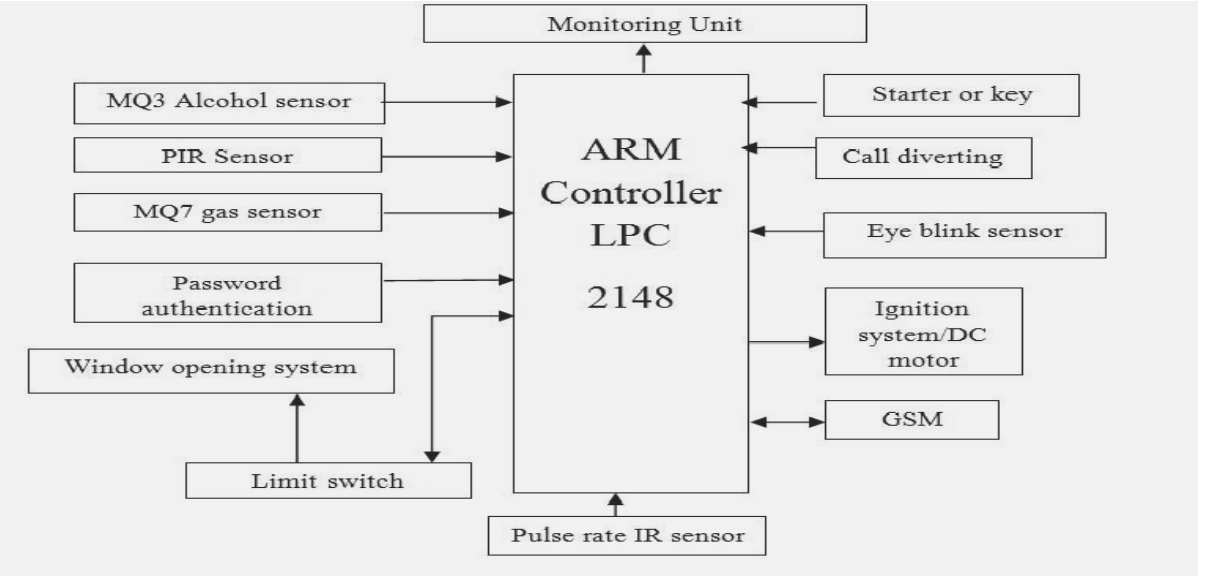

Fig 1: Hybrid Safety and Security system for vehicles

The Figure 1. Shows Hybrid safety and security system for vehicle uses different sensors such as alcohol sensor, MQ7 gas sensor, and passive infrared sensor. These methods are mainly used to sense the signal and these signals are controlled by the controller. The ARM controller LPC 2148 is programmed based on human level detection, alcohol condition and pulse rate monitoring. In addition there are three method driver vigilance level is detected and if the person is in abnormal condition then for driver side alarm is ON then for the theft detection method theft is identified by use of the password matching method. For security purpose password method is used. Then accident occurs due to attending phone call to avoid this process by using call diverting technique is used. These varieties of methods are used in the hybrid driver safety and security method. Each signal from the sensor is received by the controller then analyses with the different inputs then output is achieve. Alcohol sensor inform the driver to blow air into the sensor unit and checks the alcohol content present in the driver body. Heart rate sensor is used for measuring the pulse rate. If pulse level is large even in that case if driver drives the vehicle then the system will apply brakes automatically to slow down and stop the vehicle. By use of MQ7 sensor when person is

inside carbon-di-oxide level is determined and there is an automatic anti-locking system for door opening process. For eye blink sensor IR sensor is used to sense the signal. If Eye Blink range is less then automatic indication is given. Theft detection and security system are present in the hybrid model. This hardware module is laced in vehicle side and intimation is passed through use of GSM technology and these outputs are viewed using MATLAB software through interfaced process.

A. Alcohol Detection Method

Alcohol Detection system is used to measure the alcohol content present in our body. If alcohol content is high, then there is a decrement in breathing level, due to this accident may occur. The amount of alcohol in blood is called blood alcohol level. Alcohol level is calculate by use of the gas detecting sensor. There is an MQ3 gas sensor, which is used to find out the alcohol level and their values are pass to controller. If the value is higher than the threshold value then ignition system is not yet started. There is an alcohol testing feature which instructs the driver to hiss air into the sensor unit and then it checks the alcohol content present in the driver breath. If the value has crossed a certain level the vehicle ignition will be locked which prevents a drunken driver from starting the vehicle. Alcohol Detection Method used to sense the alcohol content, in this MQ3 alcohol sensor unit is used to check the breath of a person whether the alcohol drink or not. Here the analog signal is converted to the digital form then the signal is given to the ARM circuit because controller sense only the digital form. The ARM is programmed with certain threshold voltage. The low medium and the high certain level of an alcohol condition are programmed into the ARM circuit, if higher then alarm work at the vehicle side. If the alcohol usage is less, then the condition is verified. If the driver take to eat more alcohol thereby the condition is not satisfied. Therefore power supply insufficient to the controller and the relay switch. Hence the inflammation system is not connected and the DC motor turned to OFF condition. Alarm sound is obtained. Alcohol eat up by the driver is measured and the output graph viewed in MATLAB for different values. From this alcohol uses of driver is checked hence the crash or accident is avoided and for different ranges of input values the output is obtained.

B. Heart Rate Sensor Method

Heart rate sensor method is a simple device that receives a sample of signal in form of pulse rate and calculates the heart beat signal as beats per minute. Normally human heart rate is about 70 beats per minute for adult males and 75 beats for adult females. Generally there are different types of condition for heart rate. If the heart rate signal is of normal conditions is called as bradycardia and if it is in abnormal condition then it is known as tachycardia.

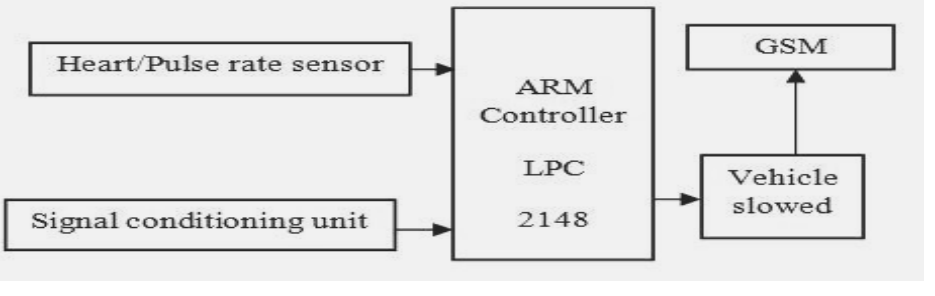

Fig2: Heart Rate SensingMethod

This Figure 2.Heart rate sensing method is used to measure the pulse rate. The normal and abnormal condition of the pulse level organized. If the pulse level is in abnormal condition then the amplified signal is fed to the controller. The controller receives the amplified signal and if abnormal then the pulse rate is high. Then the vehicle slowed and stopped based on the conditioned programmed to the controller. If ignition is started or in ON condition then the pulse rate is calculated for every 20 seconds as programmed to the controller. Normal pulse rate range is of 72 beats per minute. If the calculated value is higher or lower than the threshold value, then it is known as abnormal condition. In this case vehicle is stopped and intimation is sent by use of GSM. If pulse rate is in normal condition then the vehicle is moved without any restriction. Due to this checking process accidents can be reduced. Mainly if the value of pulse rate is abnormal it indicates that the driving person is very serious condition then information is sent to nearby hospital or relatives, this saves the human life. Heart rate sensing method used for the measuring heart rate the first the pulse rate is measured through the sensor based on the input and output signal the variation is determined. If range of the pulse is high then condition is checked if higher than the threshold value then by use of relay switches the vehicle is slowed and stopped, then in an emergency condition information is send to the predefined number through the GSM technology.

C. Human Level Identification Method

In this case if any person inside the vehicle human level identification method is used to identify number of person inside the vehicle and then indication is send to the owner of vehicle. The main use of human level identification method is to analyses the person inside the vehicle. Passive infrared sensor is used this detects the human level. If vehicle is not in use in that case door of the vehicle is in closed condition in such situation if any person is inside the vehicle without the information of the owner then the person inside the vehicle will lose their oxygen level, here the carbon-di-oxide level is high due to this person may die. Then second is the signal output circuit. Passive infrared sensor is a pyroelectric device which is used to sense the person by use of infrared sensor. Relay switch works based on the input signal. If the value of input signal is in not good then switch is opened condition. Limit switch is used to indicate gate is in close or opened. If there is a person inside in this cased limit switch is used to open the window.

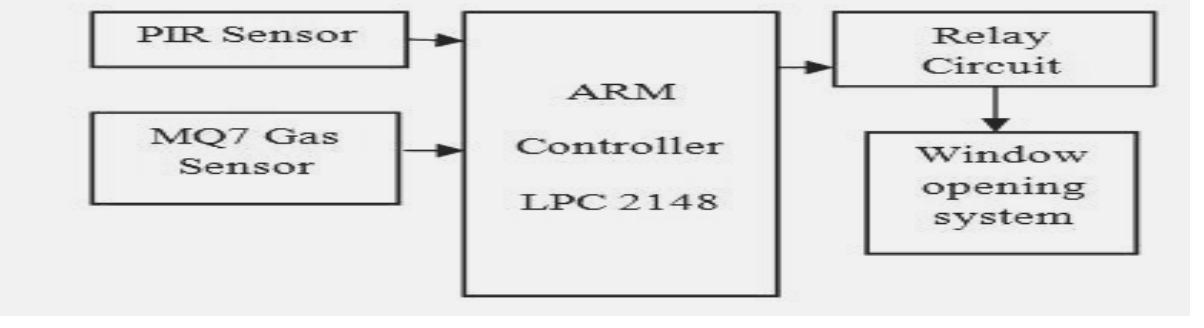

Fig3: Human Level Identification Method

There are two ways of Detection methods. One way is Eye blink sensor method, next is theft detection process. These two methods are used to avoid accident and protect the human life. A.EYE Blink sensor Driver fatigue resulting from sleep deprivation or sloppiness is an important factor in the increasing number of accidents on today's roads. Most of the accident occurs due to laziness. This laziness level is detected by use of eye blink sensor. IR sensor is used detect the blink of an eye. In this case IR transmitter is used to transmit the infrared rays in eye. The IR receiver is used to receive the reflected infrared rays of the eye. If the eye is closed means the output of IR receiver is high otherwise the IR receiver output is low. This to realize the eye is closing or opening position. The signal is given to IR transmitter whenever the signal is high, the

IR transmitter LED is conducting it passes the IR rays to the receiver. The IR receiver is connected with comparator which is constructed with LM358 operational amplifier.

B.Theft detection system

The vehicle anti-theft system consists of different steps such as password detection and the matching process .Theft occurs when the doors are opened. Once the vehicle is turned ON then with the mechanical keys along with correct key number door is opened. Vehicles theft is identified by use of the password method. If the password is matched then only the vehicle is started and then indication is send to the owner of the vehicle. Keypad switch is used for authentication process. If Password matched - indication is send to owner, ignition is started. The password is pass to the ARM controller from the keypad switch the password is given. If the password is matched then There is an inverting and non-inverting input terminal in which based on the reference signal and input signal the output is obtained. In figure 4. Eye blink detection sensor is used to realize the blink of person while driving and their range is compared. The compared output is given to the ARM controller and if their value is greater than the threshold value. If the value is high then alarm sound is produced. Counting of an eye blink is calculated. For every 20sec eye blink is counted and if the count of eye blink is less than the threshold value then alarm sound is produced and immediately intimation is send to owner of the vehicle. For each power supply is given and their outputs are viewed in module. The intimation is send to the owner hence the vehicle is started. If password is not matched then vehicle is not started then intimation is send to the owner. Thus theft of the vehicle is analyze and hence security system is provided.

IV. CONCLUSION

The given work is used to avoid the accident by use of heart rate monitoring system, person level identification method and Alcohol detection in addition to this three method there is detection method such as eye blink sensor, theft detection, security system is used. MATLAB simulation is obtained by giving different input to the process. Mobile hand held system and face detection techniques can be used for future application.

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Development of Embedded PLC with the application of Irrigation System

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Abstract - A programmable logic controller (PLC) or programmable controller is a digital computer used for automation of electromechanical operations, such as control of machinery on factory assembly lines, light fixtures or amusement rides. PLCs is inherently the relegation of human control function to technical equipment for increasing productivity, reducing cost, increasing quality, increasing safety in working condition. Unlike general purpose computers, the PLC is mapped for various inputs and output arrangements, resistance to vibration and impact, exempt to electrical noise and extended temperature ranges. Programs to control machine operation are often stored in non-volatile memory or battery backed- up. A PLC is a prototype of a hard real time system since output results must be produced in response to input conditions within a finite period of time, otherwise unexpected operation will result.

The development of the embedded PLC is designed with the combination of the LabVIEW software and the ARM Microcontroller. The flexibility of the proposed PLC makes it comparatively easy and less costly. The ARM microcontroller is preferred to develop embedded PLC since it is widely used across many embedded designs due to its low price and low power consumption. Extension to this, the LabVIEW Embedded Module for graphical programming to ARM microcontroller is used with the application of irrigation system for water sprinkling in agriculture field.

Keywords- Programmable Logic controller; ARM microcontroller; Embedded PLC; LabVIEW software; Irrigation system.

I. INTRODUCTION

Programmable logic controllers (PLCs) are especial type of systems used to control processes and machines. They have been put forward in the early 1970s to substitute the extant relay control logic that has been outworn and valuable for implementing systems at that span. Moreover, PLCs exhibits higher reliability, flexibility, better communication possibilities and faster response time. As yet, PLCs have been concern for industrial control engineers that developed, introduced and standardized their own design methods and programming languages. However, issue and obstacles in the study and experiment on PLC is the rapid pace of PLC technological development, with new layouts and innovations continually being introduced by manufacturers. Future, PLCs are faithful industrial controllers, but once purchased for laboratory use cannot be engaged for a wide range of other advantageous applications. Costs acquired in the setting up of absolute and modernized PLC laboratory facilities, and equipment are, as a result, very high.[1] [5]

A. Concept of PLC

An embedded system is frame to operate one or a few dedicated functions normally with real time computing constraints. It is enclosed as part of a complete device usually including hardware and mechanical parts. By comparison, a PLC is arranged to be adjustable and to accommodate a wide range of end-user demands for industrial control application. Embedded systems control multiple devices in use today. One or more main processing cores controls embedded systems that are commonly microcontrollers. The essential characteristic is being dedicated to handle a special task that may need very powerful processors. Since the embedded system is dedicated to precise tasks, design engineers can improve it to reduce the cost and size of the product and improve the reliability and performance.[5]

B. Concept of Embedded systems

Embedded system is based on computer technology, which makes it suitable to fit for different application system, from other aspect; it is a unusual computer system that has disciplinary requirements in power

consume, reliability, size and cost. It is the result of combination of technology development, such as electronics, computer, communication, semiconductor, and automation control. Embedded system has been extensively used in telecommunication, computer network, industrial control fields, consumer electronic product, aeronautics, medical apparatus and national defense industrial fields, and so on. The features of embedded system are as follows: Embedding, special system, extended interface .But there are still problems in implementing embedded system in control field that include: The design problem of embedded control system, the reliability problem of embedded control system, the compatibility problem of embedded control system.[4]

C. Concept of Embedded PLC

Being Studying the features and conception of embedded system and PLC, in this paper the expansion of low-cost embedded PLC for small scale industry application is proposed. The visionary design of embedded PLC combines the benefits of PLC and embedded system together. The architecture of embedded PLC is being developed by the LabVIEW with VB Module for ARM Microcontroller. The work of this development involves: 1) Based on embedded system technology, design a PLC. 2) To expand a model of embedded PLC. 3) One dedicated application to be implementing on embedded PLC. [1][2]

II. IMPLEMENTATION OF EMBEDDED PLC

The aims of the embedded PLC are that it must reinforce the sub-disciplines of computer programming, software engineering, and panel wiring. While the basic system must support digital Input/Output, also it should be supportive to analogue handling. The detailed objectives being that embedded PLC should be safe, low cost, can be interfaced to computer, integrate an industrial standard. On the other hand, embedded PLC should support IEC 6-1131 programming languages.

A. Hardware Design

The ARM microcontroller is selected to develop embedded PLC because it is broadly used across many embedded designs because of its low price, low power consumption, and wide variety of peripherals for many of the major vendors. Extension to this, we are using the LabVIEW Embedded Module for graphical programming to the ARM microcontroller. At the same instant, the properties of the LPC2378 microcontroller is used as a determinant specifications and features of embedded PLC, as shown in Fig. 1 and Table I respectively [5].

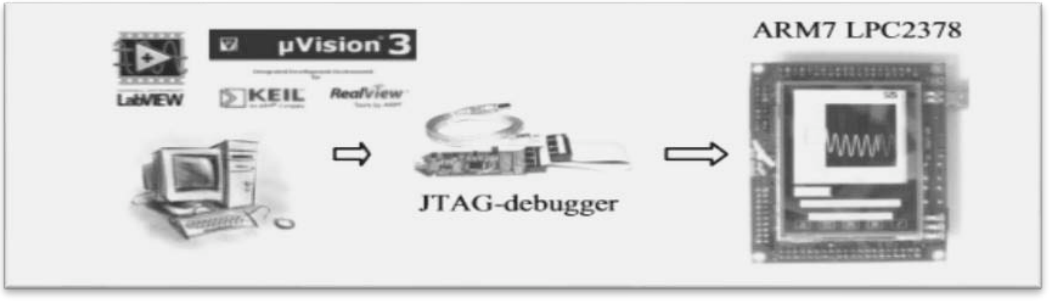

Fig 1. Main components used for developing

Table No. 1. Specifications and feature of ARM LPC2378

Sr No	Feature	ARM7 LPC 2378 (72 MHz)
1	Flash memory	512Kbytes
2	SRAM	32Kbytes
3	Digital Input	8, sink/source 24V DC
4	Digital Output	8 Sink upto 200mAeach, 24V DC
5	Analog Input	One 10 Bit resolution, input range 0-10V
6	Analog Output	One 10 Bit resolution, output range 0-10V

7	Serial Port	RS 232
8	Power supply	Single 3.3V power supply

The signals (input and output) from the Microcontroller board are limited at 3.3V, therefore it is redesign of input and output of the embedded PLC that will allow to custom external industrial equipments, as shown by Fig. 2.

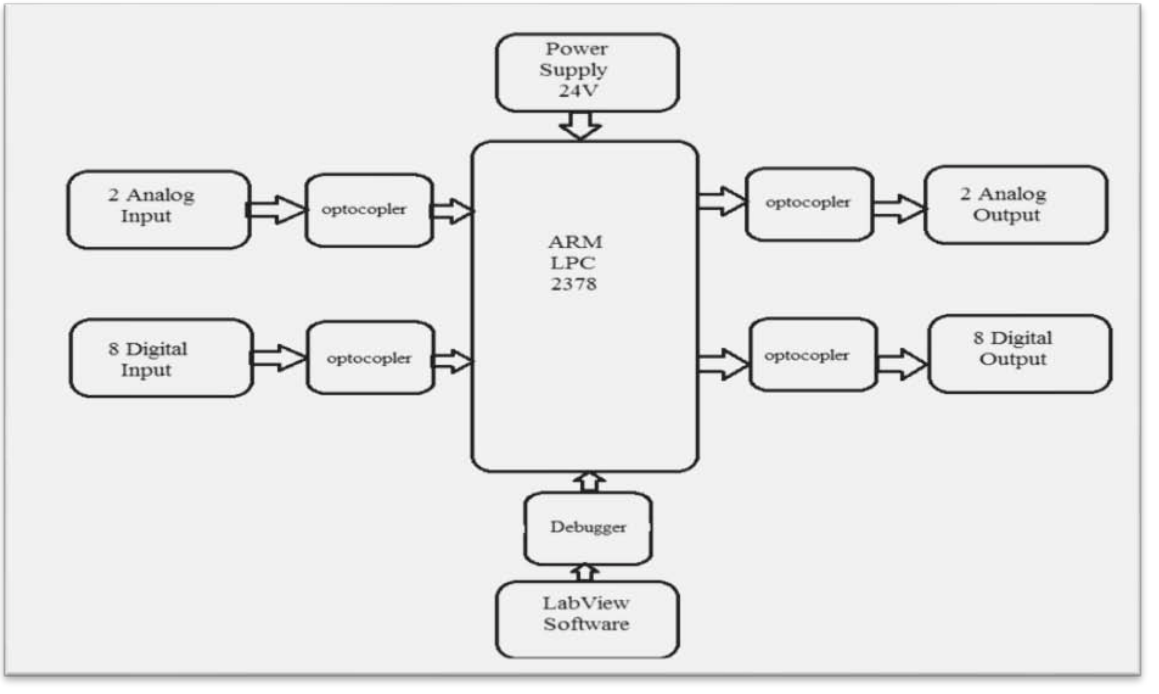

Fig. 2 Architecture of Embedded PLC

B. Software Design

Five programming languages for programmable control systems is presently defined by IEC 61131-3 are : LD (Ladder diagram), FBD (Function block diagram), ST (Structured text, similar to the Pascal programming language), SFC (Sequential function chart) and IL (Instruction list, similar to assembly language).[6]

In this work, the FBD programming language is used for control of embedded PLC as the LabVIEW Embedded Module for ARM Microcontrollers is a extensive graphical development environment for embedded design. This module combines the LabVIEW graphical development environment and ARM microcontroller. This module frame on LabVIEW Embedded technology which promote dataflow graphical programming for embedded systems and contain hundreds of analysis and signal processing functions, integrated Input/output, and interactive debugging interface. With the Embedded Module for ARM Microcontrollers, we can enhance linking and view live front panel using JTAG, serial, or TCP/IP [6]. The Embedded Module for ARM Microcontrollers incorporates the LabVIEW C Code Generator, which generates C code from the LabVIEW block diagram [6]. For the creation of FBD language, we use the avariable tools in LabVIEW, as shown in Fig. 3. A basic function of FBD language is organized according to IEC 61131-3 standards required for PLC which can be outlined as shown in Table II and Fig. 4 respectively.

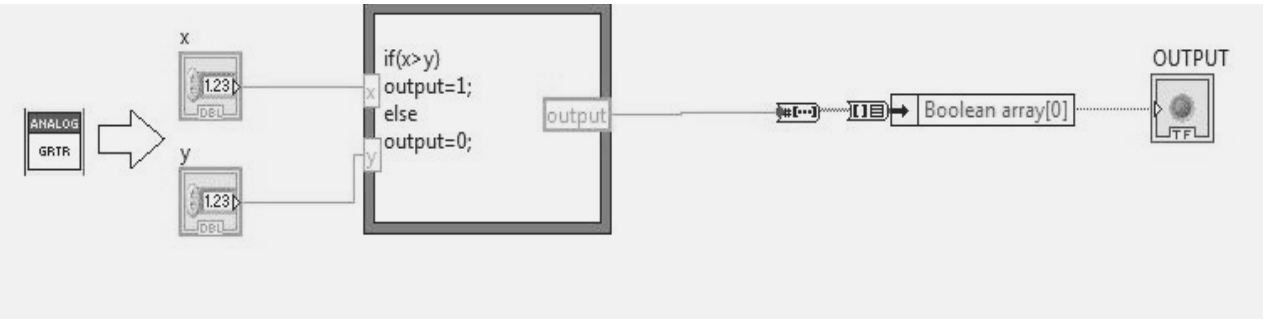

Fig. 3 The example of creating function of FBD language

Table 2 Basic functions of FBD language

Instruction	Symbol
Addition	
Substration	
Multiplication	
Division	
Equal	
Not equal	
Equal to zero	
Greater than	
Less than	
ANDing	
NOT	
ORing	
Up counter	

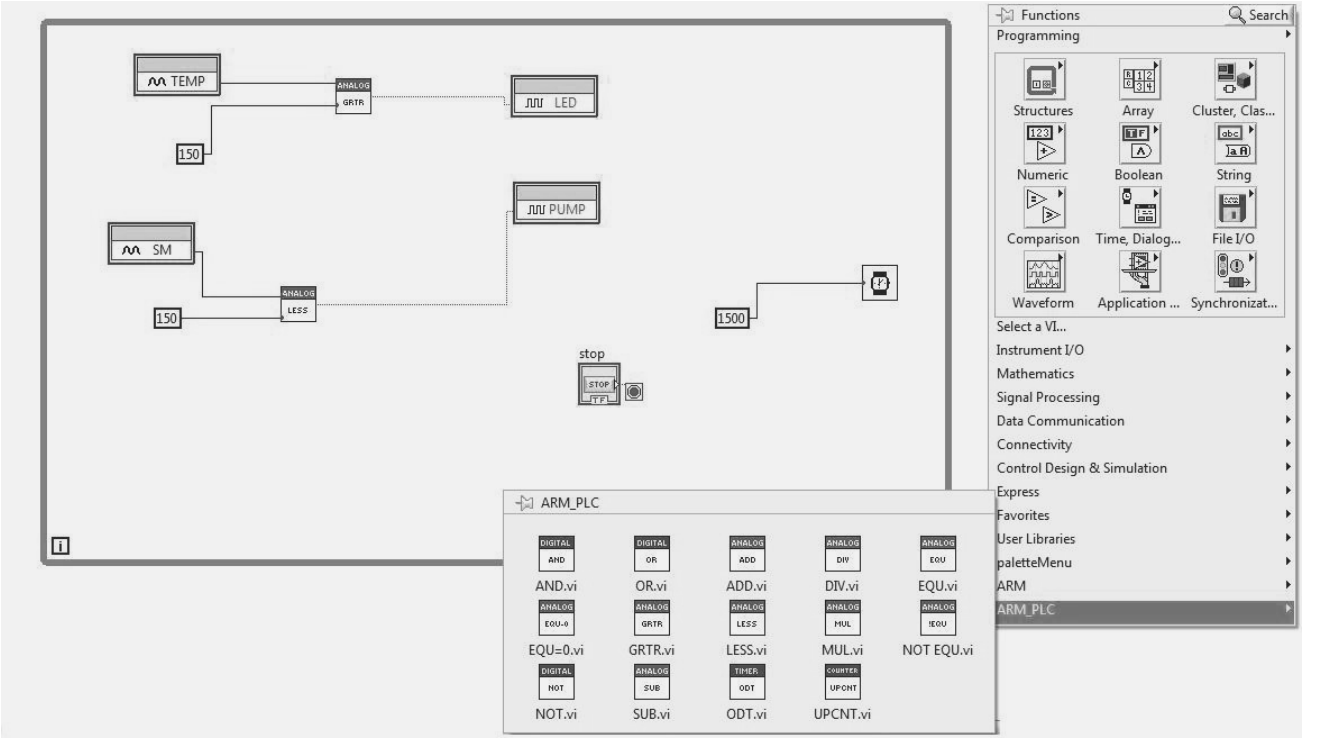

Fig. 4 Basic functions of FBD was developed for usage

For model testing, the system architecture has been implemented by testing some experiments like basic gates (AND, NOT, OR). Architecture, operation, and programming language of PLC is observed. The laboratory effort included developing a FBD based, testing via the "simulated" model, after transferring program to the embedded PLC, then interfacing external equipment to embedded PLC, and finally executing the PLC program on the physical system. Fig.5 shows steps of implementation of embedded PLC.[2]

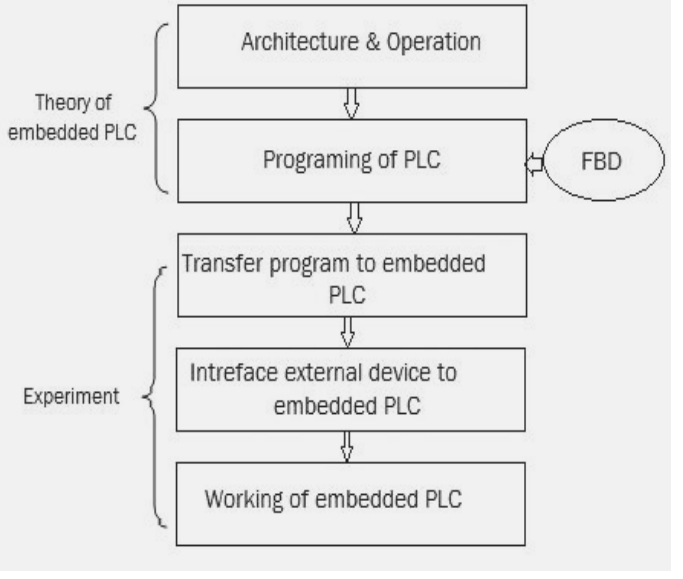

Fig. 5 Steps of implementation of embedded PLC.

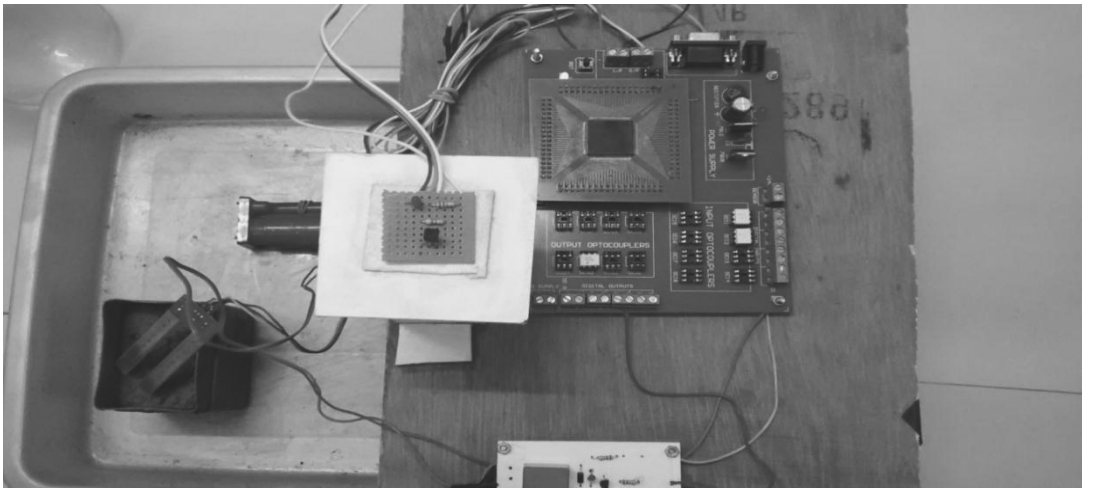

Fig. 6 Application of embedded PLC in irrigation System

The example of interfacing industrial equipment to embedded PLC: Fig. 6 shows the application of embedded PLC in irrigation system [7]. At the input side the content of soil moisture is determined by ATK SM (soil moisture sensor). If the soil moisture is below 14% (value controlled by FBD language) the data is proceed through embedded PLC & the water pump will start through relay and will spray water in the field. Similarly if the temperature in the field exceeds 29˚C is senses by LM35 then the output is produced by the LED indication.

Fig.7 shows the function block diagram for the system. The FBD code for the proposed system is generated by LabVIEW Embedded Module used for ARM with the help of LabVIEW software.[3] This diagram gives the backend view for proposed system diagram. The backend defines internal structure of front window. It shows the inputs and outputs associated with ARM for irrigation system. From the function palette components are selected.

- The programming language has typical functionality such as logic, latching, timing, mathematics, etc.
- Input and output were appropriate.
- The embedded PLC is able to interface with PC.

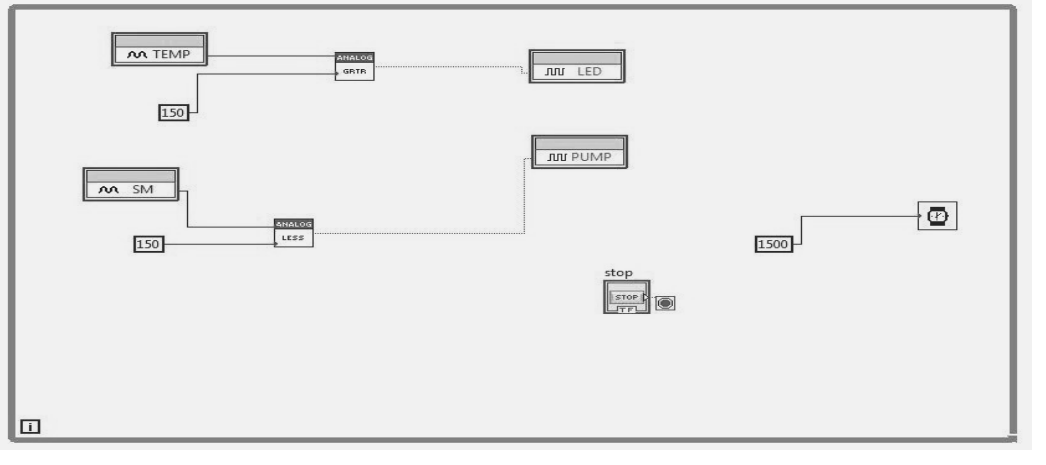

Fig. 7 Backend for irrigation system

III. EVALUATION OF EMBEDDED PLC

After completing various laboratory exercises, we found possible conditions broadly determine the effectiveness of the embedded PLC. For each statement, we verified the condition.

- The hardware are safe.
- The embedded PLC setup is comparatively easy to understand.
- To simulate the functionality of designed program before actual usage.
- PLC program file was effortlessly downloaded to the embedded PLC.
- Able to interface with common industrial electrical components.
- Reliability and Stability of embed PLC is good.
- Appearance of embedded PLC motivates to usage and experiment. .

The simplicity of Embedded PLC along with good reliability, which demonstrates the success in generating. Also by using this Embedded PLC various dedicated applications can be implemented, as this Embedded PLC can sustained to better accuracy without using actual PLC

IV. CONCLUSION

A cost-effective resolution for an embedded Programmable Logic Controller (PLC) is the use of an Integrated Circuit (IC) that is a complete PLC. Using a single-chip PLC, development time is extremely reduced because the software drivers for numerous types of Input/output are already embedded on the chip. Once the system I/O has been defined, the appropriate interface circuits can be further added to the design and programming can be completed easily using the functional block diagram programming language and software such as LabVIEW.

The implementation of the conceptual embedded PLC for controlling the irrigation system with the flawless combination of the LabVIEW software and the ARM Microcontroller module is discussed in this paper to test real time application. The flexibility of the proposed PLC makes it relatively easy and less costly to handle PLCs due to their variety and rapid change. The basics of PLC, its programming languages were discussed and a flexible, low cost, low power consuming PLC with a easy graphical interface has been designed using the ARM microcontroller

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Design and Implementation of CAN based Automobile Control System

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Abstract: In controlling the vehicle autonomously using various electronic control modules (ECU's), usually need to make some decisions with integrated actions in real time with only incomplete information. The CAN (Controller Area Network) serial bus system makes a crucial contribution here with to its specific properties. This paper describes about development of CAN based automobile control system which includes Body control and comfort electronics subsystem of automobile to address comfort in drive feature.
Keywords: CAN Bus; ECU; Node; CAN controller; Host controller; CAN transceiver; NHTSA; HMI.

I. INTRODUCTION

The modern automobile has progressed greatly in the last few years. Just as our everyday consumer life has become sophisticated, our transportation has followed suit. Just how complex the modern automobile has become, though, is most likely not known by the average person. Here is an effort made in design and implementation of CAN protocol based Automobile control system for better understanding the automobile system. Automobile instrument assembly consist of various nodes linked with each other by CAN bus. Nodes are nothing but ECU's(electronic control unit) that consisting of CAN controller and micro-controller to which various I/O devices as sensors, actuators are attached, identifies and processes the required data. Modern motor vehicles can contains over hundred ECUs which are interconnected by the CAN Bus network. The system could be well illustrated by figure 1 below, showing In-Vehicle CAN Bus Network joining various ECUs.

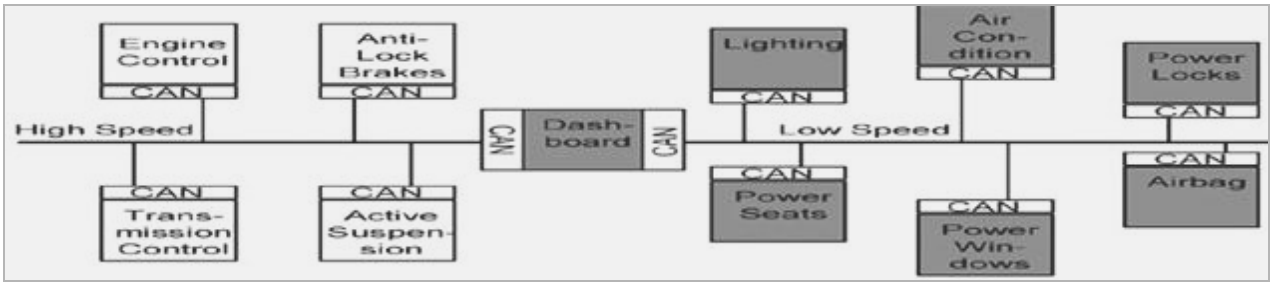

Fig. 1 CAN based Automobile Instrument Assembly

This intensive electronification and higher complexity in vehicles necessitates the use of data buses in vehicles for information exchange between various control units. Using a digital network controller (ECU) can efficiently and with the desired speed of data exchange can be possible. CAN bus (Controller Area Network) is the most widely used data bus in formation of internal digital network in vehicle [14]. It assures reliable data exchange even under harsh environmental conditions for example. The data transmission over CAN bus takes placed using CAN protocol specified by the CAN standard ISO-11898 [15], [16]. Information on the CAN bus is in the form of data messages whose structure is defined by the CAN protocol [16]. The data on the communication line contain commonly information about a vehicle operating parameters such as vehicle speed, fuel consumption, engine performance etc.

II. LITERATURATURE SURVEY

A. Problem Formulation

According to NHTSA figures, since 1994 seat-belt-use in India increase steadily has been accompanied by a comparably steady reduction in daytime passenger-vehicle fatalities. In 2010, the last year for which fatality data was available, the number had been reduced by 42% fatalities among 76% front seat passengers while 59% rear seat passengers that use seat belt in India [17]. In the present automobiles the number of facilities is much higher. The National Highway and Transportation Safety Association reports [17] that 26% of all car accidents are caused by distractions due to talking on cell phones, eating while driving, and other similar distractions that take a driver's focus off the road. The driver has to concentrate on road while driving, and with increased traffic, things get frustrating. The distraction considered in this project is for wiper on/off and dome light on/off. While increasing vehicle theft is another important issue needs to be addressed. In 2012 Times of India reported [18], out of 16 crore vehicles registered in the country, 1.7 lakh got stolen. On an average, there were 98 thefts per one lakh registered vehicles during the same period.

The characteristic of the automobile buyer has undergone a rapid change in the last few years. Good fuel efficiency along with high speed**,** Comfort in drive and lastly Cost consideration are the new variables that are influencing the buyer. Comfort in drive is a feature that comprises of many other features itself that assist the driver by not only making driving simpler but also assist to increase vehicle safety and security. Cost is always been a matter of concern and efforts are to be made in designing to decrease the cost. Electronics plays decisive role here to increase comfort level and decrease the cost of vehicle. Our proposed model will implement the comfort in drive feature and provide solution over the problems identified in the area.

B. Related Work

Thomas Nolte and Hans Hansson [1] stated historical perspective for development of automotive systems, Communication requirements, typical subsystems and automotive communication technologies. How communication over automobile instrument assembly takes placed using CAN Bus is analyzed in [11]. Jadsonlee da Silva Sá , Jaidilson Jó da Silva, Miguel Gonçalves Wanzeller and José Sérgio da Rocha Neto [2] implemented Monitoring of Temperature Using Smart Sensors Based on CAN Architecture in which they monitored and displayed temperatures of two different places and accordingly made auto-cooler on/off at the places. Similarly in [3], [4], [5], [7] and [8] implemented system is based on CAN along with embedded system, to monitor and control of different vehicle parameters addressing vehicle safety issue mainly but many of these parameters are not driver friendly so our proposed prototype model is designed considering this prospect with similar objective but different parameters as per requirement of the model.

III. PROPOSED MODEL

Body control and comfort electronics subsystem of automobile system includes climate control, cruise control, locks, window lifts, seat control and Human Machine Interfaces (HMI) etc [1]. Vehicle security can be increased by using Anti-Theft Devices. Anti-theft device used here is GSM interfaced and alarm equipped electronic locks key that not only cut fuel supply but also alarm owner about probable vehicle theft by sending massages so by use of physical as well as electronic key security level increases. Passenger's safety is been increased by making seat belt use mandatory for passengers and making use of HMI that shows important massages alert driver for driver each time. Also driving is made simpler and enjoyable by making environment control as dome-light, wiper etc. auto on/off to avoid driver's distraction.

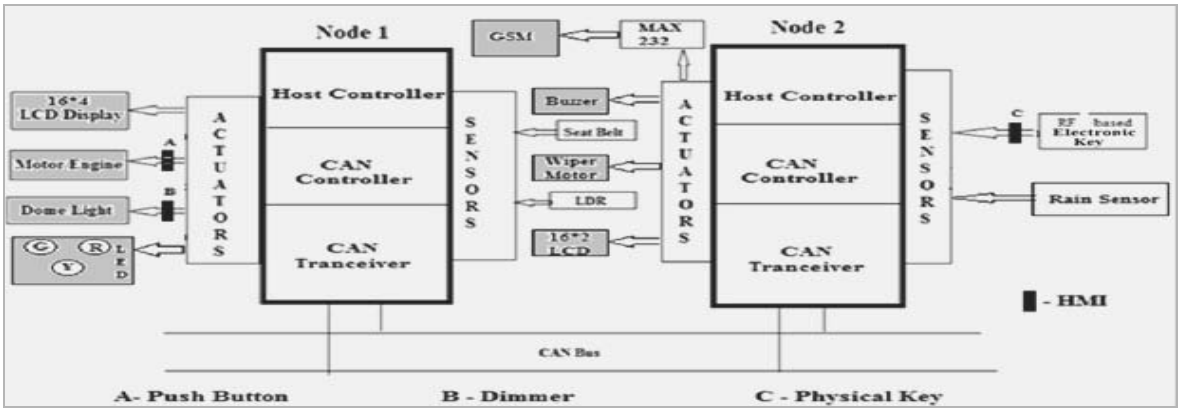

Fig. 2 Block Diagram of Proposed System

After initialization of module display connected to the node 1 shows massage as 'Design and Implementation of CAN based Automotive Control System'. System would check for Authorized person entry or not by validation of both of RF based electronic key and traditional physical key used by the respected person at node 2. If the entry is authorized then display at node 1 will show massage as 'Key is detected Authorized entry' along with its massage id otherwise it will show massage as 'Key not detected Your entry is discarded' and system will automatically disable the connection to engine motors while node 2 will activate the alarm and send owner massage of probable vehicle thief via GSM module. Then system will check for presence of light in car if it is not there then system will automatically make dome light on showing massage as 'Light not detected Dome Light ON' or else system will automatically make dome light off showing massage as 'Light detected Dome Light OFF' and if not. Most importantly after that system will check for seat belt lock/unlock if it is being locked then only display will show massage as 'Push Start button to start the car' or else it will display 'wear seat belt or car stop' so that the seat-belt is made mandatory. Finally system will start motor engine after start button is being pushed. Rain Sensor present at node 2 continuously track presence of moisture and will make wiper motor on or off accordingly and also it will send massage to node 1 to display the massage of rain detection and wiper on and vice versa otherwise. LCD at node 2 is used to check whether the same massages would be received by node 1 that would had transmitted from node 2.

IV. HARDWARE AND SOFTWARE REQUIREMENT

1. ATMega 16

Host Controller over the CAN controller is programmed to decide what the received messages mean, what actions are to be taken and what messages it wants to transmit. ATMega 16 is to be used here as host controller as per requirement of the system.

2. MCP 2515

The CAN controller stores the received serial bits from the bus until an entire message is available which can then be fetched by the host processor. MCP2515 is a CAN Controller used for the proposed system that meet the entire system requirement. CAN Controller is also responsible for error handling and fault confinement. MCP 2515 supports CAN 2.0B protocol and compatible with ISO 11898 CAN standard. MCP 2515 interfaces with host microcontroller via industry standard Serial Peripheral Interface.

3. TJA1050

The TJA1050 is the third Philips high-speed CAN transceiver fully compatible with ISO 11898 CAN standard. The transceiver is a transmitter and receiver amplifier. It converts the serial bit stream of the CAN module into electrical voltage values and vice versa. CAN bus uses two dedicated wires for communication. The wires are called CAN high and CAN low. When the CAN bus is in idle mode, both lines carry 2.5V. When data bits are being transmitted, the CAN high line goes to 3.75V and the CAN low

drops to 1.25V due to the resistance of 120ohm used at the termination thereby generating a 2.5V differential voltage between the lines. A dominant bit is represented by CAN_H going to about 3.5 V and CAN_L going to about 1.5 V and recessive bit when voltage difference is zero. TJA1050 supports CAN 2.0B protocol.

4. LDR Sensor

A photo-resistor or light-dependent resistor (LDR) or photocell is a light control variable resistor. The resistance of a photo-resistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. LDR sensor is used in system for detection of light or dark in order to automatic dome light on.

5. Limit Switch

Limit switch is a switch operated by the motion of a machine part or presence of an object to make or break an electrical connection. They are used for controlling machinery as part of a control system, as a safety interlocks, or to count objects passing a point. Here limit switch is used for indication of seat belt lock or unlock.

6. Rain Sensor

It was found that the rain sensor is the expensive unit in the present system so an effort is done in making a sensor which is reasonable by price, the Cup Sensor. The sensing device used here is basically a conical shaped cup with a tray on the top of the cup to collect maximum possible amount of water. Based on level of water in the cup wiper will be operated.

7. GSM Module

SIM900D GSM Module uses AT commands for sms, calls and gprs. Here GSM Module will send owner massage of probable vehicle thief in case of unauthorized person's interference is detected.

8. LCD

There are two LCD (Liquid Crystal Display)Modules are required in system in which one is 16*8 matrix attached at node 1 display data received at node 1 and other 16*2 matrix display at node 2 to display data received at node 2. Also communication over CAN Bus also can be verified using LCD displaying CAN massages transmitted or received via CAN Bus.

9. DC Motor

There are three DC Motors are to be used in the system in which two for driving vehicle used as engine motor prototype and one for wiper to wipe rain water present on windshield.

10. Locks Key

Two types of key as electronic and physical key i.e. traditional key are required to validate the entry. Electronic key used here is based on RF module consisting of transmitter chip embedded at the physical key and receiver chip fixed on door. After validation of both key persons entry will get authorized.

11. Dome light

Series LED's are used here as a dome light having advantage of energy efficiency and additional feature as light dimmer over the existing system in which Florescent tube used for dome light.

12. Proteus

Proteus software is to be use to design circuit diagram for the system.

13. AVR Studio 4

AVR Studio version 4 software is to be use to develop code for the system. Embedded C is the coding language use for coding in AVR Studio.

V. CONCLUSION

When taken into account that CAN is still at the beginning of a global market penetration, even conservative estimates show further growth for this bus system for the next ten to fifteen years [6]. So the project on CAN implementation makes major significance here. Proposed system is designed in a way

having advantage of feasibility, expandability, energy efficiency, cost effectiveness and reasonable data speed upto 1MBPS with the only limitation of regulation of cable length as data transmission rate decreases with increase in cable length. This paper describes about design and development of automobile control system using CAN protocol which will not only make driving simpler but also increase vehicle safety and security.

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Touchscreen Based Character Interpretation Plotter

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Abstract— Touchscreen Based Character Interpretation Plotter is a device that propounds the fastest scheme to effectively produce very large and complex drawings. The Touchscreen Based Character Interpretation Plotter is basicallysimple two axis deer stratagem stir a pen draw out anything . This been implemented in the current work wherein the X-Y plotter plots the input given from the touchscreen on the drawing board using ATMEGA 16 microcontroller on a any paper or material. The X-Y plotter has a two axis control and a distinctive clockwork to heighten and lower the pen. Each axis is powered using a single stepper motor. Pen control is achieved using a servo. This instrumentation allows the plotter to perform tasks at a faster pace and with increased accuracy.
Keywords- resistive touch; capacitive touch; symbol; signs; design; copy; print; drawing; x-y axis; robotic arm; drawing bot.

I. INTRODUCTION

Robotics is the field of computer science and engineering solicitous with making robots, devices that can move and reenact to sensory input. Robotics is department of artificial intellect. Robots are now extensively used in factories to accomplish high-precision jobs. They are also used in peculiar situations that would be hazardous for humans – such as, cleansing toxic wastes or deactivation bombs. Although big improvement have been made in the field of robotics during the last decadeIn 1942 the science fiction writer Isaac Asimov created his Three Laws of Robotics.The term 'robotics' was quoined by Isaac Asimov in his science figment short story called 'Liar'[1]. The plotter has a aperture in its base where the pen goes through it. It is designated to print on paper .Each axis is governed using a individual stepper motor and band. Pen control is achieved using a servo. Pen plotters print by moving a pen or other tools across the surface of a portion of paper. This signifies that plotters are vector graphics devices, rather than raster graphics as with other printers. Pen plotters can draw complicated line artifice, containing text, but mechanical motion is slow. They are often unable of effectively composing a firm tract of shade, but can develop a region by drafting many close, normal lines. Plotters immolates the fastest way to effectively generate very huge drawings or shades of high-resolution vector-based graphics when data processor memory was very costly and CPU power was very definite, and other types of printers had restricted graphic production capabilities. Pen plotters have really become old fashioned, and have been replaced by huge data format inkjet printers and LED toner supported printers. Such devices may still interpret vector languages primarily designed for plotter applications, since in many uses, they offer a more efficient alternative to raster data.

II. DESIGN METHODOLOGY

The components of the touchscreen based character interpretation plotter include the following:

A. Atmega 16 Microcontroller

The device is made using Atmel's high density non-volatile core technology. The ATmega16 is assisted with a full suite of program and system elaboration tools, containing C compilers, macro assemblers, program debugger or simulators, In-Circuit Emulators, and valuation set. The features of Atmega16 include16 Kbytes of In-System Self-programmable Flash program memory, Optional Boot Code Section with Independent Lock Bits, Programmable Serial USART, Master/SPI Serial Interface, On-chip Analog Comparator[2]. It operates at frequency of 16MHz with power supply of 4.5 to 5.5 v[3].

B. Motor Driver

In order to supply the exact amperage to the motor using the low current signal from microcontroller, motor administrator is used. A motor administrator is a stratagem or assembly of devices that helps to govern the performance of a stepper motor. A motor administrator might include a manual or automatic means for starting and stoppage of motor, choosing forward or reverse rotation, governing the speed, restricting the torque, and guarding against overcharge and faults.

The flow chart and block diagram of the Touchscreen Based Character Interpretation plotter are shown in Fig.1, Fig.2 and Fig.3

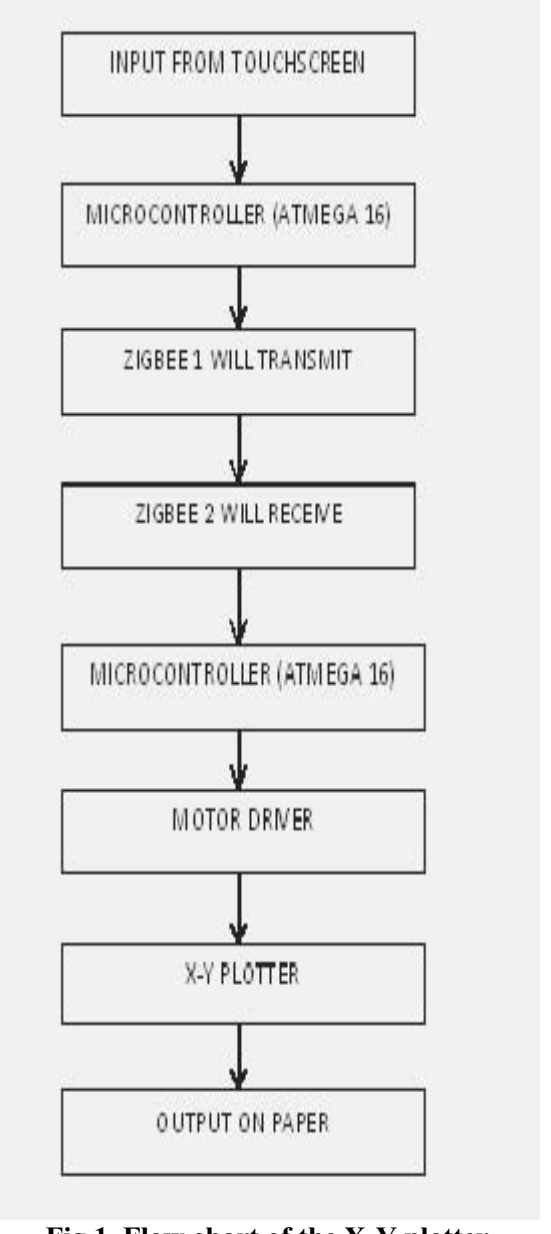

Fig 1. Flow chart of the X-Y plotter

C. Stepper Motor

Astepper motor is a brushless DC motor that distributes a full rotation into many uniform steps. The motor's place can then be dictated to move and sustain at one of these steps without any feedback sensor , as long as the motor is carefully sized to the application in consideration to torque and speed. DC brushed motors revolve continuously when DC voltage is applied to their terminals. The stepper motor is understood by its property to transform a trail of input pulses into a exactly defined addition in the shaft proposition. Each pulse move the shaft through a firm angle. Stepper motors thoroughly have multiple "dented" electromagnets ordered around a middle gear-designed part of iron. The electromagnets are activated by an exterior driver circuit or a microcontroller. To compel the motor shaft to turn, first, one electromagnet is given power, which magnetically draws the gear's teeth. When the gear's teeth are alined to the first electromagnet, they are marginally setoff from the next electromagnet. This indicates that when the next electromagnet is turned on and the first is turned off, the gear revolve a little to line up with the next one. From there the procedure is recited. Each of those rotations is called a "step", with whole number of steps making a full rotation. In that way, the motor can be turned by a accurate angle.

D. Power supply

The duty of regulated power supply is to provide a constant voltage to a circuit that must work within stated power supply boundaries. This is used to provide the power to the microcontroller and the driver circuits.

E. Working procedure

Touchscreen based Character interpretation plotter is project about to provide or produce character from Touchscreen and can be drawn against paper or other materials. Here Touchscreen will be used as input device, where we have to give some random character by moving stylus on resistive touch screen. Then co-ordinates will be displayed on LCD . This will indicate us that our input section is working properly without any error . Then this co-ordinates will be transmitted wirelessly to another system by ZigBee where we can receive it through ZigBee. Then it will provide this co-ordinates of each point to motor driver. This will be plotted against paper or any material. Stepper motor is used to move plotter in x and y directions as well as some hardware assembly

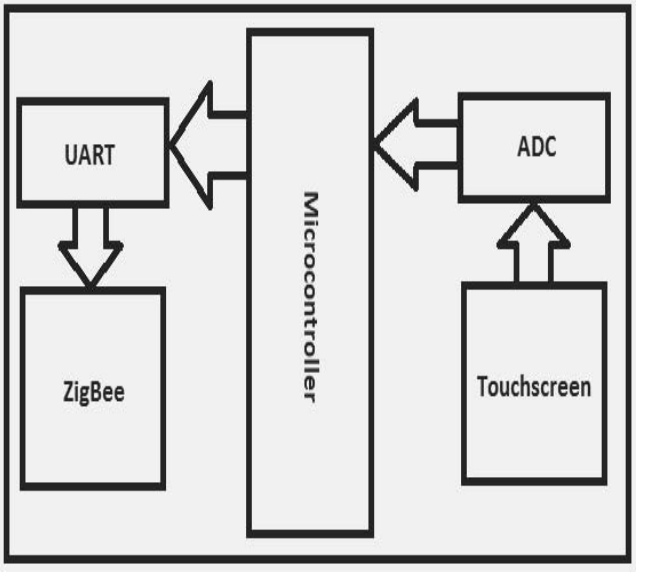

Fig 2. Block diagram of Transmitter Side

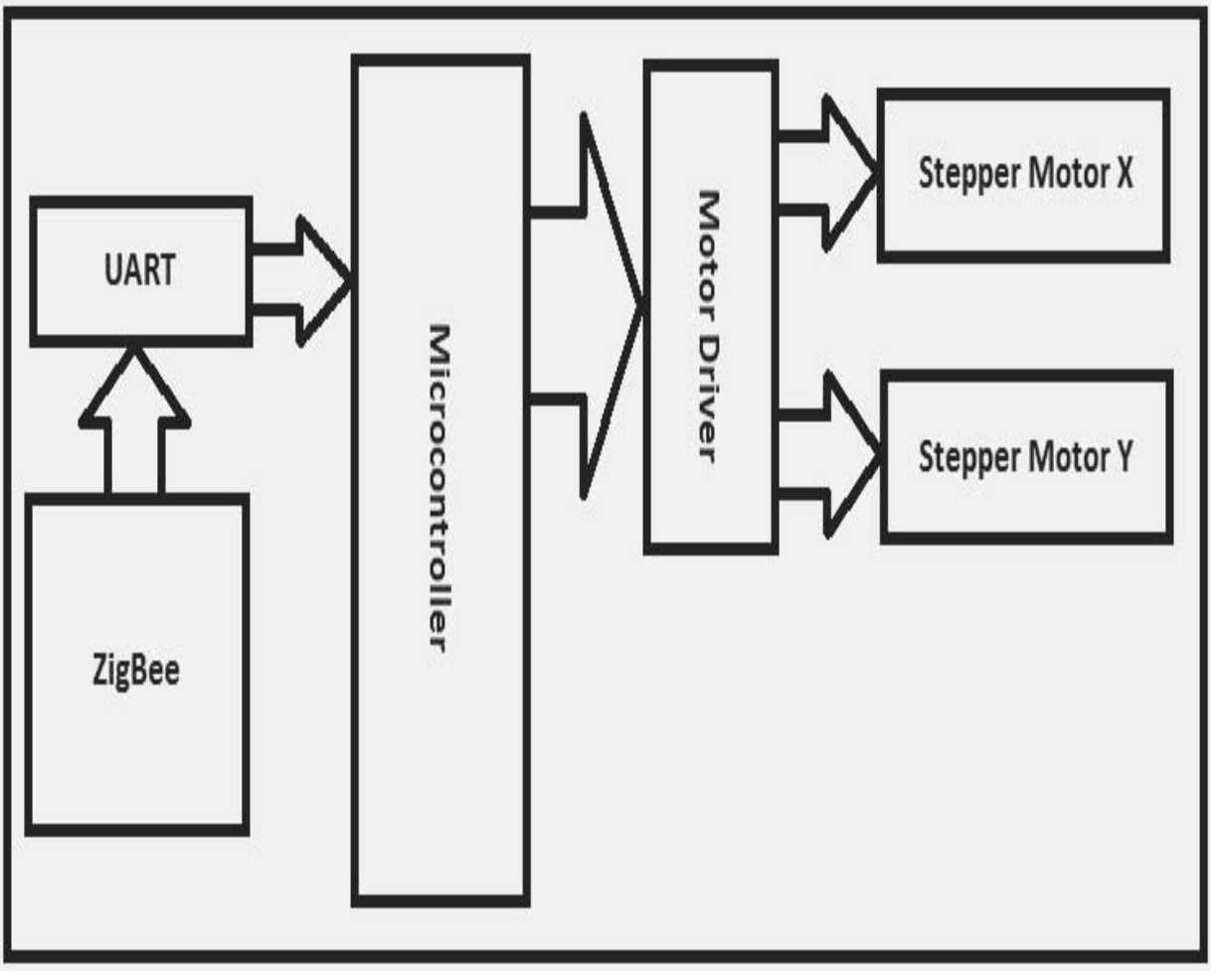

Fig.2. Block diagram of Receiver Side

IV. APPLICATIONS

1. PCB creation: Electronic Circuit layout can be plotted on to a cupric-clad board which can be engraved ordinarily.
2. PCB hole drilling :The drill can be used in place of pen, then user can exactly pierce holes in circuit boards. This technique will highly abbreviate printed circuit board production.
3. Plotting of graphs, charts and documents.

V. CONCLUSION

The plotter establishes its relevancies in the many fields. It is a beneficial invention in the field of graphics. Letters and images can be drawn by taking the inputs from the PC. Further, supplemental improvisation can be done by associating the graphical user interface for making the plotter more user serviceable and developing a web interface so that plotter could be directed in small places by the Web browser.

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A Literature Survey on Character Recognition of Indian Scripts for New Researchers

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Abstract- After the printed character recognition handwritten character recognition is always a leading area of research in the field of pattern recognition. Even though, sufficient studies have performed in foreign scripts like Arabic, Chinese and Japanese, only a very few work can be traced for handwritten character recognition mainly for the south Indian, devnagari scripts. OCR system development for Indian script has many application areas like banking, libraries, preserving manuscripts and ancient literatures written in different Indian scripts and making digital libraries for the documents. Feature extraction and classification are the two essential steps of character recognition process affecting the overall accuracy of the recognition system. This survey represents a history of character recognition with digital image processing techniques such as Feature Extraction, classification, Image Restoration and Image Enhancement.

Keywords: Optical Character Recognition (OCR), Feature Extraction, Classification, Digital Image Processing.

I. INTRODUCTION

The history of OCR can actually found back in 1923 Tausheck [4] and 1933 Handel [2] gave the first idea of the concept of the OCR. Optical Character Recognition deals with the problem of recognizing optically processed characters. Optical recognition is an offline process i.e. the recognition starts after writing or printing has been completed. Handwritten character recognition is a frontier area of research for the past few decades and there is a large demand for OCR on handwritten documents. Even though, sufficient studies have performed in foreign scripts like Chinese, Japanese and Arabic characters [3], only a very few work can be traced for handwritten character recognition of Indian scripts. Even now no complete hand written text recognition system is available in Indian scenario and it is difficult due to large character set of Indian languages and the presence of vowel modifiers and compound characters in Indian script. The problem of character recognition can be classified based on two criteria. One is based on the type of the text which is printed or hand written. The other is based on the acquisition process which can be on-line of off-line. It is generally considered that the on-line method of recognizing handwritten text has achieved better results than its off-line counterpart. In case of online character recognition, there is real time recognition of characters. Online systems have better information for doing recognition since they have timing information and can avoid the initial search step of locating the character as in the case of their offline counterpart. In case of offline character recognition, the typewritten or handwritten character is typically scanned in the form of a paper document and made available in the form of a binary or gray scale image to the recognition algorithm. Offline character recognition is a more challenging and difficult task as there is no control over the medium and instrument used.

1. Brief History of Character recognition

Many methods have been proposed for character recognition; they are often subjected to substantial constraints due to unexpected difficulties. Historically character recognition system has evolved in three ages [1], namely the periods cited denoting as

1.1 1895-1975 (initial ages) – The history of character recognition can be traced as early as 1900. When the Russian Scientist Tyering attempted to develop an aid for visually handicapped the first character recognizers appeared in the middle of 1940s with the development of digital computers. The previous work on the automatic recognition of characters has been concentrated either upon machine printed text or upon small set of well distinguished hand written text or symbols. The commercial character recognizers were available in 1950s.

1.2 1975-1990 – The studies until 1975 suffered from the tack of powerful computer hardware and data

acquisition derives. However, the character recognition research was focused on basically the shape recognition techniques without using any semantic information.

1.3 After 1990 till date – The real progress on character recognition system is achieved during this period, using the new methodologies and development tools, which are empowered by continuously growing information technologies. In the early nineties, Image processing and Pattern recognition techniques are efficiently combined with the Artificial Intelligence methodologies. These days in addition to the more powerful computers and accurate electronic equipments such as cameras, scanners and electronic tablets, we have efficient use of methodologies such as Hidden Markov models, neural networks; Fuzzy set reasoning and Natural language processing. Character recognition system is the base for many different types of applications in various fields, which we use in our daily lives. Post offices, banks, security systems, number plate recognition system and even in the field of robotics use this system as the base of their operations.

II. CHARACTER RECOGNITION APPROACHES

Character recognition systems extensively use the methodologies of pattern recognition, which allots an unknown sample to a predefined class. Many techniques for character recognition are investigated by the researchers and character recognition approaches can be classified as [5] Template matching, Statistical techniques, Syntactic or structural, Neural network, Hybrid or Combination approaches.

2.1 Template matching approach - This is the simplest way of character recognition, based on matching the stored data against the character to be recognized. The matching operation determines the degree of similarity between two vectors i.e. group of pixels, shapes curvature etc. a gray level or binary input character is compared to a standard set of stored data set. According to similarity measure (e.g. Euclidean, Yule similarity measures etc.), a template matcher can combine multiple information sources, including match strength and k-nearest neighbor measurements from different matrices. The recognition rate of this method is very sensitive to noise and image deformation.

2.2 Statistical Techniques - Statistical decision theory is concerned with statistical decision functions and a set of optimality criteria, which increases the probability of the observed pattern given the model of a certain class. Statistical techniques are based on the assumptions such as Distribution of the feature set, statistics available for each class, collection of images to extract a set of features which represents each distinct class of patterns. The measurements are taken from n-features of each word unit that can be thought to represent an n-dimensional vector space. The major statistical methods applied in the character recognition field are Nearest Neighbor Likelihood or Bayes classifier, clustering Analysis, Hidden Markov Modeling, Fuzzy Set Reasoning, Quadratic classifier etc.

2.3 Syntactic or Structural Approach - In Syntactic Pattern recognition a formal analogy is drawn between the structure of pattern and syntax of a language. Structural pattern recognition is intuitively appealing because in addition to classification, this approach also gives a description of how the given path constructed from the primitives. Flexible structural matching is proposed for identification of alphanumeric characters

2.4 Neural Networks - Various types of neural networks are used for character recognition classification. A neural network is a computing architecture that consists of massively parallel interconnection of adaptive neural processors. Because of its parallel nature, it can perform computations at a higher rate compared to classical techniques. Because of its adaptive nature, it can adapt to changes in the data and learn the characteristics of input signal. Output from one node is fed to another one in the network and final decision depends on the complex interaction of all nodes. Several approaches exist for training of neural networks like error correction, Boltzman, Hebbian and competitive learning. Neural network architectures can be classified as, feed-forward, feed-back and recurrent networks. The most common neural networks used in the character recognition systems are the Multi Layer Perceptron (MLP) of the feed forward networks and the Kohonen's Self Organizing Map of the feedback networks.

2.5 Hybrid or Combination Classifier - We may have different classification methods or different training sections, different feature sets, different training sets, all resulting in set of classifiers, whose outputs may be combined together, with the hope of improving overall classification accuracy. If this set of classifiers is fixed, the problem mainly focuses on the combination function. It is possible to use a fixed combiner and optimize the set of input classifiers. A typical combination scheme consists of a set of

individual combiner and classifiers which combines the results of the individual classifiers to make the final decision. Various schemes for combining multiple classifiers can be grouped into three main categories according to their architecture cascading, hierarchical, and parallel.

2.6 Indian Character Recognition - Not many attempts have been made on the character recognition of Indian character sets. However, some major works are reported on Devanagari. Some attempts are also reported on hindi, Marathi, Tamil, Kannada, Gujarathi, Bengali, Malayalam and Telugu. Character recognition of handwritten and printed text is of great importance for electronic conversion of historical information including letters, diaries, wills and other manuscripts. The problem is challenging because of human handwriting variability, uneven skew and orientation as well as noise and distortion such as smudges, smears, faded print, etc. identification of handwritten Indian scripts especially of Bangala, as well as Malayalam, Hindi, English, etc. Most of the Indian scripts have 500 or more characters or symbols used in running text, through the number of basic vowels and consonants is not more than 50. The number is multiplied by three types of vowel modifiers that may be glued below the consonants, thus generating threefold consonant-vowel combinations. Further increase in number is possible where consonant creates a complex orthographic shape called compound characters. For some scripts like Bangla, Gujarthi, Telugu and Devanagari languages consists of large number of compound characters. These compound characters can also take vowel modifiers to generate threefold more shapes. Thus orthographic shapes may run of the order of thousand. Only Tamil and Punjabi scripts are relatively simpler, where the number of characters/ symbol is about 150 and 70 respectively. Most Indian script lines can be partitioned into three sub- zones. The upper and lower zones may consist of parts of the basic characters as well as vowel modifiers. These parts of two consecutive text lines normally do not overlap or touch in case of printed script, but for handwriting, people have the tendency to write them bigger, leading to overlapping and touching characters. Overall these characteristics make handwritten and printed Indian text recognition more challenging.

III. ARCHITECTURE OF A GENERAL CHARACTER RECOGNITION SYSTEM

The major steps involved in recognition of characters include, pre processing, segmentation, feature extraction and classification (fig. 1)

3.1 Pre Processing - The sequences of pre-processing steps are as follows

3.1.1Noise Removal - Noise is defined as any degradation in the image due to external disturbance. Quality of handwritten documents depends on various factors including quality of paper, aging of documents, quality of pen, color of ink etc. Some examples of noises are Gaussian noise, salt and pepper noise. These noises can be removed to certain extent using filtering technique. Technical details of filtering can be observed in [6].

3.1.2Thresholding - The task of thresholding is to extract the foreground (ink) from the background (paper) [7]. Given a threshold, T between 0 and 255, replace all the pixels with gray level lower than or equal to T with black (0), the rest with white (1).

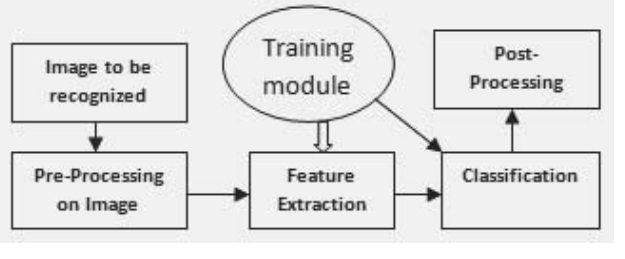

Fig. 1 Architecture of a character recognition system

If the threshold is too low, it may reduce the number of objects and some objects may not be visible. If it is too high, we may include unwanted background information. The appropriate threshold value chosen can be applied globally or locally. Otsu's [8] algorithm is the commonly used global thresholding algorithm.

3.1.3 Skeletonization - Skeletonization is an image preprocessing technique performed to make the

image crisper by reducing the binary valued image regions to lines that approximate the skeletons of the region. A complete survey of thinning methodologies is discussed in [9]

3.2 Segmentation - Segmentation step contains word segmentation, character segmentation and line segmentation. Methods for character segmentations [10] are based on

i) White space and pitch
ii) Projection analysis and
iii) connected component labeling

3.3 Normalization - It is the process of converting the random sized image into standard sized image. In this, size
normalization avoids inter class variation among characters. Bilinear, Bi-cubic interpolation techniques are a few methods for size normalization.

3.4 Feature Extraction - Features are a set of numbers that take the salient characteristics of the segmented image. There are different feature extraction methods for character recognition [15].

3.5 Classification - The feature vector obtained from previous phase is assigned a class label and recognized using unsupervised and supervised method. The data set is divided into training set and test set for each character. Character classifier can be Bayes classifier, Nearest neighbour classifier, Radial basis function, Support vector machine, Linear discriminate functions and Neural networks with or without back propagation.

3.6 Post-processing - Post-processing step involves grouping of symbols. The process of performing the association of symbols into strings is referred to as grouping.

IV. FEATURE EXTRACTION AND CLASSIFICATION TECHNIQUES

Veena Bansal and R.M.K Sinha [12] presented a complete OCR for printed Hindi text written in Devanagari script. The system used following features: Coverage of the region of the core strip, Vertical bar feature, Horizontal zero crossings, Number of positions of the vertex points, Moments, Structural descriptors of the characters for classification, Tree classifiers are used. Overall accuracy obtained at the character level is 93%. Sinha and Mahabala [13] designed a syntactic pattern analysis system for Devanagari script recognition. The system stores structural descriptors for each symbol of the script. They achieved 90% accuracy. Reena, Lipika and Chaudhury [14] have tried to exploit information about similarity between numerals, Style invariant features and stylistic variations. They presented a approach for recognition of handwritten Devnagari numerals using multiple neural classifiers. Sandhya Arora [11] have used Intersection features with Neural Network for Devanagari script and achieved 89.12% accuracy.

Singh and Budhiraja [16] presented an OCR system for handwritten isolated Gurumukhi script using Zoning, Projection histogram, Distance profile features, and Background directional features and used Support Vector Machines (SVM) for classification and thus obtained 95.04% of overall accuracy. Further Geeta and Rani [17] represented an OCR system for Gurumukhi numerals using Zone Distance features and SVM classifier and achieved 99.73% accuracy. G. S. Lehal and Chandan Singh [18] directed their efforts towards development of OCR system for Gurumukhi. They used Local features (concave/convex parts, number of endpoints, branches, joints) and Global features (number of holes, projection profiles, connectivity etc.). For classification hybrid classification technique, binary decision tree and nearest neighbour was used. They achieved a recognition rate of 91.6%. Dharamveer Sharma and Puneet Jhajj [19] used zoning feature with hybrid classification technique using KNN and SVM classifier and achieved 72.7% accuracy.

A very influential attempt made by the Jalal, Feroz and Choudhuri [20] for Bangla script. They represent neural network classifier by using Bounded rectangle calculation, Chain code generation, Slope distribution generation features. They achieved 96% system accuracy. Chaudhuri and Paul [21] represent an OCR system to recognize Bangla and Devanagari using stroke and shaded portion feature with tree classifier. U. Bhattacharya, M. Shridhar, and S.K. Paruil [22] implemented Neural network classifier for isolated Bangla characters with chain code features and achieved 92.14% accuracy on testing sets and 94.65% on training sets. Negi and Chakravarthy [23] represent an OCR system with 92% performance using template matching, fringe distance for Telegu script. Another attempt was made by Patvardhan and

Lakshmi [24] for Telegu script. They used neural classifier by using directional features and they achieved 92% accuracy. Arun K Pujari, and C Dhanunjaya Naidu [25] implemented an adaptive character recognizer for Telugu scripts using Multi resolution Analysis. They represented DNN (Dynamic Neural Network) using Wavelet analysis and achieved 93.46 % success rate. In south India, Kannada and Telugu have similar scripts.

R Sanjeev and R D Sudhakar [26] represent an OCR system for printed Kannada Script using two stage Multi-Network (Neural Network) classification technique employing wavelet feature and achieved 91% accuracy at character level. M Sagar, Shobha and Ramakanth [27] designed a syntactical analysis system using Ternary Tree based classification for isolated Kannada characters. They have given more emphasis on Post-processing step, using dictionary based approach to increase the OCR accuracy. T V Ashwin and P S Sastry [28] represents a font and size-independent OCR system for printed Kannada documents using support vector machines (SVM).

B Chaudhuri U Pal and Mitra [33] gave a prototype OCR system for Oriya script. They use Directional features and Global Features and classified them using Decision tree classifier and achieved 96.03% accuracy at character level. Junaid, Umar, and Muhammad Umair [30] attempted to make an OCR system for isolated Urdu characters using NN classifier using structural features like width, height and checksum of the character. Their prototype gained the accuracy of 97.43%. Another good attempt was made by Jhuwair and Abdul [31] for Urdu script. They achieved the 97.12% recognition rate using Sliding window and Hu-moment feature using KNN classifier.

Bamb K K, Zope R.G and Sharma K S [34] gave a new approach which implements combination of template matching and statistical techniques to recognize the devnagari plane script in which they used pixel information for recognition.

V. APPLICATIONS

Character Recognition has a extensive range of applications in various fields. In bill processing systems it is used to read payment slips like electricity bills, telephone, water bills. It will read and recognize the amount to be paid and also recognize the account number. The character recognition system can also be used for reading the address, assigning Zip codes to letters, application forms, voter ID cards, and identification of bank cheques by recognizing the account number and the amount written on the cheque. It can be used as a telecommunication aid for postal address reading for the deaf, processing of documents, in recognition of foreign language and also for language translation [32]. These systems can also be used in automatic processing of issuing tickets to air line passengers, validation of passports and visa cards etc. Address readers in postal departments locates the address on letters and sorts them according to their location using the zip code. The multiline optical character reader (MLOCR) by United States Postal Services (USPS) locates the address block on a mail piece, reads the address, identifies ZIP and generates a 9-digit bar code and sorts the mail to the correct stacker. This classifier recognizes up to 400 fonts and the system can process up to 45,000 mail pieces per hour [29].

VI. CONCLUSION

There are lots of digital image processing techniques that provide a wide application variety in feature extraction and classification. Artificial neural networks are frequently used to undertake character recognition because of their high tolerance to noise. The systems have the capability to realize perfect results. it seems that, the feature extraction stage of OCR is the most significant. Survey represents a study of feature extraction methods with different classifiers implemented in OCR systems for different Indian scripts. Discrepancy between the features should be clearly discriminative and specific so that system can classify the characters with maximum efficiency and minimum error rate. This survey paper helps researchers and developers to understand history of the OCR research work for Indian scripts. OCR for Indian scripts that works under all possible conditions and gives highly accurate results still remains a highly challenging task to implement.

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Image Enhancement For Satellite Image

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Abstract- In this work, image resolution enhancement technique which generates sharper high resolution image. The proposed technique uses DWT to decompose a low resolution image into different sub bands. Then the three high frequency sub band images have been interpolated using bicubic interpolation. The high frequency sub bands obtained by SWT of the input image are being incremented into the interpolated high frequency sub bands in order to correct the estimated coefficients. In parallel, the input image is also interpolated separately Discrete wavelet transform (DWT) is one of the recent wavelet transforms used in image processing. DWT decomposes an image into different sub band images, namely low-low (LL), low high (LH), high-low (HL), and high-high (HH). Another recent wavelet transform which has been used in several image processing applications is stationary wavelet transform (SWT). In short, SWT is similar to DWT but it does not use down-sampling, hence the sub bands will have the same size as the input image.

Keyword: DWT, IDWT, Interpolation, SWT

I. INTRODUCTION

Image resolution can be measured in various ways. Basically, resolution quantifies how close lines can be to each other and still be visibly resolved. Resolution units can be tied to physical sizes (e.g. lines per mm, lines per inch), to the overall size of a picture (lines per picture height, also known simply as lines, TV lines, or TVL), or to angular subtenant. Line pairs are often used instead of lines; a line pair comprises a dark line and an adjacent light line. A line is either a dark line or a light line. Resolution is the capability of sensor to observe or measure the smallest object clearly with distinct boundaries. There is difference between resolution and pixel. Pixel is actually a unit of digital image. Resolution depends upon the size of pixel. Smaller the size of pixel, higher will be the resolution and more clearly will the object in image. Image having smaller pixel size occupy more size on disk. Over the past several years, the wavelet transform has gained widespread acceptance in signal processing in general and in image compression research in particular. In applications such as still image compression, discrete wavelets transform (DWT) based schemes have outperformed other coding schemes like the ones based on DCT. Since there is no need to divide the input image into non-overlapping 2-D blocks and its basis functions have variable length, wavelet-coding schemes at higher compression ratios avoid blocking artifacts. Because of their inherent multiresolution nature, wavelet-coding schemes are especially suitable for applications where scalability and tolerable degradation are important. A DWT is a wavelet transform for which the wavelets are discretely sampled. The DWT of a signal is calculated by passing it through a series of low and high pass filters to obtain four sub bands

II. PROPOSED SCHEME

Fig. 1 shows block diagram of the proposed system. Low resolution image obtained is passed for wavelet transform like discrete wavelet transform and stationary wavelet transform which will give sub band coding.diffrent bands like LL, LH, HL, HH all bands are interpolated with bicubic and linear interpolation technique to increase resolution with pixel based improvement then estimated bands are passed to inverse discreet wavelet transform for reconstruction of high resolution of image. Discrete wavelet transform gives multi resolution analysis.

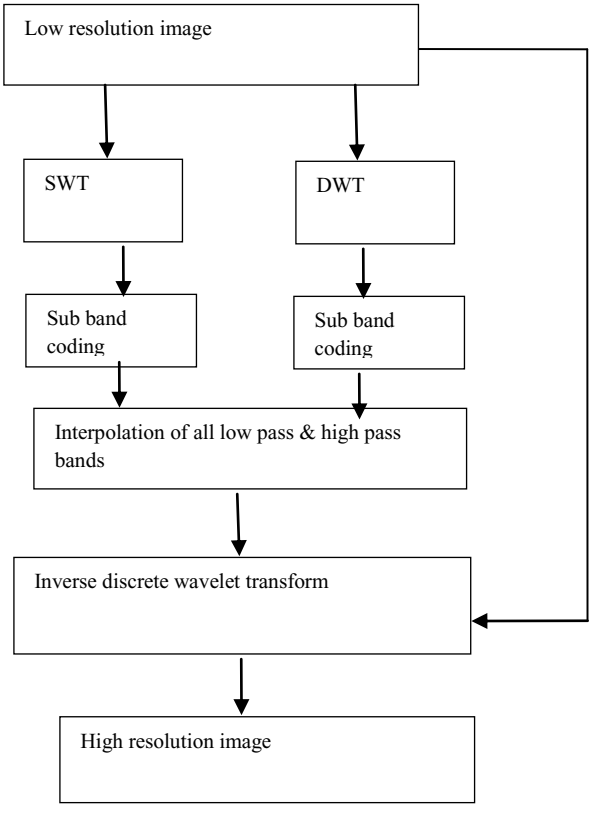

Fig.1: Block diagram of proposed system

2.1 *Low resolution image*

Fig 2. Capture of low resolution image

Figure 2 shows the low resolution image whose resolution will be increased with wavelet transform. Using satellite images of low resolution image is captured and passed further for preprocessing.Diffrent cameras can be used to take input images which can be resized after processing for further operations.

2.2 DWT (Discrete Wavelet Transform)

The wavelet transform concentrates the energy of the image signals into a small number of wavelet coefficients. It has good time-frequency localization property the fundamental idea behind wavelets is to analyze signal according to scale. It was developed as an alternative to the short time Fourier to overcome problems related to its frequency and time resolution properties .Wavelet transform decomposes a signal into a set of basic functions. These basic functions are obtained from a mother wavelet by translation and

dilation

$$wφ(a,b) = \int_{-\infty}^{+\infty} f(x) * φa,b(t)\,dx \quad 1)$$

$$φa,b(t) = \frac{1}{\sqrt{a}} φ\left(\frac{t-b}{a}\right) \quad 2)$$

Where a and b are both real numbers which quantify the scaling and translation operations respectively.

$$DWT(x, y) = \begin{cases} dj,k = \sum(x(n)h * j(n-2jk) \\ dj,k = \sum(x(n)g * j(n-2jk) \end{cases} \quad 3)$$

The coefficients dj, k refer to the detail components in signal x (n) and correspond to the wavelet function, whereas aj, k refer to the approximation components in the signal.

The functions h(n) and g(n) in the equation represent the coefficients of the high-pass and low-pass filters respectively, whilst parameters j and k refer to wavelet scale and translation factors. For the case of images, the one-dimensional (1-D)

Fig.2 Process of decomposing using DWT of an image

The symbols L and H refer to low-pass and high-pass filter respectively. LL represents the approximation sub-band & LH, HL and HH are the detail sub-bands. LL is the low frequency sub-band gives global description of an image with directional features. Horizontal coefficients (LH) correspond to the low-frequency component in the horizontal direction and high-frequency component in the vertical direction.DWT based wavelet transform gives good multiresolution analysis compared to other wavelet transform.

2.2.1 Advantage of DWT

The advantage of DWT over DFT and DCT is that DWT performs a multi-resolution analysis of signal with localization in both time and frequency. Also, functions with discontinuities and with sharp spikes require fewer wavelet basis vectors in the wavelet domain than sine-cosine basis vectors to achieve a comparable approximation.DWT gives sub band coding using low pass and high pass filtering. DWT gives multiresolution analysis good compared to other transform like fourier transform which genrally use for staionary signals.

2.3 S*WT*

We know that the classical DWT suffers a drawback: the DWT is not a time- invariant transform. This means that, even with periodic signal extension, the DWT of a translated version of a signal X is not, in general, the translated version of the DWT of X. How to restore the translation invariance, which is a desirable property lost by the classical DWT ?The idea is to average some slightly different DWT, called $\mathfrak{E}$-decimated DWT, to define the stationary wavelet transform (SWT).This property is useful for several applications such as breakdown points detection. The main application of the SWT is de-noising.

2.4 *Interpolation Techniques*

Interpolation is the process of using known data values to estimate unknown data values. Various interpolation techniques are often used in the atmospheric sciences. One of the simplest methods, linear interpolation, requires knowledge of two points and the constant rate of change between them. With this information, you may interpolate values anywhere between those two points. More sophisticated interpolations are also available in the Data Library. They are often applied to station datasets with irregular spacing between stations. The Cressman and Weaver analysis interpolation techniques are covered in this tutorial section. Both methods are primarily used to estimate equally-spaced latitude /longitude grid data from station data or gridded data with non-constant spacing. bicubic interpolation is an extension of cubic interpolation for interpolating data points on a two dimensional regular grid. In image processing, bicubic interpolation is often chosen over bilinear interpolation or nearest neighbor in image resampling, when speed is not an issue. In contrast to bilinear interpolation, which only takes 4 pixels (2x2) into account, bicubic interpolation considers 16 pixels (4x4). Images resample with bicubic interpolation are smoother and have fewer interpolation artifacts.

2.5 IDWT (Inverse discrete wavelet transform)

After DWT sub band coding LL sub band concentrates the illumination information. That is why only the LL sub band goes through the process, which preserves the high-frequency components (i.e., edges). Hence, after inverse DWT (IDWT), the resultant image will be sharper with good contrast.

III APPLICATIONS

Resolution has been frequently referred as an important aspect of an image. Images are being processed in order to obtain more enhanced resolution. One of the commonly used techniques for image resolution enhancement is Interpolation. Interpolation has been widely used in many image processing applications such as facial reconstruction, multiple description coding, and super resolution

IV RESULTS

The proposed technique uses DWT to decompose an image into different sub bands, and then the all frequency sub band images have been interpolated. In previous work only high frequency bands are used for interpolation here differently low pass band is also considered because LL low –low frequency band mainly consist directional information feature .The interpolated frequency sub band coefficients have been corrected by using the frequency sub bands achieved by SWT of the input image. An original image is interpolated with half of the interpolation factor used for interpolation the high frequency sub bands. Afterwards all these images have been combined using IDWT to generate super resolved image.Uptil now DWT & SWT processing is completed further enhancement and super resolved techniques processing are done..Results shown from processing shows that bilinear processing is low level intensity improvement method where bicubic interpolation is better but adds more balck color and then proposed with combination of DWT and SWT makes image cleary enhanced and with super resolved technique there is cornel pixel improvement also.Results also shows that PSNR is improved.For bilinear it is 28db for bicubic it is 30 db and for poroposed its 36.64db and for super resolved it is 36.84 db.

V CONCLUSIONS

The interpolated frequency sub bands and the SWT frequency sub bands have the same size which means they can be added with each other. The new corrected frequency sub bands can be interpolated further for higher enlargement. Also it is known that in the wavelet domain, the low resolution image is obtained by low pass filtering of the high resolution image. In other words, low frequency sub band is the low resolution of the original image. But still we are interpolating it to achieve high resolution using directional information features of low low band. We are using the input image for the interpolation of low frequency sub band image. Using input image instead of low frequency sub band increases the quality of the super resolved image.DWT gives better performance compared to discrete cosine transform.

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Some Studies on Machined Surface Integrity in Precision Turning of Nylon

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Abstract- The use of plastic with superior characteristics has increased in several sections such as equipment of precision, electronics and optics. Due to the need of high dimensional accuracy and good surface finish, components of plastic for these ends should be produced by means of machining processes instead of moulding processes. Nylon is the commercially available polymers which fulfill the requirements of precision products. Present paper focuses the effect of machining parameters on surface roughness of Nylon obtained by precision CNC turning. The experiments were conducted according to Taguchi L16 design. The machining parameters chosen for turning are feed rate, spindle speed, depth of cut and tool nose radius. However, it is observed that minimum and maximum roughness values obtained as 29 µm and 201 µm respectively. Also depth of cut is having dominating effect and spindle speed is having secondary effect on final surface integrity of machined Nylon substrates.
Keywords- Nylon, Precision Turning, Taguchi DOE, ANOVA, Surface Roughness.

I. INTRODUCTION

Nowadays plastic has been widely employed in the industrial sector. The use of plastic with superior characteristics has increased in several sections such as equipment of precision, electronics and optics. Due to the need of high dimensional accuracy and good surface finish, components of plastic for these ends should be produced by means of machining processes instead of moulding processes [10]. When the objective is to produce components in plastic with high dimensional accuracy, it is applied the machining process as final operation. In some cases, it is economically viable to produce the components in plastic using only machining processes. The plastics reaction during machining depends mainly on the mechanical, thermal and rheological properties. Consequently, any evaluation of the machining characteristics should take into account the peculiar properties of the material to be used. When examining the machined surface of a plastic in full detail, it is noted that, while in some cases the roughness is high and with cracks, in others the surface comes covered with undesired feed marks. It may occur that the excessive heat, generated by the machining, causes burning (thermosetting) or gumming (thermoplastic) in the machined surface, demanding a process of finish [1].
Nylon is the commercially available polymers which fulfill the requirements of precision products [2]. Nylons are crystalline thermoplastics with good mechanical properties to allow its use in structural as well as in precise small parts. Nylons have tensile properties comparable to some extent of aluminum alloys. It has an excellent fatigue resistance, and it is often used for precise parts in automobiles and aero applications. A unique property of nylon is its low density.
However, shaping of polymers into desired precise products to required precision and accuracy is a challenging task. It has been observed from the available literature that very few researchers have conducted research in precision machining of polymers. The information required for successful and rapid manufacturing of a precise polymeric product is less adequate. The precision machining using a precision turning lathe enables a high flexibility in the production of precision products. Higher form and shape accuracies can be achieved by the precision turning process than with conventional grinding and polishing techniques [11]. The present investigation aims at quantitative as well as qualitative analysis of surface integrity of the machined surface produced using CNC turning operations on Nylon. The analysed results could help prescribe suitable machining parameters that produce most favourable and acceptable surfaces for precision applications.
The precision machining methods such as precision CNC turning have been used by very few researchers to analyze the machinability of polymers in the past. The paragraph below throws light on some of the

earlier studies related to precision machining of polymers. Salles [5] investigated that the influence of the cutting speed and the feed rate in the turning surface roughness of UHMWPE. Carr [8] performed single point diamond turning of various polymers. It has been reported that the rake angle has a major role on the surface roughness, which further influences the direction of crack propagation into the surface. It was found that the rake angle of -2° produces better surface finish. Grabchenko [3] investigated the mechanism of surface formation using photo emission technique during machining of polymers. A single point diamond turning of CD/DVD pick up lens on PMMA has been carried out by Liu [5]. Author achieved the form accuracy obtained by him was less than 1 micron within a tolerance of 1 micron. Gubbels [6, 7] performed precision turning on polycarbonate and PMMA using different cutting environments. It is observed that the type of cutting environment during machining influences the tool wear pattern in diamond turning. Author further explained the tribo-chemical wear as a predominant phenomenon as compared to other wear. Mamalis [4] investigated the wear of diamond tool in ultra precision and diamond turning operations. It was observed that the latent defects of diamond crystals or misalignment by the operations are the reasons for macro wear on diamond tool wedge. According to Kobayashi [1], different types of discontinuous chips can be formed when great compressive stresses are involved or when a brittle material is machined. It can also happen when a thermoplastic is machined at a large rake angle or a great cutting depth.

II. EXPERIMENTAL WORK

2.1. Process, Equipment and Tooling

Precision CNC turning process is adopted for investigation on surface roughness of polymers. The work material used for process is Nylon. The Ultra Precision lathe PD Spinner (PD-3-01/04-840D) made Germany is used for carrying out the all experimental trails. Carbide inserts are used with different tool nose radii in dry cutting environment.

2.2 Experimental Design

A Taguchi experimental design L16 orthogonal array was used for designing the parameter combinations for each experimental trial (See Table 1). In this orthogonal array, number of factors are 4 and number of levels are 4. Hence total numbers of runs are 16. The response variable chosen is the arithmetic average of surface roughness for the experiments in CNC turning of Nylon. The input control factors selected for CNC turning of Nylon are: depth of cut (20-40-60-80 μm), feed rate (0.02-0.04-0.06-0.08 mm/rev), spindle speed (1000-2000-3000-4000 rpm) and tool nose radius (0.1-0.2-0.3-0.4 mm). Table 1 shows the experimental runs with the assigned factors to each of the columns of OA for Precision CNC turning process.

Table No. 1. Experimental layout using L16 orthogonal array for Nylon

Expt. Run	Depth of cut (μm)	Feed rate (mm/rev)	Spindle speed (rpm)	Tool nose radius
1	20	0.02	1000	0.1
2	20	0.04	2000	0.2
3	20	0.06	3000	0.3
4	20	0.08	4000	0.4
5	40	0.02	2000	0.3
6	40	0.04	1000	0.4
7	40	0.06	4000	0.1
8	40	0.08	3000	0.2
9	60	0.02	3000	0.4
10	60	0.04	4000	0.3
11	60	0.06	1000	0.2
12	60	0.08	2000	0.1
13	80	0.02	4000	0.2
14	80	0.04	3000	0.1
15	80	0.06	2000	0.4
16	80	0.08	1000	0.3

2.2 Experimental procedure

Initially the 16 work pieces to the required length from a long rod of Nylon were cut as substrates. These substrates are exactly made to size of Ø25 × 8 mm thickness. The sets of 16 experiments were performed on ultra precision CNC lathe. The substrate of 25 mm diameter was hold in the jaws of the power chuck (see Fig. 1). Two carbide inserts with different tool nose radii are attached on the tool pockets, which are attached on turret head. Initially the rough cut of 50 µm is taken on each substrate. Then all the substrates were machined as per the L16 experimental design. Finally for protection of CNC machined surfaces from dust and foreign particles, each substrate is covered with the help of food rapped paper.

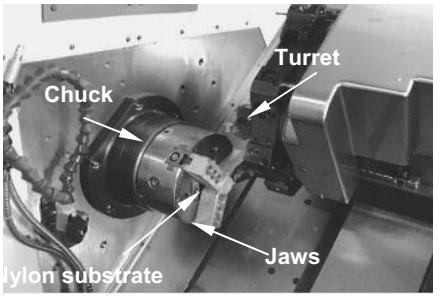

Fig. 1 Close view of set up of CNC turning operation

All CNC turned surfaces were measured by contact type of measurement in a controlled environment temperature. After machining trials, the Nylon machined surfaces were measured to analyze profile on Taylor-Hobson Form Talysurf, Model- 120 made Japan. This instrument uses diamond stylus with one mN force to trace the profiles and laser interferometer to generate profile counters with a resolution of 10 nanometers.

III. RESULTS AND ANALYSIS

Table No. 2 shows the obtained roughness values of machined Nylon substrates.

Table No. 2. Roughness values of CNC turned Nylon

Substrate No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Roughness value (µm)	87	63	145	105	29	201	117	103	69	47	37	83	94	101	36	58

Fig. 2 and Table 3 show the main effects plots for flatness (ANOM) and the table of analysis of variance (ANOVA). It is observed from the ANOVA table, there is no statistically significant factor in this experiment. Since the P-value in the ANOVA table for any input parameter is not less than 0.05, there is a not statistically significant relationship between any input parameter and the response variables at the 95.0% confidence level. Notice that the highest P-value is 0.808 in the ANOVA table. Since the P-value is not less than 0.05, that term is not statistically significant at the 95.0% confidence level. The percentage contribution of the input variables influencing, depth of cut: 38.27%, feed rate: 11.79%, spindle speed: 32.99% and tool nose radius: 16.95%. The effect of each input variables on the surface roughness in detail using ANOM plots.

Table No. 3. ANOVA table for surface roughness in CNC turning of Nylon

Source	DF	SS	MS	F	P	% Cont.
Depth of cut, *d*	3	7265	2442	1.28	0.324	38.27
Feed rate, *f*	3	2239	746	0.32	0.808	11.79
Spindle speed, *s*	3	6262	2087	1.06	0.402	32.99
Tool nose radius, γ	3	3215	1072	0.48	0.701	16.95
Residual error	0	-	-	-	-	-
Total	8	18981	-	-	-	100

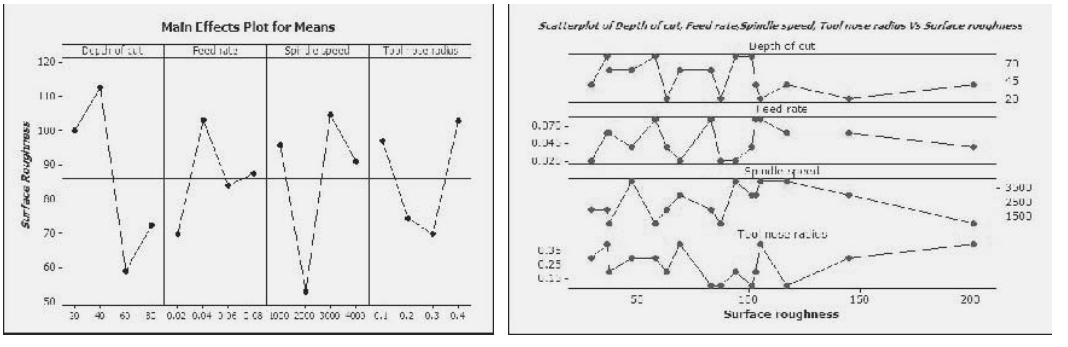

Fig. 2 Main effect plots and scatter plots for surface roughness in CNC turning of Nylon

There is a non linear effect when the depth of cut changes from 20 µm to 40 µm, surface roughness is increased from 100 µm to 115 µm. if the depth of cut changes from 40 µm to 60 µm there is a sudden reduction roughness up to 60 µm. Further increment of depth of cut up to 80 µm, roughness is also increased in some amount.

It is seen from MEP's there is increasing and decreasing trend for feed rate. If the feed rate changes from 0.02 mm/rev to 0.04 mm/rev then roughness value increases from 70 µm to 105 µm, if the feed rate changes from 0.04 mm/rev to 0.06 mm/rev there is a sudden reduction roughness up to 70 µm. Further increment of feed rate up to 0.08 mm/rev, roughness is also increased in small amount up to 87 µm.

It is observed from above figure that there is a non linear trend of spindle speed on machined surface roughness. If spindle speed changes from 1000 rpm to 2000 rpm there is sudden reduction on surface roughness from 95 µm to 50 µm. If spindle speed increases up to 3000 rpm then there is a sudden increment of roughness up to 105 µm. Further increment of spindle speed up to 4000 rpm, roughness is also decreased in small amount up to 90 µm.

Tool nose radii show linear effect on machined roughness of Nylon. If the tool nose radius changes from 0.1 mm to 0.2 mm to 0.3 mm then roughness value also decreased from 100 µm to 70 µm to 65 µm. If the tool nose radius changes as 0.4 mm then there is a sudden increment in roughness value up to 105 µm.

IV. CONCLUSIONS

Following conclusions can be deducted from the investigation carried out on surface roughness assessment of Nylon by precision turning process.

- It is observed that the depth of cut is having dominating effect on machined surface roughness of Nylon. However, spindle speed is having secondary effect for the same.
- It is observed from this experiment that minimum and maximum roughness values obtained as 29 µm and 201 µm respectively.
- Also the minimum feed rate with moderate spindle speed showing the better surface quality than other parameters.
- The higher tool nose radius gives not good quality surfaces due to maximum friction between tool arc and the work piece surface.

- It is also observed that at higher spindle speeds there is sudden rise in temperature in machining zone and it affects directly on final machined surface integrity.

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Factors Affecting Surface Finish of Abrasive Water Jet Machining- A Review

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Abstract-The Abrasive Water Jet Machining (AWJM) is used for cutting materials in precision machining [1].The process represents cold, precise cutting with minimal thermal load. This technology covers requirements for quality and manufacturing productivity [2].In manufacturing process high quality products are improved by dimension, shape accuracy and surface roughness of the products is observed [3].Various machining technologies of high speed cutting by using water jets can be used for the betterment of surface finish and accuracy. The effective machining process and to predict the optimal choice for each parameters such as transverse speed, abrasive flow rate and standoff distance respectively [4].It is based on significant analysis of quality and technical of surface finish its main process is to check accuracy of the most precise components [5].The quality of surface roughness is expressed through the abrasive materials. The quality terms is based on the composite materials in which that has been differing according to several components and its material characteristics [6].This technology is widely used in manufacturing sectors for irregular surface and polishing hard materials, cleaning constrained surfaces on surface roughness. The results show that a smooth surface finish is more easily obtained on hard materials under the operation of abrasive water jet machining.

Keywords: Transfer speed, Stand off distance, ANNOA, abrasive water jet, Surface roughness

I. INTRODUCTION

It is one of the fast growing non traditional machining techniques of abrasive water jet technology. This process having good adaptability to various composite materials also having low impact force of the products to friendly environment. This application and techniques mainly involves in improving competitiveness for modern manufacturing and technology [1].The process of machining work piece material through high pressure water jet mixed with abrasive particles. The abrasives are helps us to reduce surface roughness of aluminium cutting surface in machining process. Machining of surface roughness in particulate reinforced conventional machining process such as turning, drilling. The surface finish of the machined surface acts as a major role in dimensional accuracy. The proper selection of this process is important in achieving of better surface finish [8].The parameters of machining process such as water pressure, standoff distance and transverse speed were considered on the machining process. It has become highly developed industrial technology for the proper surface finish and accuracy with material properties.

II. LITERATURE SURVEY

Surface roughness of carbides produced by abrasive water jet machine. In this article the work aims to evaluate the effect of jet of pressure, abrasive flow rate and work feed rate on smoothness of the surface produced by abrasive water jet machining of carbide of grade P25 is a very hard and cannot be machined by conventional machining techniques Cutting was performed on a water jet machine model WJ 4080. The abrasive used in investigations was garnet of mesh size 80. It was found from the investigations that with increase in jet pressure the surface becomes smoother due to higher kinetic energy of the abrasives. But the surface near the jet entrance is smoother and the surface gradually becomes rougher downwards, and the roughest near the jet exit. Increase in abrasive flow rate also makes the surface smoother which is

due to the availability of higher number of cutting edges per unit area per unit time. Feed rate didn't show any significance influences on the machined surface, but it was found that surface roughness increase drastically near the jet entrances. Finally they have concluded that A jet Pressure And Abrasive Flow rate are the Most influencing parameter on the surface roughness, the work feed rate is less insignificant as compared to jet pressure and abrasive flow rate.

Experimental investigations were found the influence of Abrasive Water Jet Machining (AWJM) process parameters on surface roughness (Ra) and kerf taper ratio (TR) of aramid fiber reinforced plastics (AFRP) composite. The approach was based on Taguchi's Method and Analysis of Variance (ANOVA) to optimize the AWJM process parameters for effective machining. It was found that traverse rate was considered to be the most significant factor followed by hydraulic pressure in influencing the Ra quality criteria. In case of TR, traverse rate showed the greatest influence by standoff distance. It was also confirmed that increasing the kinetic energy of water jet may produce a better quality of cuts. It was confirmed that determined optimal combination of AWJM parameters satisfy the real need for machining of AFRP composites in practice. They have concluded that Traverse rate is the most significant factor on surface roughness during AWJM while standoff distances and abrasive mass flow rate are the insignificant control factor on surface roughness (Ra). By applying the optimal setting to the Experiments there are considerable improvement in the process.

A study of the depth of jet penetration (or depth of cut) in abrasive water jet (AWJ) cutting of alumina ceramics with controlled nozzle oscillation is presented and discussed. An experimental investigation is carried out first to study the effects of nozzle oscillation at small angles on the depth of cut under different combinations of process parameters. Depending on the other cutting parameters in this study, it is found that a high oscillation frequency (10-14 Hz) with a low oscillation angle (4-61) can maximize the depth of cut. Using a dimensional analysis technique, predictive models for jet penetration when cutting alumina ceramics with and without nozzle oscillations are finally developed and verified. An experimental investigation of the depth of jet penetration in AWJ cutting of alumina ceramics with controlled nozzle oscillation has been carried out and reported. Hence oscillation frequencies (10-14 Hz) and small oscillation angles (4-61) are recommended for maximizing the depth of cut in nozzle oscillation cutting.

III. FACTORS AFFECTING SURFACE FINISH

Level	Water pressure, MPa (A)	Standoff distance, mm (B)	Traverse speed, mm/s (C)
I	200	2.5	1.0
II	250	5.0	1.5
III	300	7.5	2.0

Table 1-Parameters and levels

Parameters	DOF	Seq.SS	Adj.MS	F value	P value	Pc
Water pressure, MPa (A)	2	27.1107	13.5553	50.98	0.019	74.083
Standoff distance, mm (B)	2	2.6294	1.3147	4.94	0.168	7.185
Traverse speed,mm/s (C)	2	6.3231	3.1615	11.89	0.078	17.278

Table 2-ANOVA analysis for surface roughness

ExpNo	Water pressure, MPa (A)	Standoff distance, mm (B)	Traverse speed, mm/s (C)	Surface roughness, microns	S/N ratio
1	200	2.5	1.0	8.20	-18.2763
2	200	5.0	1.5	10.56	-20.4733
3	200	7.5	2.0	11.96	-21.5546
4	250	2.5	1.5	7.05	-16.9638
5	250	5.0	2.0	8.62	-18.7101

6	250	7.5	1.0	7.60	-17.6163
7	300	2.5	2.0	6.60	-16.3909
8	300	5.0	1.0	5.23	-14.37
9	300	7.5	1.5	6.20	-15.8478

Table 3- Measured values and S/N ratios for surface roughness of composite

Under the chosen experimental conditions. In light of this, it is reasonable to use the estimate of water-hammer pressure as the appropriate impact pressure.

Similarly, the average surface roughness value with respect to the three different traverse speeds at optimum water pressure of 300 MPa and traverse speed of 1mm/s. It demonstrates that a decrease in traverse speed decreases the surface roughness of the machined surface of the composite. Surface roughness decreased from 6.6 μm to 4.7 μm when traverse speed was decreased from 2 mm/s to 1 mm/s. It can be noted that the considerable reduction (29%) in surface roughness is achieved by decreasing the traverse speed. It can be revealed that the lower traverse speed enhance easier removal of material within a short time, resulting in considerable improvement in surface finish. The results revealed that the surface roughness decreased by 19 % when the standoff distance was decreased from 7.5 mm to 2.5 mm at optimum traverse speed (1 mm/s) and water pressure (300 MPa). A lower standoff distance ensures the smoother surface roughness due to increased kinetic energy of the abrasive-waterstream.

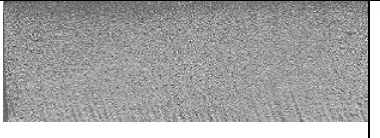
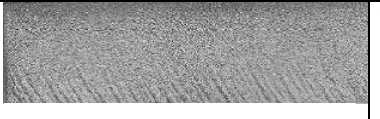
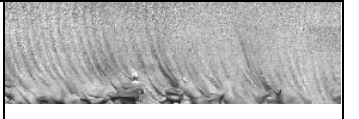
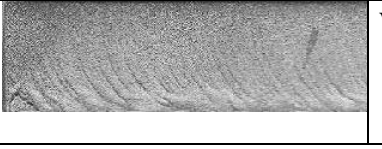
Technical Parameters	Images	Technical Parameters	Images
v = 350mm/min ma = 250 g/min		v = 350 mm/min ma = 400 g/min	
v = 450mm/min ma = 250 g/min		v = 450 mm/min ma = 400 g/min	
v = 550mm/min ma = 250 g/min		v = 550 mm/min ma = 400 g/min	

Table 4- Technical Parameters

Similar observation was made by John Kechagias and they reported that when the standoff distance was increased, the surface roughness increased considerably in machining of TRIP sheet steels. It can be seen from the high magnification SEM image that de-bonding between the graphite particles and Al –Si alloy matrix occurred on the cutting surface where the soft graphite particles pulled out and form a valley on the machined surface of the Al –Gr composite. This could be the cause for higher surface roughness values while machining graphitic reinforced composites.

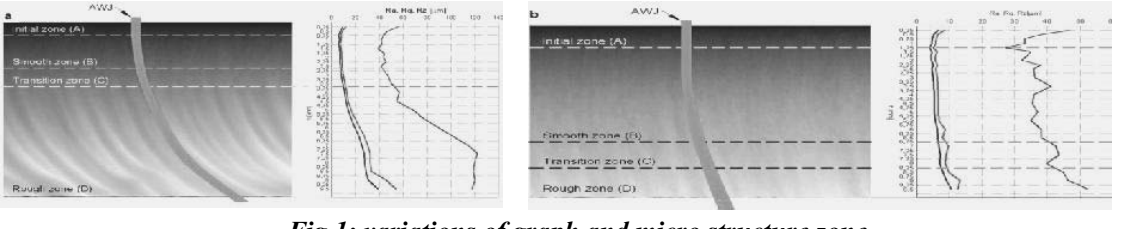


Fig 1: variations of graph and micro structure zone

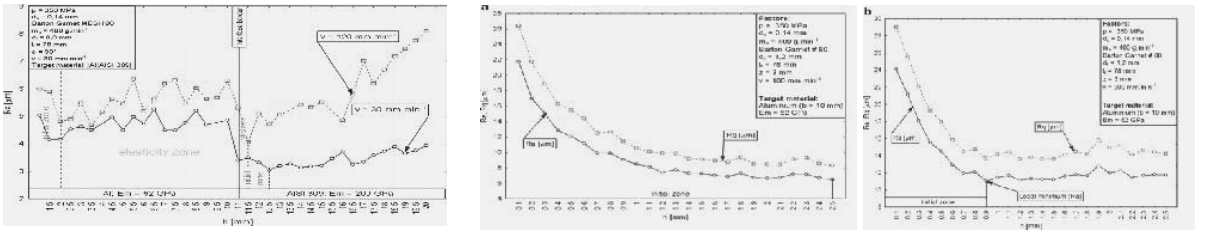


Fig 2: Heterogeneous surface with highlighted initial zones

Surface profile parameters Ra and Rq in entry area of sample (initial zone is highlighted) High-magnification SEM imaging was conducted in order to better understand the initial mechanisms of damage illustrate the damage initiation at the boundary between _ grains and the matrix at the lower water hammer pressure (0.94 GPa), whilst show some fracture features of the damage associated with impact at the higher water hammer pressure (1.24 GPa). Following a single jet pass at the lower water hammer pressure, initial damage over the jet footprint can be seen in some of the grain boundaries exhibiting contrast in the SEM images, a feature which was not observed before the PWJ exposure. A few isolated micro pits can be observed indicating regions where material has been removed. It is not clear from such images whether these micropits were formed within grains or located along the grain boundaries. Higher magnification imaging on the same surface indicates some slight damage to the grains themselves, in the form of micro voids and micropits with much smaller sizes than the grains. However, it is unlikely that these features result directly from plastic deformation as they have angular shapes.

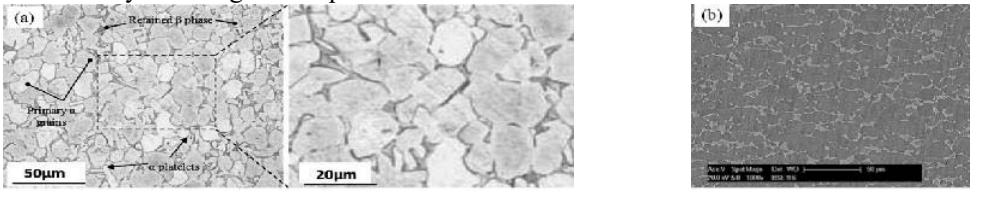


Fig 3: Surface roughness in initial zone Ra(MI) and Ra(MII)

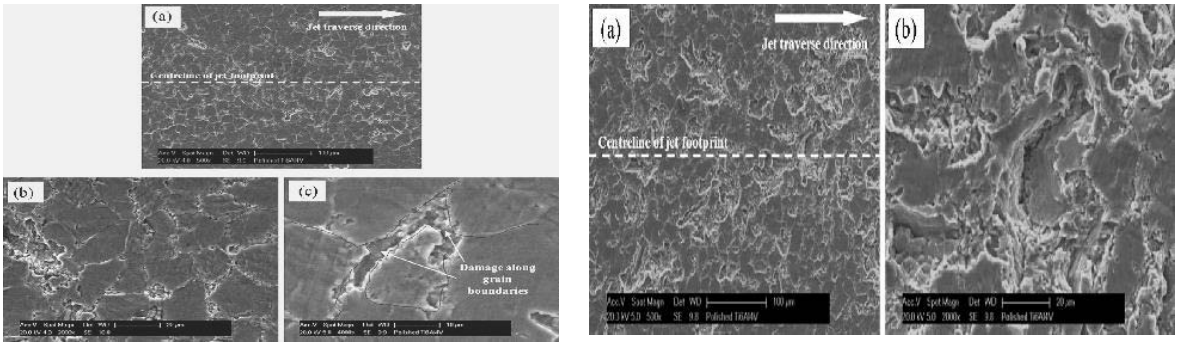


Fig 4: Micro structure analysis

When water is pressurized to a high pressure and discharged from a small orifice, a water jet with

high velocity is generated which can cause damage to the target materials by means of erosion. The loss of jet velocity and breakdown of jet into droplets start occurring once the jet departs the nozzle exit due to aerodynamic interaction, turbulence and cavitation.Described that the initially coherent jet fully breaks up to form droplets as air is entrained into the jet. Sohr and Thorpe argued that this breakdown into droplets occurred at a critical distance (SODc) which is approximately 175 orifice diameter from the orifice. In this work, the SODs reported are the distances from the nozzle exit to the work piece the true SODs are the distances from the orifice to the work piece (i.e. an additional 76 mm due to the length of the nozzle). Thus, both of the SODs examined are above the SODc indicating droplet work piece impacts represent the conditions experienced during the erosion process

IV. ADVANTAGES

- Possible to cut materials having higher hardness value, that cannot cut in other machining process.
- There is no cutting force during and after cutting operation, there is no more strain on the material.
- Production operations such as deburring, cutting, drilling, turning, milling can be done easily with multiple machining mode of water jet lathe.
- There is no need to use edges of cutting tools so no loss of time in changing tools.
- It is efficient and economic since it has high rate of machining.
- It is possible to machine materials in macro and micro sizes.
- It is environmental friendly since there is no burning, oxidizing or toxic slag during machining operation.

V. CONCLUSION

Results showed that surface roughness of composite decreased with increasing water pressure. The lowest surface roughness values occurred at the lowest traverse rate and the standoff distance. The outcomes of investigation show that the water pressure (74.08 %) has the highest influence on surface roughness followed by traverse speed (17.28 %) and standoff distance (7.18 %) in machining of Al-Gr composite. Obtained mathematical modeling can be successfully employed to predict the surface roughness of composites.

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Design and Analysis of Oil Seal Finishing Machine

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Abstract: The research work deals with design, analysis, manufacturing and testing of Oil Seal Finishing Machine. This machine is capable of polishing operation. This project is sponsored by Shri Siddhivinayak Workshop, Mumbai. By manual operation they finish 500 oil seal per hour, but company requirement is 5000 oil seal per hour approximately. So, we design new machine which can finish 5400 oil seal per hour approximately. As simple layout and tricky operation enables this type of machine to work practically at low cost, low maintenance, low capital investment in less space.

Keywords: Oil seal, Design, FEA, Conclusion.

I. INTRODUCTION

1.1 Problem Statement

Now a day oil seals are polish by using the drilling machine and it is very time consuming process. And also it is the inaccurate method. By this method worker are get irritated to do this work because it is very hard process and required more effort. By old method production rate is very low.

1.2 Objective

Research is mainly focused on above difficulty in industries and workshops. Hence we get some ideas to solve this difficulty. We design new semi-automatic machine to increase the production rate. This machine is more beneficial than older machine. This concept saves time & energy which leads to efficient working.

1.3 Methodology

India is progressing at higher rate and hence industrial development is on its high that's why efficient working equipment required. Oil seal polishing machine is required so theindustry context of view of the project work. Hence the future of thisproject work seems promising. The work can be modified further more onfollowing basis:-

- Single phase single motor can be use to drive both grindingwheel as well as rotating disc.
- Production rate can be increase.
- Speed can be varies as per requirement.

II. THEORY

2.1 Oil seal

The automotive radial lip seal works by creating a thin layer of oil between the sealing lip and shaft Journal. Capillary action causes the oil to seep between the lip and the shaft, which results in the oil lifting the sealing lip clear of the shaft. This thin layer is retained, and prevents leakage of the oil. Material selection for automotive engine applications is based on size, operating temperature, Environment, pressure and maximum shaft surface speed.

2.2 Traditional Polishing Processes

The principle of action of commonly used traditional finishing processes – grinding, lapping and honing. All these processes use multipoint cutting edges in the form of abrasives, which may or may not be bonded, to perform finishing action. These processes have been in use from the earliest times because of their capability to produce smooth surface at close tolerances. Higher hardness of abrasive particles is an important prerequisite for processing. If properly conducted these abrasive machining processes can produce a surface of higher quality with a controlled surface roughness combined with a desirable residual stress distribution and freedom from surface and sub-surface damages.

2.2.1 Grinding

Grinding is the most widely used abrasive finishing process among all traditional Processes used in production. In grinding the material is removed from the work piece surface by relative motion ofthe cylindrical wheel having abrasive particles embedded on its periphery.

2.2.2 Lapping

Lapping uses loose abrasives to finish the surface. It works on three body abrasive wear principle in which finishing action takes place through abrasion by hard particle strapped between work piece surface and a relatively soft counter formal surface called lap.

III. DESIGN

3.1 Basic Procedure of Machine Design

In design the components are listed down and stored on the basis of their procurement design in two categories namely –

- Design of parts.
- Parts to be purchased.

3.2 Selection and Design of Machine Parts

3.2.1 Motor Selection

Ref. – Design PSG Data Book (Page no: - 5.124)

0.5 HP AC Motor is selected due to their lower weight and suitability of high running speeds. Motor is selected of following parameters –

- KW Rating : 0.37
- RPM : 2800
- Dia. of shaft : 12j6

3.2.2 Oil Seal Specification

Ref. – Design PSG Data Book (Page no. 1.18).

- BHN = 170 – 311

3.2.3 Grinding Wheel Design

Ref. – Design PSG Data Book

Table 1: Selection of Grinding Wheel

Type	Grinding Wheel Abrasive	Grit	Grade or Bond	Peripheral Speed (m/s)	Grinding Method
Straight or Kup Wheel	Diamond	D100 – D70	Metal	12 – 18	Machining

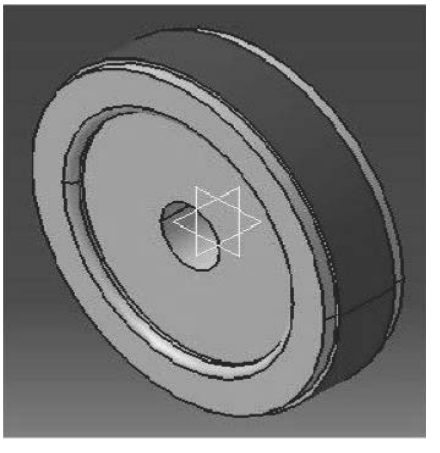

Figure 1: Design of grinding wheel

From Design Data Book, we select peripheral speed as 18 m/s to calculate diameter of wheel. We know that,

$$V = r \times \omega$$

Where,

V = peripheral speed in (m/s).
r= radius of wheel in (m).
w = angular speed (rad/s).

$$18 = r \times \frac{2 \times \pi \times 2800}{60}$$

r = 0.0615 m.

Therefore the radius of wheel = 0.0615m.
Grinding material thickness = 0.002m.
Total Radius of wheel = 0.0635 m.

Wheel selection is dependent on the kind of material to be ground and the type of grinding operation.Important factors that need to be considered in theselection of a grinding wheel are - Material to be ground and its hardness, Stock removal and surface finish, Peripheral speed of the wheel, Type of grinding machine, etc.

Aluminum is selected as material of wheel. Aluminum oxide is a chemical compound of aluminum and oxygen with the chemical formula Al_2O_3. Al_2O_3 is significant in its use to produce aluminum metal, as abrasive owing to its hardness, and as a refractory material owing to its high melting point.

3.2.4 Plate Design

Project aim is to increase production of oil seal from 500 per hr up to 5000 per hr approximately.
Thus, Estimate oil seal per min. = 83.33 oil seal / min.
Oil seal finish in one rotation = 9 oil seal / rotation
Oil seal finishing rate = 90 oil seal / min
Therefore oil seal finishing rate in 1 hr = 5400 oil seal / hr.

We done Finite element analysis of Brass Plate by using Ansys Workbench 14.1. We modeled the brass plate in Catia V5. Then, Ansys shows the results as shown in Fig. 2 to 5.

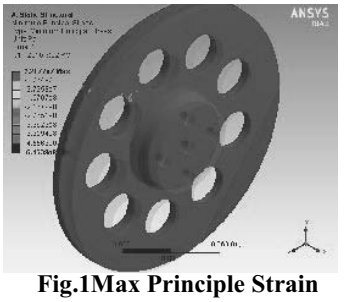

Fig.1Max Principle Strain

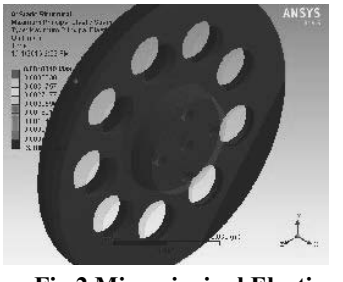

Fig.2 Min principal Elastic

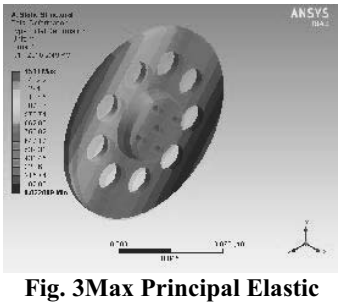

Fig. 3Max Principal Elastic

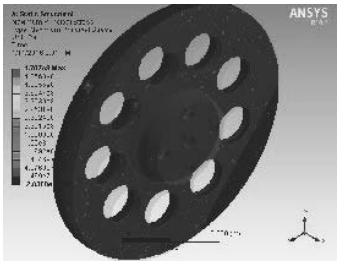

Fig. 4 Total Deformation

Brass is selected as material for plate. Brass is an alloy of copper and zinc. Additional elements, such as aluminum, lead, tin, iron, manganese, or phosphorus, are added to give the alloy specific properties. Naval rolled brass (Tobin bronze) contains about 60% copper, 39% zinc, and 0.75% tin. This brass is highly corrosion-resistant and is practically impurity free. Brass is an extremely strong and hard wearing material which should not become scratched or damaged easily. This means that, although brass is much more expensive than other materials, it will last much longer.

IV. CONCLUSION

This research concludes that, by using engineering principles, design concepts and design calculation with help of Engineering Data books, and FEA tools, we can increase the production rate as per industry requirement. Semiautomatic machine is finish 5400 oil seal per hour approximately. As simple layout and tricky operation enables this type of machine to work practically at low cost, low maintenance, low capital investment in less space. In future, this research work can help to convert semiautomatic oil seal finishing machine in to fully automatic machine at less cost and high production rate.

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Springback Prediction Analytical Model for V-Bend Process

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Abstract- The deviation from desired dimensions due to elastic driven change in shape during unloading of the forming part is known as springback phenomenon. This springback causes increase in time, cost & trials to develop the acceptable part. To eliminate these cost effective factors the springback prediction analytical model is developed and applied to V-bend forming process. The analytical model is developed by calculation of the bending stress & bending strain induced in blank in loading conditions, followed by the yield moment and elastic plastic moment conditions, and then the springback is evaluated by the geometrical analysis for the completely loaded component in v- bend forming process. The proposed model is validated using FEA software HyperForm.
Keywords- Springback Prediction, Sheet metal, Bends angle, Analytical model, HyperForm.

I. INTRODUCTION

Various research works has been carried out for effective understanding of forming process in experimental, analytical & computational studies. Elastic unloading process causes change in shape of forming part i.e. springback. However springback is majorly affected by the complexity in combination of bending-unbending, loading-unloading & stretching during forming process. As per the consideration of the manufacturing industrial practices this springback is the one of parameter affects to design tool for the forming part. As the change in dimensions after unloading due to springback leads to increase in trials, time & cost to achieve acceptable dimensions of forming part. Hence the understanding the effect of the design parameters along with component material properties on springback, Springback prediction model is effectively helps to design forming tool.

The research work of springback prediction analytical model were developed for flange bending by Nan Song & et.al.[2] & Thaweepat Buranathiti, et.al.[3], Jenn-Terng Gau, et.al for aluminum sheet forming[4], Tian-xiaZou, et.al. for thin plate forming[10]. The simple tool description is assumed in this analytical methodology to evaluate springback angle. Bending stress & strain, bending moment applied for the deformation of blank & the elastic property of the sheet metal causes the change in shape while unloading of part from V-bend tool. This research activity is purely based on analytical model and is focused on the V-bend process of the sheet metal with different three materials & bend angles. Validation of proposed model is carried out using FEA software HyperForm.

II. V-BEND PROCESS DEFINITION

This paper used a straight V-Bending process to develop the model for springback prediction for the sheet metal with different bend angle and sheet material. V-bend process consists of punch, die, and blank. The setup of tool is shown in figure 1 with following characters:

- A: The touching point between the deformed sheet and the punch
- B: The separation point between the deformed sheet and the die
- C: Part width
- L: Length of die shoulder
- O: The die root position

- t: Thickness of sheet
- θ0: Fully loaded configuration
- θf: Fully unloaded configuration, the springback angle is defined by,

$$\Delta\theta = \theta_f - \theta_0 \quad \ldots (a)$$

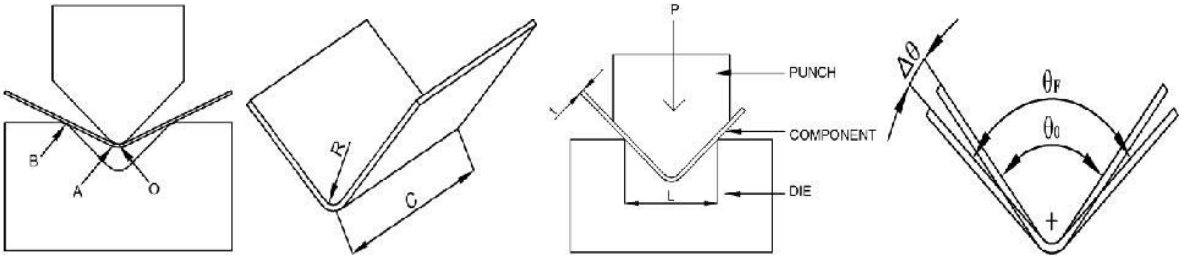

Fig 1. V-bend tool design parameters

III. ANALYTICAL MODEL

In this paper the analytical springback prediction model for V-bending process is proposed based on the earlier model in Reference [3]. The proposed analytical model is verified using FEA software HyperForm. In this model the springback is predicted by assuming linear distribution of moment from point B to point O. For most of the analytical models following assumptions are used [3]:

- For the sheet metal of blank, along width of blank the plain strain conditions and along thickness direction plane stress conditions are considered
- The blank sheet metal is isotropic and homogeneous in nature
- The blank sheet metal follow the power hardening law and Von-Mises yield criterion
- During the deformation process the normal planes to the sheet surface remain planes
- Bauschinger effect is neglected.
- Bending-strain-free conditions are considered for the blank sheet middle layer
- Conservation of volume is assumed- variation of volume due to elastic deformation is negligible.
- Along the straight and curved parts bending moment distributions are linear.
- During unloading stage only the elastic deformation occurs.

3.1. Strain & Stress expressions

The curvature κ of the deformed sheet with thickness t is defined as

$$\kappa = \frac{1}{R_d + t/2} = \frac{1}{R} \quad \ldots (b)$$

Where Rd is the die corner radius and R is the effective bending radius.
Using Von Mises law, Young's Modulus E', Yield Stress Y'& Strength Coefficient K' for plane strain calculation using Poisson's ratio (υ) are,

$$E' = \frac{E}{1-\nu^2}\ ,\ Y' = \frac{2Y}{\sqrt{3}}\ \&\ K' = \frac{2K}{\sqrt{3}} \quad \ldots (c)$$

Yield strain using hooks law is εy1 & using power law is εy2 given as,

$$\varepsilon_{y1} = \frac{Y'}{E'}\ \ \&\ \ \varepsilon_{y2} = \max\left|\varepsilon_{y1}\left(\frac{Y'}{K'}\right)^{\frac{1}{n}}\right| \quad \ldots (d)$$

Hence, the bending fiber position at εy1 & εy2 are given as,

$$t_{y1} = \frac{\varepsilon_{y1}}{\kappa}\ \ \&\ t_{y2} = \frac{\varepsilon_{y2}}{\kappa} \quad \ldots (e)$$

Yield moment M_y can be given as, $M_y = \frac{2}{3}Y'\left(\frac{t}{2}\right)^2$ …(f)

3.2 Computation of bending moments

Bending moment (M) of deformed sheet is represented by,

$$M = \int_{\frac{-t}{2}}^{\frac{t}{2}} \xi . \sigma(\xi) d\xi \quad \text{... (g)}$$

Bending moments of deformed sheet is decomposed in following bending moments [3]:
Bending moment M_{elas} is in elastic region, Mplas1 is along in Luders Band, M_{plas2} is along plastic region under power law and they expressed as,

$$M_{elas} = \frac{2}{3} E'. \kappa . (t_{y1})^3 \quad \text{... (h)}$$

$$M_{plas1} = \min\left|Y'.\left(\left(\frac{t}{2}\right)^2 - (t_{y1})^2\right), \max\left\{Y'.\left((t_{y2})^2 - (t_{y1})^2\right), 0\right\}\right| \quad \text{... (i)}$$

$$M_{plas2} = \max\left|\frac{K'}{n+2}\frac{2}{R^n}\left(\left(\frac{t}{2}\right)^{n+2} - t_{y2}^{n+2}\right), 0\right| \quad \text{... (j)}$$

$$\text{Total bending moment} = M_{elasplas} = M_{elas} + M_{plas1} + M_{plas2} \quad \text{... (k)}$$

The external force from punch P acting normally at A with the angle θP with respect to the loading direction of punch is

$$P = \frac{(1.2)C.t^2.TS}{L} \quad \text{... (l)}$$

T.S.: Ultimate Tensile strength of sheet material,

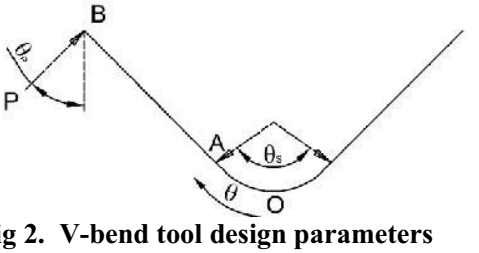

Fig 2. V-bend tool design parameters

The bending moment at die root position O is represented by MO and it is derived using the pressure distribution along the bend part S between point O and A. Mo is derived & expressed as,

$$M_0 = P\,[l.\cos(\theta_b - \theta_p) + R.\sin(\theta_b - \theta_P)] \quad \text{... (m)}$$

Here θ_p: Angle applied by die at point B is vertical to the plane of sheet hence = 90º

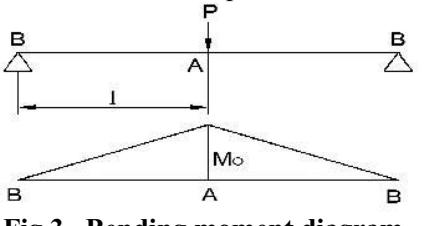

Fig 3. Bending moment diagram

3.3 Computation of bending moments

l, θ_B, θ_P, and S are geometrical based parameters used in the force/moment expressions are calculated from their geometry relations Where l is length between applied load by punch and the support of blank at the die opening length-distance between A and B & expressed as, $l = \sqrt{\frac{4E't}{LY}}$ and approximately l= L/2, $\theta_B=(\theta_p-\theta_l)$ &S=R.θ_B

3.3 Prediction of springback angle

In this springback prediction model for V-bending, the springback is considered as a purely elastic recovery of the process. Hence to calculate the springback along the straight region between point A to B, along l is derived by assuming M_B=0 & Bending moment at A (M_A) is

$M_A = M_{elasplas}$, hence it is expressed as – … (n)

The springback angle for the curved part S along V-shape bend can be given by solving as

——— – … (o)

The springback of complete V-bend is given as the summation of springback angle along straight part and the curved part and can be given as:

$$\Delta\theta = \theta s + 2\theta_l \quad \text{… (p)}$$

IV. RESULTS AND VALIDATION

Tooling & material parameters used for analytical model calculations are,

Table No. 1. Component dimensions

C	Width	R	t	L
200mm	110mm	5mm	0.9 mm	70mm

Table No. 2. Blank material properties

Exp. No.	Material	U.T.S (Mpa)	E(Gpa)	Y(Mpa)	υ	K(Mpa)	n	Bend angle θp
1.	SAE-CR-550R	700	210	600	0.3	1017	0.12	80º
2.	SAE-CR-700R	800	210	750	0.3	1163	0.12	95º
3.	SAE-CR-830R	1000	210	900	0.3	1254	0.12	110º

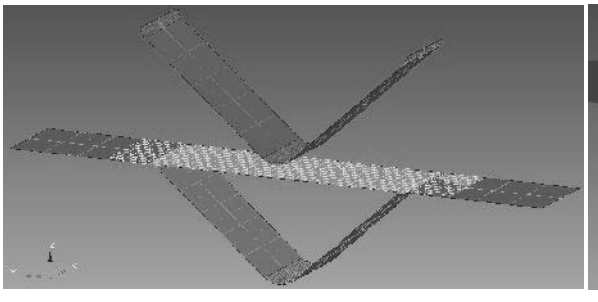

Fig. 4 Meshing of punch, blank & die in FEA HyperForm software

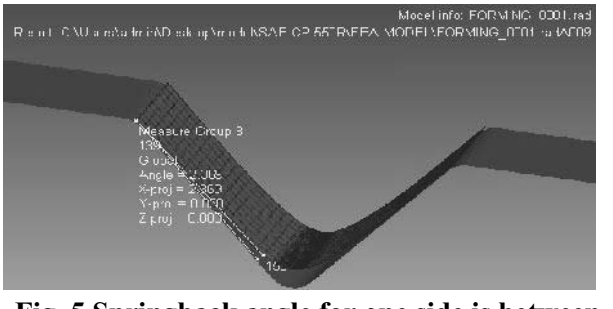

Fig. 5 Springback angle for one side is between fully loaded & unloaded condition for Exp. No.1

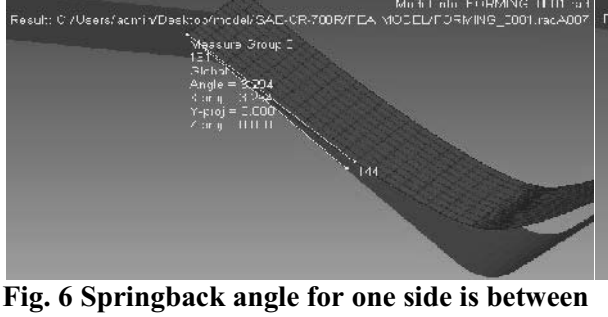

Fig. 6 Springback angle for one side is between fully loaded & unloaded condition for Exp. No.2

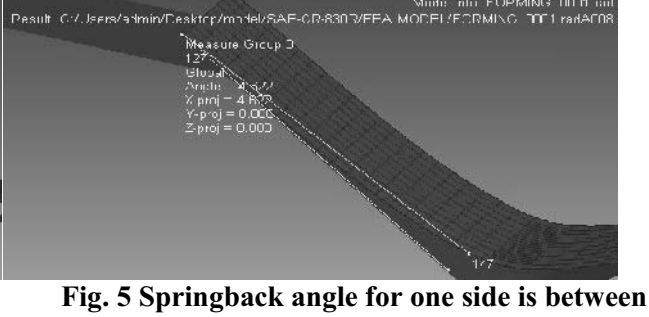

Fig. 5 Springback angle for one side is between fully loaded & unloaded condition for Exp. No.3

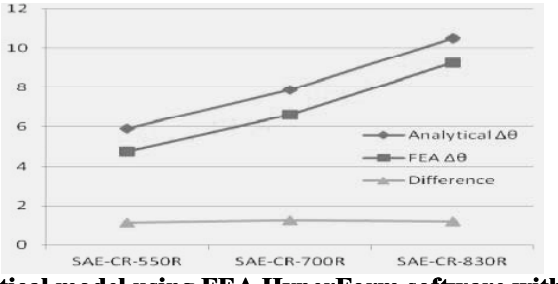

Fig. 6 Validation of Analytical model using FEA HyperForm software with the avg. error of 1.2°

V. CONCLUSION

In the proposed analytical model the bending stress and bending strain are analytically calculated by considering the incremental change in the deformation in V-shape during loading. The yield moments and elastic-plastic moments are calculated followed by the geometrical analysis of the blank for the fully loaded conditions. Using these parameters the springback prediction is carried out with calculating the springback along straight and curved part of the blank after the unloading conditions. The proposed analytical model is applied for the materials SAE-CR-550R, SAE-CR-700R, SAE-CR-830R and the springback prediction is calculated. By analyzing the results it is seen that the springback prediction using analytical model is showing approximately similar results as compared to FEA springback prediction values. The results are showing avg. error of 1.2° error compared with FEA results, & hence they are acceptable. It is seen that this analytical model is effectively helps for the understanding of the springback angle after forming, so that it can be compensate by change in design parameters. This model helps to reduce the computational & experimental efforts for compensation of springback for this particular part. This model is really cost effective by reducing time & trials to develop the tool for acceptable part.

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Failure Analysis of A Helical Compression Spring

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Abstract- Helical compressions springs function as an energy absorbing machine element. They absorb vibration and protect structure from damage. They act as shock absorber in a vehicle suspension system and thus help in giving comfortable ride by mitigating the transfer of vibration from road irregularities to the vehicle and the rider in turn. It has been observed that most of the compression coil springs fracture at the transition position from the bearing coil to the first active coil in service, while the nominal stress here should always be much less than that at the inside coil position of a fully active coil. This paper aims at analysis of the reasons for failure of a helical compression spring. The prime focus is on fatigue failure because this is the mode of failure for most of helical compression spring in dynamic loading conditions.
Keywords: Raw Material Defect, Surface Imperfection, Improper Heat Treatment, Corrosion, Shot peening and decarburization.

I. INTRODUCTION

Most of the vehicles have helical compression spring as one of the primary elastic members in their suspension systems. They act as an energy absorbing machine element. The prime aim of a vehicle suspension system is to connect the wheel to the body. A helical compression spring being an important part of the vehicle suspension system absorb energy and smooth out shocks that are received by the wheel from road irregularities. Thus, it helps in giving comfortable ride by mitigating the transfer of vibration from road irregularities to the vehicle body and the rider in turn. Fatigue failure of the suspension spring often results in a variety of ways owing to the dynamic service loading conditions. The reasons for fatigue failure of suspension spring are raw materials defects, surface imperfections, improper heat treatment, corrosion, surface conditions and decarburization. It is the combined act of some the above mentioned reasons or all of them that lead to fatigue failure. The inner surface of an active coil of the helical spring is the position of maximum stress. Raw materials defects, surface imperfections, improper heat treatment, corrosion, surface conditions and decarburization act as stress raiser and lead to failure of spring usually at the inner surface of an active coil of the helical spring.

II. COMMON REASONS FOR SPRING FAILURE

Some of the common reasons that lead to failure of a helical compression spring in service are as listed below. They are the prime factors that lead to failure of spring under dynamic loading conditions.

1. Raw Material Defect
2. Surface Imperfection
3. Improper Heat Treatment
4. Corrosion
5. Surface condition and decarburization

2.1 Raw Material Defect

A typical raw material defect is the existence of a foreign material inside the steel, such as non-metallic inclusions. In general, there are two types of foreign materials that can become trapped inside the steel solution: large imperfections such as spinells, and smaller imperfections such as inclusions that are caused by alloying elements. The fig.2.1.1 shows a raw material defect that is usually very difficult to find after a

coil is formed. This type of defect is easy to detect during the cold drawing process of coil manufacturing preparation. An ideal raw material has the form of ferrite pearlite. However, a raw material can also have local bainite inside the ferrite pearlite matrix. Due to a hardness difference, such raw materials may exhibit internal cracking.

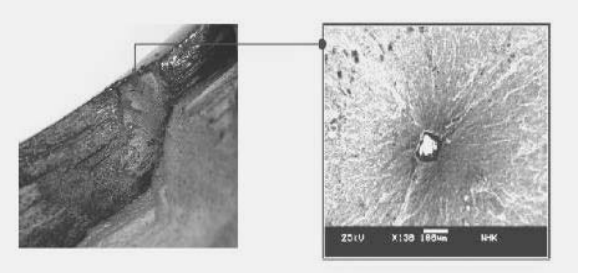

Fig.2.1.1 Fracture surface of a coil failed early due to an inclusion and Its SEM appearance [P.S. valsange, 2012]

The figure below depicts FEA model of inclusion inside the material and stress concentration near the inclusion. The stress at this inclusion is higher than at other positions in the material. These stress concentration leads to failure of material during dynamic loading conditions.

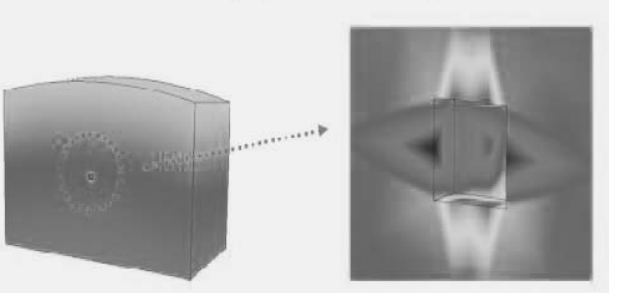

Fig. 2.1.2 FEA Model showing inclusion and stress concentration due to the inclusion [P.S. valsange, 2012]

2.2 Surface Imperfections

Surface imperfections can occur as small hardening cracks, tool marks, scale embedded to the base material during cold drawing or surface flaws inherited by the raw material. Poorly shotpeened surfaces can also be classified as surface imperfections. A crack alongside of the centerline of the wire is shown in the part model and its FEA model below. The stress distribution is also shown in the next FEA model. One can observe a high stress concentration at the crack location which is much higher than the outer surface stress level. Therefore, the product would likely fail from this point.

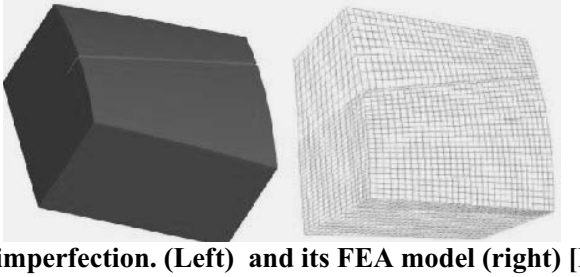

Fig. 2.2.1 Part model with imperfection. (Left) and its FEA model (right) [P.S. valsange, 2012]

Fig. 2.2.2 FEA model showing high stress level than nominal at point of imperfection [P.S. valsange, 2012]

2.3 Improper Heat Treatment

Improper heat treatment can be easily overlooked since a temperature difference in heating does not relate directly to the hardness of the material. Extensive evaluations are usually needed to identify this problem. The fig. 2.3.1 shows a typical example of an improper heat treatment. Prolonged heating can cause the prior austenite grain size to grow significantly. Improper heat treatment can also result in the microstructure becoming pearlite instead of the required martensite. This type of defect is easier to identify due to the clear difference in hardness. The figure shows two different coils of the same product with varying microstructure. This defect usually occurs when the heating system does not operate normally. Again, referring to the figure, the left hand side coil has a much lower lifetime than that of the right side. Tempering induces the decomposition of the retained austenite into mixture of ferrite and carbides

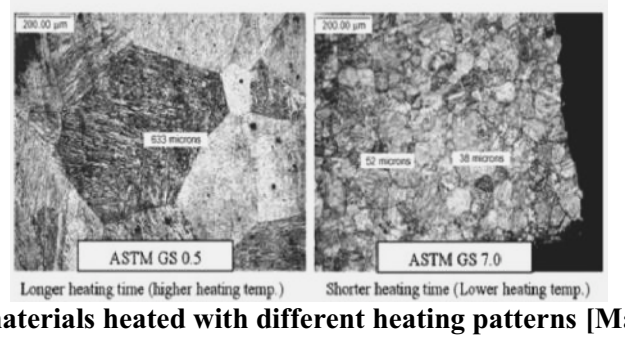

Fig. 2.3.1 Identical raw materials heated with different heating patterns [Manish Dhakore et. al,2013]

2.4 Corrosion

In case where springs are subject to even mildly corrosive action while under fatigue stressing, the endurance limit for most ordinary material is reduced greatly. Higher value of endurance limits are achieved on corrosion resistant steels like chromium steel. In spring design, one should use either low working stress or protect material from corrosive action. Electroplating is one method to protect against corrosion. Cadmium plating and chromium plating is usually used. The FEA models below depict the corrosion in the material. The stress concentration around the place of corrosion is shown in the next FEA model. Finer meshing is used around the corrosion area since a higher stress concentration is expected there. This high stress concentration will cause early spring breakage from this point. One should either protect spring materials from corrosion or else use low working stress. Even then, if corrosion is present, there is no assurance that eventual fatigue failure will not occur, if sufficiently large no of stress reversal take place.

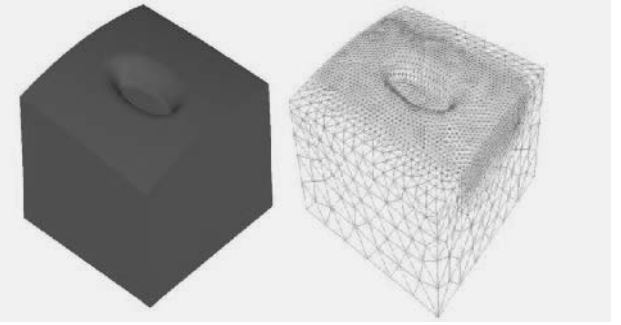

Fig. 2.4.1 FEA Model showing corrosion [P.S. valsange, 2012]

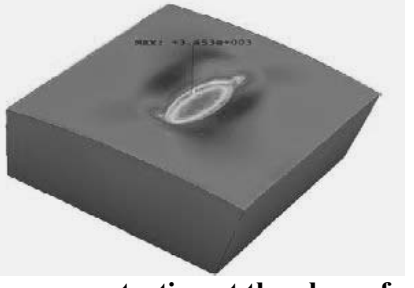

Fig. 2.4.2 FEA Model showing stress concentration at the place of corrosion [P.S. valsange, 2012]

2.5 Surface Condition and Decarburisation

Surface conditions in spring steel have a marked effect on the fatigue strength of the material. During heat treatment and forming operations of springs, the surface layer is decarburised to some extent (i.e. there is loss of carbon content form a thin upper layer of surface). Thus there is, in fact, a thin layer of low-carbon steel (which is relatively week) over the body of the spring which is composed of the relatively strong high-carbon steel or alloy steel. Under repeated loading conditions, the weaker low carbon steel on the surface may a develop crack which then spreads across the section as a consequence of the high stress concentration at base of the crack. Actual tests have shown that a layer of this decarburized material is sufficient to greatly weaken the spring during fatigue. A decarburised layer is shown in the FEA model below. This decarburized layer is weaker than the high carbon layer steel below it. It is prone to crack initiation during stress reversal under dynamic loading conditions.

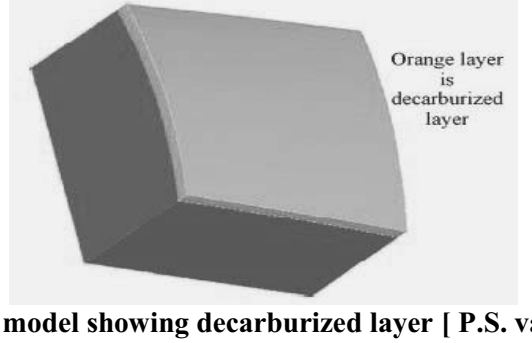

Fig. 2.5.1 FEA model showing decarburized layer [P.S. valsange, 2012]

III. CONCLUSION

It is clear from above analysis that raw materials defects, surface imperfections, improper heat treatment, corrosion, surface conditions and decarburization act as stress raiser and lead to failure of spring usually at the inner surface of an active coil of the helical spring. So, it is imperative that a helical spring is designed with great care. Raw material selection for spring manufacturing is the first step where a designer must look for presence of raw material defects as they play an important role in fatigue failure of spring. It is equally important to look for manufacturing blunders like imperfection in coil surface that may develop during coiling of spring and improper heat treatment that may lead to decarburization. If helical spring is to be used in corrosive environments, then corrosive prevention methods like colour coatings, use of grease on the coil surface etc. are to be adhered to. In order that a helical spring functions well during its intended service life, fatigue failure is to be avoided as far as possible. This goal can be fulfilled to a great extend by carefully avoiding the above mentioned factors that lead to fatigue failure of a helical compression spring.

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Stress Analysis of Connecting Rod of Two Wheelers

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Abstract:-It is the main component of internal combustion (IC) engine. The connecting rod is the intermediate member between the piston and the crankshaft.It is the most heavily stressed part if IC engine. During its operation various stresses are acting on connecting rod.Its primary function is converting the reciprocating motion of the piston into rotary motion of the crank. Existing connecting rod is manufactured by using casting. This project describes modeling and analysis of connecting rod. The objective of this project is to investigate the compressive stress acting on connecting rod at different loading condition and to explore weightreduction opportunities for a production forged steelconnecting rod. Firstly a proper Finite Element Model is developed using software CATIA V5. Then the FEA is done to determine the stresses in the existing connecting rod for the given loading conditions using FEA software. Based on the observations of the static FEA and the load analysis results, the load for the optimization study was selected. The results are also used to determine degree of stress multiaxiality, and the fatigue model to be used for analyzing the fatigue strength. Outputs include fatigue life, damage, and factor of safety.
Key Words:-Connecting rod, Finite Element Analysis(FEA), Von Mises, Vibration Analysis, ANSYS, Static Structural Analysis

1. INTRODUCTION

Connecting rod is the intermediate link between the piston and the crank. And is responsible to transmit the push and pull from the piston pin to crank pin, thus converting the reciprocating motion of the piston to rotary motion of the crank. For automotive it should be lighter should consume less fuel and at the same time they should provide comfort and safety to passengers, that unfortunately leads to increase in weight of the vehicle. This tendency in vehicle construction led the invention and implementation of quite new materials which are light and meet design requirements. The major stresses induced during its operation are axial and bending stress. The compressive stress has more influence due to gas pressure. The gas pressure is the maximum force acting on connecting rod. Hence calculation of compressive stress is of more importance. So the compressive stress generated in connecting rod is calculated experimentally and will be verified with numerical results. The carried out stress analysis of connecting rod by finite element method using CATIA V5 and ANSYS work bench 14.5 software.

I. OBJECTIVES

1. To do the comparative analysis of three different connecting rods.
2. To determine the Von Misses stresses, Shear stresses, and Equivalent Alternating stress, Total Deformation, Fatigue life and to optimize in the existing Connecting rod design.
3. To calculate stresses in critical areas.

II. METHODOLOGY

1. For stress analysis two most critical area is considered bigger end and smaller end of connecting rod. Four different sections are consider of stress calculation as Load is applied at bigger end and smaller end kept fixed. Three different load which are obtained with the help of engine specifications are used for analysis purpose. three model of connecting rod is created in CATIA V5R17software.

2. Dimensions are obtained by measuring the dimension of connecting rod by using Vernier caliper, micro meter, ruler and graph paper.
3. FEM analysis of a connecting rod is done in ANSYS workbench 14.5 software. First connecting rod model is imported to the ANSYS by converting the CATIA V5 file into ".igs" extension file format. After successful import of model material property is defined. As this connecting rod is of {Hero Honda splendor}, similarly two others connecting rod is imported. The property which is used and necessary for analysis of {Hero Honda splendor}.

MATERIAL PROPERTIES

Serial No.	**Material properties**	**Material**
		Cast Iron
1.	Young's modulus (E)	1.78×105 MPa
2.	Poisson's ratio (μ)	0.3
3.	Density (ρ)	7.197×10-6 kg/mm3
4.	Tensile strength	100 to 200 MPa
5.	Compressive strength	400 to 1000 MPa
6.	Shear strength	120 MPa
		Structural Steel
1.	Young's modulus (E)	2.0×105 MPa
2.	Poisson's ratio (μ)	0.3
3.	Density (ρ)	7.85×10-6 kg/mm3
4.	Tensile ultimate strength	460 MPa
5.	Tensile yield strength	250 MPa
6.	Compressive yield strength	250 a

III. FEA ANALYSIS:-

In this study of finite element model the force is applied at piston end and the crank end of 600N. The force applied at the piston end. The Von-misses (compressive) stress is calculated for each different force. The figures presents the stress generated in connecting rod. By performing numerical results are obtained for stress generated at piston end and the crank end of connecting rod.

Hero Honda splendor

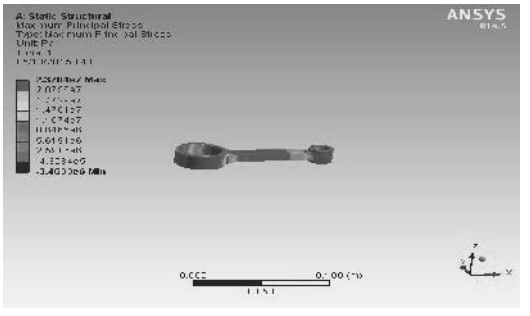

Fig 1:- Maximum principal stress

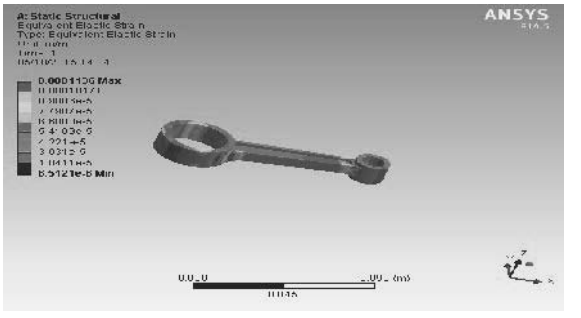

Fig 2:- equivalent elastic strain

Bajaj CT100

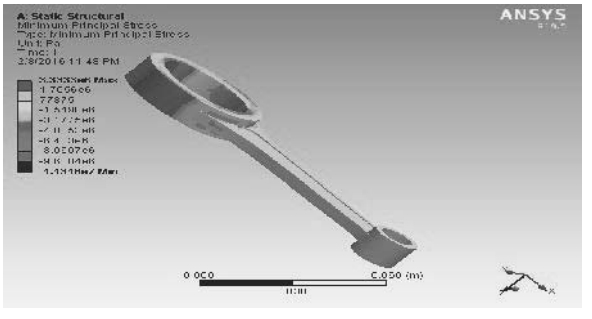

Fig 3:- Maximum principal stress

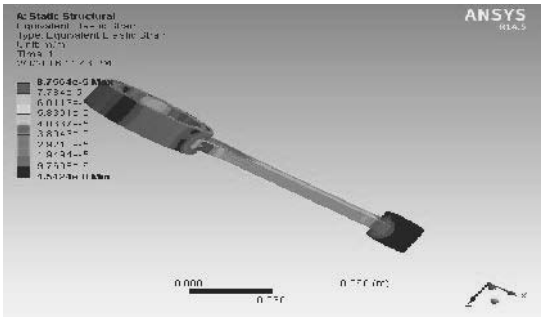

Fig 4:- equivalent elastic strain

Honda Activa

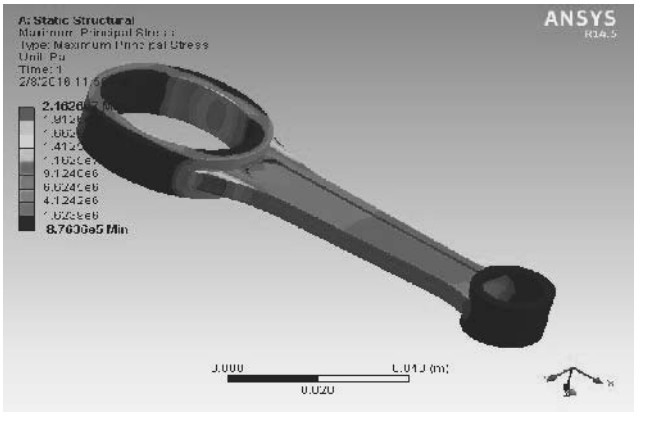

Fig 5:- Maximum principal stress

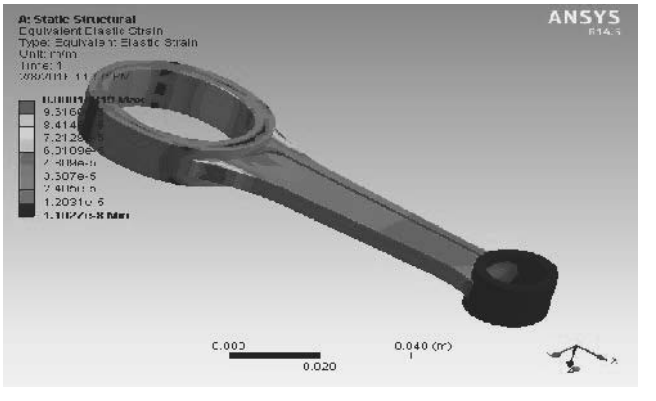

Fig 6:- equivalent elastic strain

IV CONCLUSION

1. It is observed from numerical analysis that maximum stress is obtained at fillet region of three connecting rod, and shank region. The stress generated at shank is well below allowable limit. Based on numerical analysis with finite element analysis it is also observed that maximum stress is generated at piston end of connecting rod. So the chances of failure are more at the piston end.

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Furnace Nozzle Cleaning Standardization

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Abstract - Although the great majority of carburizing is still carried out at atmospheric pressure, recent developments in vacuum furnaces and steel technology have meant that carburizing can now be carried out in a more environmentally friendly way under low pressure. In this process huge furnace is used for carburizing with number of nozzles. This are made up of Inconel alloy. Inconel is a alloy derived from effect of Nickel-Chromium matrix. This nozzles are used to pass acetylene and hydrogen gas to the main inlet of furnace. Due to certain chemical reaction this nozzles are choked up by tar, sludge, soot or carbon particles. Nozzles are of very minor diameter approximately 2mm.
Certain traditional methods are used such as to replace the entire set of nozzle to swipe out the problem of choking. This report describes the current state of the art and practical experiences with low-pressure carburising nozzles.
Keywords - Inconel, nozzle, carburizing, soot, sludge

I. INTRODUCTION

Of the many technologies available today to improve the performance of engineered surfaces, carburising is one of the most common. Carburising is enduringly popular because it uses a higher temperature than most thermochemical processes so that a deep hard layer can be formed in a short time. The great majority of carburising takes place at atmospheric pressure in an atmosphere containing large quantities of carbon monoxide. The benefits achieved by vacuum carburizing can be realized in high volume, critical component manufacturing. Vacuum carburizing has proven itself a robust heat treatment process and a viable alternative to atmosphere carburizing.

Low pressure carburizing furnace is used in BOSCH Pvt. Ltd. for hardening of various components. These are also known as vacuum furnaces. Nozzles are used in the low pressure carburizing furnace through which gases pass. It passes the gas namely Acetylene, Hydrogen and Nitrogen. The process is carried out at very high temperatures. These temperature is responsible for various process carried out in furnace. While this process is carried on, various chemical reactions takes place. During the process due to chemical reaction between the gases sludge is formed in the nozzles. We are focused on the above problem. Our first preferences towards the problem solving is to drill the holes in nozzles by using specific parameters.

II. CARBURIZING

In low-pressure carburising (LPC), the vacuum furnace is evacuated after charging. When the pressure has dropped below 10Pa, the furnace chamber is effectively free of oxygen and the heating cycle can start. The charge is heated to between 790 and 1040°C in up to three stages, depending on the carburising temperature and the sensitivity of the components. Once the whole charge has reached the carburizing temperature, the first carburising phase is initiated by admitting the hydrocarbon into the furnace at pressures between 10 and 1000Pa. Carbon transfer is so effective that the austenite is saturated with carbon after only a few minutes. The first carburizing phase must therefore be stopped after a relatively short time by interrupting the gas supply and evacuating the furnace.

Carburization is a heat treatment process in which iron or steel absorbs carbon liberated when the metal is heated in the presence of a carbon bearing material, such as charcoal or carbon monoxide, with the intent of making the metal harder. Depending on the amount of time and temperature, the affected area can vary in carbon content. Longer carburizing times and higher temperatures typically increase the depth of carbon diffusion. When the iron or steel is cooled rapidly by quenching, the higher carbon content on the outer surface becomes hard via the transformation from austenite to martensite, while the core remains soft and tough as a ferritic and/or pearlite microstructure.

III. PROBLEM DEFINITION

The process is carried out at very temperatures and due to certain reactions between gases carbon deposition takes place on the components. Also these reaction is so effective that the nozzles present inside the furnace gets choked up. The nozzle get choked by soot, sludge which are nothing but the carbon particles. Due to this the flow of gases through the nozzle is stopped. Hence the problem is so critical that it cannot be easily solved.

IV. PROBLEM SOLUTION

The solution which was usually used was of replacing the whole nozzle setup. This method results in high cost and company needed to stop it and find alternate solution. The soot formed is so hard that it cannot be cleaned easily. So we found a solution and started drilling. Usually drilling is used for making holes and the same principle we used here. We used a 2mm drill made of carbide to drill the nozzle. Currently the method is worth working and the material viz. soot and sludge are removed. These method makes easy to flow the gases which was initially going in process.

Figure 4.1 Set of nozzles on the furnace door

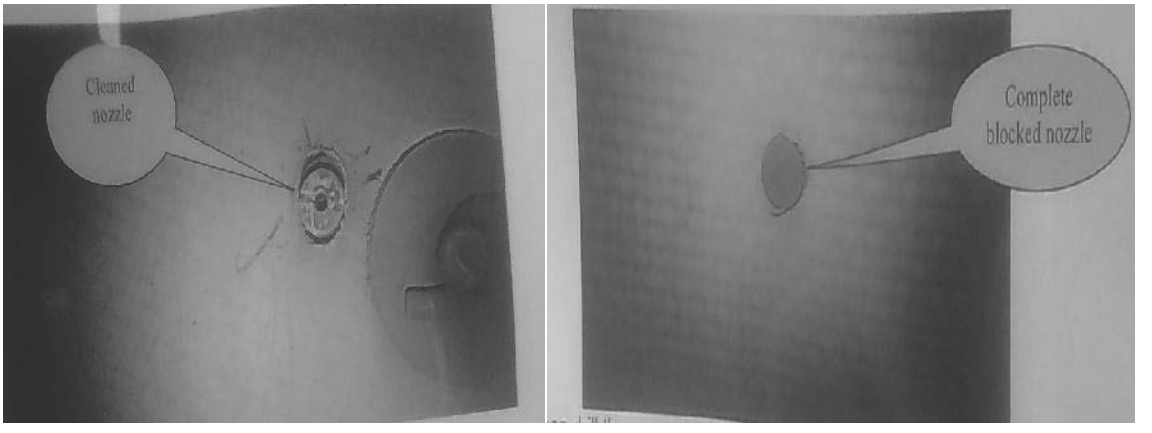

Fig 4.2 Cleaned nozzle & blocked nozzle

V. CONCLUSION

A great deal of experience has now been gained operating LPC systems around the world with various process parameters, different modes of operation and types of vacuum pumping equipment. The problems that arise are familiar and can be resolved by selecting the right approach for the given process type. However, for typical LPC furnaces using propane and generating a lot of soot and tar, operating reliability can be assured by using Drilling Process, Or by changing of nozzles set up. Many LPC carburized components can be designed so that they can be quenched with high pressure nitrogen.

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Treadmill Bike

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Abstract-The treadmill bike is totally new way of moving it is done by the combination of electric and mechanical part assessment i.e. battery and gear .Motion of bike from one place to another place will be done by human effort. The electric assist is in the combination with the gear. The three gear pair boosting your walking pace up the regular bike. The treadmills consist of component i.e. small motor, push type switch, battery, wheel, treadmill, gear box of cycle. There are following type of gear boxes are used in automobiles there are two main types of gear change mechanisms, known as Derailleurs and hub gears. These two systems have both advantages and disadvantages relative to each other, and which type is preferable depends very much on the particular circumstances.
Keywords-Derailleurs and hub gears, treadmill bike, motor, battery, gear box.

I. INTRODUCTION

The treadmill bike is totally new way of moving it is done by the combination of electric and mechanical part i.e. battery and gear .Motion of bike from one place to another place will be done by human effort. The electric assist in the combination with the gear has three gear pair boosting your walking pace up the regular bike. With the electric assist it takes no more effortsthan a walk in the park. Treadmill bike is basically a new concept for travelling and exercising. [5]

It eliminates most of the issues related to both. As we know how important exercise is in this stress full world so it helps to maintain our health as it works through human effort. Due to the ever increasing demand of fuel for various purposes it also eliminates the use of any fuel in any case. The gears present in it provide us the speed which is required for travelling faster. This makes this bike different from a simple bicycle. With less effort we can drive through a long way. [6]

A treadmill is a device generally for walking or running while staying in the same place. Treadmills were introduced before the development of powered machines, to harness the power of animals or humans to do work, often a type of mill that was operated by a person or animal treading steps of a tread wheel to grind grain. In later times, treadmills were used as punishment devices for people sentenced to hard labour in prisons. The terms treadmill and tread wheel were used interchangeably for the power and punishment mechanisms. [7]

Treadmills were introduced before the development of powered machines, to harness the power of animals or humans to do work, often a type of mill that was operated by a person or animal treading steps of a tread wheel to grind grain. In later times, treadmills were used as punishment devices for people sentenced to hard labour in prisons. The terms treadmill and tread wheel were used interchangeably for the power and punishment mechanisms.

II. LITERATURE SURVEY

"Physical activity," "exercise," and "physical fitness" are terms that describe different concepts. However, they are often confused with one another, and the terms are sometimes used interchangeably. This paper proposes definitions to distinguish them. Physical activity is defined as any bodily movement produced by skeletal muscles that result in energy expenditure. The energy expenditure can be measured in kilocalories. Physical activity in daily life can be categorized into occupational, sports, conditioning, household, or other activities. Exercise is a subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness. Physical fitness is a set of attributes that are either health- or skill-related. The degree to which

people have these attributes can be measured with specific tests. These definitions are offered as an interpretational framework for comparing studies that relate physical activity, exercise, and physical fitness to health. [1]

A new continuous treadmill protocol (USAFSAM) has been designed using a constant treadmill speed (3.3 miles/hour) and regular equal increments in treadmill grade (5 percent/3 min). The constant treadmill speed requires only initial adaptation in patient stride, reduces technician adjustments and produces less electrocardiographic motion artefact than do protocols using multiple or higher treadmill speeds, or both. The regular equal increments in treadmill grade are easy to implement and provide a larger number of workloads than do protocols that are discontinuous or require larger changes in work load. [2]

In this paper, an experimental validation of the lateral dynamics of a bicycle running on a treadmill is presented. From a theoretical point of view, bicycling straight ahead on a treadmill with constant belt velocity should be identical to bicycling on flat level ground with constant forward speed. However, two major differences remain: first, stiffness's of the contact of the tire with the belt compared to the contact on flat level ground; second, the belt velocity is fixed with respect to the world, irrespective of the change in heading of the bicycle on the treadmill. The admissibility of these two differences is checked by comparing experimental results with numerical simulation results. The numerical simulations are performed on a three-degree-of-freedom benchmarked bicycle model [3]

Exercise is inevitable to keep health in good status. There are few scientific studies to show the differences between different types of exercises in health and disease. In our study we compared the treadmill exercise and bicycle ergometer exercise and their effect on maximum heart rate attained, systolic blood pressure and diastolic blood pressure in twenty one healthy volunteer aged between eighteen to twenty years. We recorded these subjects' blood pressure before exercise and after exercise; heart rate before exercise, during exercise and after exercise. Also we enlisted the advantages and disadvantages of treadmill exercise and bicycle ergometer exercise, so that these two types of exercise can be appropriately used for health promotion, diagnosis of diseases and for rehabilitation of the individuals. [4]

III. METHODOLOGY

Millions of people used bicycle everyday although very little modification has been done till now, very little research has been done in order to modify the basic structure of bicycle into the most effective design which is the best for human comfort. Modification has been tested on the racing track where many uncontrollable factors may affect the result. It is important to identify the energy output while riding different types of bicycles. Design change in the model should not make the cycle look bulky.

Cycling is considered as one of the best exercise to eliminate the disease such as blood pressure and obesity. The Dutch has deep love affair with the bicycle which it was probably deemed a good idea to mixing concepts of treadmill with that of bike. We know treadmill is one of the modern equipment for excising in modern era. So it was new idea to merge the treadmill and cycle in order to exercise as well as to move from one place to another.

Treadmill bike is a combination of bicycle and treadmill, it help us to perform two works at a time firstly transport ,which is the most essential activity of a person in day to day life. Secondly since the treadmill bike works on human efforts it saves time for exercising. The main feature of the treadmill bike which makes it different from cycle is that it contains gear motor and battery which helps to travel at a faster rate than the cycle with less human efforts as compared to cycle. It is also cheaper than a normal motor bike which also makes it economic. No fuel is consumed.by it because of this reason it is economic and environment friendly.

IV SPECIFICATION

A. Motor

- DC motors for electric scooters and other electric devices
- Voltage: 24V
- Wattage: 350W

- Rotation: 2650 RPM
- Torque: 2.5 N.M to 4 N.M
- Efficiency(%): >75
- Dimension(Width x Length) = 101*69

B. Battery

- 12AMH

Fig 1: Treadmill Bike

The basic components of the treadmill bike consist of motor, treadmill, push type switch and cycle gear box. As soon as we push the push type switch then metal slit of push type switch is pushed and electrical contact is created in between motor and push type switch. Switch is connected to a motor the starting torque is given to the motor by the battery the treadmill bike start moving simultaneously and we start moving on treadmill bike. The work of the motor reduces as soon as we start moving on it, the gear arrangement provide us the variation in the speed as per our requirement.

The shaft of the treadmill is connected to the chain type mechanism which drives the gear through which cycle tiers moves. The battery is situated in the box above the rear wheel it can be a onetime use or rechargeable battery. The speedometer is connected on the handle to indicate speed of the treadmill bike. A treadmill bike requires a larger area to take turn than a normal bicycle. So distance should be maintained as soon as we know we should have taken a turn.

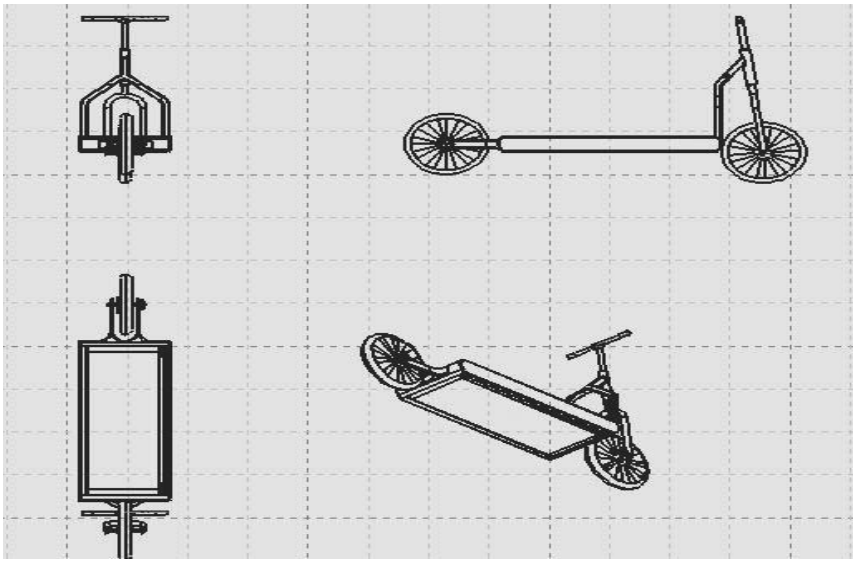

Fig2: Different Views of Treadmill Bike

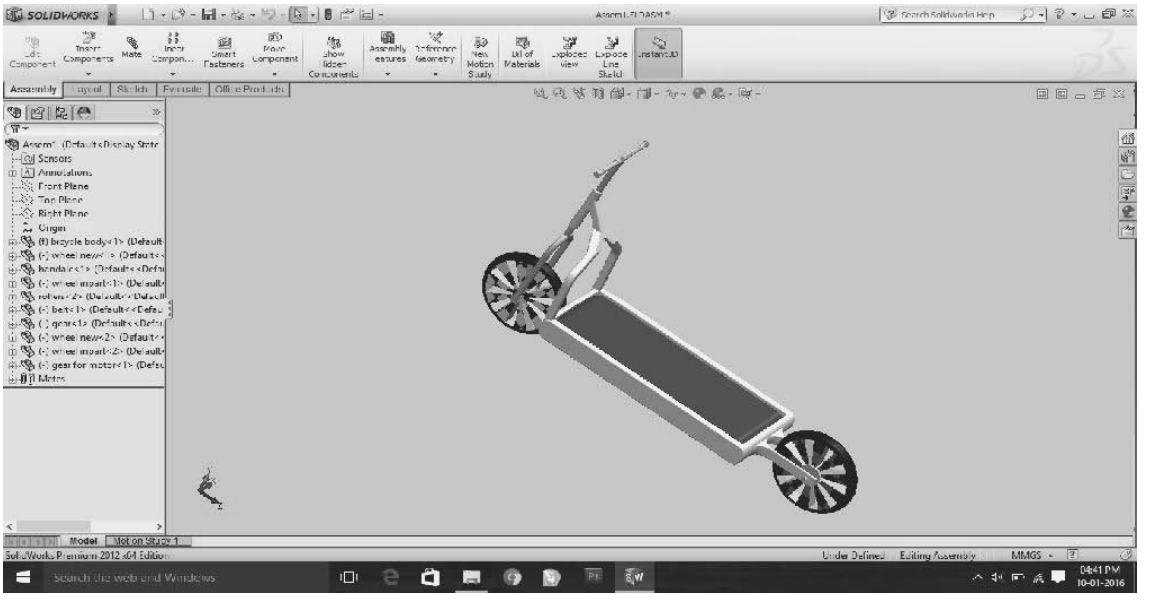

Fig 3: Assembly of Treadmill Bike

V. FUTURE SCOPE

The treadmill bike is totally new way of moving it is done by the new way of electric and mechanical part assessment battery and gear .Motion of bike from one place to another place will be done by human effort. The electric assist is in the combination with the gear. The three gear pair boosting your walking pace up the regular bike. As we know the bike works on more on human effort it helps to eliminate a health issues like obesity and lungs diseases, driving it daily through as short distance can help to maintain good health as we know it does not use any fuel of which the cost is increasing frequently nowadays becoming very

costly this will be a good option for travelling in the near future. It can be driven by any person of different edges. Due to scarcity of fuel, treadmill bike will benefit e great extend to human life. It also helps in exercising which is required for a person to be fit, so treadmill bike also saves time for exercising.

VI. CONCLUSION

In this paper we have described a new way of travelling as well as exercise with the help of a new model of bike which is combination of treadmill and bicycle. It can be used in place of regular bike at cheaper cost and without use of fuel. The treadmill bike will proof to be a future vehicle as no fuel is used for travelling through this and it is pollution free. The treadmill which is used for walking helps to keep us fit as exercise is also one of the important task for a person to be fit and healthy for day to day life. Treadmill is cheaper than the normal bike which also makes it efficient and economic.

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Study of Sloshing Phenomenon in an Automotive Irregular Shaped Fuel Tank Using CFD

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Abstract-Sloshing is a phenomenon which has gained importance where liquid and air interaction happens with in a closed volume. This is predominantly observed in the field of Automotive, Aeronautics, and Petrochemical storage to name a few. Fundamentally enclosed fluid in a defined volume is a relative motion with respect to time when there is acceleration or de-acceleration which will change the direction of fluid with in enclosed volume leading to damage the encloser itself.In order to study the influence and impact of sloshing we have taken an irregular shape fuel tank from an automotive application. Here in this case the study revolves around different level of fluid in the fuel tank, tank without baffle and tank with baffle in order to understand the Fluid Structure Interaction (FSI). During the course of our study it helps us to understand the design, position of baffle and opening on the baffle in co-relation with the different level of fluid in the tank. To carry out the study we have taken the help of ANSYS FLUENT 15.0.7 and User Defined Function (UDF) to understand different parameters and evolve a viable design which meets the performance criterion. During this act, an internal guideline in terms of meshing, planning and solution time is developed without compromising the results.

Keywords: Sloshing;CFD; FSI;Baffle;UDF

I. INTRODUCTION

Liquid is one of the phase of a material which does not have a definite shape and geometry. Due to this arbitrary nature it takes the shape of encloser in which it is stored. The enclosed liquid is characterized by its own properties like density, viscosity and surface tension which defines the interactive relationship into Fluid Structure Interaction (FSI). Atmospheric operating conditions are taken into account while studying the sloshing phenomenon. Volume of Fluid (VOF) multiphase model in ANSYS FLUENT is used to simulate the sloshing phenomenon; though this approach gives a good result for sloshing phenomenon but it is unable to give the forces exerted on different parts of fuel tank. So in order to capture those forces we developed a User Defined Function (UDF) which gives the magnitude of forces acting normally on each cell of the particular part of fuel tank at each instant.
In a tank, fluid by itself is laminar in nature at stationary condition but when excited by an acceleration or de-acceleration of defined value, liquid get displaced from its equilibrium position into a phenomenon called sloshing. Momentum and inertia which comes with the sloshing leads to a force on baffles and tank structure. These developed forces by sloshing are captured with the help of UDF. The importance of sloshing is not only limited in catering the turbulence but also in curbing Noise, Vibration, Harshness (NVH) and the stability of system.

II. CFD SLOSH MODELING

Initially laminar flow is assumed and the flow is considered to comprise of two fluids: air as a gas phase fluid and water as liquid phase fluid. In the model air is treated as primary phase and water as secondary phase. The liquid flow is governed by unsteady incompressible continuity and Nervier-Stokes (N.S)momentum equation.

$$\nabla.\vec{u} = 0 \quad (1)$$

$$\rho\left(\frac{\partial\vec{u}}{\partial t} + (\vec{u}.\nabla)\vec{u}\right) = -\nabla p + \mu\nabla^2\vec{u} + \bar{f} \quad (2)$$

Where,
$\nabla$is the gradient operator

$\nabla.$ is the divergence operator

$\nabla^2$is the Laplace operator*s* is the pressure

$\rho$is the density of fluid
$\mu$is the fluid viscosity
$\vec{u}$ is the velocity vector and
$\bar{f}$is the body force vector representing the forces arising from accelerations due to gravity and external disturbances, such as vehicle maneuvers, such that

$$\bar{f} = \vec{\rho} + \vec{\rho} \quad (3)$$

Where, is the acceleration due to gravity and is the acceleration attributed to a vehicle maneuver.
The air-water interface is tracked by solving the volume fraction equation:

$$\frac{\partial F}{\partial t} + \nabla.(\vec{u}F) = 0 \quad (4)$$

Where, *F* is the volume fraction function. In the computation domain, the unity value of *F*is assigned for all grid cells which are completely occupied by the liquid, while zero valueis assigned for all grid cells completely occupied by the gas. The grid cells partially occupied by liquid assume values of *F* ranging from zero to one, depending on the fractions of both fluids in the cells. The gas-liquid interface is thus determined by the cells with *F* values lying between zero and unity.
Although the flow is treated as a two phase flow, only one set of the governing equations, Equations (1) and (2), coupled with the volume fraction equation (Equation (4)), are solved. The fluid properties, such as density and viscosity, for different phase fluids in the Navier-Stokes (N.S.) equations are determined by the evolution of volume fraction for a grid cell. For example, since the liquid phase is the interest of tracking, the liquid density in each cell can be determined by a general expression:

$$\emptyset = F_2\emptyset_2 + (1 - F_2)\emptyset_1, \quad (\emptyset = \rho \, or \, \mu) \quad (5)$$

Where □*1* and □*2* indicate the densities or viscosities of air and water, respectively. *F2* is the value of volume fraction of the liquid phase for a cell. The above modeling was realized using the ANSYS FLUENT software package. The software uses the finite volume method to discrete the integral form of the governing equations, Equations (1) and (2). In the present modeling, the segregated solver was activated, so the governing equations could be solved sequentially. The flow equations are solved based on the pressure correction and pressure-velocity coupling technique, Pressure-Implicit with Splitting of Operators (PISO). This scheme requires dramatically less number of iterations to reach convergence, particularly for the transient flow. The second order upwind scheme was chosen for the momentum discretization. Considering the large body forces involved in the twophase flow, the body-force weighted scheme was adopted for the pressure interpolation. The implicit body force treatment was used to achieve the partial equilibrium of pressure gradient and body forces, and also to obtain a good convergence. The first order implicit scheme was chosen for the transient formulation with non iterative time advancement. No slip condition was selected for all the tank walls.
The geometric reconstruction (Geo-Reconstruct) scheme was used for the calculation of face fluxes near the interface between two fluids for the VOF model. The geometric reconstruction scheme represents the interface between fluids using a piecewise-linear approach. A smooth interface shape could be formed using this interpolation scheme, even for an unstructured grid. Since the FLUENT software uses the gauge

pressure in the calculations, the location of reference pressure is very important. It should be kept constant; the reference pressure is located in the lighter air phase within the tank ceiling. Since the FLUENT software does not give the output parameters of interest, slosh forces were calculated at each instant using the user defined functions (UDF).

The slosh force components, *Fx*(lateral), *Fy*(longitudinal) and *Fz* (vertical), can be derived from the integration of the pressure over the liquid wetted wall and baffle boundaries, such that:

$$F_y(t) = \sum_{\partial\Omega} (P_i \bar{A}_{yi}) \quad (6)$$

$$F_x(t) = \sum_{\partial\Omega} (P_i \bar{A}_{xi}) \quad (7)$$

$$F_z(t) = \sum_{\partial\Omega} (P_i \bar{A}_{zi}) \quad (8)$$

Where*Pi* is the pressure at the ith face centroid in the wall zones$\bar{A}_i$ is the area vector of the ith face in the wall zones, and $\delta\Omega$is the domain of liquid wetted faces on the wall boundary.

III. CFD SLOSH ANALYSIS

3.1. Geometry

The geometry of the tank is generated by using CATIA V5. Following are the different tank geometries used for the simulation.

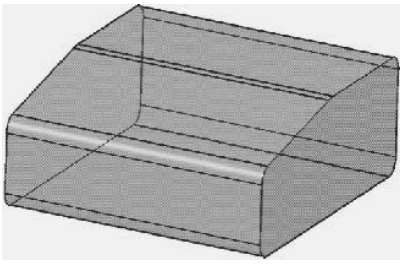
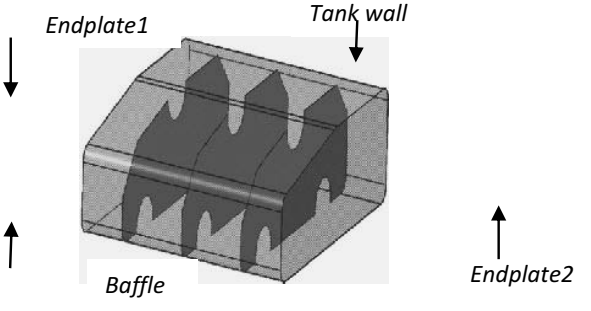


Figure 1. Tank without baffle Figure



2. Tank with baffle (Basecase)

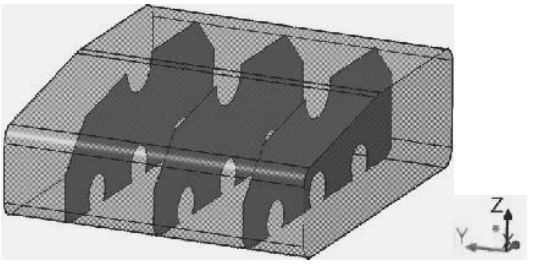


Figure 3. Tank with baffle-3 hole

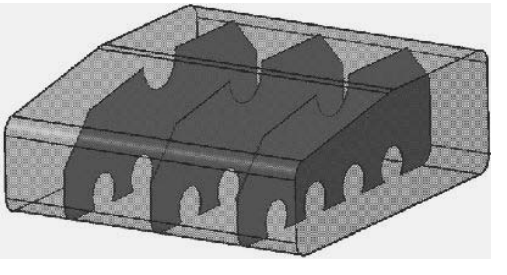


Figure 4. Tank with baffle- 4 hole

Mesh generation process is carried out using GAMBIT. Hex mesh is preferred in order to reduce the cell count and ultimately the solution time. The meshing details are as below.

Element type – Hexahedral

Total elements – 0.4 to1.2 million cells (Depends on configuration)

Mesh quality (Skewness) < 0.8 (0-best quality, 1-worst quality)

3.2. Simulation Set-up

The simulation is done with the help of ANSYS FLUENT by using Volume of Fluid (VOF) multiphase model. The simulation was done for 4 seconds of sloshing, from 0 to 2 seconds with an acceleration of 4.5 m/s2 and for the next two seconds i.e., after breaking 2 to 4 seconds with a de-acceleration of 4.5 m/s2 (assumed). As the process is isothermal, the energy equation is turned off because there is no exchange of heat energy.
The two phases used here are air and water. The primary phase is air and secondary phase is water.

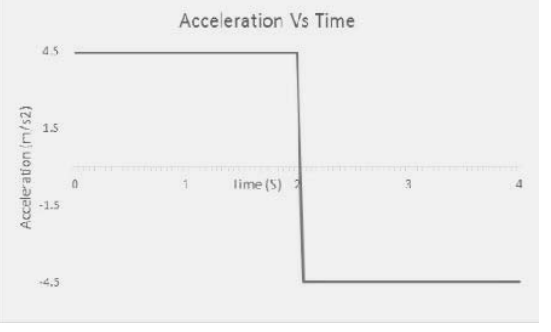


Figure 5. Input data

3.3. CFD Results

To study the liquid sloshing phenomenon, interface between the air and fluid has to be simulated and the sloshing behavior has to be found out on the interface. The contours of the sloshing at t = 0.2 s, 0.5 s, 1.0 s, 1.5 s, 2.0 s, 2.5 s, 3.0 s, 3.5 s, 4.0 s are shown below for both the cases i.e., without baffle and with baffle.
Simulation is carried out for 25%, 50% and 75% tank fill condition for given tank geometries. Comparison of contours for tank 50% fill before and after breaking is done as shown below:

Without Baffle **with Baffle**

Before breaking

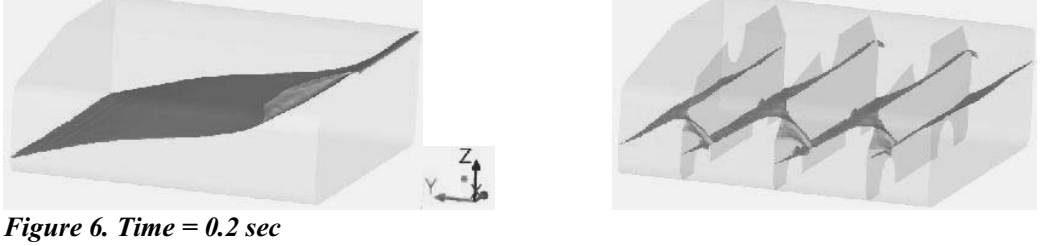


Figure 6. Time = 0.2 sec

Figure 7. Time = 0.5 sec

Figure 8. Time = 1 sec

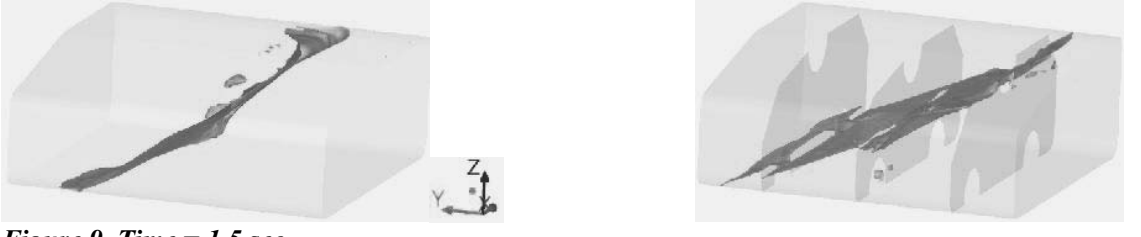


Figure 9. Time = 1.5 sec

Figure 10. Time = 2 sec

After breaking

Figure 11. Time = 2.5 sec

Figure 12. Time = 3 sec

Figure 13. Time = 3.5 sec

Figure 14. Time = 4 sec

3.4.Force variation on tank

To evaluate strength of sloshing force acting on different parts of tank, the force variation on different parts of tank with respect to time is plotted at different tank fill condition. When there is more turbulence inside the tank more force is acting on the tank surface. With the help of UDF the force extracted on tank surfaces is computed. The plotted force is the force acting normally on the tank surface. It is observed from the plot that sloshing is more in lower and moderate tank fill condition.

The plot suggest that the presence of baffle could help to reduce the slosh force developed under the application of longitudinal acceleration, reduction in the peak is observed as compared with and without baffle case. The results show that the fluid motion yields lower magnitude of longitudinal slosh force, particularly under the higher fill level. The presence of baffles not only diminishes the peak but also yields lower steady values due to portions of fluid being trapped in lower section of the tank between two consecutive baffles or between the baffle and the endplates.

3.4.1. Tank 25% fill

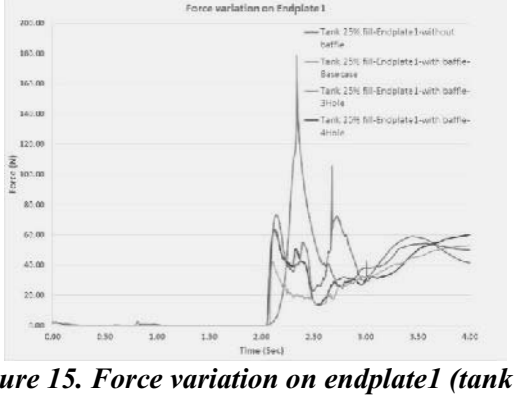


Figure 15. Force variation on endplate1 (tank 25% fill)

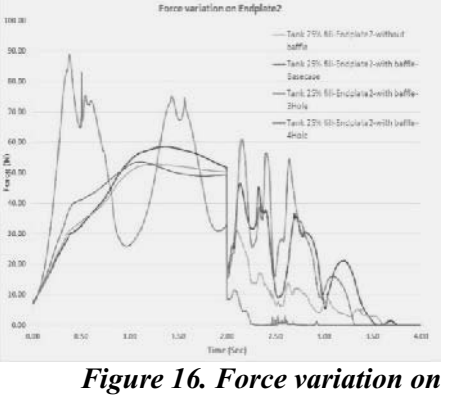


Figure 16. Force variation on endplate2 (tank 25% fill)

Figure 17. Force variation on tank wall (tank 25% fill)

3.4.2. Tank 50% fill

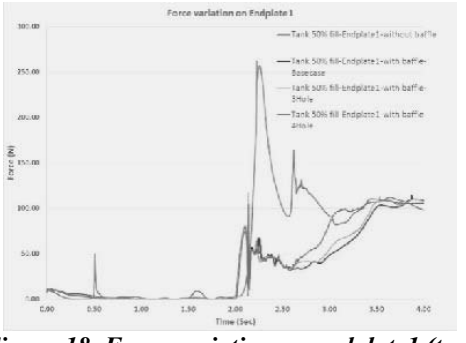


Figure 18. Force variation on endplate1 (tank 50% fill)

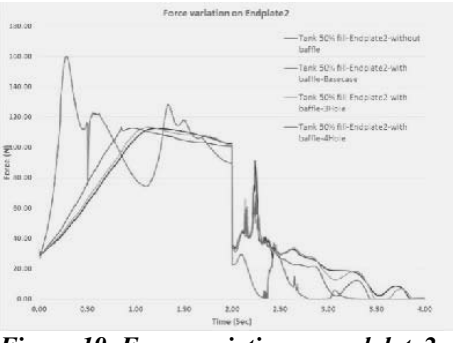


Figure 19. Force variation on endplate2

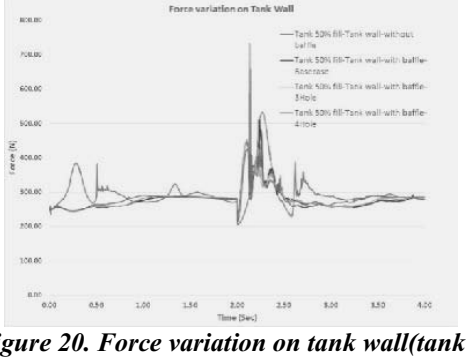


Figure 20. Force variation on tank wall(tank 50% fill)

3.4.3. Tank 75% fill

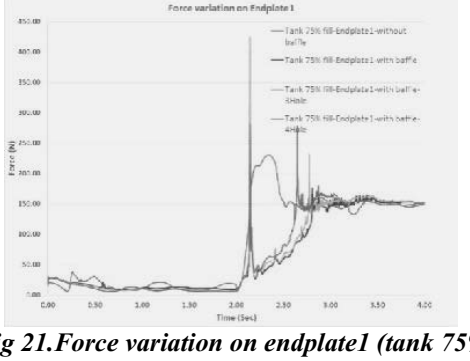


Fig 21.Force variation on endplate1 (tank 75% fill)

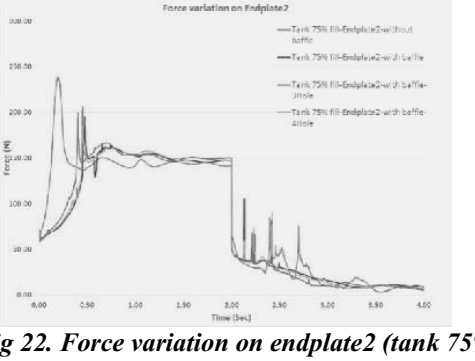


Fig 22. Force variation on endplate2 (tank 75% fill)

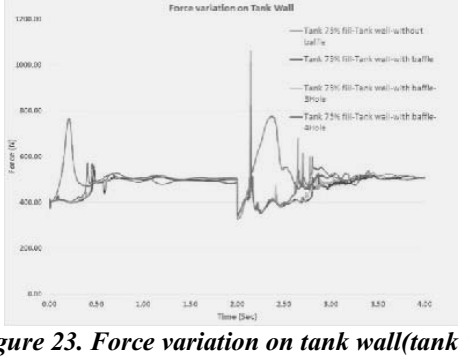


Figure 23. Force variation on tank wall(tank 75% fill)

IV. CONCLUSION

It is observed that sloshing force fluctuations are higher in lower and moderate tank fill condition than that of at higher fill level. At intermediate fill level, baffles are attributable to greater containment of fluid between the successive baffle or between the baffles and the tank endplates. In order to reduce the sloshing excitation, baffles are used as anti-sloshing device. Number of holes (baffle opening area) on the baffle plays important role in limiting the sloshing force.

V. FUTURE SCOPE

The future scope of the proposed study is:

a) Examine CFD method validity against the experimental results under different conditions, such as tank configuration and fill level.
b) Analyze transient fluid slosh effects within a partly filled tank with different types of baffles.
c) Obtained pressure/force variation from CFD gives as input for CAE(Computer Aided Engineering) and carry out the failure analysis for tank in CAE.

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Design of Head Light Moving Mechanism With Steering

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Abstract— The most important of this paper is Front wheel of steering system with moveable headlights with latest technology. The most conventional steering arrangement is to turn the front wheels using a hand–operated steering wheel which is positioned in front of the driver, via the steering column, which may contain universal joints to allow it to deviate somewhat from a straight line. This idea gives more advantages for automobile. It gives the advantages such as low level of steering torque during static steering, increase fuel efficiency or economy, low weight of vehicle because of using EPS system, flexibility in steering system and more space for driver and front passenger.
Keywords-Design, Headlight Mechanism, Synthesis of Mechanism, Rack And pinion spur gear.

I. INTRODUCTION

The aim is to design and develop a "Steering Controlled Headlight Mechanism" which acts as directional headlights. This is done by connecting headlights and steering. Present day automobiles don't have effective lighting system. Due to this many accidents are taking place during night times especially in hilly areas. The accidents can be avoided by incorporating Steering Control Headlight Mechanism. The rack and pinion steering gear mechanism is used for this project. When the steering wheel is rotated and rotary motion is converted to translatory motion through the rack and pinion mechanism. When the front wheels are steered, the headlights follows the same path and the light is focused on more divergent area. In the present project, it is planned to design "Steering Controlled Headlight Mechanism" and a live model unit is fabricated.

II. PROBLEM DEFINATION

A four wheeler usually find difficulty to drive especially at sharp turn .The model helps them to change the focus of headlight as the steering move on either direction. Adaptive headlights react to the steering system of the car and automatically adjust to illuminate the road wheel. Turn the car left, the headlights angles to the left. Instead of moving the headlights, reflectors are fitted on the inside on either side of the headlamp casing. These reflectors are moved to direct a beam in the same direction as the movement of the vehicle .The power required to move the reflectors is transmitted using hydraulic linkages.

Objectives:-The main aim to move the head light on sharp turning as possible as. The vehicle should get illumination front view that could help to driver taking turn on hill areas, And also to make the nation with an accident free.

III. SYNTHESIS OF MECHANISM

Steering System

The manual steering system incorporates:-

1) Steering wheel and column,
2) A manual gearbox and pitman arm or a rack and pinion assembly,
3) Linkages; steering knuckles and ball joints; and
4) The wheel spindle assemblies.

Rack And Pinion Steering

Rack-and-pinion steering is quickly becoming the most common type of steering on cars, small trucks and SUVs. It is actually a pretty simple mechanism. A rack-and-pinion gear set is enclosed in a metal tube, with each end of the rack protruding from the tube. A rod, called a tie rod, connects to each end of the

rack. The pinion gear is attached to the steering shaft. When you turn the steering wheel, the gear spins, moving the rack. The tie rod at each end of the rack connects to the steering arm on the spindle.

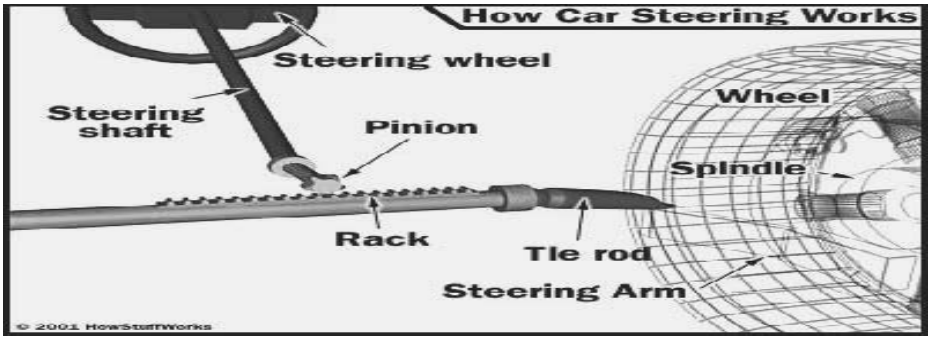

Fig 3.1 Rack And Pinion Mechanism system

The rack-and-pinion gear set does two things:-

1) It converts the rotational motion of the steering wheel into the linear motion needed to turn the wheels.
2) It provides a gear reduction, making it easier to turn the wheels. On most cars, it takes three to four complete revolutions of the steering wheel to make the wheels turn from lock to lock (from far left to far right).

IV. METHODOLOGY

The paper here is all about Front wheel steering system with moveable headlights with latest technology. The most conventional steering arrangement is to turn the front wheels using a hand–operated steering wheel which is positioned in front of the driver, via the steering column, which may contain universal joints to allow it to deviate somewhat from a straight line. Rack and pinion steering gear mechanism where the steering wheel turns the pinion. The pinion moves the rack, which is a linear gear that meshes with the pinion, converting circular motion into linear motion along the transverse axis of the car (side to side motion)

V. DESIGN OF MECHANISMS

Working Principle

In our concept of mechanism lead-acid 12 Volt batteries is used. The lead-acid batteries output is given to the limit switch. There are two Limit switches are used in this project. These switch outputs are connected to the steering D.C mot or in Forward and reverse rotation of operation. The rack and pinion arrangement is used to turn the wheel in left and right direction. The Rack is connected to the wheel with the help of liver mechanism and the pinion is coupled to the permanent magnet D.C motor shaft. The Motor is drawn supply from the battery through limit switch arrangement. When the steering is turn in the left direction, it pushes the left side limit switches, so that the D.C motor rotate in forward direction to move the wheel in left side. Similarly When the steering is turn in the right direction, it pushes the right side limit switches, so that the D.C motor rotate in reverse direction to move the wheel in right side.

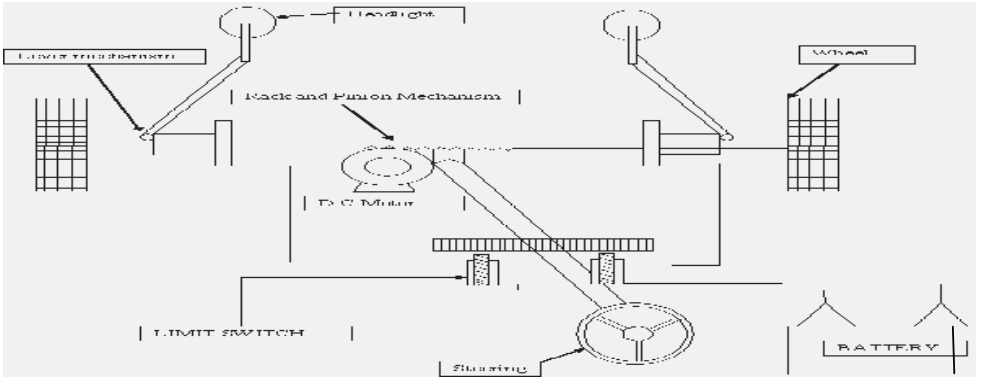

Fig4.1. Line Diagram of Head Light Moving Mechanism with Steering.

Mechanical Design

Mechanical design phase is very important from the view of designer as whole success of the project depends on the correct design analysis of the problem. Designer should estimate these forces very accurately by using design equations. If he does not have sufficient information to estimate them he should make certain practical assumptions based on similar conditions. This will almost satisfy the functional needs. Assumptions must always be on the safer side. 1) Design parts 2) Parts to be purchased

Design of Frame

Input data,

Total weight = 10KG (assume)
No of links = 4
2 links of 3000 mm
1 link of 1500 mm
1 link of 1500 mm

Force = 10 kg

= 10 x 9.81 = 98.1 N ≈ 100 N

No of links = 4

Hence,

Force on each link = 100 / 4 = 25 N

Considering the max value of FOS = 2

Buckling load on each link = 25 x 2 = 50 N

LET,

T_1 = Thickness of link, B_1 = Width of link

Area of link = T_1 X B_1

Assuming width of the link = 3 X T_1

Hence,

$B_1 = 3 X T_1$

AREA = $3T_1^2$

MI of link

$I = 1/12 X T_1.B_1$ ...(i)

$= 0.25 T_1$

Let,

K = Radius of Gyration

A = AREA

K = √ I / A
K = 0.28 T_1
For link – 1
L_1 = 3000 mm
PR = 50N
RANKINE CONSTANT = a = 1 / 7500
Crushing Load (Fy) = 325 MPa for MS
Now, Buckling Load
PR = Fy. A / 1 + a λ ... (ii)
WHERE λ = L / K
PR = F. A / 1 + a (L / K) ... (iii)

$$50 = \frac{325 * 10^6 * .25 * X\text{^}4}{1 + \frac{1 * 3}{7500 * 0.28 * X}}$$

T_1 =1.42 mm ≈ 2 mm
Similarly,
Calculating the thickness for all links,
Hence we take thickness
T = 2mm to 20mm we consider.

Design of Steering Gear Mechanism
In order to make the design of our rack-pinion for the steering box, we base our work on the choice of the rack and the pinion which will produce a greater lateral Displacement of the wheels with the same turn of the steering wheel. The other start point is that the rack and the pinion must be the same modulus and the same material. A suitable material for these elements is SAE 1045 steel which is easy to mechanize.

Design of Rack and pinion spur gear
Ultimate tensile strength (S_{ut}) = 625 N/mm$^{2.}$
Assumptions:-
Number of teeth on pinion = 12
Number of teeth on rack = 28
Pitch line velocity of pinion = 0.5 m/sec.
Tangential force on pinion = 600 N.

Results:-
Hence selecting standard module m = 2 mm
Hence dimension of spur pinion:
D_p= Z_p*m = 12 * 2 = 24 mm
B = 15* m = 15* 2 = 30 mm
Pressure angle = 20 ^{0}
Addendum = 1 m = 2 mm
Deddendum = 1.25 *m = 2.5 mm
Pitch (p) = 6.0283 mm
We have a pinion with a diameter of 24 mm,
T = 105.948*12= 1.27136Nm
This is the torque in the pinion and it is transmitted through the steering column.

Steering movement ratio
Therefore the movement ratio is **12.47:1** we needed to know the movement ratio in order to determine the output load transmitted to the tie rods for a given input load.
The output load will be:
*F = 2 *MR *F* = = 2* 20* 12.47 = 498.8 **N**

Therefore the load transmitted to the tie rods is **498.8 N.**

Selection of Motor

Motor Selection

1) Phase Induction Motor (2 Pole)
2) Power Rating = 0.05 Hp
3) Speed = 600 rpm (DC MOTOR)
4) Frame size = 71
5) Current = 1.70 Amp
6) Torque = 2.56 Nm
7) TEFC Construction.

Design of Main Spindle

T Design = 1.15 Nm. = 1.15x 10^3 N.mm

Selection of main spindle material:-C30

Table No 5.2.6.1- Design of Main Spindle

Designation	Ultimate Tensile Strength N/mm2	Yield strength N/mm2
EN 24(40 N; 2 CR 1 Mo28)	720	600

After Calculations Selecting minimum diameter of spindle = 10 mm

Assembly Designs on CATIA

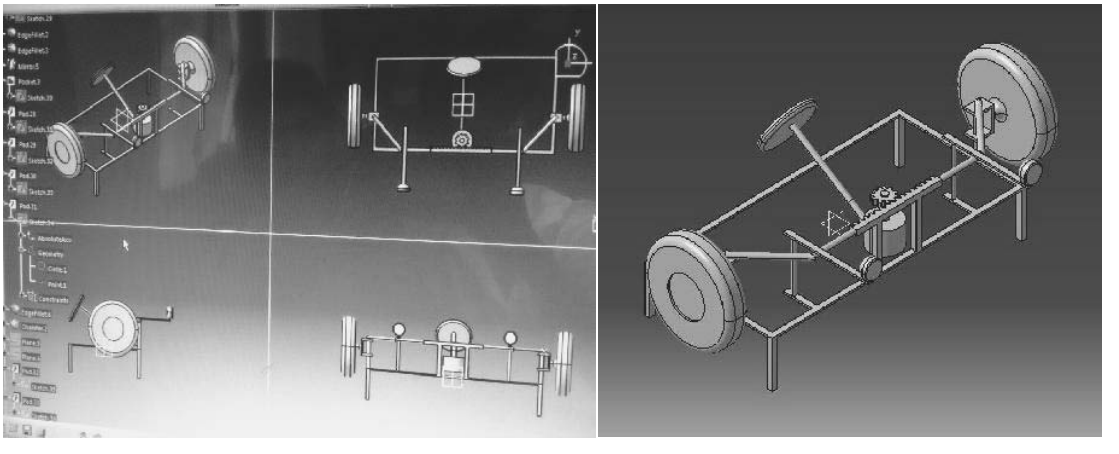

Fig. Assembly Design on CATIA

VI. RESULT AND CONCLUSION

The effective Headlight Moving mechanism with Steering was designed, based on Rack and pinion mechanism, to move the steering arm that gives predefined motion to wheel and headlights. This is very important system, which help to move the headlight as per turn, right or left. And it can be help for making nation accidents free roads.

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Health Monitoring and Fault Diagnosis of Gearbox

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Abstract- Gear box plays vital role in automobile industry. Therefore, there is a strong demand for their reliable and safe operation. If any fault and failures occur in Gear box it can lead to excessive downtimes and generate great losses in terms of revenue and maintenance. Therefore, early fault detection needed for the protection of the Gear box. In the current scenario, the health monitoring of the Gear box are increasing due to its potential to reduce operating costs, enhance the reliability of operation and improve service to the customers. The on-line health monitoring involves taking measurements on a machine while it is in operating conditions in order to detect faults with the aim of reducing both unexpected failure and maintenance costs. In the present paper, a comprehensive survey of Gear box faults, Motor current signature analysis (MCSA) to monitor the gearbox away from its actual location has been discussed.
Keywords- Health Monitoring, Gear box faults, Reliability, operating costs Motor current signature analysis (MCSA).

I. INTRODUCTION

Even though there are a number of condition monitoring and analysis techniques, researchers are in search of a simple and easy way to monitor vibration of a gearbox, which is an important power transmission component in any machinery. In gearboxes, load fluctuations on the gearbox and gear defects are two major sources of vibration. Further, at times, measurement of vibration in the gearbox is not easy because of the inaccessibility in mounting the vibration transducers. Techniques such as wear and debris analysis, vibration monitoring and acoustic emissions require accessibility to the gearbox either to collect samples or to mount the transducers on or near the gearbox. But dusty environment, background noise, structural vibration etc. may hamper the quality and efficiency of these techniques. Hence, there is a need to monitor the gearbox away from its actual location, which can be achieved through Motor current signature analysis (MCSA). An efficient and new but non intrusive method to detect the fluctuation in gear load may be the motor current signature analysis (MCSA).The objective of this paper is to detect artificially introduced defects in gears in single stage spur gearbox using MCSA as a condition monitoring technique. In order to perform the analysis on gearbox, an experimental set up is designed that can accurately repeat the measurements of current signals. In the present work MATLAB software are used to diagnose the faults of gearbox with direct online monitoring. There are different algorithm are available like Fast Fourier Transform algorithm FFT, Short Time Fourier transform algorithm and Wavelet Transform based analysis algorithm. Fast Fourier Transform algorithm FFT Method is used to track and detect the gear faults in single stage spur gearbox. The results obtained from this experiment show that any fault in either the pinion or the driven wheel generates a harmonic component in the motor current spectrum which can be detected in power spectrum of motor. Also to find unknown fault location in gearbox crest factor is plotted by using MATLAB.

II. EXPERIMENTAL VALIDATION

2.1 Experimental setup

In order to diagnosis the fault of gear box, motor current analysis method use. Block diagram of these two experimental setup as shown in figure. Experimental setup consists of DC motor, single stage spur gear box, Resistance, data acquisition card, current sensor, Pentium-4 computer with software MATLAB.

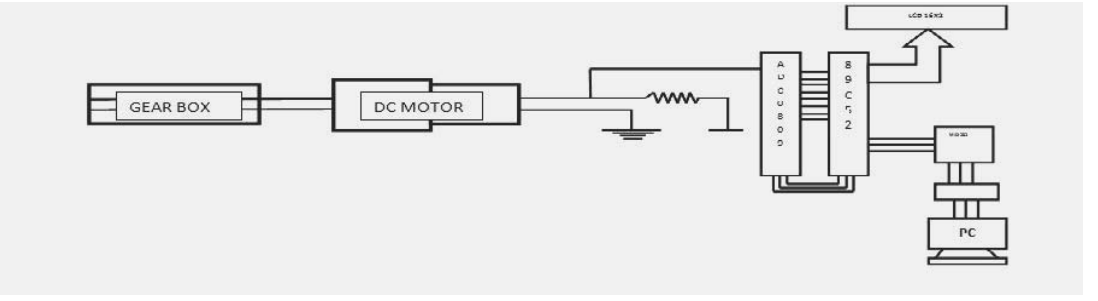

Fig. 1 Experimental Setup

III. GEAR BOX FAUILT ANALYSIS USING FFT BASED POWER SPECTRUM

3.1 Bearing Fault Analysis

The bearing consists of mainly of the outer race and inner race way, the balls and cage which assures equidistance between the balls. The different faults that may occur in bearing can be classified according to the affected element are as follow,

1) Outer raceway defect.
2) Inner raceway defect.
3) Ball defect.

The relationship of bearing vibration to the stator current spectra can be determined by remembering that any air gap eccentricity produces anomalies in the air gap flux density. Since ball bearings support the rotors, any bearing defect will produce a radial motion between the rotor and stator of the machine. The mechanical displacement resulting from damaged bearing causes the machine air gap to vary in a manner that can be described by a combination of rotating eccentricities moving in both directions. Due to rotating eccentricities, the vibrations generate stator currents at frequencies given by

$$f_{bearing} = f_1 \pm m f_{io} \qquad (1)$$

where m=1,2,3,4……..and f_{io} is one of the characteristic frequencies which are based upon the bearing dimension as shown in fig 5.2 Outer race

$$f_{io} = \frac{N_b}{2} \times f_r \left(1 \pm \left(\frac{D_b}{D_c}\right) \times cos\beta\right) \qquad (2)$$

Where,
N_b = number of bearing balls.
f_r = mechanical rotor speed in hertz.
D_b = Ball diameter.
Dc = Bearing pitch diameter.
β = Contact angle of the balls on the races.
It should be noted from 2 that specific information concerning the bearing construction is required to calculate the exact characteristic frequencies. However, these characteristics race frequencies can be approximated for most bearings with between six and twelve balls.

$f_o = 0.6\ N_b\ f_r$ (3)
$f_i = 0.4\ N_b\ f_r$ (4)

Thus from above equation we can calculate expected fault frequencies for inner race fault and outer race fault at various load condition. In order to diagnose the bearing fault of gearbox, above experimental setup will be use. The bearing of gearbox is single row, deep groove ball bearing, type 6206.

Fig. 2 Damage Bearing

Table No. 1. Expected Fault Frequencies for Input Shaft Bearing at Various Load Conditions (inner race)

load	Speed	frequency(fr)	frequency(f_i) $f_i = 0.4\ N_b\ f_r$	fault frequency ($f_{bearing} = f_1 +/- m\ f_{io}$)	
				m =1	m =2
0	1000	16.6666	79.99	79.99	159.99
2	890	15.83333	75.984	75.984	151.968
5	830	14.80	69.19	69.19	138.38
8	830	13.834	64.38	64.38	128.76
10	770	12.60	59.29	59.29	118.58

Table No. 2. Expected Fault Frequencies for Input Shaft Bearing at Various Load Conditions (Outer Race)

load	Speed	frequency(fr)	frequency(f_i) $f_i = 0.6\ N_b\ f_r$	fault frequency ($f_{bearing} = f_1 +/- m\ f_{io}$)	
				m =1	m =2
0	1000	16.6666	13.33	13.33	26.66
2	890	15.83333	11.46	11.46	22.93
5	830	14.80	9.8656	9.8656	19.73
8	830	13.834	8	8	16
10	770	12.60	5.866	5.866	11.73

3.2 Gear Box Analysis Using Matlab

The experiments have been performed to detect bearing fault in gearbox using MATLAB software. Gearbox is tested with two defective bearings, input shaft wear gear, output shaft wear gear, input Shaft broken teeth under no load and full load condition.

3.2.1 Inner Race Bearing Fault of Gearbox

The gearbox is tested under different load condition with faulty bearing. Single nick fault was introduced to the test bearings inner race using laser cutting machining with fault width of 2 mm and the fault depth is 1 mm. It is observed from the power spectrums of faulty gearbox with Single nick fault in bearings inner race, Magnitude Increases with increase of load.

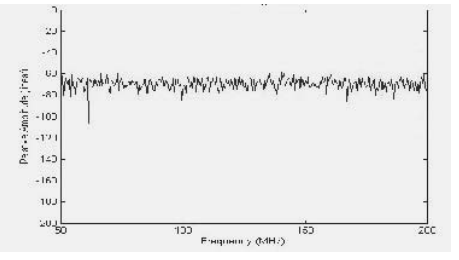

Fig. 3. Power Spectrum of Healthy Gearbox

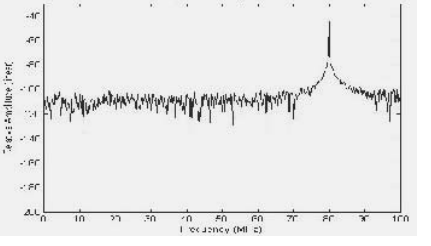

Fig. 4. Power spectrum of faulty gearbox with inner race of bearing under no load condition

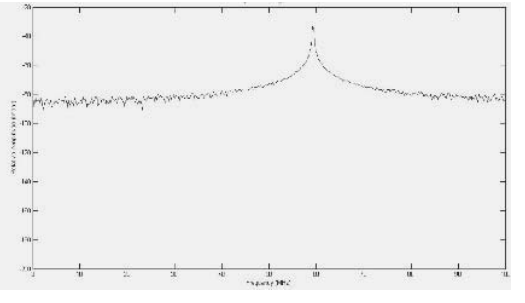

Fig. 5. Power spectrum of faulty gearbox with inner race of bearing under 10kg load condition

3.2.2 Outer Race Bearing Fault of Gearbox

The gearbox is tested under different load condition with faulty bearing. Single nick fault was introduced to the test bearings outer race using laser cutting machining with fault width of 2 mm and the fault depth is 1 mm. It is observed from the power spectrums of faulty gearbox with Single nick fault in bearings inner race, Magnitude Increases with increase of load.

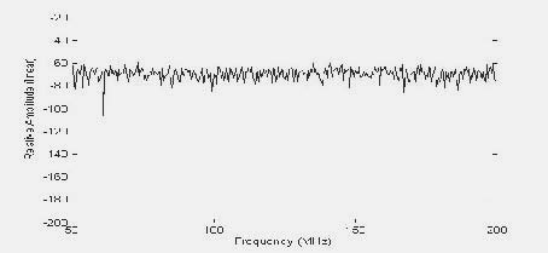

Fig. 6 Power Spectrum of Healthy Gearbox

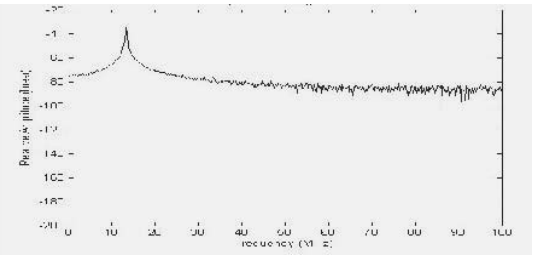

Fig. 7 Power spectrum of faulty gearbox with

outer race of bearing under no load condition

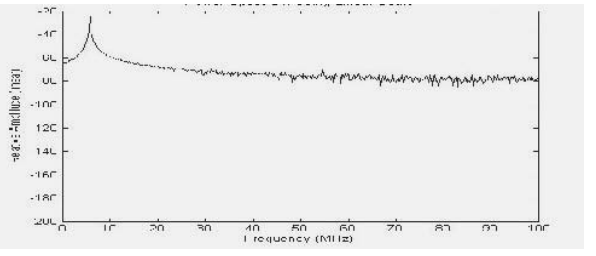

Fig. 8 Power spectrum of faulty gearbox with outer race of bearing under 10kg load condition

IV.CONCLUSION

In order to perform accurate and reliable analysis on gearbox, an experimental set up is designed that can accurately repeat the measurements of signals and can introduce a particular fault of the gearbox. In the present work, MATLAB environment is used to diagnose the faults for condition monitoring. Experimental results show that the characteristic frequencies could not see in the power spectrum if bearing fault small in size. As severity of fault increases, the characteristic frequencies become visible. Amplitude Increases with increase of load and decrease of speed is experimentally verified.

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Performance Analysis Of Multi Chamber Reactive Silencer For Different Configurations Of Tuning Chamber For Acoustic Control

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Abstract-Silencers plays an important role in reducing noise coming out from IC engine, turbines, compressors or on the ventilation pipe lines of industrial plants, etc. Reactive silencers are used to serve this function by sending pressure waves back to the source. It is observed that the production of specific sound is because of back pressure striking on plates of reactive silencer's chambers. In order to have different sound from the reactive silencer the new theory of reactive silencer for different configuration of tuning chamber is proposed. Taking the reactive silencer of 150cc Bajaj pulsar bike, the author made two different configuration of tuning chamber and sound produced is measured and recorded. By comparing the result of new type reactive silencer with the original reactive silencer it is verified that the sound produced by silencer can be reduced to some level by modifying the tuning chamber.
Keywords-IC engine, Noise, Reactive Silencers, Back pressure, tuning chamber

I. INTRODUCTION

The increase in vehicle population day by day increases the noise pollution and to make it within the limits number of efforts and precautions are taking place. This leads the development of new innovative ideas or some modifications in the existing system. To reduce noise level coming out from high operating pressure devices like I.C. Engines, Turbines etc, and the conventional silencers are used which has a specific construction to reduce the noise. E.g. the active silencer which reduces the noise by providing sound of opposite phase to the source by loudspeaker. The dissipative silencer which uses acoustic pack material to absorb sound and a reactive silencer which sends pressure waves back to the source and reduce noise. While designing a silencer the effect of back pressure must be taken under consideration as the backpressure and noise are inversely proportional to each other [1]. Again the increase in number of chamber provides higher attenuation of sound pressure compare to one or two muffler chamber [2]. In reactive silencers also the length of tuning chamber, wall thickness plays a vital role in sound production [3]

II. DESIGN AND DEVELOPMENT OF MULTICHAMBER REACTIVE SILENCER

Any reactive silencer has three main parts Muffler, Tuning chamber and End pipe section. The all three mentioned have their own characteristic towards noise production. To reduce the noise level the two different configurations of only tuning chamber is made by keeping the muffler and end pipe section configuration as it is.

2.1. Standard assembly

The reactive silencer of Bajaj Pulsar 150cc is taken as an standard silencer and after analyzing it the data is collected as the length of silencer is 390mm. the internal assembly of silencer has three parts namely muffler, tuning chamber and end pipe. The first part i.e. muffler is of conical shape on which number of holes are made for primary sound reduction which again increases the pressure of exhaust gases as it is required higher than atmospheric pressure. The second part is tuning chamber which is of much interest

which acts as a main element of silencer to reduce noise. And the last part is an end pipe which exhausts the gases to atmosphere from main silencer body.

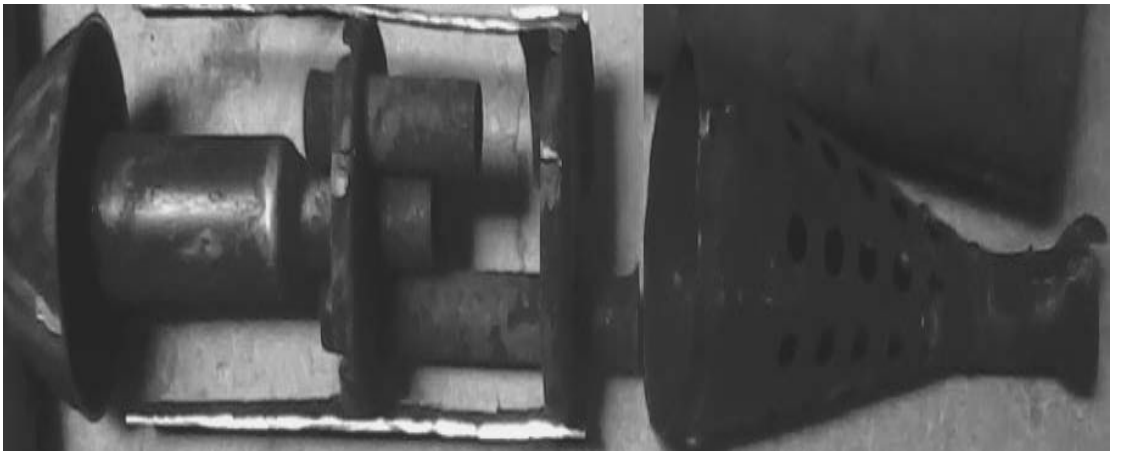

Figure 1. Standard assembly of Pulsar 150CC reactive silencer

2.2. Configuration one

In the first configuration of tuning chamber the modification is made in the standard baffle plate by increasing the number of holes in the plate i.e. One of the plate which consist of three holes were replaced by five holes & other plate which have only one hole is replaced with two hole in the same assembly. As shown in (Figure 2).

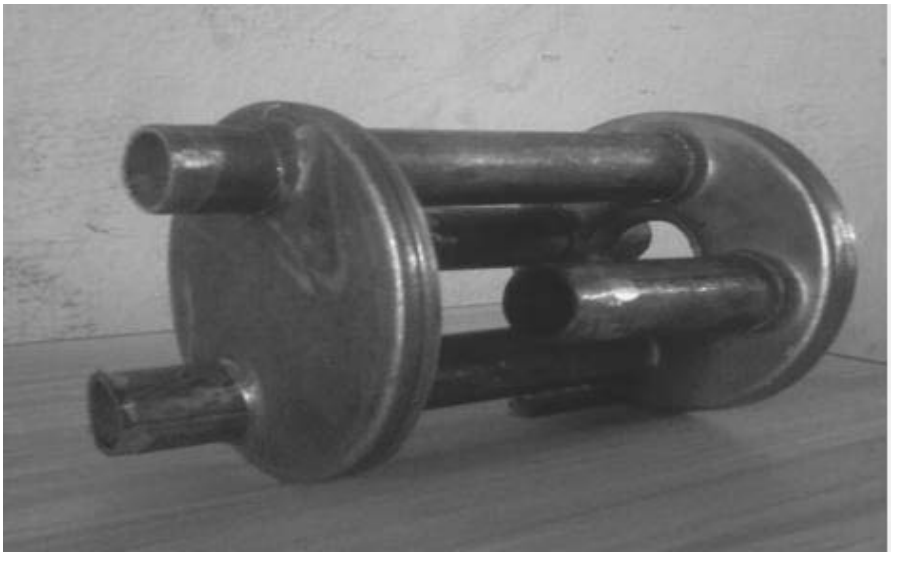

Figure 2. Configuration one with increased hole on baffle plate

2.3. Configuration two

In configuration two of tuning chamber the modification is made in the standard baffle plate by increasing the distance between the plates i.e. the standard distance between two Baffle plates was 90mm.And now it is replaced (increases) by length 110mm. Also the length of the pipe is increase. The plates holes were

kept as standard i.e. One of the plate which consist of three holes & other plate consist only one hole in the second assembly. As shown in (Figure 3).

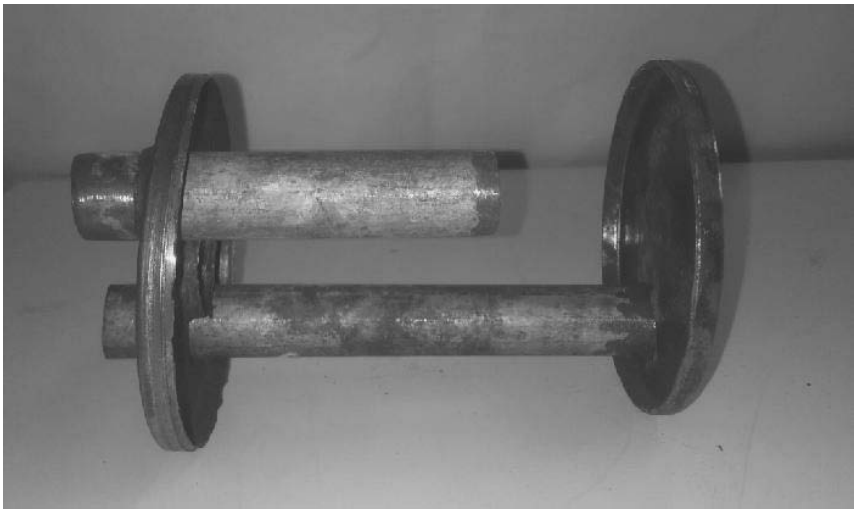

Figure 3. Configuration two with increased length between baffle plates

III. RESULT

The sound standard for motorcycle, scooters and three wheeler and the vehicles having rated engine power below 250 KW is 80 dB. And the sound recorded by standard silencer and the modified configuration is tabulated as follows.

Table1. Result showing sound level at different r.p.m.

Speed (r.p.m.)	**1000**	**3000**	**5000**
STD Silencer(dB)	88	90	91
Silencer Assembly 1(dB)	84	87	90
Silencer Assembly 2(dB)	85	88	92

IV. CONCLUSION

By observing the sound recorded by dB meter at different speed conditions it is cleared that the modified configuration of silencer produces less noise as compare with the standard one. This is because in first modified configuration as the number of holes increases, it increases the area for striking of waves hence

reduces more and more noise by striking more sound waves back to the source while in the second modified configuration the length between baffle plate is increased which increases the path of exhaust gases which will again reduces the noise. It is cleared that the sound can be increased or decreased by modifying the tuning chamber so by making changes in it the dynamic system can be made which is used to change the noise as desired by the rider.

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Performance of Diesel Engine with Jatropha Biodiesel Blends

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Abstract—The scarcity of reserves of petroleum and environmental pollution issues have led to the search for more environmental friendly and renewable fuels. This study evaluates the use of jatropha biodiesel blends as an alternative fuel for diesel engines. This experimental analysis is carried out to determine the effect of using biodiesel blends (i.e. B20 to B50) on the performance and exhaust emissions in a Variable Compression Ratio (VCR) diesel engine equipped with eddy current dynamometer. The thermal performance and emissions characteristics are evaluated by operating the engine at preset compression ratio 18, and varying loads in steps of 3 kg. The thermal performance parameters evaluated are brake thermal efficiency (BTHE), and brake specific fuel consumption (BSFC) and Exhaust Gas Temperature (ExGT). The emission constituents measured are carbon monoxide (CO), unburnt hydrocarbons (UHC) and Oxides of nitrogen (NOx). It was found that the performance parameters of the biodiesel blends did not differ greatly from those of diesel fuel. A slight decrease in thermal efficiency, with an increase in brake specific fuel consumption (BSFC), was noticed with the biodiesel blends. The CO and HC emissions were reduced for the blends while NOx was increased remarkably for the biodiesel blends.
Keywords- Biodiesel, Diesel Engine, Engine Performance, Emission Characteristics.

I. INTRODUCTION

The continual rise in the prices of crude oil and depletion in the reservoirs of the crude oil, increasing hazard to environment due to exhaust emissions, the problem of global warming have adversely impacted the developing countries like India. From the point of view of long term energy security, it is necessary to develop new alternative fuels with properties comparable to petroleum based fuels. Jatropha biodiesel as an alternative fuel for diesel engine offers an advantage because of its comparable fuel properties with diesel fuel. It was described that engine parameters such as CR and Load were found to have major effect on performance and emissions of diesel engine when run with biodiesel and its blend with diesel [1–3]. Hence an experiment is carried out to study the performance of a diesel engine operated with biodiesel blends at varying load.It is possible to use jatropha biodiesel in the diesel engines as a fuel if cleaned and properly converted to combustible diesel oil.

II. EXPERIMENTS

Experimental study is carried out on a Kirloskar make, 1C, 3.5 kW, constant speed 1500rpm Variable Compression Ratio (VCR) diesel engine. Performance tests are conducted on an engine at fixed compression ratio of CR18 and varying load (25%, 50%, 75% and 100%) using jatropha biodiesel with diesel blends (B20 to B50) to determine BSFC , BThE and ExGT. Engine emissions such as CO, HC and NOx were measured by using gas analyzer.

2.1. Experimental set-up

The specifications of the Kirloskar engine are given in Table 1. The engine with fixed compression ratio can be modified by providing additional variable combustion space. Tilting cylinder block method is one of the arrangements which can be used to vary the combustion space volume. The experimental study is

conducted at various loads and hence an accurate and reliable load measuring system is a must. The load measuring system of this experimental test rig consists of a dynamometer of eddy current type,a load cell of strain gauge type and a loading unit. The load is applied by supplying current to the dynamometer using a loading unit. The load applied to the engine is measured by a load cell.

Table No. 1. Engine Specifications

Manufacturer	M/s Kirloskar Oil Engines Ltd.
Model	TV 1
Cycle	4 STROKES
Rated Power	3.5 kW @ 1500 RPM
Type of Combustion System	Direct Injection
No. of Cylinders	1 Cylinder
Bore/Stroke	87.5 /110 mm
Compression Ratio	17.5 : 1 Modified to VCR 12 to18 : 1
Swept Volume	0.661 cc
Type of Cooling	WATER COOLED
Fuel Injection	INLINE

2.2. Biodiesel

The biodiesel obtained from jatropha and its blend with diesel was considered in this study. The jatropha biodiesel is purchased from commercial supplier from Pune. The pure diesel is purchased from local petrol pump. The properties of the biodiesel blends are as given in table 2.

Table No.2. Properties of Diesel and Jatropha Biodiesel Blends

Properties	Diesel	J20	J30	J40	J50
Density (Kg/m3)	849	857	861	865	869
Viscosity (@ 40°C)	4.38	4.47	4.51	4.56	4.61
CV (KJ/Kg)	42100	41352	40984	40619	40257

III. RESULTS AND DISCUSSION

3.1. Engine performance

3.1.1 Brake Specific Fuel Consumption

After the engine reached the stabilized working condition for each test, fuel consumption, torque applied and exhaust temperature were measured from which BSFC, BTE were computed. The variations of these parameters with respect to load are presented in figure 1 to 3, at compression ratio of 18.

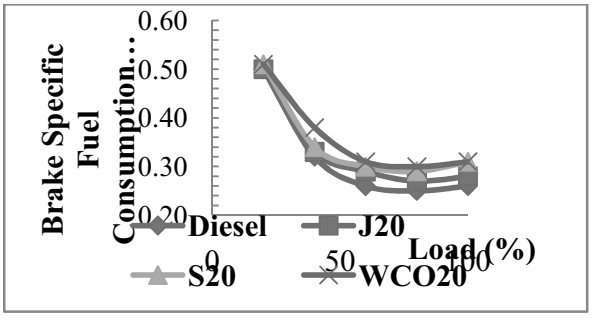


Fig. 1 Variation of BSFC with Engine Load at Constant Speed 1500rpm at CR 18

It can be seen from Figure 1 that the BSFC lines for different blends came closer to each other as load was increased from 25 to 100%, indicating a comparable performance of the blends at higher load. The lowest BSFC values obtained using diesel, B20 and B30, for full load were 0.25, 0.27 and 0.28 kg/kW-hr respectively. The variation in BSFC of different blends was less at full load conditions than at part load; possibly due to increased temperatures and consequently increased efficiencies of the engine. Due to their low volatility and higher viscosity, biodiesel might be performing relatively better at higher compression ratios. The BSFC was observed to decrease sharply with increase in load for all fuels. The main reason for this could be that percent increase in fuel required to operate the engine is less than the percent increase in brake power due to relatively less portion of the heat losses at higher loads. From the above discussions it could be concluded that the BSFC is a function of biodiesel blend, and load.

3.1.2 Brake Thermal Efficiency

The variation of BThE of VCR engine obtained in this study is shown in Figure 2 as a function of load for compression 18.

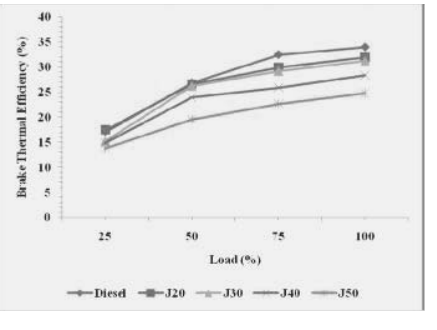


Fig.2 Variation of BThE with Engine Load at Constant Speed 1500rpm at CR 18

It can be observed from these figures that the parameters, which were responsible for giving best fuel economy, also resulted in showing maximum BThE. The highest value of BThE using diesel was 34.02% whereas it was 31.99% and 31.27% in case of B20 and B30 respectively. B50 gives BThE of 24.87% which lowest for all blends at same load conditions. Based on these results it can be concluded that the performance of the engine with biodiesel blends is comparable to that with diesel, in terms of BThE. The change of load from 25% to full load resulted in increase in BThE for biodiesel blends. This could be due to the fact that biodiesel blends had lower volatility as compared to diesel and therefore the improvement in their combustion characteristics might have been relatively more at higher temperatures resulting from higher loads than the improvement in case of diesel with the same rise in load. The brake thermal efficiency of the engine was low at part loads as compared to the engine running on full load.

3.1.3 Exhaust Gas Temperature

The variation of exhaust gas temperature with the engine load for all the blends of jatropha biodiesel are shown in figure 3 at the constant speed of 1500rpm. Figure 3 shows that as the load increases the exhaust gas temperature increases for the biodiesel blends. The diesel fuel shows less exhaust gas temperature as compared to all the biodiesel blends at all loads.

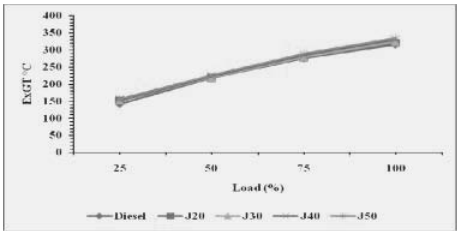
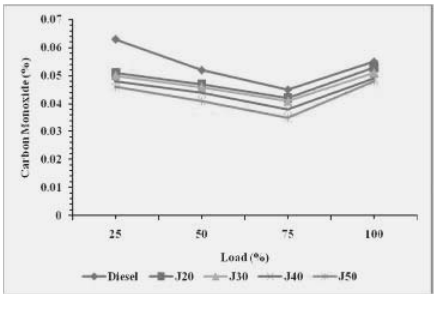


Fig. 3 Variation of ExGT with Engine Load at Constant Speed 1500rpm at CR 18

The exhaust gas temperature for the diesel , J20, J30, J40 and J50 are 315 ºC, 320ºC , 324ºC,331 ºC and 335ºC respectively. It can be seen from the above figures that as the biodiesel blend ratio increases the exhaust gas temperature also increases. This is because more oxygen content in the biodiesel blends as compared to diesel fuel which leads to complete combustion of biodiesel. It may be because of higher viscosity, late burning of fuel particles take place on the walls of cylinder which will lead to higher gas temperatures as compared to other blends.

3.2. Engine Emission Characteristics

Figure 4 shows that the CO emissions for biodiesel blends are lower when compared to diesel.Figure 5 shows the HC emission for biodiesel blends are lower that the diesel for all loads.Figure 6 shows that the NOx emission for biodiesel blends and diesel at constant speed 1500rpm. The NOx emission for biodiesel blends is more compared to diesel. With increase in blend ratio the NOx emission increases. This can be attributed to the variation of the maximum combustion temperature inside the cylinder for both blends.



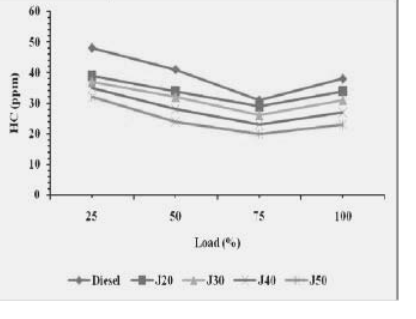


Fig. 4 Variation of CO with Engine Load at Constant Speed 1500rpm at CR 18 Fig. 5 Variation of HC with Engine Load at 1500 rpm

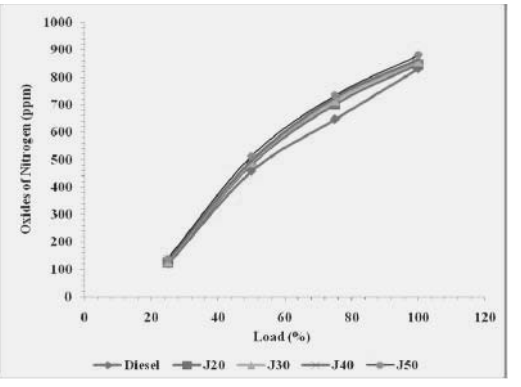


Fig. 6 Variation of NOx with Engine Load at Constant Speed 1500rpm at CR 18

IV. CONCLUSIONS

Based on the results of this study, it can be concluded that the BSFC, BThE and ExGT of the engine are function of the biodiesel blend and load. For the same operating conditions, performance of the engine reduced with increase in biodiesel percentage in the blend. However, with increase in load this difference was reduced and the engine performance became similar to that of diesel. Biodiesel could be safely blended with pure diesel. B20 shows similar performance at any of the load as that of the diesel. Biodiesel blends have shown reduced emissions of CO and HC than that of the diesel. The NOx emission is more for biodiesel blends than the diesel fuel.

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Transmission Noise and Gear Rettle in Automotive Driveline

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Abstract— For many years, research efforts led to reduction of acoustic levels. Consequently, noise sources that were previously masked emerge. Specifically, gear rattle noise due to impacts between teeth of unloaded gears is particularly audible at low speed regime of the engine. [1]Gear rattling noise is one of the major problems facing the industry, and the car industry in particular, because cars spend so much time idling under no load very light loads. Minimizing noise is becoming an increasingly important factor in motor vehicle development. The importance of this development goal is increasing with rising customer expectations and increasingly stringent legal restrictions on noise emissions. The cause of rattling and clattering noise is torsional vibration of transmission components that are not under load, that move backwards and forwards within their functional clearances.

This paper describes a research work on classification of transmission noise, gear rattle phenomenon occurring in automobiles, Cause effect diagram of gear rattle, Effect of Gear rattle on human body, rattle criteria, rattle index, possible ways to reduce gear retelling.

Keywords- Neutral gear rattle, Transmission noise, external measures, internal measures, driveline etc.

I. INTRODUCTION

Gear rattle noise is an undesirable sound quality for passenger cars and light trucks equipped with manual transmissions. Unlike automatic transmissions, manual transmissions do not have the high viscous damping inherent to a hydrodynamic torque converter to suppress the impacting of gear teeth oscillating through their gear backlash. Therefore, a significant level of noise can be produced by the gear rattle and transmitted both inside the passenger compartment and outside the vehicle. Gear rattle, idle shake, and other noise generated in the automobile driveline have become an important concern to automobile manufactures in their pursuit of an increased level of perception of high sound quality.

The torsional vibration of driveline is a major source of gear rattle noise. The manual transmission produces gear rattle by the impacting of gears oscillating through their gear backlash. The impact collisions are transmitted to the transmission housing via shafts and bearings. The vibrations are then converted into an audible rattle.[7]

A. Classification of Transmission Noise:

The importance of minimizing noise in motor vehicle development is increasing with rising customer expectations and increasingly stringent legal restriction on noise
emission. Vehicle transmission noise arises from the types of causes identified in Figure 1 [1, 2, 3, 4, 5].[7]

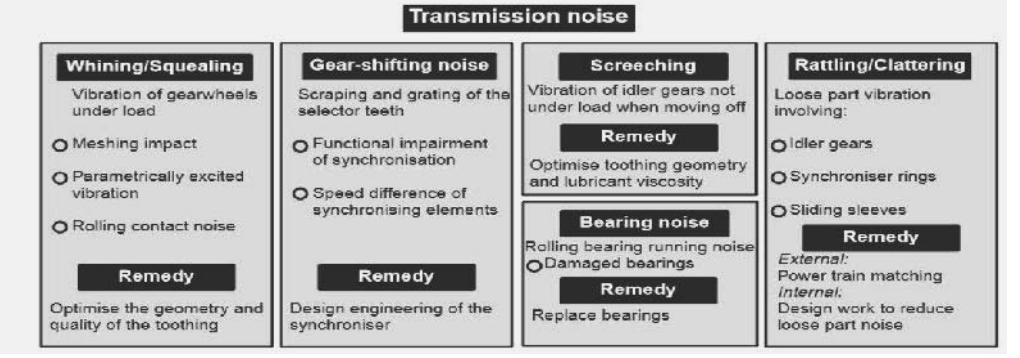

Fig. 1 Classification of Transmission Noise [7]

II. GEAR RATTLE

Specifically, gear rattle noise due to impacts between teeth of unloaded gears is particularly audible at low speed regime of the engine. Gear rattling noise is one of the major problems facing the industry, and the car industry in particular, because cars spend so much time idling under no load or very light loads

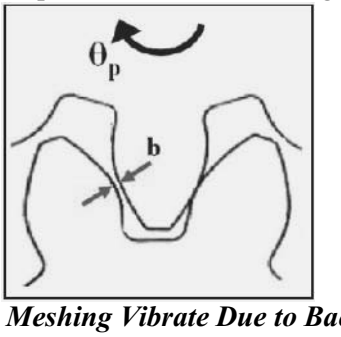

Fig.2 Gears in Meshing Vibrate Due to Backlash (B)

A. Rattling Meshes in a 5-Speed Manual Front and Transverse Mounted Transmission:

Table No.1: Rattling Meshes In a 5-Speed Manual Front and Transverse Mounted Transmission [7]

Gear / Status	1st gear	2nd gear	3rd gear	4th gear	5th gear	Reverse gear	Lay shaft
Neutral	✶	✶			✶	✶	
1st speed		✶		✶	✶	✶	
2nd speed	✶			✶	✶	✶	
3rd speed	✶	✶		✶	✶	✶	✶
4th speed	✶	✶	✶		✶	✶	✶
5th speed	✶	✶	✶	✶		✶	✶
R. speed		✶	✶	✶	✶		✶

B. The Cause and Effect Diagram of Gear Rattle System for The First-Speed:

The power-transmitting gears are laden gears and together with the shaft synchronizer assemblies, they provide the baseline torsional vibration characteristics. The laden gears are considered to be always in contact with a linear meshing stiffness. The meshing stiffness however is time-varying due to the conjugate action of the involute helical gear teeth. In the in drive mode, there are 4 pairs of unladen gears and they become a problem. Without any loading but in meshing, the gear and the spline teeth may be driven across the Backlash, causing impacts and rattle noise. The unloaded gear pairs are all potential rattle sources. Rattle may also occur at idle when the vehicle is at rest, the transmission is in neutral, and the clutch is engaged. [6]

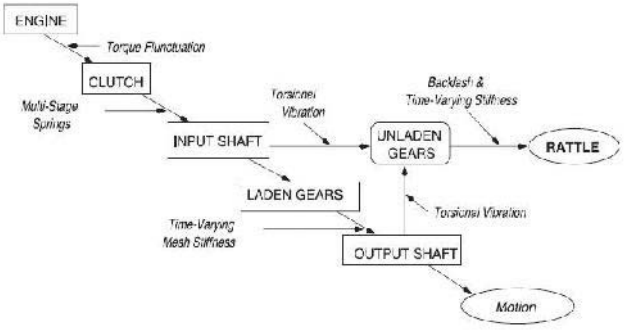

Fig. 3 Cause and Effect Diagram of Gear Rattle System for The First-Speed [7]

C. Effect of Gear Rattle on Human Body:

Gear rattle frequency is 4-5 Hz and its sound level is 2-14 dB. A general guide for defining human tolerance to whole-body vibration has been developed and adopted as the International Standard IS0 2631 {7.4, 7.51}. This guide is recommended for the evaluation of irrational environments in transport vehicles as well as in industry, and it defines three
distinct limits for whole-body vibration in the frequency range 1-80 Hz as mentioned in table2

Table No. 2 Effect of Gear Rattle on Human Body [2]

Sr. No.	Symptoms	Frequency (Hz)
1	General feeling of discomfort	4-9
2	Head symptoms	13-20
3	Lower Jaw symptoms	6-8
4	Influence on speech	13-20
5	Lump in throat	12-16
6	Chest Pain	5-7
7	Abdominal pains	4-10
8	Urge to urinate	10-18
9	Increased muscle tone	13-20

10	Influence on breathing movements	4-8
11	Muscle contractions	4-9

III. POSSIBLE WAYS TO REDUCE GEAR RETELLING

Numerous publications and patent specifications o er means of suppressing rattling and clattering noise. These measures have so far however been constrained by technical limitations, and are either not economically viable, or viable only in combination with other measures. The possible ways of reducing or avoiding rattling and clattering noise can be sub-divided into external and internal measures:

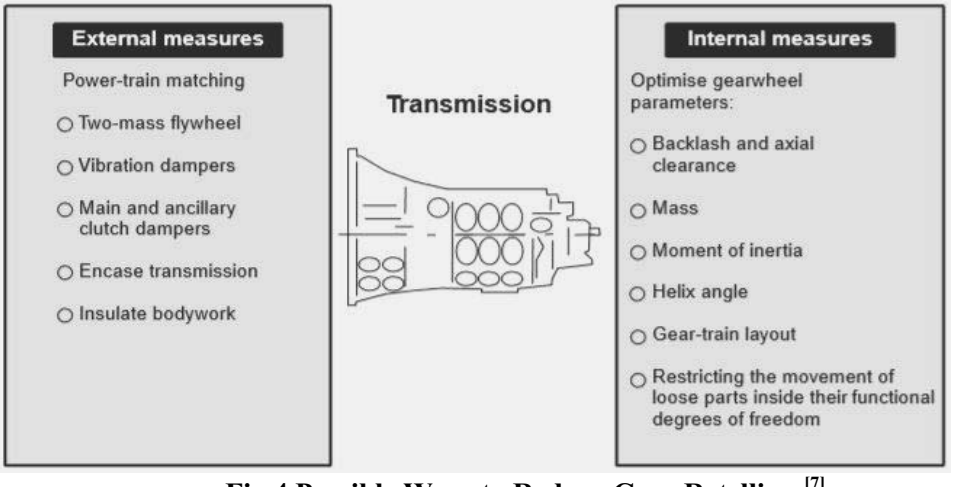

Fig.4 Possible Ways to Reduce Gear Retelling [7]

External measures include isolating the combustion engine from the transmission by means of clutch dampers or a two-mass flywheel, in order to reduce torsional vibration in the power train. Vibration dampers are suitable for attenuating resonance peaks in the power train; sound transmission and radiation in the passenger compartment can be reduced by encasing the transmission housing.

These external measures are, however, subject to physical and economic constraints and do not always yield the desired results. Solutions therefore have to be sought within the transmission itself.

Internal measures within the transmissionff can limit the freedomff of movement of loose parts within their functionalff clearances. E ort can be cost-e ectively targeted at the main sources of noise, but a di erent combination of the numerous solutions available has to be individually contrived for each power train unit. There is no prospect of a universal solution for all vehicle transmissions. [7]

IV. SUMMARY

The cause of rattling and clattering noise is torsional vibration of transmission components that are not under load, that move backwards and forwards within their functional clearances. This noise is perceived as distinct from other sources of noise, and is intrusive because of its undesirable character. The transmission parameters backlash, axial clearance and main centre distance were varied by experimental analyses in test stand trials, showing the effect on the propensity to rattle and clatter. By optimizing these parameters, it was possible to minimize the rattling and clattering noise. Measures internal to the transmission to reduce loose part vibration in vehicle transmissions were also considered.

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Development of Lateral Cock Valve Considering its Needs and Problems Using 3D Printing Technology

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Abstract— Lateral Cock Valve is used in Drip irrigation and Sprinkler systems, for regulating water flow and pressure. It regulates the flow of water manually, as and when required. Study shows that, organization using the lateral cock valve, have few functional problems such as, leakage, proper gripping, fitting of top part, slipping problem etc., which has to be identified and rectified before it can be practically used. So, Modeling and Development by 3D CAD Software of the Lateral Cock Valve is needed to be done. Considering all its functional problems and needs, development of the original part is to be done. Prototype can then be manufactured using 3D Printing Technology which is one of the Rapid Prototyping Technology which save time and cost by giving accurate results. The research focuses on Prototype development considering functional needs and problems using 3D Printing Technology, to save time and cost of fabrication and die design for Lateral Cock Valve.
Keywords - Functional Problems, Lateral Cock Valve, Rapid Prototyping, 3D Development, 3 D Printing Technology.

I. INTRODUCTION

Today Water is a very important resource. Wastage of water is a crucial issue and there are many methods use for it's saving. One of the method which is recently implemented are Drip and Sprinkler Method. It saves water in large quantity and delivers it as and when required with minimum wastage. Lateral Cock Valve is one of the type of shut off Valve used in Sprinkler and Drip irrigation method. These valves are manually operated. They are typically installed at the point of connection, junctions where the mainline branches off in different directions or at clusters of remote control valves. These valves can shut off parts or an entire system in case of water flow to be stopped or work is needed on the mainline or control valves. There operating positions are either fully open or fully shut and is a important part or component in sprinkler. So these valves should be leak proof for better performance and as they are manually handled should be easy to operate with proper gripping and without slipping. So these problems and needs are identified for a Organization and they are developed and manufactured accordingly [2,3].
In this Research work Modeling and Development of a Lateral Cock Valve according to the functional requirement needed by Organization will be done. The Modeling of the original component will be done first and then the required development will be done taking into consideration its needs and problems. After the development, its Prototype will be made. The Manufacturing of Prototype will be done on 3D Printing Machine which is one of the type of Rapid Prototyping Technology. By using this technology we can directly convert the 3D CAD Model into Sample Prototype by slicing the part Model and developing the Prototype layer by layer by using wire form of ABS material. This will save time and money of manufacturing a prototype before finalizing the die design and fabrication of Lateral Cock Valve. Hence we can see that requirement identified from Organization and then Modeling, Development and Manufacturing of Prototype will be done.

I. LITERATURE REVIEW

Gouri et. al (2014), focus on the review on design of self regulating pressure valve by using transient finite element analysis and it includes study of various papers related to self regulating pressure valve. It focuses on exchange of of liquid between two chambers, when in it required flow be shutoff when ascertain pressure is reached [1]

Pujari et. al (2015), carried out analysis and design optimization of valve body using FEA and stress analysis on valve. He perform a literature review on optimization of various mechanical parts and concluded that the results of decreasing thickness and increasing the neck size are better than only reducing the wall thickness.[2]

Daniel et. al (2011), carried a research on low pressure drip Irrigation for Small Plots and Urban Landscapes. Researcher conducted a survey in western US for water management that provide incentive to help conserve available water supply for essential needs. It includes suggestions and recommendations for scheduling irrigations and provides plans for a low-pressure drip system that could be adaptable to rainwater catchment or other gravity-fed systems. [3]

M. Stanek et. al (2012), gave the basic introduction of Rapid Prototyping and compared two different methods commonly used for prototype parts production in terms of cost and time consumption and final mechanical properties and concluded that Rapid prototyping method is very useful tool which can accelerate the way of product from the idea to market.[4]

Pham D.T et. al (2003), studied different methods of rapid prototyping and rapid tooling and discovered its new uses and appliances in practical purpose. [5]

Pulak M. Pandey (2010), provided an overview of RP technology in brief along with details of few important processes was given. The description of various stages of data preparation and model building was also presented and found out that Rapid prototyping shorten the product design and development process with the consideration of some important factors before starting part deposition for proper utilization of potentials of RP processes. [6].

II. METHDOLOGY

A Identify the required Need and Problem of Lateral Cock Valve

According to the requirement of Organization, the product need development in its functional needs and problems like (1) When it was tested with the flow of water and joined between two small pipes there is leakage observed. (2) As it is press fit, when it was tried to open the gripping of product was not up to the mark for proper handling. (3) While turning the top part for on and off of water flow , there was slipping problem (4) Also the Valve was not having proper fitting at both end i.e. it should fully go into the pipe which is around 16mm hole and 2 to 3 mm thick. (5) Also the development and manufacturing of Lateral cock Valve Prototype at should be minimum cost without the design of die initially.

So there is a requirement to develop the above Lateral Cock Valve with elimination and modification in the above constraints. They can also be flexibility in size up to some minimum limit if needed during modification [2,3]

B Modeling the Original Prototype of Lateral Cock Valve Using 3D CAD Software.

So after getting the requirement for the Lateral Cock Valve, first Model the original product as per its dimension on a 3 D base software of Unigraphics. While Modeling few areas were concentrated minutely where the actual development was required. After the dimension were taken of the original Lateral Cock Valve the 2D and 3D Model were done.

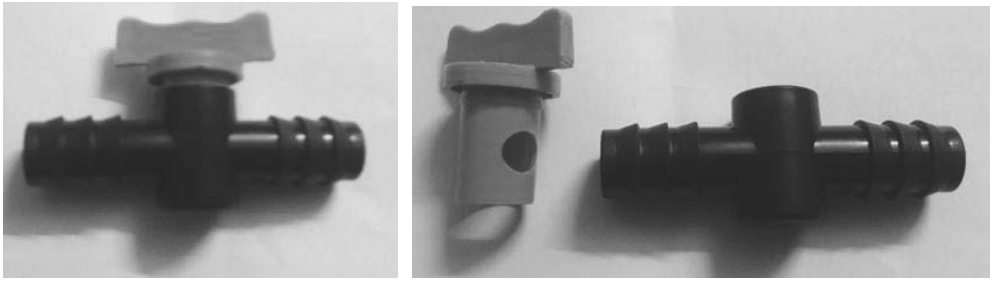


Figure 1. Image of Original Lateral Cock Valve

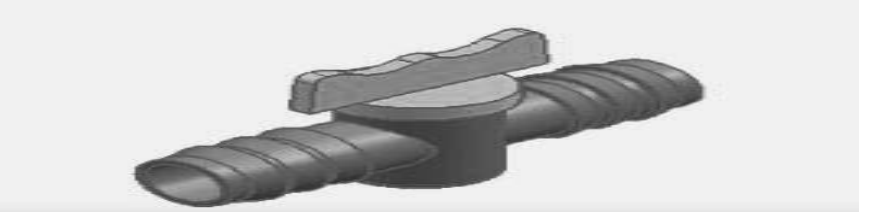


Figure 2. 3D Modeling of the Original Lateral Cock Valve

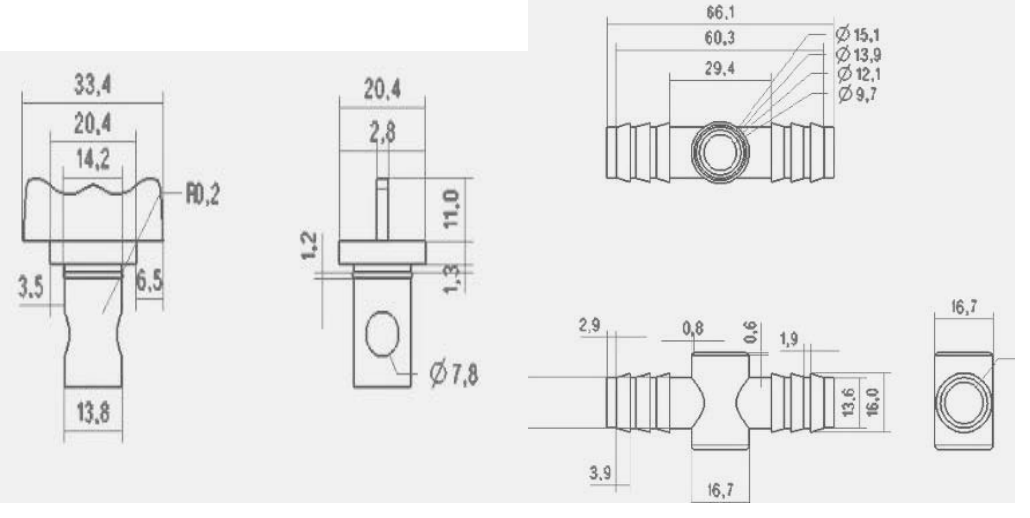
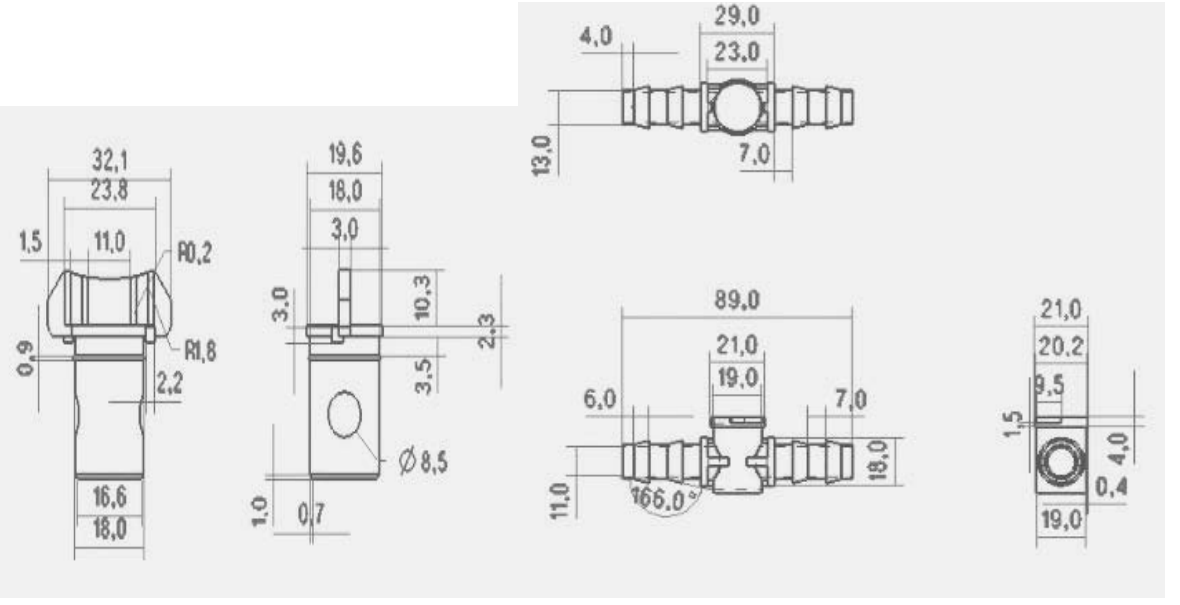


Figure 3. 2D Part Drawing of the Original Lateral Cock Valve

C Modeling and Development of the Prototype

After the Modeling of the Original Part was done than areas where development was possible were concentrated according to the functional problem and need.

Figure 4. 3D Modification of Developed Lateral Cock Valve



(a) Top Part **(b) Bottom Part**

Figure 5. 2D Development Drawing of the Original Lateral Cock Valve

The following Modification were done as per communication with the Organization :
1) The diameter of the inner recess of bottom part was increased from 16.7 mm to 19.0 mm The top part can move freely without slipping.
2) The lock system having rotation 180° is changed to half rotation of 90 ° either end for proper Gripping and Leakage purpose.
3) The diameter of end part at both sides was reduced from 13.6m to 11.0 mm for proper fitting in pipe along with the upper contour changed accordingly.

D Manufacturing the Prototype of Lateral Cock Valve by 3D Printing Technology

Rapid prototyping is an additive production processes. Rapid Prototyping is a joining process as compare to abrasive processes such a milling, drilling, grinding eroding etc. in which the form is shaped by material removing. Rapid prototyping processes work with layers where single layers are produced and joined to a final geometry. On principle, rapid prototyping processes are two and half D processes, tacked up by 2D contours with constant thickness. 3D model are necessary for layer creation.

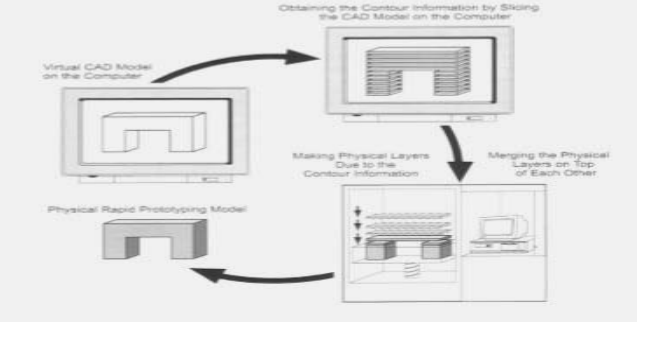


Figure 5. Rapid Prototyping Process [0]

Rapid prototyping has one process called 3D printing method which is very often used. Ink jet pointer is very similar to 2D printing process. Injected material is a polymer which after cooling forms the required layer or binder which bonds powder particles. PolyJet Technology provides a quick turnaround for smooth, fully cured parts. The process consists only of UV bulbs and photopolymer materials. PolyJet machines fully cure each layer of super fine UV photopolymer and support materials as eight jetting heads precisely deposit the product. By either a water jet or hand and brush, support material is easily separated from the part. Special baths or extra finishing treatments are not needed. The small-footprint is a cost effective system which uses a completely clean process, making it ideal for standard office environments. The materials are deposited in layers as fine as 0,016 mm thick. [5].
So the Lateral Cock will be developed by 3D Printing technology which will save cost and time for die design and fabrication with accurate results.

IV. SUMMARY

- The Functional need and Problem for Lateral cock Valve were identified and 3D development was done.
- The diameter of the inner recess of bottom part of Lateral Cock was increased from 16.7 mm to 19.0 mm to avoid slipping. The lock system was reduced from 180° rotation to 90° degree half rotation on either side for proper gripping and to avoid leakage.
- The outer diameter of the Original Lateral Cock was reduced from 13.6 to 11.0 mm accordingly the outer contour for proper fitting of pipe.
- Development of Lateral Cock once finalized by the Organization will converted to Prototype by 3D Printing technology one of the Rapid prototyping technology to save cost and time of die manufacturing and giving accurate results.

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Design of Stationary IC Engine's Exhaust Valve and Optimization Based on Finite Element Analysis

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Abstract- Exhaust valves are the precision engine components. Purpose of the exhaust valves is to send the exhaust gases out of the cylinder. This process is essential for the smooth-running of internal combustion engine. If the exhaust valve is not designed properly then it fails and the following stroke will begin to mix with exhaust fumes rather than clean air. This may be inadequate for proper combustion and it leads to poor running conditions. Valves are subjected to spring force and thermal loading due to high temperature and pressure inside the cylinder. During the operation of internal combustion engine, the axial stresses are produced in exhaust valve due to cylinder gas pressure (compressive only) and inertia force arising on the account of valve spring action. At the same time it is subjected to overheating due to very high temperature. The result of which maximum stresses are developed at the fillet section of exhaust valve. In the proposed work, stress concentration on valve can be further reduced using suitable filet radius through optimization based on finite element analysis and experimental validation on UTM to increase working life of exhaust valve. Design of valve is done based on given specifications with study of valves and its failure modes. In the next part of work modelling, analysis of valve is to be done with optimization of valve fillet radius.
Keywords-exhaust valves; fillet section; modeling spring force; UTM

I. INTRODUCTION

Engine valves are precision components of internal combustion. Failure rate of exhaust valve is higher than inlet valve. Because intake valves are virtually cooled by fresh air, Exhaust valves are very important engine components that are used to control the flow and exchange of gases in internal combustion engines, however burnt gases have very high temperature and because of that it can be exposed to very high thermal stresses more than intake valves and hence there are more chances of failure of exhaust valves rather than inlet valves. The following section details the literature available relevant to the proposed study.

II. LITERATURE SURVEY

Jerzy Jaskólskiet. al. (2014) has proposed the temperature and Stress Fields of Valves of IC Engine. Aim of this paper is to Study of the Temperature and Stress Fields of Valves of IC Engine. In this author has performed Structural and thermal analysis using ANSYS and it is noticed that the temperature field is not easy comprehensible in techniques, the temperature computed in the middle are too low. S. M. Jafari et.al (2014) has proposed the valve fault diagnosis in internal combustion engines using acoustic emission and artificial neural network.Time and frequency domain, detects the difference between only faulty and healthy valves. B.E. Gajbhiye, et.al (2014) has proposed the vibration testing and performance analysis of ic engine exhaust valve using finite element technique.
Aim of this paper is to find out effects of vibration on IC engine exhaust valve and to identify the resonance phenomenon frequency level by finding out the natural frequency of valve.Author has performed Modal analysis of valve using FEA software.It is observed that stem of valve is most affected zone. A. S. More et.al (2014) has proposed the analysis of Valve Mechanism – A Review. This paper focused basics of Valve mechanism, components, analysis models, valve performance parameters. In this proposed work dynamic and kinematic analysis of IC engine is done. Sanoj. T, et.al (2014) has proposed the Thermo Mechanical Analysis of Engine Valve. In this thermal and structural analysis of valve with different materials (Nimonic80A and Nimonic 105A) were used for valve analysis. Yuvraj K Lavhale,

et.al (2013) has proposed the overview of failure trend of inlet & exhaust valve. In this work, different modes of failure of valves, Methods of fracture analysis were used for valve failure analysis and inlet and exhaust valve failure based on fatigue, wear, erosion and corrosion were studied. GoliUdaya Kumar, et.al (2013) has proposed the Failure Analysis of Internal Combustion Engine Valves by using ANSYS. The focus of proposed system is mainly to identify the failure modes of internal combustion engine valves. Failures of fatigue, affect high temperature, and failures due to impact load.Structural, thermal and transient structural analysis For Life Calculation using ANSYS software. Analysis is done with two conditions as valve, valve with seat and fin segments by varying two materials. Two different valve materials used are aluminium and magnesium alloy. Naresh Kr. Raghuwanshiet.al (2012) has proposed the Failure Analysis of Internal Combustion Engine Valves: A Review. This paper focused on different modes of failure of valves, Number of cycles for failure. High temperature results into decrease in hardness and yield strength of valve material, and also causes corrosion of exhaust valves. Kum-Chul et.al (2011) have proposed the a study of durability analysis methodology for engine valve considering head thermal deformation and dynamic behavior.

III. RESEARCH GAP

From the literature review it is seen that most of the studies on exhaust valve design had focused on fatigue behavior, wear behavior, deformation mechanisms in metallic materials. However, very less research is done in design of exhaust valve based on optimization of its any parameter. Therefore this study is conducted to design the exhaust valve by optimizing the fillet radius and to recommend the best alternative material for valve through experimentation and validation in order to increase the working life of exhaust valve.

IV. SPECIFICATION OF THE PROBLEM

In the present work the stress concentration of exhaust valve is reduced using suitable fillet radius based on optimization of fillet radius. Because past research and experiences had indicated that during the operation of the internal combustion engine, the axial stresses are produced in exhaust valve due to cylinder gas pressure (compressive only) and the inertia force arising in account of valve spring action. At the same time it is subjected to overheating due to a very high temperature.It results into the development of maximum stresses at the fillet section of the exhaust valve. Hence the problem statement is "To design the valve with modeling & structural analysis and to optimize it based on valve fillet radius. So, that it can withstand to given operating conditions. Further material selection is to be done based on analysis".

V.OBJECTIVE

a) Find out the problem (failure) areas by studying the existing exhaust valve system for redesign of the exhaust valve to overcome the problem.
b) CAD model of exhaust valve will be created in CATIA and the Finite element analysis is done to determine the stresses in the present design of the exhaust valve for the given loading conditions using Finite Element Analysis software (ANSYS).
c) Structural strength for the exhaust valve will be verified over an Universal Testing Machine (UTM) for compressive loading.
d) To recommend the best alternative design for the exhaust valve through experimentation and validation in order to increase the working life of exhaust valve.

V. METHODOLOGY

6.1 Specification of existing exhaust valve

4-Stroke CI engine-
Allowable Stress 57.5 N/mm^2 (Carbon Steel), Valve Seat Angle 45^0,
Gas Velocity - 2100m/min Mean Piston Speed 275 m/min,

Max. Gas Pressure 6.0 N/mm^2, Cylinder Bore Diameter 120 mm,
Stroke: 125 mm Engine speed: 1150 rpm
Exhaust valve Temperature is 750^{0}C. Length = 10.5 cm

6.1.1 Mathematical calculation

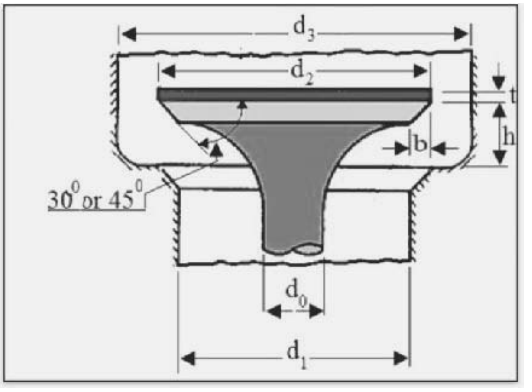

Fig.1.Valve dimensions

d1= dport = port diameter = 43.42 mm = (Piston speed / Velocity of gas through valve)$^{1/2}$

Valve lift h = (0.25 d1 / cosalpha)=15.35 mm
Where,
α = valve face angle = 45^o
Port area= (1/4) πd1^2
1480.70 mm^2
Thickness of valve disc, t = $(_{Pmax}/\sigma)^{1/2}$ $_{K1}$ d1= =0.42 x 43.42 =5.89 mm
Where, k1 = 0.54-for cast iron; 0.42-for carbon steel & high grade steel
σ= allowable stress = 55 MPa for plain carbon steel
= Diameter of Valve head, d2= d1+ 2(t x sin (90– α)) =43.42 + 2 (5.89 x sin 45) = 51.74 mm
Diameter of valve head opening area, d3= $(d1^2+d2^2)^{1/2}$
= 67.55 mm
Width of seating,b = 0.5 (d2–d1)
=0.5 (51.74 - 43.42)
= 4.16 mm
Diameter of valve stem do = (d1/8)+ 4= 9.42 mm
Diameter check :

$0.7854 (d3^2 – d2^2) \geq 0.7854 d1^2$
$0.7854 (67.55^2 – 51.74^2) \geq 0.7854 (43.42)^2$
$1480.83 \geq 1480.71$
Design is safe.

Size of valve ports Check :
Vg × a = Ap × Cpave.
Where Vg = velocity of gas ≈2000 to 3300 m/min-for stationary/marine engines

= 2100 m/min ≈3300 to 5000 m/min-for automobile engines Ap =
area of piston= πD^2 = 11309.73 mm^2

Cpave = average piston velocity = 2 L N, m/min = 2 x 0.
120 x 1150
= 287.5 m/min

Where,

Vg = gas velocity – fixed – in ft/min

$(180+\alpha+\beta)$ = Duration of valve opening = $(180+45+15) = 240^0$C T=

Exhaust temp. inRankine – T(R)= $T^oF + 459.67$

Exhaust valve Avg temp ≈ $400^oC = 752^oF = 1211.67$ Rankine ch= Charging efficiency ≈ 85%;

P = pr. of gas in psi =14.7 psi - for intake = 1atm. Exhaust valve –

α = opening advance = 45^o, &

β = closing delay, generally = 10 to 20^o

V'g :For Stationary engines 18000 ft/min – for exhaust valve.

For Automobile engines 27000 ft/min – for exhaust valve

Vg' = 16800.16 ft/min

= 16800.16 ft/min < 18000ft/min .... hence design is safe.

6.2 Software used for modeling &analysis

6.2.1CATIA V5 R20

CATIA V5 provides three basic platforms: P1, P2 and P3. P1 is process oriented companies that grow toward the large scale digitized product definition which are in small and medium sized. P2 is required in product, process and resource modeling for the advanced design engineering companies. P3 is for the high-end design application and is basically for Aerospace Industry, where high quality surfacing or class-A surfacing is used for designing. Advantage is that any change made to the external data is notified to user and the model can be updated quickly. A workbench is defined as a specified environment consisting of a set of tool, which allows the user to specific design tasks in a particular area.

6.2.2 ANSYS 14.0

Ansys is user friendly finite element analysis software which can also use for modeling and meshing varies kind of analysis. ANSYS 12.0 include the following new enhancement that improves the solution procedure and high performance computing due to shared memory. Ansys now run on windows 32- and 64-bit systems. PCG Lanczos method provides a robust and efficient option for large modal analyses.

6.2.3 UTM (Universal Testing Machine)

Make: Star Testing System (India) - Software based
Model No: SPS 248 Type: DC Servo Control Speed
for loading: 5mm/min to 500mm/min

VI. FUTURE WORK OF PROPOSED SYSTEM

In the further part of work, Modelling and Analysis of existing Valve is to be done along with optimization of Valve. The analysis of the valve will be done using ANSYS 14.0 software and the results of the same will be validated through experimental testing.The test will be carried out on UTM machine and results will be compared and based on the results, suitable solution will be finalized. In this way valve will be designed by optimizing the fillet radius through experimentation and validation in order to increase the working life of exhaust valve.

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A Review on Corrosion Behavior of Duplex Stainless Steel in Severe Working Condition

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Abstract- Duplex stainless steel exhibits higher resistance to stress corrosion cracking and it has higher strength than austenitic stainless steel. Taking advantages of these positive factors, duplex stainless steel is widely used in the marine applications, tubing for heat exchanger, oil and gas, petrochemical, pulp and paper, and pollution control industries. It is well known that the duplex stainless steel exhibit good weld ability, but the melting and solidification associated with fusion welding processes destroy the favorable duplex microstructure of this stainless steel**.** The heat treatment process is often used for the refinement of grain structure of the steels to improve the corrosion and wear resistance properties of the base material e.g. vessels, valve cone, spindle and valve seat, valves collar and pipes used in marine and other application where the material exposes to severe atmospheric conditions to improve the mechanical and tribological properties of the key element like pressure vessels, valve seat and sleeve which is made up of duplex stainless steels or Inconel for chemical, petrochemical, oil/gas, marine and nuclear industries, for economic reasons. In this respect a literature review of behavior of duplex stainless steel to severe working conditions is presented here.

Keywords: - Corrosion resistance, Potentiodynamic testing, SEM, XRD, Heat treatment

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I. INTRODUCTION

Failure of duplex stainless steel in corrosive environment due to corrosion. And what if heat treat part exposed to corrosive medium orimposed to marine applications? As heat treatment improve the grain structure would it be beneficial for corrosion resistance or not? This is the main question behind the problem and analysis. This problems arrived from the failure analysis of the failed part during the working condition of duplex stainless steel. The failure occur due to stress corrosion cracking in the marine environments. Various industries facing the problem of failure of mechanical components due to corrosion and abrasion.

Duplex stainless steel has equal phase balance of approximately equal amounts of ferrite and austenite. It has a mixed microstructure consisting of ferrite (BCC) and austenite (FCC) phases. Considering the effects of microstructure with different steps of the heat treatment on the pitting and sulphide stress cracking (SSC) properties. The corrosion properties of stainless steels can be studied in marine or chloride environments with the effect of heat treatment and investigation of changes in microstructure and corrosive property

II. REVIEW OF RESEARCH AND DEVELOPMENT IN THE SUBJECT

Muhammad Nauman Zafar et. al. [1] studied the evaluation of the corrosion resistance of SA-543 and X65 steels in emulsions containing H2S and CO2 using a novel emulsion flow loop. Thiago J. Mesquitaet. et. al. [2] have studied the corrosion and metallurgical investigation of two super martensitic stainless steels for oil and gas environments in that, the corrosion properties of two super martensitic stainless steels were studied in chloride and H2S environments. A comparison between 1.4542 and 1.4418 SS grades was made considering the effects of microstructure, different steps of the heat treatment on the pitting and sulphide stress cracking SSC properties. N. Mundhenket. et. al. [3] in their investigation of corrosion and scaling as interrelated phenomena in an operating geothermal power plant the study refers to an experimental research and contributes to a better understanding of corrosion and scaling in an operating geothermal power plant (Soultz-sous-Forets, France). An in situ physicochemical monitoring program has been performed in order to characterise the processed brine. In situ and laboratory corrosion experiments were performed using conventional and candidate metals

L. Mohan et. al. [4] have investigated the corrosion behavior of titanium alloy Beta-21S coated with diamond like carbon in Hank's solution. I.M. Pohrelyuket. al. [5] have investigate the corrosion resistance of Ti–6Al–4V alloy with nitride coatings in Ringer's solution. Matteo Gastaldi ,LucaBertolini et. al. [6] investigated the effect of temperature on the corrosion behaviour of low-nickel duplex stainless steel bars in concrete. Yinqun Hua et. al. [7] investigated the hot corrosion behavior of TC11 titanium alloy treated by laser shock processing. E. Godlewskaet. al. [8] carried a research on hot corrosion of Ti–46Al–8Ta (at.%) intermetallic alloy. The samples were purposely contaminated with salt deposits consisting of NaCl or Na2SO4 or a mixture of these. The progress of degradation was followed by mass change measurements and visual inspection. KazimieraKonefalet. al. [9] investigate the methods to improve corrosion resistance by means of stainless steel X6CrNiMoTi17-12-2 by slide diamond burnishing. S.M. Alvarez et. al. [10] have studied the Corrosion behaviour of corrugated lean duplex stainless steels in simulated concrete pore solutions. E. Machnikovaet. al. [11] have studied the Corrosion inhibition of carbon steel in hydrochloric acid by furan derivatives.

F. Iacoviello et al. [12] had studied the Effect of "475 °C embrittlement" on duplex stainless steels localized corrosion resistance. In their investigations the influence of the 475 °C ageing treatment on the localized corrosion resistance of austenitic–ferritic (duplex) stainless steels has been investigated by means of double loop electrochemical potentiodynamic reactivation (DL-EPR) and potentiostatic tests. The effect of different ferrite/austenite (α/γ) volume fractions has been also considered. For this purpose, two different 22 Cr 5 Ni duplex stainless steels, with different α/γ ratios (respectively equal to 1 and 1.5) have been investigated. The ageing treatment at 475 °C was conducted up to 1000 h. The resulting microstructural modifications were analyzed with transmission electron microscopy observation. The microstructure resulting from solid state transformations, like spinodal decomposition and G-phase precipitation, were characterized and the relevant mechanisms identified.

N. Lopez et al. [13] had investigated the Influence of σ-phase on mechanical properties and corrosion resistance of duplex stainless steels In order to find out the influence of s-phase on the behaviour of duplex stainless steels, two tests are performed. The first one is the double loop electrochemical potentiodynamic reactivation (DLEPR) test that indicates the degree of sensitisation to intergranular corrosion. The second one is the slow strain rate test (SSRT) that enables us to the degree of sensitisation to stress corrosion cracking.

R.A Perren et al. [14] had studied the corrosion resistance of super duplex stainless steels in chloride ion containing environments: investigations by means of a new microelectrochemical method: I. Precipitation-free states. In which theattemptd had made to develop a new mircoelectrochemical method which was applied to perform potentiodynamicpolarisation experiments on areas in the range of 10 μm. For the first time, the individual corrosion behaviour of both single phases in super duplex stainless steels was determined. The results show a good correlation with the empirical pitting resistance equivalent number (PREN) of the corresponding single phase. The microelectrochemical experiments have revealed two different kinds of interactions between the ferrite and the austenite phase at the phase boundary, namely a superposition or a separation of the two polarisation curves of the single phases.

R. Merello et al. [16] studied the Influence of chemical composition on the pitting corrosion resistance of non-standard low-Ni high-Mn–N duplex stainless steels. In which the ateempt had been made to accessed the pitting corrosion resistance of a new family of duplex stainless steels. These non-standard duplex stainless steels were characterised by low Ni content and high N and Mn levels.

III. METHODOLOGY ADAPTED BY INVESTIGATOR FROM THE LITERATURE

To carry out this detail investigation a research methodology has been planned and the general steps involved in the methodology are presented here, by following these steps required investigation can be done.

Specimen preparation

A standard laid down procedure is available for the specimen preparation, this procedure require to follow to prepare the specimen for corrosion and microstructural analysis.

Microstructure examination

To carry out this experimentation specimen preparation is required to be done, after the specimen preparation the detail microstructure analysis need to carry out in order to study the microstructure before and after the corrosion test by the microscopic examination of material with the help of microscope.

Corrosion testing of the specimens

There are various corrosion testing are available in which intergranular and pitting corrosion resistance of the material is evaluated.

Corrosion tests

In order to test the corrosion behavior of the treated surface,salt spray corrosion test require to perform.
A test rig can be repaired accordingly.

Investigation and Analysis of microstructure and corrosion

By proper investigation and analysis of specimen for microstructure and effect of microstructure by heat treatment and corrosion analysis one can derive a fruitful conclusions and results by investigation and analysis of corrosion and microstructure test.

IV. DISCUSSION

Duplex Stainless steels (shows both the ferritic and austenitic) have proved to be the most satisfactory materials for marine and saline applications due to its superior corrosion resistance with good erosion and wear resistance even at high water velocities, good mechanical properties and weldability . Most of the time it is heat treated to improve the mechanical and tribological properties of the key elements. In addition, they are attractive from a commercial standpoint due to their availability and relatively low cost. However, the greatest drawback with conventional stainless steel is susceptibility to localized corrosion in chloride-containing aqueous solutions which limits their use in seawater systems. The influence of the chloride ion on the pitting behavior of stainless steels has been the subject of extensive studies due to its importance in seawater processing plants (desalination plants) and marine installations as it shows the superior characteristics to other marine construction materials, investigation can be done to improve the resistance of stainless steels to localized corrosion. The alloying elements that increase the resistance of stainless steels to pitting and crevice corrosion are chromium, molybdenum and nitrogen.
The problems related to corrosions are worldwide and the research related to corrosion is going on international level number of researchers have tried to cope up with this problems but the research related to heat treatment of duplex stainless steels and comparison between heat treat and not heat treat duplex steels is very scanty and reported research work related to the effect of heat treatment and evaluation of new microstructure which resulted more corrosion is also very rare. Moreover, no systematic study has been reported so far to analyze the influence of heat treatment on corrosion and metallurgical properties of duplex stainless steels.
This investigation aims to carry out a systematic study to investigate the corrosion behavior of plain duplex stainless steel and the effect of heat treatment on the microstructure and corrosion resistance on the duplex stainless steels in seawater.

V. FUTURE SCOPE FOR STUDY

1) To study the behavior of duplex stainless steel under the action of corrosive environments.
2) To investigate the effect of heat treatment on the microstructure and corrosion resistance of the duplex stainless steel.
3) To compare the corrosion behavior of simple and heat treat duplex stainless steel.

4) To study and investigate the cause of corrosion and effect of heat treatment on the corrosion resistance offered by the duplex stainless steels.

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Application of Different Cutter Materials in Gear Hobbing to Improve the Productivity

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Abstract- To meet the future goals of higher productivity and lower production costs, the cutting speeds and feeds in modern gear hobbing applications have to increase further. Basically, the parameters that have an influence on the cutting process should be known and possible to control. Gear manufacturing is highly important in automotive industry. The prevalent manufacturing method is gear hobbing with gear. Through the experimental investigations and theoretical studies of significant parameters such as speed, feed, depth of cut, material, surface finish, cost etc, a continuous process optimization is necessary to satisfy the customer demands. Changing the substrate material is a basic approach in optimization of operation times. Taguchi method can be used for selecting the design of experiments and Principle Component analysis can be used to optimize the process. This research paper focuses on improving the productivity by using different cutter materials.
Keywords- Gear Hobbing, Optimization, Principal Component Analysis, Productivity**,** Taguchi

I. INTRODUCTION

The competition between companies and industrial countries of industrial and emerging countries is advancing with globalization. In the past years the demand for gears is continuously increasing. The majority of gears are manufactured for the requirement of automobile industry. Therefore high productive and manufacturing processes are needed currently and in the future. Hobbing is the dominating manufacturing process for helical gears and external spur hobbing is of major importance for gear production. In the hobbing both the tool and the machine can be optimised. These components are developed continuously. A basic approach is to fully exploit the potential of existing tools and their substrate material to increase the productivity in an industrial environment [1].

1.1 Gear hobbing

For massive production of external gears, gear hobbing is a highly utilized flexible manufacturing process. Hobbing is a machining process for gear cutting splines, cutting sprockets, and cutting on a hobbing machine, which is a special type of milling machine. The hob is a cutting tool by which the teeth or splines are progressively cut into the workpiece by a series of cuts. Hobbing is relatively inexpensive but still quite accurate as compared to other gear forming processes, thus it is used for a broad range of parts and quantities [1]. Current processes for producing transmission gears involve hobbing, milling or shaping of a forged stock to obtain the gear shape. Gears are typically formed by hobbing tools made from solid tooling material, such as tungsten carbide, and have dozens of teeth [2]. By using higher cutting speeds the productivity of machining operations can be expanded and the quality of products can be improved than the applied traditional methods. Developments in machine tools, work materials and cutting tools have resulted in the spread of high speed cutting (HSC) technology [4].

1.2 Hob tool

A cutting tool used to cut the teeth into the workpiece is known as hob. It is cylindrical in shape with helical cutting teeth. The selection of hob tool mainly depends on

- Selection of number of starts.
- Selection of number of hob gashes.

- Selection of hob diameter.
- Hob accuracy.

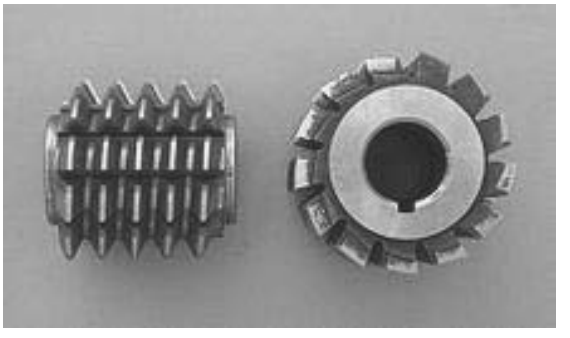

Fig. 1 Hob Tool[13]

Most hobs are single-thread hobs, but double and triple-thread hobs increase production rates. The downside is that they are not as accurate as single-thread hobs. Depending on type of gear teeth to be cut, there are custom made hobs and general purpose hobs. Custom made hobs are different from other hobs as they are suited to make gears with modified tooth profile [13]. A hard coating with a thickness of 2 to 3 μm increases the life of the hobs or permits higher cutting rates. Coated solid type hobs with a high no. of gashes are ideally suited to high performance hobbing of straight spur gears. The stability of solid type hobs is more than any other type of hob. The no. of gashes are directly proportional to the rate of chip removal, and the tool life is increased substantially by the coating and where applicable, recoating. Compared to conventional hobs, high performance hobs are required to have:

- At least equal if not superior gear quality higher tool life quality;
- Shorter machining times;
- A higher tool life quality.

Hobs can be optimized only in consideration of the machining environment. Based upon the material, the geometry and quality characteristics of the gear in question, the cutting parameters and the hob design must be matched such that the requirements are broadly fulfilled [13].

1.3 Hob Tool Materials

There are many materials that may be used for the manufacture of gear cutting tools. Cutting tools must simultaneously withstand big mechanical loads and high temperatures. Temperature in the chip/tool interface reaches more than 700 °C in some cases. Additionally, the friction between tool and removed chip, on one hand, and tool against the new machined surface, on the other, is very severe. Bearing this in mind, the main factors for a good tool design and post-manufacturing are:

- Cutting-tool substrate material must be very stable chemically and physically at high temperatures.
- Material hardness must be kept to the high temperatures suffered at the chip/tool interface.
- Tool material has to present a low wear ratio, both for the abrasion and adhesion mechanisms.
- Tool material must present enough toughness to avoid fracture, especially when operation to perform implies interrupted or intermittent cutting.

The most commonly used materials for manufacturing the hob tools are High speed steel and sintered carbide. [12]

II. LITERATURE REVIEW

Prengel et. al [1] discussed for the machining of steels, Cemented carbide is the most commonly used cutting tool material. Despite their high toughness, cemented carbide tools have low hardness values, which restrict their use in the HSM of hardened steels. To improve the machining performance of carbide cutting tools, they are usually coated with single or multi-layers of hard, wear resistant TiCN, TiN and TiAlN coatings by physical vapour deposition (PVD) or chemical vapour deposition (CVD) techniques.

Liua et. al [2] presented that gears are typically formed by hobbing tools made from solid tooling material, such as sintered carbide, high speed steel, tungsten carbide, etc. and have dozens of teeth. Aslan et. al [3] discussed the most common tool material for machining of castings and alloy steels is carbide. Compared to advanced tool materials such as CBN and ceramics. These tools have high toughness, but poor wear characteristics. In order to improve surface conditions and the hardness, carbide tools are coated with hard materials such as TiAIN, TiN and TiCN by physical vapor deposition (PVD) and chemical vapor deposition (CVD). The cutting tools used in HSC of different work materials. Dewangana et. al [4] done some of the modifications in two sets of experimental data published by the past researchers and the PCA-based approach are analyzed using this modified procedure. It was observed that the PCA-based optimization can give better results than multi response S/N ratio based methods and the constrained optimization, which can be attributed to the fact that the possible correlation among the multiple responses is taken care in the PCA-based approach. Ramanujam et.al [5] presented that for the optimization of process parameters Taguchi's robust design method has been extensively used. Taguchi method uses the S/N ratio of the response instead of the response itself to decide the level of the input parameter to optimize the output response. Such a procedure is beneficiary when it is used to optimize single response, but fails to optimize multiple responses. By using MRSN technique such multi response problems can be solved where the total loss function is computed using to summing up weighted loss functions of individual response variables and then transformed to MRSN followed by optimizing the MRSN, determining the weightage for each response which is a difficult task is one of the major limitations of this method. Principle component analysis is one such method which eliminates these problems, where the numbers of variables are reduced to few, interpretable combinations. Each of this combination corresponds to a principal component and is uncorrelated with each other. Karpuschewski et. al [6] observed that powder metallurgical high-speed-steel (PM-HSS) and carbide are mainly used as cutting materials. In the last few years the usage of the more productive tungsten carbide in hobbing is decreasing, because of its high price and its sensitivity to impacts. So, the importance of PM-HSS has increased. In conjunction with high-performance coatings based on chromium-aluminum, the development of dry cutting is increasing regarding rising cutting parameters and productivity. Klock et. al [7] investigated the influence of coating, substrate, layout and edge preparation on tool performance and optimized the hobbing process. Nair et. al [8] presented that nowadays there are required high demands on cutting tools for a gear production. Cutting tool live increase is the most important demands which is to be focused. New trends are mainly focused on develop of coating films and high wear-resistance materials which decrease final cost for gear production and increase the tool live. Cutting tool live is dependent on a lot of other factors, which cause cutting tool wear. Research of the factors and their elimination respectively optimization can decrease wear, maximal increase tool power and extend cutting tool live. Gear manufacturers would like to increase their productivity and reduce their production costs to be competitive on the global market. Therefore, feed rates and cutting speeds have increased significantly over the last years. Klock et. al [9] Hobbing cycle time decreases with the increase in no. of hob start and ultimately it results increase in productivity. Hyatt et. al [10]described the two techniques InvoMilling and five axis machining using gearMILL and compared their quality and production times with those of traditional gear manufacturing techniques. In some cases higher productivity, and higher quality levels are obtained by the agile machines. Hipke [11] presented that gears of case-hardened steel in the module range from 1.5 to 2.8 mm for automobile gear boxes and up to 4 (4.5) mm for truck-gear boxes are produced by hobbing, the most productive procedure (predominantly under automated conditions). Carbide and powdermetallurgical high-speed-steel (PM-HSS) are mainly used as cutting materials. In the last few years the usage of the more productive (because of its high temperature hardness) tungsten carbide in hobbing is decreasing, because of its sensitivity to impacts and its high price. Thus, the importance of PM-HSS has increased.

III. METHODOLOGY

It becomes necessary to develop a technique to predict cutting parameters before machining in order to obtain minimum cycle time. Figure 1 shows the research scheme of the methodology carried out in this work. The proposed methodology of the present research scheme is given below.

- Pilot experiments have to be conducted to study the effect of cutting parameters on machining time and surface roughness.

- Find out the suitable levels of parameters for hobbing process based on the pilot experiments conducted for various work piece materials.
- Best non-traditional optimization technique has to be found among the available techniques.
- The best optimization technique has to be implemented in the proposed mathematical model.
- Validation experiments have to be conducted to validate the proposed methodology.

Pilot experiments were conducted on COOPER hobbing machine HSS, M2.0, M35 grade hob tool for cutting the proposed work piece materials. By varying the speed, feed and No. of hob start, hob tool diameter and three levels respectively.

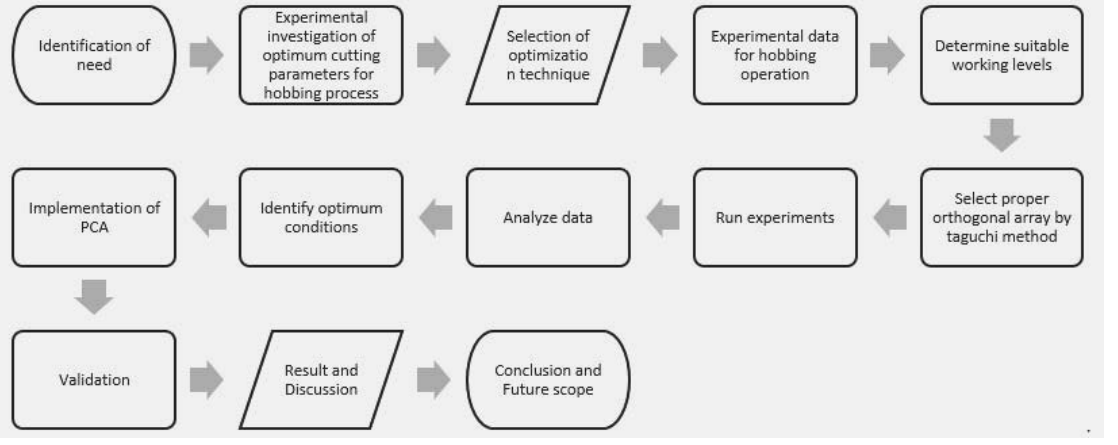

Fig. 2 Work Scheme Flow Chart

IV. SUMMARY

In order to find out the optimal parameters use of optimization is an effective tool to achieve the required result. To optimize process parameters such as speed, feed, hob start etc, Taguchi method combined with Principle component analysis method can be used in order to take care of the possible correlations, between the response variables.

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Study on Development of Rotary Desiccant Dehumidification from Air Conditioning Point of View

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Abstract- Rotary desiccant air conditioning system, which combines the technologies of desiccant dehumidification and evaporative cooling, is advantageous in being free from CFCs, using low grade thermal energy and controlling humidity and temperature separately. Compared with conventional vapor compression air conditioning system, it preserves the merits of environment-friendly, energy saving, healthy, comfortable, etc. Recent research suggest that new desiccant materials and hybrid system have significant potential for improving the performance and reliability and reducing the cost and size of rotary desiccant dehumidification and air conditioning system. hence this paper explains the development of rotary desiccant dehumidification from air conditioning point of view.

Keywords- Desiccant dehumidification, Evaporative cooler, Solid desiccant, Air conditioning

I. INTRODUCTION

Desiccant materials attract moisture based on differences in vapor pressure. Due to their enormous affinity to absorb water and considerable ability to hold water, desiccants have been widely applied to marine cargo, pharmaceutical, electronics, plastics, food, storage, etc. [1]. Recently, the rapid development of desiccant air conditioning technology, which can handle sensible and latent heat loads independently without using CFCs and consuming a large amount of electric power, and thus meet the current demands of occupant comfort, energy saving and environmental protection, has expanded desiccant industry to a broader niche applications, such as hospitals, supermarkets, restaurants, theaters, schools and office buildings. The basic idea of desiccant air conditioning is to integrate the technologies of desiccant dehumidification and evaporative cooling together. While the former adopts water as refrigerant and can be driven by low grade thermal energy as solar energy, district heating, waste heat and bioenergy, the later is near-zero cost technology [2]. These indicate that desiccant air conditioning would be not only energy efficient and environment-friendly but also cost-competitive, especially for hot dry and hot humid areas. Besides, since desiccants remove moisture in the vapor phase without liquid condensate, desiccant dehumidification can continue even when the dew point of the air is blew freezing; in contrast, cooling-based dehumidification is limited by freezing phenomenon occurring at 0ºC.As a result desiccant air conditioning is capable of handling the dew point of the air to -40ºC [3], whereas the counterpart of traditional vapor compression air conditioning (VAC) is 4 ºC [4].

As desiccants can be either solid or liquid, desiccant air conditioning systems can be classified into two categories, namely, solid desiccant air conditioning systems, which consist of fixed bed type and rotary wheel type, and liquid desiccant air conditioning systems. Due to being advantageous in handling latent heat load, all these technologies have been used widely. Especially, rotary desiccant air conditioning systems, which are compact and less subject to corrosion and can work continuously, attract more attention.

II.WORKING OF ROTORY DESICCANT DEHUMIDIFIER

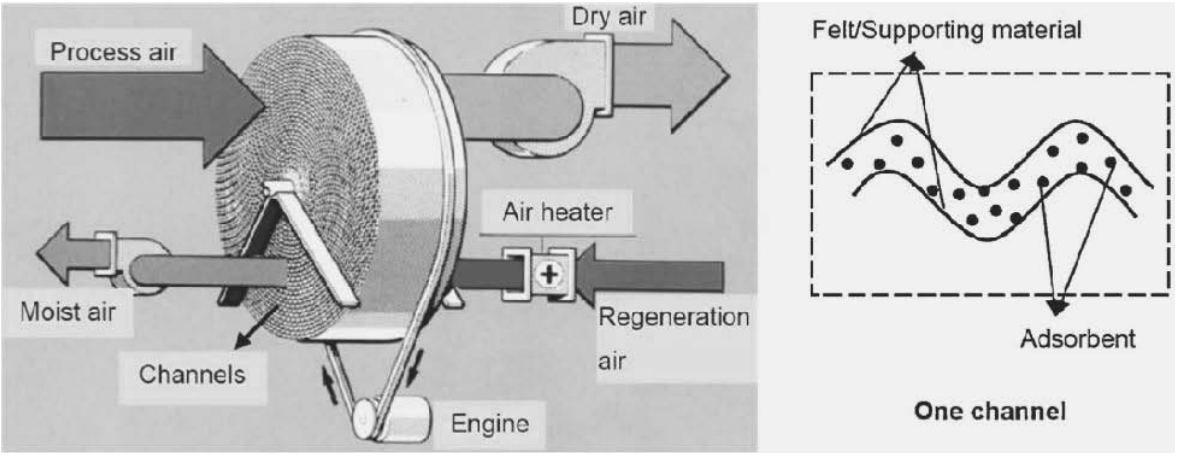

Fig. 1. Schematic diagram of rotary desiccant dehumidifier [7].

Fig. 1 illustrates the basic operating principle of rotary desiccant dehumidifier schematically. As seen, the desiccant material is impregnated into a support structure. The cross section of wheel is divided into process air side and regeneration air side by clapboard. When the wheel constantly rotates through two separate sections, the process air is dried by the desiccant due to the adsorption effects of the desiccant material and support material. At the same time, the regeneration air is humidified after being heated by a heater and desorbing the water from the wheel in tandem. It should be noted that the desiccant dehumidification process is close to an isenthalpic procedure, namely, it merely converts latent energy to sensible energy and produces no useful cooling.

Therefore, in order to accommodate cooling effect, auxiliary cooler, like evaporative cooler and other air conditioning equipments, must be incorporated to remove the sensible heat; and the performance of desiccant air conditioning systems are principally determined by the system configuration when the desiccant material, wheel structure and operation condition are invariant. For this reason, extensive types of rotary desiccant air conditioning systems have been proposed and studied both analytically and experimentally [6,7–13]. To provide an overview of the recent research, the conventional rotary desiccant air conditioning cycles and the newly developed technologies are explained in the next section.

III. BASIC ROTARY DESICCANT DEHUMIDIFICATION AND AIR CONDITIONING PROCESSES

The first patent on rotary desiccant air conditioning cycle was introduced by Pennington in 1955 [8]. Fig. 2 shows the Pennington cycle, also known as ventilation cycle, schematically and psychometrically. Ambient air at state point 1 is adopted as process air and passes through a desiccant wheel (DW), where its moisture is removed and temperature is increased due to the adsorption heat effect. Then this hot dry air is sensibly cooled from state point 2–3 in a heat exchanger (HE). Whereafter, the process air is evaporatively cooled to supply air state by passing through a direct evaporative cooler (DEC). On the regeneration air side, return air at state point 5 is cooled and humidified in another DEC. This air is then sensibly heat exchanged with the process air to precool the process air and pre-heat itself. The warm air stream is then further heated from state point 7–8 by the heat source (HS). After regenerating the DW, the air is exhausted at state point 9. Since the building exhaust of room air is not centralized or is not located in a convenient location for co-processing of ambient air for some applications, a modified ventilation cycle (Fig.3), which also processes ambient air to the building, but uses ambient air for regeneration, is proposed. It is obvious that, the thermal performances including thermal coefficient of performance (COP) and specific cooling capacity would be reduced in comparison with standard ventilation cycle due to that both the humidity ratio and temperature of ambient air are usually higher than that of return air. To

elevate the cooling capacity, recirculation cycle, which is a variation of Pennington cycle and reuses return air as process air, is developed.

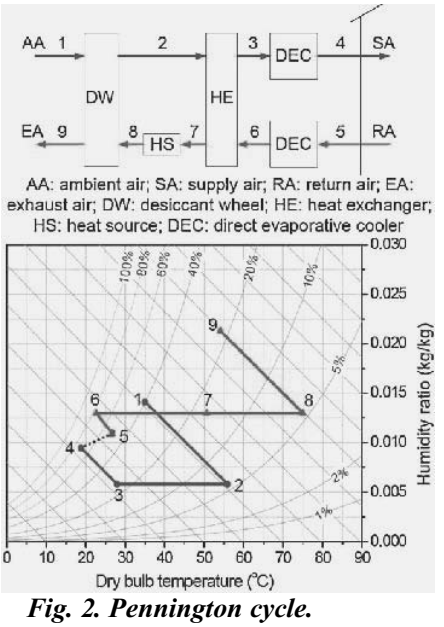

Fig. 2. Pennington cycle.

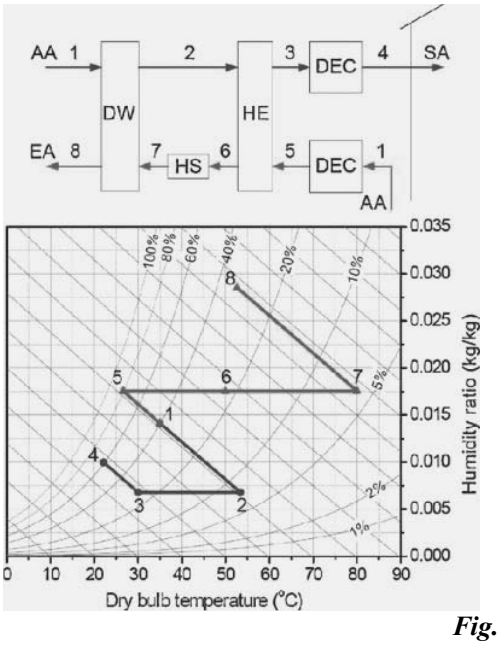

Fig. 3. Modified ventilation cycle

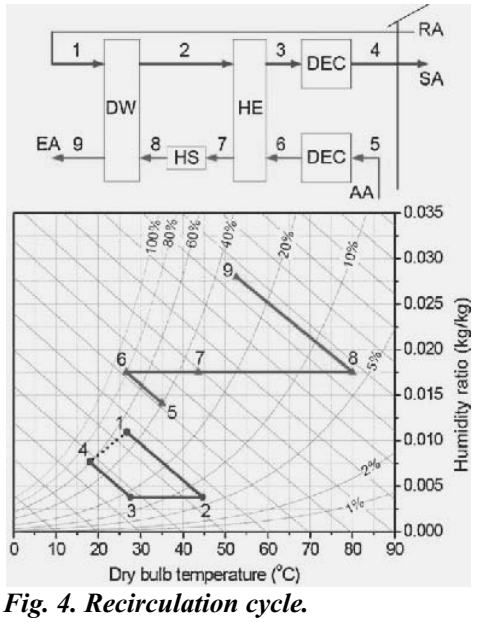

Fig. 4. Recirculation cycle.

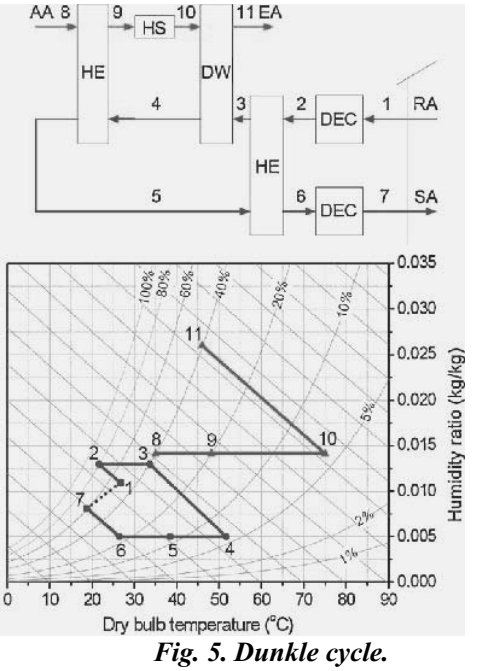

Fig. 5. Dunkle cycle.

As depicted in Fig. 4, ambient air is used for regeneration in this cycle. Due to the humidity ratio and temperature are relatively low, the thermal COP of this cycle is commonly not more than 0.8 [6]. The main disadvantage of recirculation cycle is lacking in fresh air. Dunkle cycle [9] combines the merits of ventilation cycle, which can provide cold air with relative low-temperature for the HE, and recirculation cycle, which can provide the conditioned space with relative large amount of cooling capacity. As seen in Fig. 5, an extra heat exchanger is incorporated. Like recirculation cycle, Dunkle cycle is also limited by the lack of fresh air It is obvious that fresh air not only means comfort and health but also represents an additional load. Furthermore, many cooling loads do not require that outdoor air be the source of system. Hence, fresh air should be maintained at the required level to ensure both favorable system performance

and good indoor air quality. In view of this, Maclaine-cross [10] proposed a simplified advanced solid desiccant cycle, namely, SENS cycle. Fig. 6(a) illustrates the schematic of the SENS cycle. As seen, ambient air is first dehumidified in a DW. Then the air is sensibly cooled in two HEs in tandem. Afterwards, it is mixed with certain amount of return air and cooled further in a cooling coil (CC)by exchanging heat with cold water from a cooling tower (CT). Then the air stream is divided into two parts. While one part is redirected to the CT and exhausted after exchanging heat with the process air in a HE, the other part is supplied to the conditioned space. On the regeneration side, ambient air is pre-heated in a HE. It is then heated by HS, drawn through the DW and exhausted back to the outdoors. Mathematical modeling predicted that the SENS cycle can achieve a thermal COP above 2.0. Moreover, testing at the Solar Energy Applications Laboratory at Colorado State University [6] demonstrated that the thermal COP of this cycle was about 2.45 under ambient conditions of 26 ºC and 26% RH. However, this cycle is blocked by its complexity. REVERS cycle [11] is a simplified version of SENS cycle with the only change of removing a HE, as shown in Fig. 6(b). Fig. 7 depicts the direct-indirect evaporative cooling (DINC) cycle proposed by researchers in Texas A&M University [12].

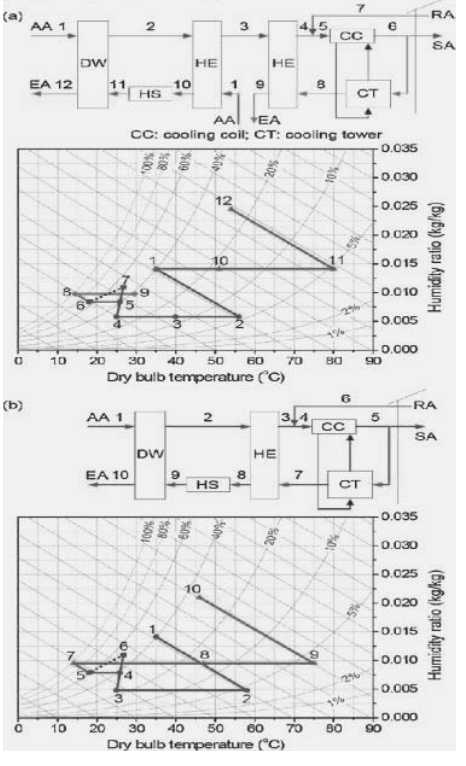

Fig. 6. (a) SENS cycle and (b) REVERS cycle.

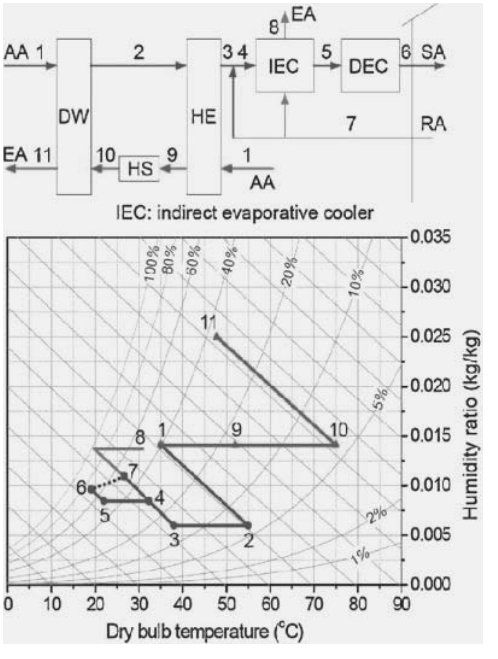

Fig. 7. DINC cycle.

Differently from REVERS cycle, the CC and CT are replaced by an indirect evaporative cooler (IEC) and a DEC. This change simplifies the system configuration further. In addition, only an IEC is added in comparison with modified ventilation cycle. As Waugaman [12] predicted, the thermal COP of DINC cycle could be over 1.6 under ARI conditions.

IV. RECENT APPLICATION

The industry market of rotary desiccant dehumidification has been well-developed since the 1980s [1]. Corresponding rotary desiccant air conditioning system has also been experiencing an aggressive commercial application increase for several decades With the more than half a century R&D in rotary desiccant dehumidification for comfort control as well as the increase of occupant comfort demands and deterioration of global energy and environment crisis, more and more commercial and building owners have been willing to invest in dehumidification equipment [15,16]. Hence, favorable market prospect can be expected. Due to the largest energy expenditure in a desiccant system is the heat used to reactive the

desiccant, according to the heat source coupled with, rotary desiccant air conditioning systems can be generally classified into two categories in practical application, namely, solar-powered rotary desiccant air conditioning system and rotary desiccant air conditioning system powered by other low grade heat sources, such as district heating, heat supplied from a combined heat and power (CHP) plant, waste heat and bioenergy

V. CONCLUSIONS

Rotary desiccant air conditioning is a typical thermally activated technology, which mainly consumes low grade heat sources as solar energy, district heating, waste heat, etc., thereby decreasing the peak electric demand caused by traditional air conditioning systems. Now a days due to development in desiccant material and hybrid system their practical applications have been implemented around the world. This is a significant achievement compared with the earlier research works, which were primarily performed on computer analysis [6]. While the most widely used desiccant materials in market, namely silica gel and lithium chloride, are either limited by dehumidification capacity or problematic for crystallization and corrosion, composite desiccants combine the merits of existing desiccants and overcome these problems by confining salt to porous host adsorbent, and have been recognized as a better choice. Additionally, the reduction in regeneration temperature and the increment in dehumidification capacity over a wide range will be of great benefit to utilize low-temperature heat and expanding the application of desiccant air conditioning.

The majority of existing rotary desiccant air conditioning systems originates from the typical basic configurations, such as ventilation cycle, recirculation cycle and Dunkle cycle. These cycles are appropriate for different applications, for example, ventilation cycle is recommended for conditioned-space with high outside air requirement, whereas recirculation cycle is suitable to space requiring much less fresh air. hybrid desiccant air conditioning is most researched as it combines the merits of desiccant dehumidification system and other air conditioning systems, desiccant air conditioning producing both dry air and chilled water is a newly proposed technology using desiccant dehumidification with regenerative evaporative cooling and is worthwhile for future research for its outstanding property of realizing independent temperature and humidity control without any assistance from VAC unit.

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Effect of Castor Oil as Bio Lubricant on Tribological Characteristics of EN31 Steel

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Abstract:-When two moving parts having relative motion between them, then the lubricants have to play very important role in reducing friction and wear between them. The lubricants are mainly formulated from petroleum oil, as we know the petroleum oils are poorly biodegradable and toxic in nature which is highly undesirable due to environmental concerns and health and safety of human beings, also the reserves of petroleum oils goes on decreasing. .This paper represents the primary investigation of Wear analysis of EN31 Steel using SAE40 oil. Wear and friction analysis is done using a pin/ball on disk wear testing machine at various parameters like applied normal load, rotational speed and time. The results (wear rate, frictional force and coefficient of friction) indicate that for increasing load wear rate and frictional force increases.
Keywords: Bio lubricants, Castor Oil, SAE40, ball on disc machine.

I. INTRODUCTION

1.1 Lubricant

Lubricant is a substance which is applied between two relatively moving surfaces for reducing friction, wear and tear of machine parts due to relative motion. Lubricating oils have wide range of application including proper functioning of every machine, equipment and instrument. Lubricating oils are mainly known for their five essential functions like lubrication, coolant, carrier, protecting and sealant. Lubricants form a film which keeps the contacting surfaces apart. Lubricants can be solid, liquid, semisolid and gaseous. Lubricants mainly consist of base fluid and additives to impart desirable properties. Conventional lubricants have petroleum oil as a base fluid. Petroleum based lubricants are the major cause of environmental pollution, because of their poor biodegradability and toxic nature. Due to higher environmental concerns there is a need of some alternate lubricants from non-edible vegetable oils for industrial and other applications. To minimize all given problems related to environment, worldwide lubricating industry has developing interest for the use of bio lubricant.

2.1 Bio lubricants

Lubricants derived from edible or non-edible vegetable oils are generally known as bio lubricants. Vegetable oils are chemically triglycerides of fatty acids. The bio lubricants have very high biodegradability in comparison with petroleum based lubricants. The toxicity of bio lubricants is also very less or they are non-toxic. Bio lubricants also give the similar performance properties that petro based lubricants have. The objective of this paper is to show the wear and friction behaviour of SAE40 oil for Piston pump application.

3.1 Castor oil

Castor oil is obtained from the seeds of castor plant and it is non edible vegetable oil. The botanical name is ricinus communis and castor plant is from euphorbiaceae family. Castor plants are available worldwide and also famous for its medicinal usage as a laxative. In India castor plants are available in abundance, and seeds from castor plants have an oil content of 40 to 60% by volume and have annual production of 271 MT. Castor oil is having high lubricity out of all the available non edible vegetable oils and also having high oxidative stability therefore it will be used as base oil.

II. EXPERIMENTAL METHOD

2.1 Pin on Disc (POD) Wear Testing Machine

POD is one type of tribometer which is used for determining the tribological characteristics of wide

range of materials under the various normal load conditions. A stationary pin/ball mounted on a pin/ball holder is brought into contact against a rotating disc at a specified speed. Pin/ball slides in the presence of lubricating oil, introducing frictional force between the pin/ball and disc (see, figure1).

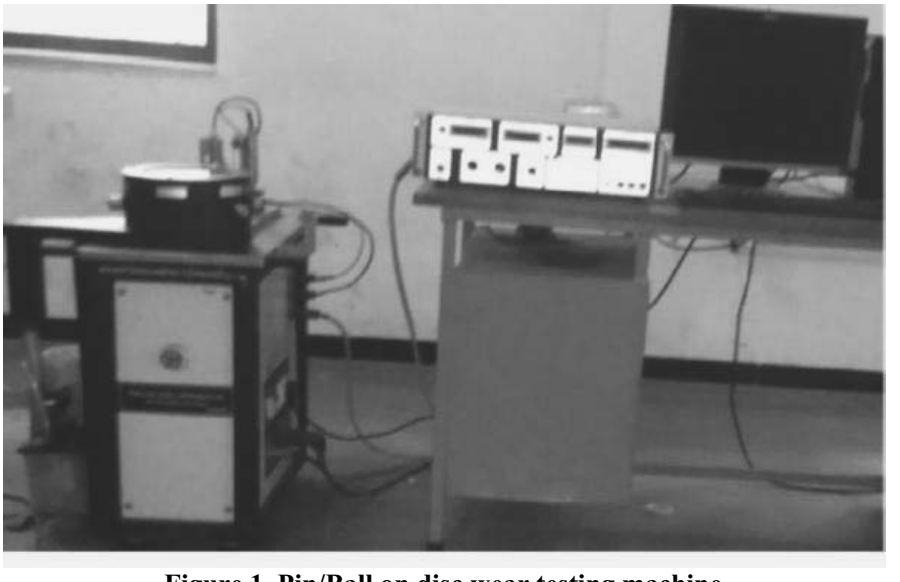

Figure 1. Pin/Ball on disc wear testing machine

2.2 Test Specimen

The Ball of diameter is 10 mm. Material of Ball for testing is EN31 Steel. The disk material is also EN31 steel on which the Ball slides.

2.3 Test Parameters

2.3.1 Normal Load: For this experimental study the starting load was 10 N and it is varied up to 60 N.

2.3.2 Speed: The relative sliding speed between the contacting surfaces in metres per second. The test was performed at 200 rpm.

2.3.3 Time: Running time of experiment in minutes. For this experimental study the running time was 20 minutes.

2.3.4 Track Radius: The path generated is circle, so the track radius for this experimental study the track radius was 25.5 mm.

2.3.5 Flow Rate: A constant flow of oil is maintained for this experimental study to achieve a film between the contacting surfaces.

2.4. Output Parameters

2.4.1 Wear Rate (mm3/Nm): Material removal rate per unit parameter due to wear.

2.4.2 Frictional Force (N): Force exerted by a surface on a relative moving object.

2.4.3 Coefficient of Friction: A dimensional less quantity indicating the frictional force between the two relative bodies.

2.4.4 Sliding Distance: It is the linear distance travelled by the ball over the plate within given time

interval. Sliding distance does not vary with load, time, flow rate etc. It varies only with speed. The value of sliding distance reported at 200 RPM is 640.884m.The wear rate can be evaluate by the sliding distance

2.4.5 Sliding Velocity: Sliding velocity denotes Velocity with which the ball slides over the plate. The value of sliding velocity reported at 200RPM is 0.534 m/s.

2.5 Experimental Procedure

Using a conventional pin/Ball-on-disk machine the lubricated frictional and sliding wear tests were carried out. The ball and the disc were positioned in such way that they ensure maximum contact. The principle of sliding consisted of a cantilever loaded ball pressed against a horizontal rotating plain disc in a lubricant oil bath. All tests were carried out at room temperature (34 ± 2 °C). In this experiment, the constant speed (200rpm) and different loads are applied .The finished surface of the wear sample and disc were measured both before and after the experiment. Before the experiment began, the disk and pin surfaces were cleaned with acetone to confirm that there were no additional particles on these surfaces. A starting load of 10 N was applied at the contact zone of a ball and disk and a constant flow of oil sample is maintained. The disk is rotated at 200 and is allowed to run for duration of 20 minutes. After that wear rate, frictional force and coefficient of friction was measured for the particular load. Four tests were carried out.

III. RESULTS AND DISCUSSION

3.1 Effect of Applied Normal Load on Wear Characteristics

Figure 2 shows the comparative study of the effect of normal load on the wear rate at 200 for SAE40 oils. It is evident from the curve that the wear rate increased with increase in applied load for SAE40 oil.

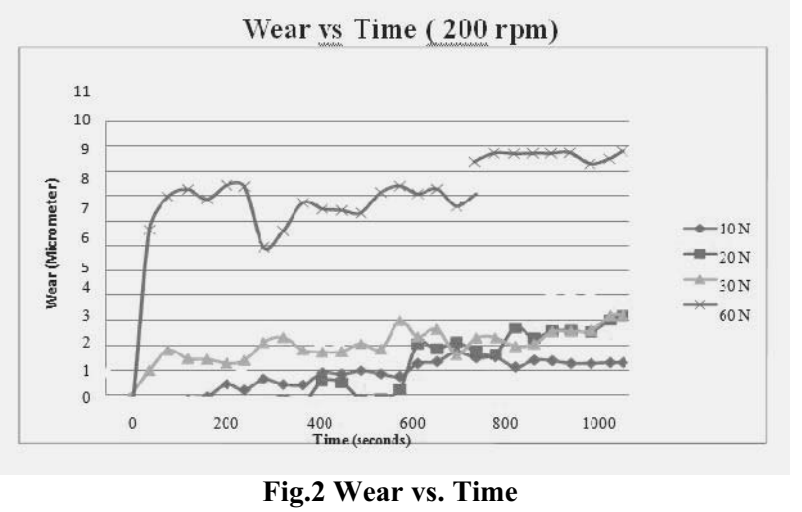

Fig.2 Wear vs. Time

3.2 Effect of Applied Normal Load on Frictional Force

Figure 3 shows the comparative study of the effect of normal load on the frictional force at 200 for SAE40 oils. It is evident from the curve that the frictional force increased with increase in applied load for SAE40 oil.

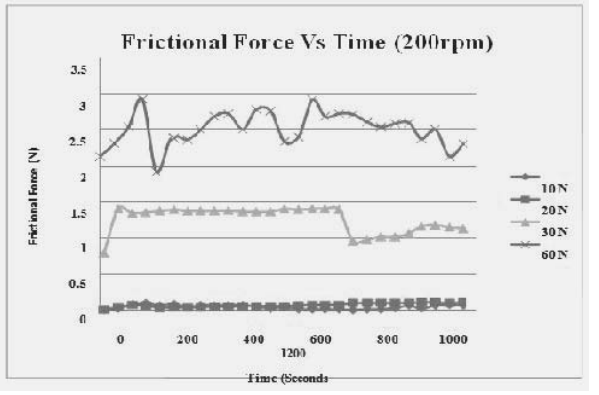

Fig.3 Frictional forcer vs Time

IV. SUMMARY

A experiments were conducted and observed the relationship between responses and input parameter

1. The rate of wear for different load was different. However, the rate of wear is increased with increased in normal loads. And
2. The frictional force also different for different load condition, as the load increased the frictional force also increased.

Acknowledgment

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Development and Fabrication of Sheet Metal Cutting Machine Using Pantograph Mechanism

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Abstract- Traditional sheet metal cutting dies were able to cut only on a shape of punch of that particular die and could not generate the replica of already existing object. This kind of machine has large workspace, high sleight and good manoeuvrability; it can be widely used in field sheet metal cutting and wood/metal engraving. However due to its cantilever type structure, the manipulator is inherently not very rigid and thus the link connecting the assembly to the bed is the most vulnerable to failure due to bending load. It is poor in dynamic performance in high speed and heavy duty operations. Hence suitable for light duty and medium speed operations. The mechanical efficiency of pantograph mechanisms and conventional open-chain and closed-chain type manipulators are studied and evaluated using the concept of modified geometric work. The kinematics of 2-DOF pantograph type manipulators are studied and special: mechanisms which simplify the kinematics are introduced.

Keywords-Pantograph Mechanism, Degree of Freedom, Links, Sheet Metal Cutting, Dies.

I. INTRODUCTION

Traditional sheet metal cutting dies were able to cut only on a shape of punch of that particular die and could not generate the replica of already existing object. This kind of manipulator has large workspace, high sleight and good manoeuvrability; it can be widely used in field sheet metal cutting and wood/metal engraving. However due to its cantilever type structure, the manipulator is inherently not very rigid and thus the link connecting the assembly to the bed is the most vulnerable to failure due to bending load. It is poor in dynamic performance in high speed and heavy duty operations. Hence suitable for light duty and medium speed operations. The mechanical efficiency of pantograph mechanisms and conventional open-chain and closed-chain type manipulators are studied and evaluated using the concept of modified geometric work. The kinematics of 6-DOF pantograph type manipulators are studied and special: mechanisms which simplify the kinematics are introduced. [1]

1.1 Problem Statement

Now a days for cutting of metal sheet of any complex shapes required die of that shape. From that die getting only one shape which is shape of punch of die. If there is need of only few shapes it is not affordable to purchase die. To overcome this problem this we have been developing and fabricating pantograph sheet metal cutting machine for cutting of sheet metal up to of 1-2mm thickness of any complex shape. Hence this is very good tool to cut sheet of any complex shapes.

1.2 Objectives

- The pantograph mechanism is used to design and fabricate a sheet metal cutting machine which could traverse on any contour provided that stylus is moved on the same on any already existing drawing on paper.
- Using such kind of manipulator we can generate the de-scaled replica of the object or we can say it to be a copying machine which can be employed in batch production with economical production/machining cost.

1.3 Methodology

The methodology adopted used of the standard pantograph mechanism which containing 4 links of mild steel . The advantage of this is that it has 3 DOF and each link having relative motion with respect to each other. So that stylus and tool can move in all direction for cutting of any complex shape. Initially the frame design is

adopted from an already existing pantograph mechanism and minor changes are made to suite our purpose, the reducing and increasing of scale of an object. The quarter hp motor is being to used on which reamer tool will be mounted for cutting operation.

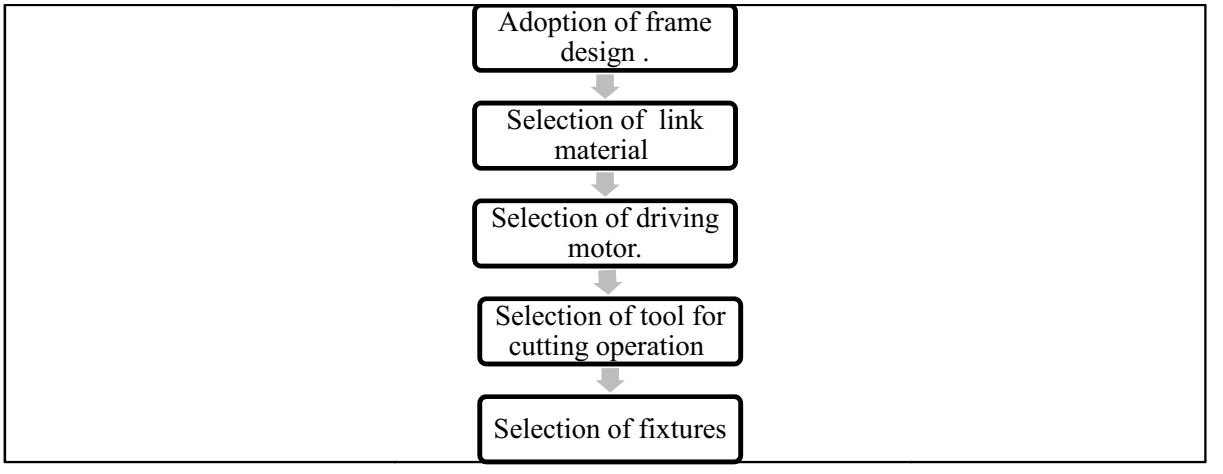


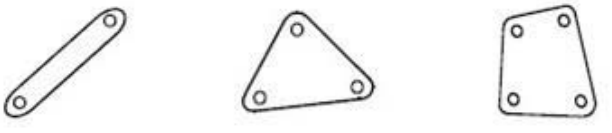
Figure 1 : Flow chart of methodology

II. LINKS

A link is a resistant body that constituents the part of the machine connecting other parts which have motion relative to it.
e.g. A slider crank mechanism of an IC engine consist of 4 links that is frame, crank, connecting rod and slider. [2]

2.1 Types of Links

Links can be classified as binary, ternary, quaternary etc. depending upon the ends on which revolute or turning pairs can be placed, as shows in figure. A binary link has two vertices, a ternary has three vertices, a quaternary link has four vertices and so on.



(a) Binary Link **(b)Ternary Link** **(c) Quaternary Link**

Figure 2: Types of Links.

2.2 Degree of Freedom

An unconstrained rigid body moving in space can describe the following independent motions.

1. Translational motions along any three mutually perpendicular axes x, y and z.
2. Rotational motions about these axes.

Degree of freedom of a pair is defined as the number of independent relative motions, both translation and rotational, a pair can have.

Degree of freedom = 6 - Number of restraints.

2.3 Kutzbach Criterion

The Kutzbach Criterion for determining number of Degree of Freedom(DOF) is given by,

$$F = 3 (N-1) - 2P_1 - P_2$$

Where , F= Number of DOF.
N= Total Numbers of link in mechanism.
P_1= Number of lower pair.

P_2= Number of higher pair.

For Pantograph mechanism,

N = 5 , P_1 = 5 , P_2 = 0

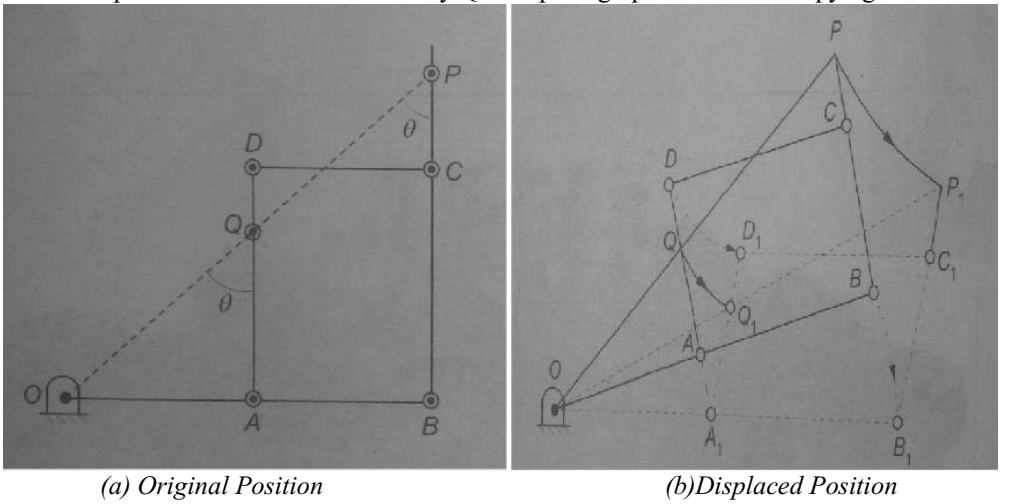
F = 3 (5 - 1) - 2 * (5) - 0

F= 2

Degree of Freedom Pantograph is found to be **2**. [4]

III. PANTOGRAPH

This is mechanism to produce the path traced out by a point on enlarged or reduced scale. Fig. shows the line diagram of a pantograph in which AB=CD, BC=BD and ABCD is always a parallelogram. OQP is straight line. Point P describes a path similar to that described by Q. The pantograph is used as a copying mechanism.



(a) Original Position *(b)Displaced Position*

Figure 3: Pantograph

Proof :-

Triangles OAQ and OBP are similar because ∠ BOP is common.

∠ AOQ= ∠ BOP are corresponding angles as AQ || BP.

Hence, $$\frac{OA}{OB} = \frac{OQ}{OP} = \frac{AQ}{BP} \quad \text{..... (i)}$$

In the displaced position shown in fig. as all links are rigid,

B_1O=BO, D_1A_1=DA, A_1O=AO

P_1B_1=PB, B_1A_1=BA, A_1Q_1=AQ

And

Hence, $$\frac{OA_1}{OB_1} = \frac{A_1Q_1}{B_1P_1} \quad \text{.....(ii)}$$

As A_1 B_1 C_1 D_1 is a parallelogram, A_1D_1 || B_1C_1, i.e. A_1Q_1 || B_1P_1.

OQ_1P_1 is again a straight line so that Δ QA_1Q_1 and OB_1P_1 are similar.

$$\frac{OA_1}{OB_1} = \frac{OQ_1}{OP_1}$$

From eq. (i) and (ii), we get

$$\frac{OQ}{OP} = \frac{OQ_1}{OP_1}$$ because $OA=OA_1$ and $OB=OB_1$.

Hence, QQ_1 is similar to PP_1 or they are parallel.

The pantograph is used in geometrical instruments in the manufacture of irregular objects, to guide cutting tools and as indicator rig for cross-head. [2]

3.1 Dimensions of Mechanism

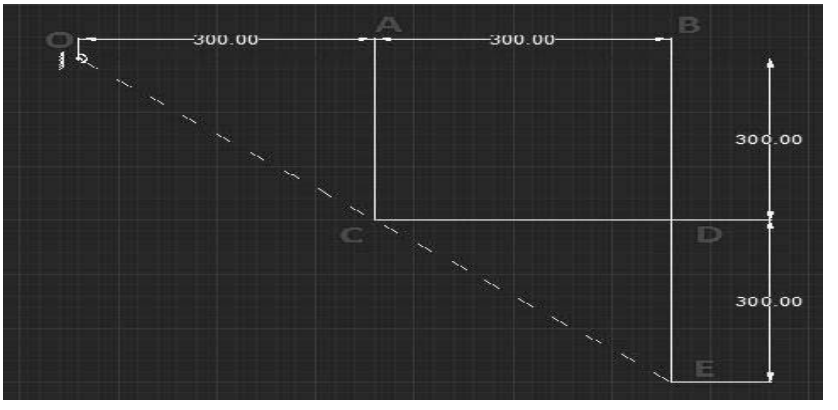


Figure 4: Dimensions of Pantograph.

From figure ,

Link OAB = Link BDE = 600 mm, Link AC= Link CD = 300 mm, ℓ OCE =850 mm, ℓ OC=CE = 425 mm

3.2 Scaling Factor (K)

$$K = \frac{\ell(OC)}{\ell(OCE)}, \qquad K = \frac{425}{850}, \qquad \mathbf{K} = \frac{1}{2}$$

Scaling factor this machine is **0.5** that is shape from paper will be cut half of that size on sheet metal. [3]

IV. COMPONENTS

1. Link or Element:-

Number of Links or Element	- 4
Material	- Carbon Steel
Cross-Section Area	- 25 mm X 12 mm
Length	- 600 mm.

2. Motor:-

Brand	- Hindustan Electrical Motors
Power Rating	- 0.5 hp
RPM	- 1200 rpm
Torque	- 0.13 kg-m
Current	- 0.93 A

3. Cutting Tool:-

Type tool	- Special Reamer
Material	- Carbide

4. Clamping Devices:- C- Clamps and Bench Vices.

5. Tracer:-

Tracer is the simple pen like component. It is used to trace the drawings from paper to cut shape of that drawin on the sheet metal.[5]

VI. APPLICTION

Mainly the pantograph sheet metal cutting machine used for the cutting the metal sheet in various shape b tracing the drawing which is already on the paper.

VII. CONCLUSION

Now a days for cutting of metal sheet of any complex shapes required die of that shape. From that die getting only one shape which is shape of punch of die. If there is need of only few shapes it is not affordable to purchase die. To overcome this problem we have been developing and fabricating pantograph sheet metal cutting machine. This machine complete the following objectives.

- The pantograph mechanism is used to cut the sheet of metal of various size and shape up to 1 to 2 mm thickness sheet.
- Using such kind of machine we can cut various size on sheet by tracing already existing shapes of the object on the paper with the help of tracer.

VIII. FUTURE SCOPE

- This machine can be used in metal engraving industries or wood carving industries to copy the engraved wooden design.
- At the end-effecter we can replace the cutter by a welding torch or a plasma cutter to perform the desired typical operation with very ease and accuracy.
- This Machine can be made fully automatic by connecting tracer point to CNC machine's arm.

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Autoclaved Aerated Concrete (AAC) Solar Cooker

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Abstract-This paper presents thermal performance of an innovative box type solar cooker constructed by using Autoclaved Aerated Concrete(AAC) blocks.AAC has less thermal conductivity, high strength, low density, long lasting, and good machinability.These promising properties find its application in construction. Also its durability is proven. Review of properties of AAC invites its use in solar cooker manufacturing.AAC solar cooker was tested to cook rice, khichadi and for drying also. The maximum temperature achieved was 97^0C.

Keywords-Box type solar cooker, Low grade material,Autoclaved Aerated Concrete(AAC), Bottom loading, Low cost.

I. INTRODUCTION

The box solar cooker must be of high quality, light weight, affordable, user friendly, stackable. The basic purpose of solar cooker is to heat things up - cook food, purify water, and sterilize instruments. A solar cooker cooks because the interior of the box is heated by the energy of the sun. Sunlight enters the solar cooker through the aperture glass. It turns to heat energy when absorbed by the dark absorber plate and cooking pots. This heat input causes the temperature inside of the solar box cooker to rise until the heat loss of the cooker is equal to the solar heat gain [1] that is thermal equilibrium with surrounding.

Autoclaved aerated concrete (AAC) blocks are light weight, environmental friendly. These blocks consist of 80% air by volume. These blocks are made using Portland cement, quartz (silica), water and aeration agent. The mixture of these constituents is poured in mould. These blocks formed as a result of reaction of aluminium on a proportionate blend of lime, cement and fly ash, the hydrogen gas that escapes creates millions of tiny air cells giving it a strong honeycomb like structure. It is further strengthened by high pressure steam curing in autoclaves [2].

The water-cementitious materials ratio is related to the amount of aeration obtained and thus the density. For a given density, water-cement ratio increases with proportion of sand. For AAC with pozzolans, water-solids ratio appears to be more important than the water-cementitious ratio, irrespective of the method of pore-formation. For gas concrete, a lesser water-solids ratio leads to insufficient aeration while a higher one results in rupture of the voids, increase in density being the consequence in both the cases. Thus the water requirement is to be gauged by consistency of the fresh mix rather than by a pre-determined water-cement or water-solids ratio [3]. Thus its density can be varied. Due to high porosity; it has low density and excellent insulation. [2]

Due to these promising properties (low density, good insulation, light in weight and easy to cut) of AAC blocks, it can be used to construct box type solar cooker.

AAC solar cooker is made with low grade material such as AAC blocks and binding material. Glass, aluminium sheet, black paint, angle plates, black painted aluminium utensils. AAC solar cooker has bottom loading and innovative fixation of glass.

II. METHODOLOGY

AAC solar cooker is made up of four AAC blocks having size 625X240X100mm, which are cut in required size as shown in fig (2) by using cutting, machining and grinding tool.AAC box is formed by binding all the four blocks and then proceed for frame work as shown in fig (3).Glazing is directly fixed in the slot made and this fixation of glass is innovative as compared to other solar cooker. Mirror of size 450X450 mm is used which is not attached to solar cooker itself. The inside taper surface of box is painted by matte black colour. The aluminium utensils having diameter 160mm and height 57mm are used for cooking.

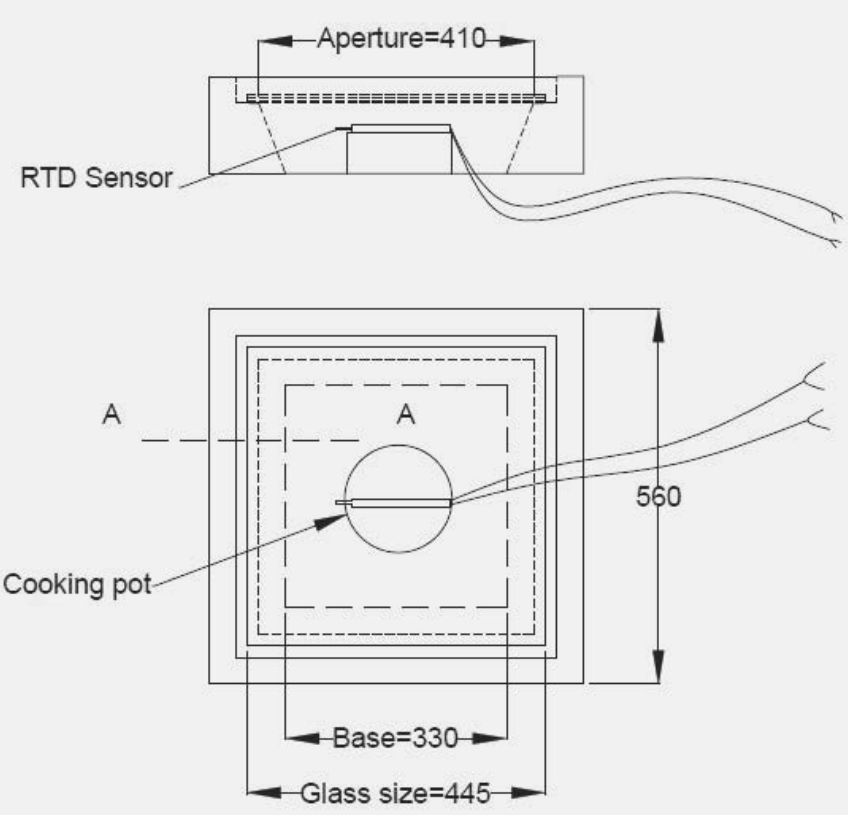

Fig.1 Design of AAC box type solar cooker (All dimensions are mm)

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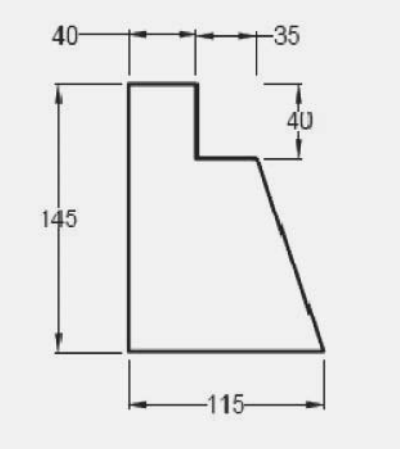


Fig.2 Sectional view of block along section AA

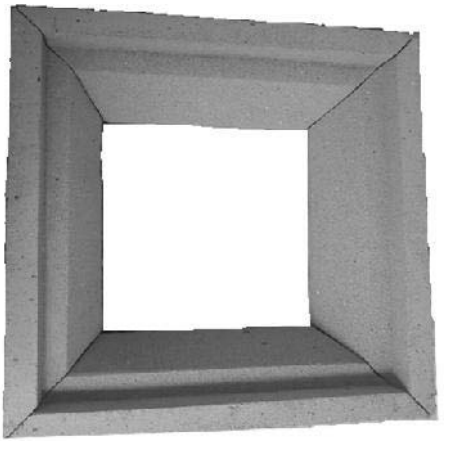


Fig.3 Cut blocks in assembled position

Fig.4 Box of AAC blocks with steel Frame

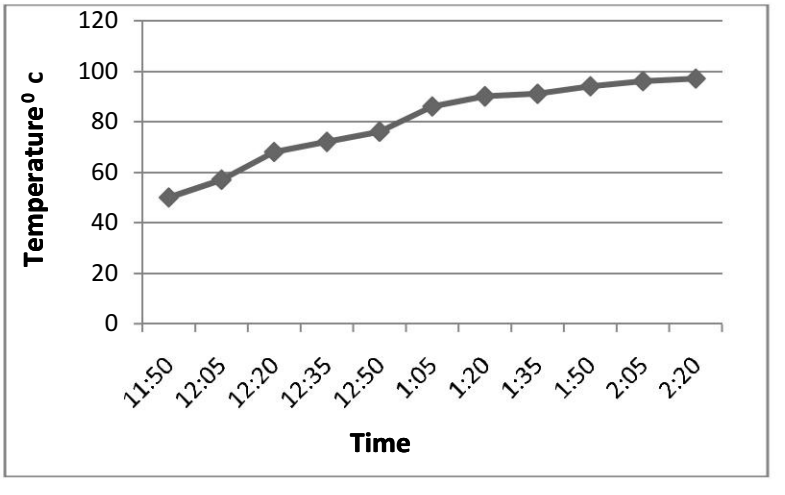
Fig.5 Testing of AAC cooker

Fig.6 Cooked rice

III. EXPERIMENTATION

The experimental test on AAC solar cooker was carried out on 10 April 2015(summer) for solar time 11:50 am to2:52 pm in Dhule (74˚45" N 20˚50", 259 m above MSL), India. The AAC solar cooker was placed on blanket (Insulation towards ground) and aluminium absorber on the insulating surface facing solar radiation. But heat lawn can also be used as insulating material to reduce heat loss from bottom. Aluminium cooking pots having cylindrical shape with the thick coating of black paint has been used to cook rice of quantity 250gm with 250ml litre of water. The solar insolation on that day was 7.37229980469kWh/m^2/day [4]. The ambient temperature and inner temperature of cooker was recorded by a calibrated digital temperature indicator.

Fig.7 Variation of temperature with time



IV. RESULT AND DISCUSSION

Above graph shows increase in temperature with respect to time. Cooking is feasible in AAC Solar cooker. It took two and half hour to cook rice (250gm). Readings were taken after every fifteen minutes. The maximum temperature reached was 97^0C.AAC solar cooker was also used to cook rice, khichadi and also for drying purpose.

V. CONCLUSION

From experimentation it is clear that results of AAC solar cooker are as usual as normal solar cooker. Since overall heat loss was more, cooking time was 20 to 30 min more than other solar cookers. There is saving of material due to bottom loading and use of low grade material (such as AAC blocks with its binding material). Cost of AAC solar cooker is 50% of solar cooker available in market. India has good sunshine hours hence AAC solar cooker can be better option. Usage of AAC solar cooker will increase due to low cost and will improve energy conservation in cooking.

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An Experimental and Numerical Study of Thermal Performance of A Radial Heat Sink Under Natural Convection

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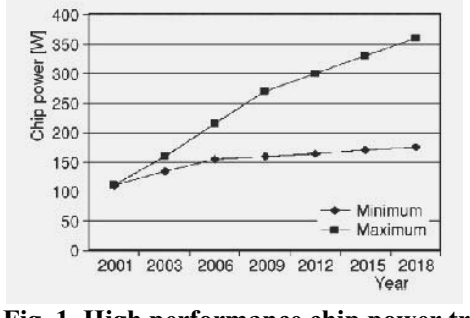
Abstract— In this paper, the effects of various parameters have been experimentally and numerically investigated for air side thermal performance under natural convection of a radial heat sink and the optimum values are found out. The overall heat transfer coefficient is measured experimentally and numerically. The general flow pattern is that of a chimney; i.e., cooler air entering from outside is heated as it passes between the fins, and then rises from the inner region of the heat sink. The thermal performance characteristics are obtained for various parameters such as number of fins, height of the fins, length of fins and the heat supplied to the heat sink. Based on the experimental data in the given range of number of fins, length & height of fins a generalised correlation is developed.

Keywords- Natural convection, Heat sink, Circular base, Computation Fluid Dynamics

I INTRODUCTION

In many electronic components, the dissipation of generated heat into the surrounding fluid is important since it can reduce the performance of device or even sometimes may destroy the components or system. Heat sinks are the heat exchanging devices that are employed extensively to increase heat transfer rate from electronic components to the surrounding fluid. Application of heat sinks is not restricted to just electronic components. They are used in various systems such as high-power semi-conductor devices, high-power lasers, light emitting diodes (LEDs), computer cooling, and many other sensitive devices [1]. The thermal design of the system is influenced by the key drivers like chip size, power dissipation, junction temperature and ambient air temperature. The semiconductor industries are taking great amount of effort over the years to reduce the size of the devices. With the increase in power dissipation and reduction in the size, the growth in power density is expected to increase further over the next decade as shown in figs. 1 and 2 [2]. The increasing power density indicates the thermal management solutions play an important role in determining the future semiconductor device technology.



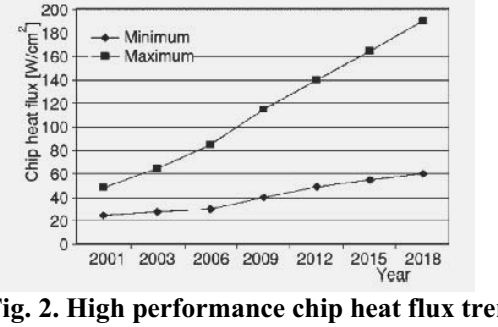


Fig. 1. High performance chip power trend **Fig. 2. High performance chip heat flux trends**

Numerous experimental [4–7] and numerical [6] studies of rectangular fin or pin fin heat sinks have been carried out. Starner and McManus [4] experimentally investigated natural convection heat transfer from four heat sinks of differing dimensions, with the heat sinks oriented vertically, at a 45^0angle, and horizontal. Welling and Woolbridge [5] conducted an experimental study of vertically oriented rectangular fins of constant length attached to a vertical base. They found that there exists an optimal fin height, corresponding to a maximum rate of natural convection heat transfer, for any given fin spacing. Harahap and Mcmanus [6] performed experiments to calculate the average heat transfer coefficients for two different fin lengths, and established a correlation with non-dimensional parameters and relevant fin dimensions. Passive cooling is a widely preferred method for electronic, power electronic and telecommunication devices since it is a cost effective, quiet and reliable solution. Air-cooling is recognized as an important technique in the thermal design of electronic

packages [7]. Mehran Ahmadi et.al. investigated numerically and experimentally steady-state external natural convection heat transfer from vertically-mounted rectangular interrupted fins. A new compact correlation is proposed for calculating the optimum interruption length [7]. However, most of these studies are concerned with heat sinks with rectangular bases, which might be inefficient for cooling circular LED lights or the electronics components having circular base.

The present study focuses upon the passive cooling i.e. natural or free convective heat transfer from a heat sink with a circular base and rectangular fins. So in this study, the heat transfer of a radial heat sink was experimentally & numerically analyzed and the thermo-flow pattern was observed. The convective heat transfer depends on number of complex parameters such that fin geometry, fin spacing buoyancy forces and fluid properties. So to study the performance of radial heat sink the effects of the number of fins, fin length, fin height, and heat flux on the thermal resistance and the average heat transfer coefficient were investigated.

II DESIGN OF EXPERIMENT

The minimum number of experimental combinations (MNE) for conducting simulations are given by MNE = kn in this research nine experimental models were generated with different parameters. For this Taguchi L9 orthogonal array was used, in which nine rows corresponding to the number of tests, with three columns at three levels were selected.

Table No. 1. Parameter & level

Parameter	Code	Level		
		1	2	3
Length of fin (m)	L	35 mm	45 mm	55 mm
Height of fin (m)	H	15 mm	25 mm	35 mm
Number of fin	n	24	28	32

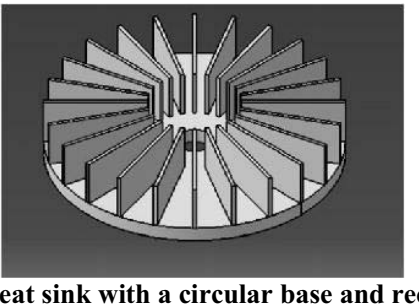


Fig. 3. Radial heat sink with a circular base and rectangular fins

The experiment set up consists of different aluminum radial fin structures heated with the electric heater and the eight thermocouples are used to measure the temperature of the heat sink and one thermocouple is used to measure the atmospheric temperature. By using taguchi optimization technique, nine different models were manufactured by varying length of fin, height of fin and number of fin by using L9 arrays. Copper and aluminum are among the most-frequently used materials for this purpose within electronic devices. Copper is significantly more expensive than aluminum but is also roughly twice as efficient as a thermal conductor. Aluminum has the significant advantage that it can be easily formed by extrusion, thus making complex cross-sections possible. Aluminum is also much lighter than copper, offering less mechanical stress on delicate electronic components. Some heat sinks made from aluminum have a copper core as a trade off. The heat sink is made of aluminum (Al2014), with no additional surface treatment. In order to measure the performance of the radial heat sink experimentally it is essential that the rate of heat transfer between the heat sink and the ambient air be accurately measured. Also it should be served for indirect measurement of convective heat transfer coefficient between the fins and ambient air The experimental analysis of natural convection around radial heat sink is carried out by using following specification as listed below:-

Outer radius of base of fin (ro) = 80 mm, Inner radius of base of fin (ri) = 10 mm

Thickness for all configuration of fin (t) = 2 mm, Total number of thermocouple = 09

Temperature indicator: Type K type

2.1 Heating System

The base of the heat sink was heated by a heater with 1000W electrical resistance strip heater. The assembly was firmly bolted together to the bottom surface of the base. The lower surface and side of heater was insulated thermally by Sindanyo H9. The power was varied by rheostat and it was measured by calibrated inline voltmeter and ammeter. The temperature at the base of heat sink at steady state was measured by equally distributed set of 8 thermocouples. The thermocouples were screwed in their positions so as to ensure thermal contact. The average values obtained from these thermocouples are regarded as the average base temperature of heat sink. At 10 min interval observations were recorded when consecutive values were identical it was assumed that steady state condition was attained. Experimentation was carried out in room temperature

According to Newton's law of cooling,

$$Q = hA(\Delta T) \quad (1)$$

Therefore heat transfer coefficient,

$$h = \frac{Q}{A\Delta T} = \frac{(V \times I)}{A\Delta T} \quad (2)$$

Therefore the effective thermal resistance of heat sinks,

$$R = 1/ h A \quad (3)$$

III COMPUTATIONAL PROCEDURE

The numerical simulation is conducted using ANSYS 13 (Workbench) Fluent toolbox commercially available CFD code based on the finite volume method.

3.1 Assumptions

For the numerical analysis, the following assumptions were imposed.

1. The flow was steady, laminar, and three-dimensional.
2. Air density was calculated by treating air as an ideal gas.
3. Aside from density, the properties of the fluid were independent of temperature.
4. Radiation heat transfer was negligible.

Table No. 2. Air and heat sink properties

Material	Cp (J/kg ^{0}C)	μ (N/m^2 s)	k (W/m 0 C)	ρ (kg/m3)
Air	1005.585	1.834 x 10-5	2.643 x 10-5	Eqn. (10)
Heat sink (Aluminum)	2800	---	193	880

3.2 Governing equations

The governing equations are as follows [10]

3.2.1 Air side

Continuity equation

$$\frac{\partial(\rho u)}{\partial x} + \frac{\partial(\rho v)}{\partial y} + \frac{\partial(\rho w)}{\partial z} = 0 \quad (4)$$

Momentum equations

$$\frac{\partial(\rho u^2)}{\partial x} + \frac{\partial(\rho uv)}{\partial y} + \frac{\partial(\rho uw)}{\partial z} = -\frac{\partial P}{\partial x} + \mu\left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}\right) \quad (5)$$

$$\frac{\partial(\rho vu)}{\partial x} + \frac{\partial(\rho v^2)}{\partial y} + \frac{\partial(\rho vw)}{\partial z} = -\frac{\partial P}{\partial x} + \mu\left(\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} + \frac{\partial^2 v}{\partial z^2}\right) + g\left(\rho - \rho_a\right) \quad (6)$$

$$\frac{\partial(\rho wu)}{\partial x} + \frac{\partial(\rho wv)}{\partial y} + \frac{\partial(\rho w^2)}{\partial z} = -\frac{\partial P}{\partial x} + \mu\left(\frac{\partial^2 w}{\partial x^2} + \frac{\partial^2 w}{\partial y^2} + \frac{\partial^2 w}{\partial z^2}\right) \quad (7)$$

Energy equation

$$\frac{\partial(\rho uT)}{\partial x} + \frac{\partial(\rho vT)}{\partial y} + \frac{\partial(\rho wT)}{\partial z} = \frac{k}{C_p}\left(\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2}\right) \quad (8)$$

3.2.2 Solid side

Energy equation

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} = 0 \quad (9)$$

The density of air will be calculated from the ideal gas law,

$$\rho = \frac{P_{atm}}{(R_c/M_w)T} \quad (10)$$

where Mw of air is 28.966 kg/kmol.

3.3 Grid Independency Study

In the present work, grid independency test was done for a randomly selected simulated case for the grid sensitivity. Multiple grids were generated starting from 1.0E+04 cells to 1.0E+05 cells. The numerical analysis over this complete range was studied and the results were compared. The temperature values showed that there was negligible difference in the results after 7.0 E+04 cells. So finally it was decided to use cell count of nearly 7.0 E+04, where fairly constant values of temperature were obtained as shown in Fig. 4.

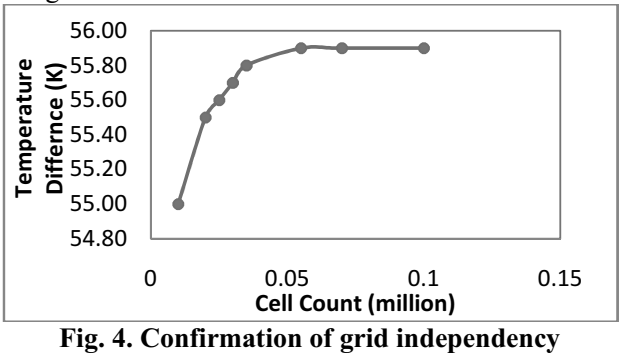


Fig. 4. Confirmation of grid independency

The velocity vectors give the results that are chimney effect so our assumption is correct. Also the values of velocity vector are shown in the Fig. 5.

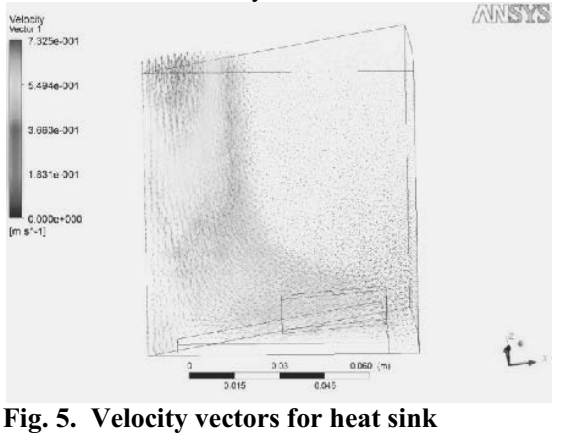


Fig. 5. Velocity vectors for heat sink

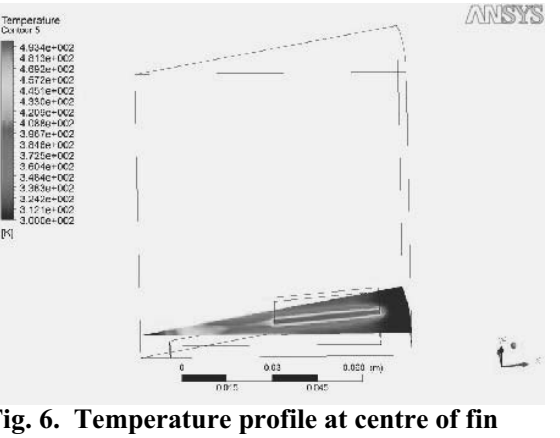


Fig. 6. Temperature profile at centre of fin

To reduce the number of experiments we have used Taguchi L9 orthogonal array, which has given the data corresponding to the number of tests. So the experimental and numerical data is analyzed by using statistical analysis software JMP 10. This software analyzes data by using analysis of variance (ANNOVA). Figure 7 shows the comparison of temperature difference between the experimental and numerical results. The numerical results are very much comparable with the experimental result, so the validity of numerical results is done and at the same time the bench marking of both the experimental and numerical procedure is carried out.

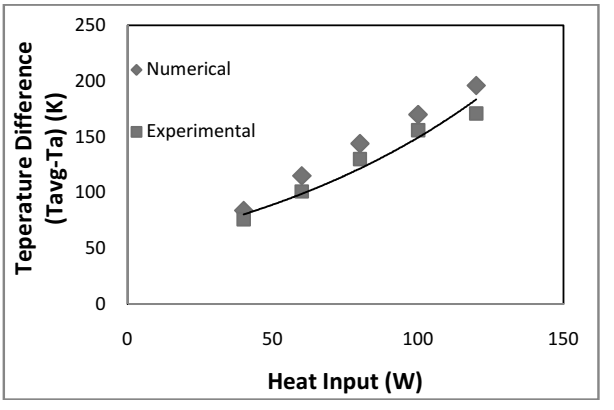


Fig. 7. Comparison of temperature difference for numerical & experimental result

IV EXPERIMENTAL UNCERTAINTIES

The uncertainties in the experimental measurement have been determined using root sum square method described by Holman (1984). In any experimental method a set of measurements is made, and these measurements are then used to calculate the desired results of the experiments. The uncertainties in the calculated results are estimates on the basis of the uncertainties in the primary measurements and are given in Table 3. [8]

Table 3. Uncertainty of variables.

Uncertainty variable	Error
Fin Length	$\pm$ 2.2223 x 10^{-2} %
Fin Height	$\pm$ 4.00 x 10^{-2} %
Outer diameter	$\pm$ 0.00625 %
Inner diameter	$\pm$ 0.05 %
Thickness	$\pm$ 0.5%
Base surface area A_b	$\pm$ 0.10077 %
One fin surface area	$\pm$ 0.7123115 %
L/H of the heat sink	0.045758 %
Temperature	$\pm$ 3.2144 %
Heat transfer rate	2.6925 %
Heat transfer coefficient	$\pm$5.833031 %
Thermal resistance	$\pm$ 5. 833073 %
Nusselt number	$\pm$ 5. 833073 %
Grashoff number	$\pm$ 5. 124563 %

V RESULTS & DISCUSSION

The thermal characteristics obtained in this study are applicable to this particular heat sink with natural convection. As expected average Nusselt number increases with increasing Rayleigh number. From figure 8 it is also observed that the numerical results are very much comparative with the experimental results. As result of high thermal conductivity and the thickness of the aluminum heat sink the sink approximate in uniform wall temperature boundary condition during experiments. The surface temperature has been observed under steady state condition.

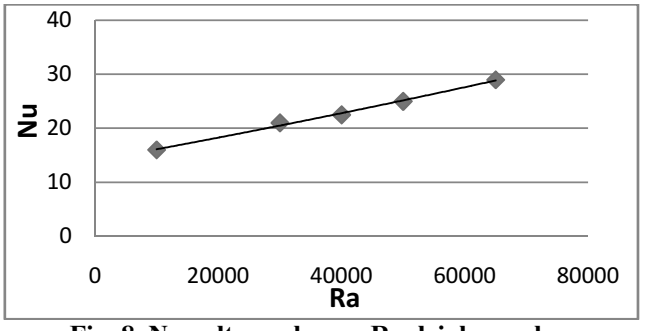


Fig. 8. Nusselt number vs Rayleigh number

5.1 Influence of different parameters on the performance of heat sink.

Figure 9 shows the effect of number of fins on the heat transfer coefficient. It is observed from the figure that as the number of fins increases the average heat transfer coefficient decreases. This is because the spaces between the fins is decreased therefore flow rate of the cooler air entering decreases and the air is heated more quickly due to the reduced space between fins. The thermal resistance (R) of the heat sink decreased with increasing the number of fins (n) up to the number of fins is less than 28 as the increased heat transfer surface area is larger than the decreased heat transfer coefficient. As the number of fins increases and are greater than 28, the thermal resistance of the heat sink increases with increase in number of fins, since the heat transfer coefficient is very small. Therefore there is optimum number of fins that gives the minimum thermal resistance.

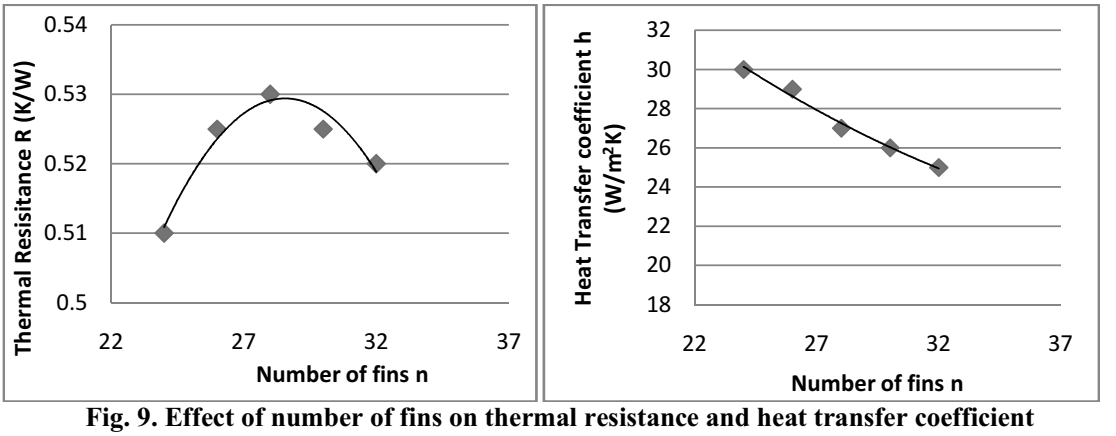


Fig. 9. Effect of number of fins on thermal resistance and heat transfer coefficient

The effect of the fin height on the performance of heat sink is shown in Fig. 10. For the incremented fin height there is lower thermal resistance resulted from the increased heat transfer surface area. The change in the heat transfer coefficient is relatively small, since the velocity of the air entering from outside increased very little with increasing fin height.

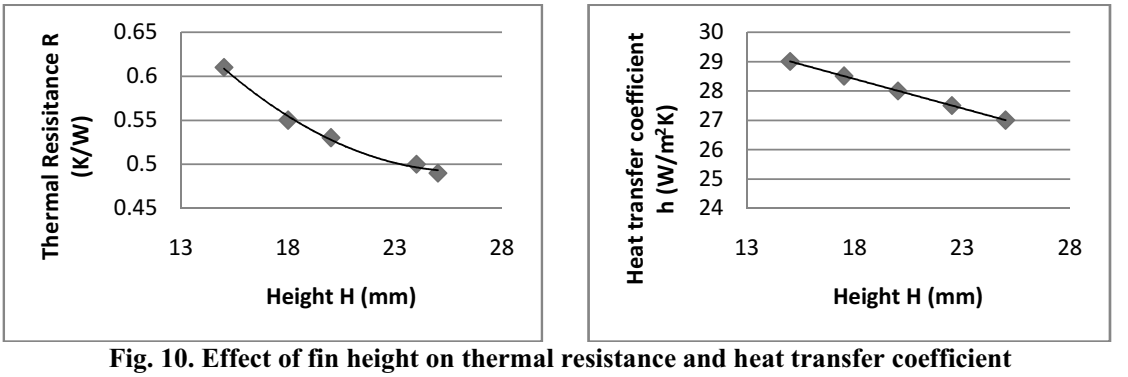


Fig. 10. Effect of fin height on thermal resistance and heat transfer coefficient

From Fig. 11. which shows the effect of the fin length on the heat transfer coefficient & thermal resistance it is observed that the thermal resistance and average heat transfer coefficient decreases with increase in the fin length. For the fin with the length longer than 55 mm the thermal resistance leveled off and reached a steady value. This is because the air temperature in the inner region is almost the same as the heat sink temperature, and hence any additional fin length beyond 55 mm does not contribute to an increase in the heat transfer rate. Thermal performance of the heat sink is shown in fig. 12. The Nusselt number is decreasing with the number of fins this is due to increase in number of fins the gap between the fins decreases and the boundary layer formed is restricting the flow of air and heat. Similarly for the L/H ratio as the length is increasing the air at the centre of heat sink is already heated as it is moving towards the centre of heat sink so the temperature difference is low so the Nusselt number decreases with L/H ratio.

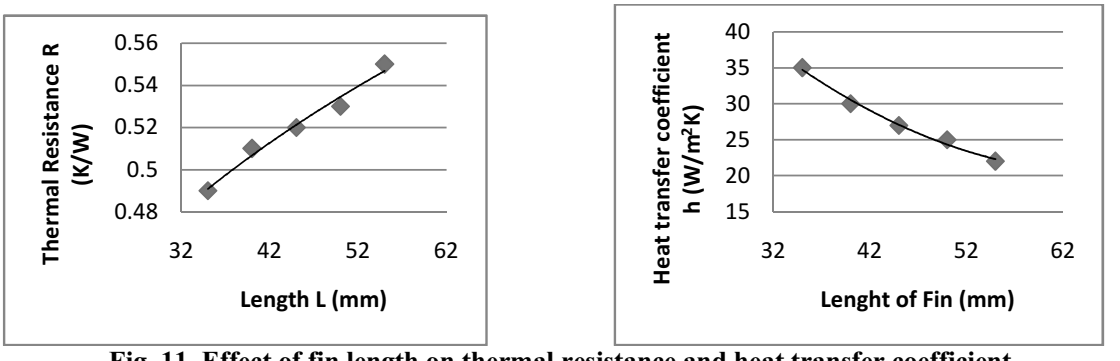


Fig. 11. Effect of fin length on thermal resistance and heat transfer coefficient

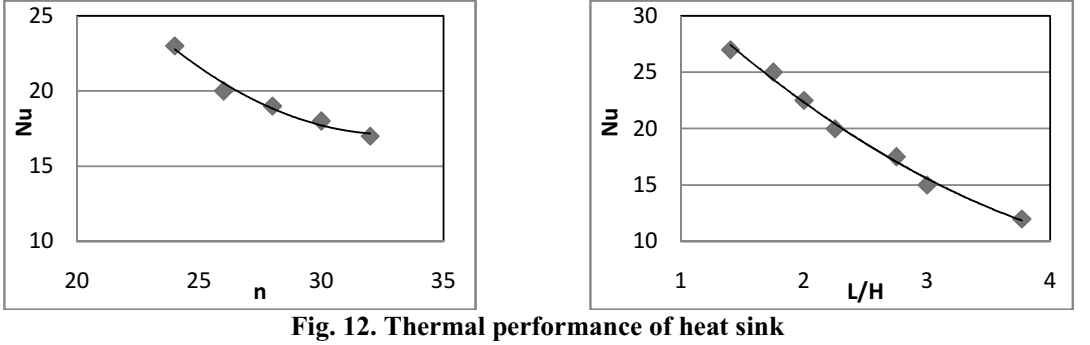


Fig. 12. Thermal performance of heat sink

5.2 Development of convective heat transfer correlation function

It was assumed that the steady state natural convective behavior of radial heat sink could be described in terms of Ra, H/L, n (no of fins) with the range $7000 \leq Ra \leq 13000$, $1.5 \leq H/L \leq 3.35$, $24 \leq n \leq 32$

$$Nu = f(Ra, H/L, n).$$

Where Nu is classical Nusselt number, Gr is Grashof number, Pr is Prandtl number and Ra is Rayleigh number.

$$Nu = \frac{h \times L}{k} \quad (11)$$

$$Pr = \frac{\mu C_p}{k} \quad (12)$$

$$Gr = \frac{g\beta\Delta T L^3}{\vartheta^2} \quad (13)$$

All the above values are obtained at mean temperature

$$T_{mean} = T_{avg} + T_{\infty} \quad (14)$$

The functional relationship between the dimensionless terms was determined by regression analysis for the range of experimental variables tested at steady state heat transfer and correlation was obtained

by least square fit.

$$Nu = 2.707\ \mathrm{Ra}^{0.071511}\left(\frac{L}{H}\right)^{-0.20383}\mathrm{n}^{0.087651} \quad (15)$$

VI CONCLUSION

Natural convection heat transfer from a radial heat sink was experimentally and numerically investigated. Sensitivity measuring instruments were used to carry out accurate and repetitive experiments. CFD analysis was performed as numerical analysis for the determination of natural convection from a radial heat sink with different study parameters.

The following results were obtained

a) In this study Nusselt number increases with increasing Rayleigh numbers.
b) The results obtained from experimental and numerical studies on the average nusselt number are found to be in good agreements.
c) Comparison of average Nusselt number was done using the correlations of Ra, H/L and n.
d) A new correlation was proposed on the determination of average Nusselt numbers for the range $7000 \leq Ra \leq 13000$, $1.5 \leq H/L \leq 3.35$, $24 \leq n \leq 32$ for air.
e) Temperature distribution over the radial heat sink was obtained by CFD analysis. Also the general flow pattern is that of a chimney; i.e., cooler air entering from outside is heated as it passes between the fins, and then rises from the inner region of the heat sink was observed.

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To Avoid The Bursting of Distributor Pipe And Base Structure By Using Analysis

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Abstract- This paper is emphasis to avoid the bursting of outlet pipe of distributor and base structure by using analysis. Initially the total load acting on the distributor and base structure is calculated. The stress analysis is carried out by applying total load to find the structural stability. The resonance frequency in system due to fluid fluctuations with high rate of fluid passing through the pipes is find out by modal analysis. Flutter analysis is carried out with pre-stress effects. The result of stress analysis shows maximum stress of distributor is much smaller than the allowable stress of the material. The first frequency of modal analysis is sufficiently high as compared to the design frequency of the problem. So structure is safe for the given loading conditions. Also the flutter analysis, results shows drop in 2nd natural frequency which indicates flutter will take place in this range.

Keywords- Distributor, Structure, Flutter, pre-stress, Frequency, Modal analysis.

I. INTRODUCTION

Engineering Design Process

A design process is the set of technical activities within a product development process that work to meet the marketing and business case vision. This includes refinement of the product vision into technical specifications, new concept development, and embodiment engineering of the new product.

Problem Definition

Stress analysis plays important role in the structural safety. Engineering problems are becoming complex with the improvement in the technology and requirements of the industry. Flow induced vibrations are becoming critical in failure of the components. Since flow study and vibration study are the mix of branches of engineering, these studies are complex and are made possible by advances in finite element based software's using coupled field algorithms.

In the present work, a distributor is facing problem of failure due to unexpected vibration. So cause of vibration need to be explored. In the present study, main concentration is given to flow induced vibration. At the distributor, a gas and fluid are mixing. So a multiphase study is required using fluent software. Later the resulting pressure loads need to be considered for prestressed modal analysis to explore possibility of failure of the distributor by flutter. Flutter analysis is a complicated iterative study which needs coupling of fluid structural interface loads. The computational fluid dynamics software gives the advantage of proper estimation of a pressure in the thermal environment. In the present work, 3 accumulators are mixing through common pipe line and exiting to the next system. But here due to sudden opening of the outer pipe line, the resulting burst pressure need to be estimated to find the structural stability of the supporting structure. So a CFD analysis is required to find the flow and existing pressure to find the correct design parameters for the base supporting structure.

II. PROPOSED WORK AND METHODOLOGY

Proposed Work

During sudden opening of the distributor main outlet, there is possibility of sudden vibration at the end. This may create a problem for overall structural behaviour of the distributor. This may lead to resonance in the system. So finding the resonant frequency which is linked to flow velocity is important by which dynamic nature of the system can be estimated.

Geometrical Model Of The Problem:

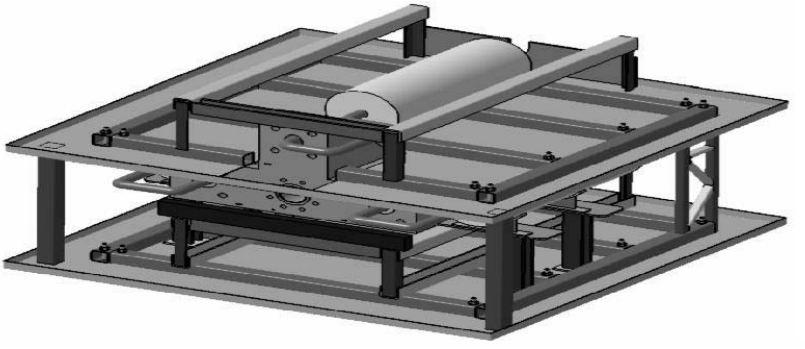

Fig. 1 Geometrical representation of the problem

The figure shows three dimensional model of the problem along with distributor mounting. Distributor is mounted using support plates. The structure is built with box and channel sections to provide strength to the structure. CATIA software is used for modelling of the assembly.

Methodology:

- Modelling and meshing of the structure for the required dimensions
- Application of inlet, outlet and wall boundary conditions to solve the problem
- Extraction of results for velocity and pressure plots.
- Calculation of exit pressure and resulting reaction forces
- Static structural analysis of the distributor.
- Structural strength analysis of the base structure.

III. DESIGN AND ANALYSIS

- Should be within the allowable stress limits
- Maximum operation frequency : 10Hz

Mesh Details:

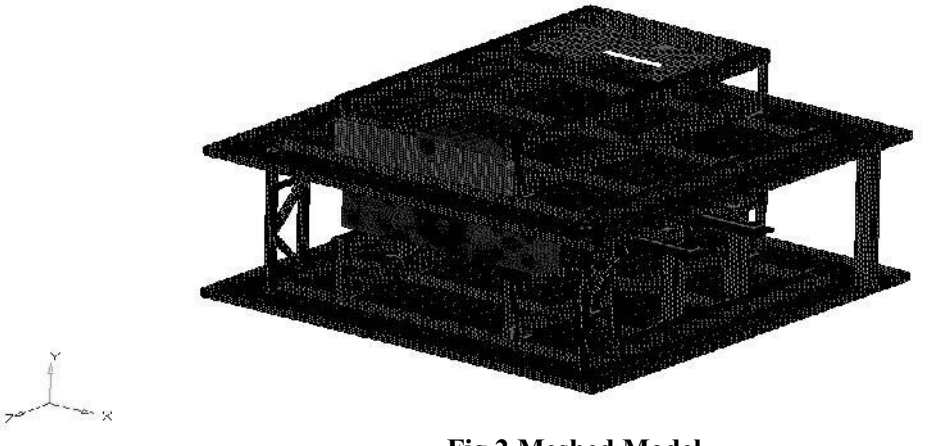

Fig.2 Meshed Model

A finer tetrahedral mesh is used for getting better results. Total of 414634 elements with 170270 nodes are used for meshing the structure. Inlet, outlet and wall collectors are made along with fluid collector to assign properties for executing into fluent software. HYPERMESH face option is very much useful in separating the surface elements from solid mesh. The boundary conditions can be applied in the HYPERMESH itself and later imported to Fluent in '.msh' file format. Gambit also can be used for meshing and exporting to FLUENT software for solving the fluid problems.

Total of 603141 elements along with 287210nodes are used for structural mesh. 4 noded tetrahedral mesh is used for meshing the distributor. Shell63 element is used for the shell structure. Beam188 element is used for bolts. Different collectors are used for meshing the geometry. The mesh is done using HYPERMESH software.

Boundary Conditions:

- Bottom region is fixed
- The accumulator supporting plates are applied with 5907N (Accumulator weight) load + 316 kg (3160N) of fluid load .So each accumulator is applying a total load of 9067N at the supporting plates.
- Self-weight effect is considered.

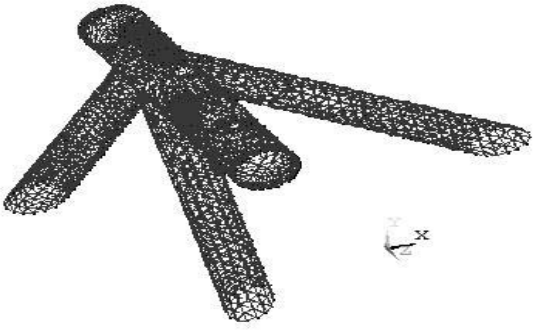

Fig. 3 Boundary Conditions on the distributor for structural Conditions

The figure shows applied boundary conditions on the problem. Here along with thermal loads, structural loads are applied to find the structural safety of the problem. A pressure load application on the inner faces of distributor is shown in the figure.

CFD Results

Initially Computational Fluid analysis is carried out to find the pressure at the exit to find reaction force developed on the base structure. CFD analysis requires inlet, outlet and wall boundary conditions. Mass flow rate condition is specified at the inlet of the openings and wall boundary conditions are applied across the manifold inner edges. The CFD results are as follows. Since all the openings are inclined, at a time, flow in two openings can be displayed.

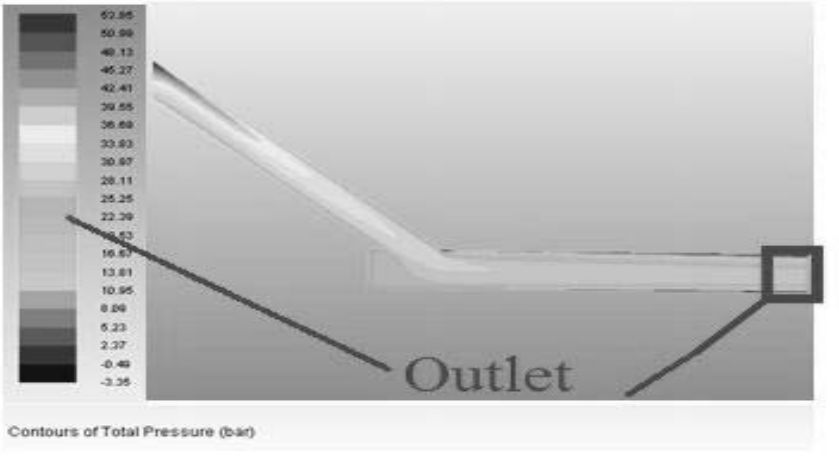

Fig. 4 Pressure Plot along the third manifold opening

The figure shows pressure flow across the bottom manifold. A maximum pressure of 53.85bar can observe in the flow. Maximum pressure is observed at the wall boundary where velocity is almost zero. The status bar at the left shows variation of pressure from lowest value to the highest value. Generally the minimum pressure is observed at highest velocity regions. The fluent software is very much helpful in changing the properties of fluid any time along with minimum input data. Also in the figure outlet pressure is shown with red arrow marks. The outlet pressure value can be observed from the left status bar colour code representation.

Velocity Vectors:

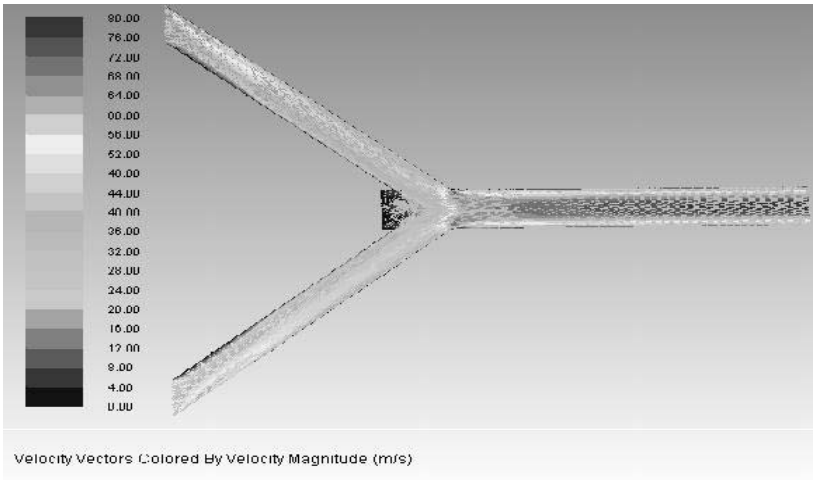

Fig. 5 Velocity Vector plot at manifold openings

The figure shows vector plot of the velocity. Vector plots helps in identifying exactly the location of maximum velocity with bigger sized arrows. In the figure maximum velocity is shown in the outlet pipe corner regions. This condition has been done for unplugged condition due to which maximum velocity at the exit can be observed, Velocity is almost minimum along the wall boundaries. Also as per the hydrodynamic theory velocity along the wall boundaries is zero and is applied as boundary condition for any Computational Fluid Dynamics problems.

Total load of 18714.76N acts at the exit, in case of sudden opening in the structure. Total pressure is the sum all the pressure including static and dynamic pressure. These values are directly available with the software. This reaction force calculation is used to check the structural stability of the system in the case of sudden opening. This load is almost equal to 1.87 tons which is a considerable load on the structure. Also the structure is subjected to pressure load internal to the body which will try to open up the base structure. The distributor structure is clamped to the base structure by 6 bolts. So these bolts also subjected to shear due to these burst load and other traction loads.

Analysis

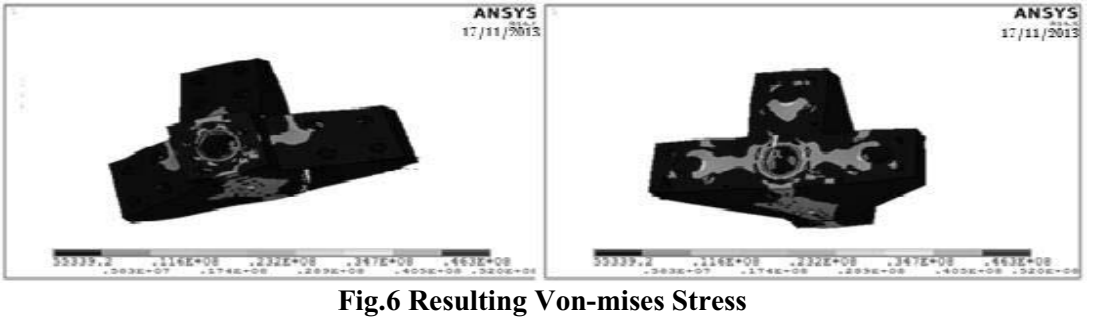

Fig.6 Resulting Von-mises Stress

The figure shows resulting thermo-mechanical stresses in the distributor, for the given loads. Maximum stress of 52Mpa can be observed in the problem. Stresses are maximum at the inner hole region due to stress concentration effect. But this stress is much smaller than the allowable stress of the distributor material. So structure is safe for the given loading.

IV. RESULTS AND DISCUSSIONS

After the manifold is analyzed, the overall structure is analyzed for the given loads. The shell structure is applied with various thickness values for optimization. So the following problem is applied with self-weight, along with reaction load at the manifold exit.

Maximum stress of 80Mpa can be observed in the problem indicating the overweight of the structure as the allowable stress of the structure is more than the developed stress.

V. CONCLUSIONS

- Initially the geometry is built using CATIA modelling software to accommodate three accumulators. The box and channel sections are considered for the base structure.
- The CFD analysis is carried out for the distributor to find reaction force on the structure in case of sudden opening which creates reaction force on the structure.
- CFD analysis is carried out using FLUENT software using inlet, outlet and wall boundary conditions. Mass flow rate is considered for inlet boundary condition.
- From CFD analysis, pressure, velocity plots are obtained. Reaction force is calculated for the obtained pressure values adding the static pressure.
- Further structural analysis is carried out using ANSYS software. The mesh excepting the distributor is done with shell mesh.

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Design Modification and Analysis of Electrically Operated Screw Jack for Light Motor Vehicles

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Abstract- Side road emergency like tire puncher, is a problem commonly observed in cars. Conventional car jacks uses mechanical advantage to allow a human to lift a vehicle by manual force. This paper analyzes the modification of the current toggle jack by incorporating an electric DC motor in the screw in order to make load lifting easier for emergency use with using power of car batter (12 Volts). Gear ratio is used to increase the lifting power. The significance and purpose of this work is to modify the existing car jack in order to make the operation easier, safer and more reliable in order to save individual internal energy and reduce health risks especially back ache problems associated with doing work in a bent or squatting position for a long period of time. The car jack is developed using CATIA V5R19 and analyzed using Finite Element Analysis to check safety factor and force acting. Fabrication work has been done using with milling, drilling, grinding, and welding machine. The developed car jack is tested on car. Implementation of design will solve problem associated with ergonomics.
Keywords- Car battery, CATIA, D.C motor, ergonomics, gear ratio, jack, screw

I. INTRODUCTION

Toggle jack is used to jack the car during side road emergency i.e. tire puncher. A mechanical jack is a device used to lift heavy equipment, all or part of a vehicle into the air in order to facilitate vehicle maintenances or breakdown repairs [Budynas, and Nisbett, 2008]. Changing a flat tire is not a very pleasant experience. Nowadays, a variety of car jacks have been developed for lifting an automobile from a ground surface. Available car jacks, however, are typically manually operated and therefore require substantial laborious physical effort on the part of the user. Such jacks present difficulties for the elderly and handicapped [ACCC, 2007]. It further requires the operator to remain in prolonged bent or squatting position to operate the jack. Doing work in a bent or squatting position for a period of time is not ergonomic to human body. It will give back ache problem in due of time.

A toggle jack is operated by turning a lead screw. In this case of a jack, a small force applied in the horizontal plane is used to raise or lower large load [Khurmi and Gupta, 2005]. A jackscrew's compressive force is obtained through the tension force applied by its lead screw. An Acme thread is most often used, as this thread is very strong and can resist the large loads imposed on most jackscrews while not being weakened by wear over many rotations. An inherent advantage is that, if the tapered sides of the screw wear, the mating nut automatically comes into closer engagement, instead of allowing backlash to develop [Rajput, 2007]. These types are self-locking, which makes them safer than other jack technologies like hydraulic actuators which require continual pressure to remain in a locked position.

The automobile service stations are commonly equipped with large and hi-tech car lift, wherein such lifts are raised and lowered via electrically-powered systems [BJC, 2008]. However, due to their size and high costs of purchasing and maintaining, such lifts are not feasible to be placed in car and owned by car owner. Such electrical-powered portable jacks not only reduce the effort required for lifting an automobile via manually-operated jacks, but also decrease the time needed to repair the automobile. Such a feature can be especially advantageous when it is necessary to repair an automobile on the side of a roadway or under other hazardous conditions [Lonon, 2007].

A specified jack purposed to hold up to 1000 kilograms, but tests undertaken by Consumer Affairs has revealed that is fails to work after lifting 250 kilograms and may physically break when it has a weight close to its 1000 kilograms capacity [BJC, 2008]. Tests have proven that the jack has the tendency to buckle under the weight it is subjected to withstand [Razzaghi and Douglasville, 2007]. The purpose of this project is to develop a car jack which is easy to be operated, safe and able lift and lowering the car without involving much physical effort. This paper discussed the design and analysis of modified car jack.

II. WORKING OF ELECTRICALLY OPERATED JACK

Under working condition the jack will lift a vehicle chassis in contact with the top plate when the power screw is rotated through its connecting gear with the pinion when electrical power applied to the wiper motor when plugged to the 12V battery in car. Motor transmits its rotating speed to the pinion gear meshing with the bigger gear connected to the power screw to be rotated with required speed reduction and increased torque to drive the power screw. The power screw rotates within the threaded bore of side member in the clockwise direction that will cause the links to be drawn along the threaded portion towards each other during load-raising process and vice versa. Initially the jack will first be placed below the chassis to be lifted such that at least a small clearance space will exist between the top plate and the vehicle chassis to be raised. Then after power screw will be turned so that the top plate makes contact with the car chassis and the clearance space is eliminated. As contact is made, load of car will be increasingly shifted to the top plate and cause forces to be developed in and transmitted through links and side member. The force transmitted through the side member will be transferred on threads of screw. A switching circuit connected to the motor is used to regulate the lifting and lowering process.

III. MATERIAL SELECTION

Scissor jacks are usually made of materials that are very strong and are suitable for withstanding heavy loads. The two main materials used for making good quality jacks are Steel and Aluminium. When selecting the material suitable for the construction of the Scissor jack one has to consider the properties that will enable it to function with no expected failure and at the same time the weight and ease of machining the product. Therefore the main areas that can be classified in this case are the strength of the material, weight, ease and cost of manufacturing. Aluminium is around one-third the density of steel at 2.72 mg/m cubed compared to steel's 7.85 mg/m cubed. The light weight and low melting point of aluminium makes it easier and more efficient to machine than steel. Aluminium's fatigue performance is half that of steel, which is an advantage steel has over aluminium in car jack life durability. Therefore Steel is the most viable material selected for the manufacture of the car scissor jack. (Comparison on basis of data given in materials and heat treatment processes by o.p. khanna). Component number 4, 5and 17 will all use the High Strength Low-Alloy Steel (40Ni2Cr1Mo28 / AISI 4340), material is selected on bases of application. Material Property is given in Table 1 below:

Table 1 Material property

Tensile Strength, Ultimate	931 MPa	135000 psi	
Tensile Strength, Yield	834 MPa	121000 psi	
Elongation at Break	20.2 %	20.2 %	
Modulus of Elasticity	205 GPa	29700 ksi	Typical for steel
Bulk Modulus	140 GPa	20300 ksi	Typical for steel
Poisson's Ratio	0.29	0.29	Calculated
Shear Modulus	80 GPa	11600 ksi	

http://asm.matweb.com/search/SpecificMaterial.asp?bassnum=M434AP

Component number 7, 13 and 16 will all use the High Alloy steel plates (N8). . Material Property is given in Table 2 below:

Table 2 Material property

`Steel plate/Sheet thickness / mm	σb MPa	σs ≥/MPa	δ Samples from the standard for 50 mm (2 in)	180 ° of cold bending test	
				longitudinal	horizontal
Hot-rolled/Cold rolling:5 - 150	520	415	16～18	2a	3.5a

http://www.steel-grades.com/Steel-grades/High-alloy/denertia-n8.html

Component number 11 will use the Mild steel/ plain carbon steel (C45/ AISI 1045) and 15 will use the Mild steel/ plain carbon steel (C35 Mn75/IS new: 35C8/ AISI 1035, http://www.btss.in/technical.php). Material Property of C45 and C35 Mn75 are given in Table 3 below:

Table 3 Material property

Parameter	Pinion	Gear
Material	C45	C35Mn75
Tensile strength, ( )	670 N/mm^2	600 N/mm^2
BHN	229	223
Elastic modulus, (E)	210 GP_a	190 GP_a

PSG Design data book.

IV. ANALYSIS

This section shows the details of Finite Element Analysis of this developed prototype. The Finite Element Method is the easy technique to the theoretical method to find out the stress developed in various components of toggle jack. In this paper Finite Element Analysis is carried out in ANSYS Workbench 11 to determine the maximum stress in toggle jack and gear when applied with boundary conditions. Also the deformation is found out for jack and gear pair.

4.1 Steps in analysis

a. Step 1: Import geometry
Figure 6.1 shows CATIA model imported in Ansys.

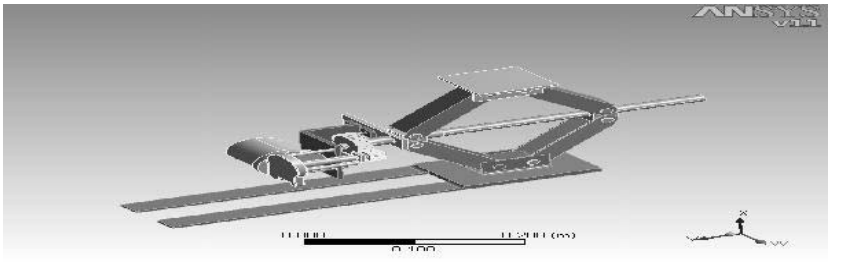

Figure 1: 3-D geometry of scissor jack

b. Step 2: Meshing

Figure 6.2 shows the component meshing. Cores meshing of geometry are performed.

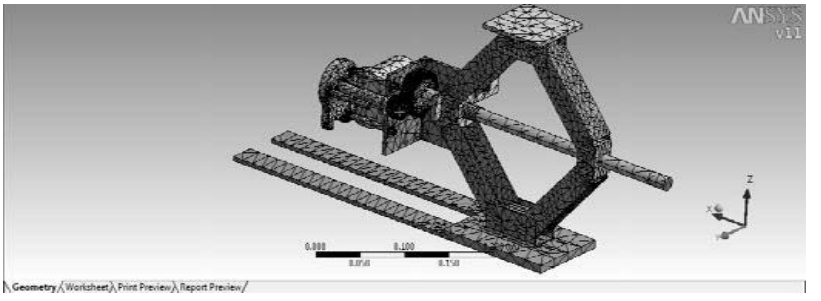

Figure 2: Coarse mesh of scissor jack

c. Step 3: Boundary conditions:

Stabilizer base is fixed as per required initial condition. The load of 5000 N is applied on top plate of jack in geometry. Fixed support is applied on inner rim of the pinion. Frictionless support is applied on inner rim of gear to allow its tangential rotation but restrict radial translation. Moment of 13 N-m is applied on outer rim of pinion in clockwise direction as a driving torque. Figure 6.3(a) and 6.3(b) shows applied boundary conditions.

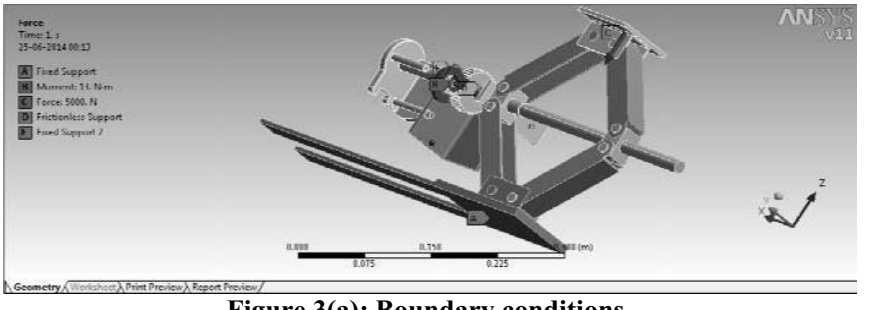

Figure 3(a): Boundary conditions.

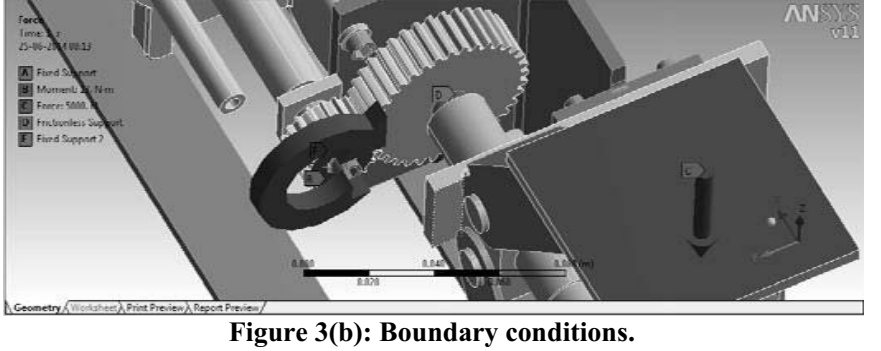

Figure 3(b): Boundary conditions.

V. RESULTS

The design was focused on all the processes of conception, visualization, calculation, refinement and specification of details that determine the form of the product. Hence, the said electrically operated toggle jack for Vehicles, specifically the Scissors type has gone under force analysis so that its performance criterion will not fail in any sense. The main physical parameters of the design are determined through the appropriate calculations and practical considerations with reasonable assumptions. From the force and stress diagram in figure, it was discovered that at the maximum raising height of 240mm of the horizontal Tensile force in the opposite direction are the same. It is also the same for the minimum raising height of 115mm. Mild steel is used as the materials for both gears due to its high strength, toughness, tooth hardness and its economical effects.

Based on the analysis on Finite Element Analysis, it shows that the maximum nodal displacement magnitude on the system car jack is around 0.087974 mm as shown in Figure 7.1 when maximum load

(5000 N) applied Furthermore, it observed that maximum Von Misses stress, maximum principle stress, maximum shear stress and shear stress values in safe point because analyzed < σy since tensor stress for all material used. Compression between analyzed and allowable material value of stress are in Table 3.5 below:

Table 4 Stress comparison table

Parameter	Analytical	Allowable (Jack)	Allowable(Gear)	Safety
Von-miss stress	135.06 *N/mm*		400 *N/mm*	Safe
Max. Principle stress.	145.33 *N/mm*	*N/mm*	400 *N/mm*	Safe
Max shear stress	71.57 *N/mm*	86.875 *N/mm*	200 *N/mm*	Safe

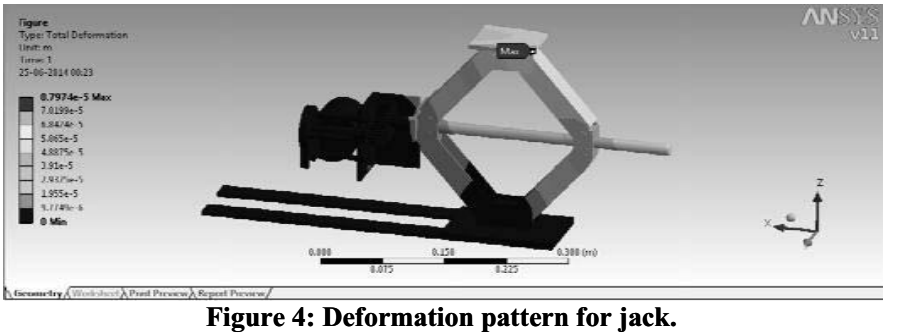

Figure 4: Deformation pattern for jack.

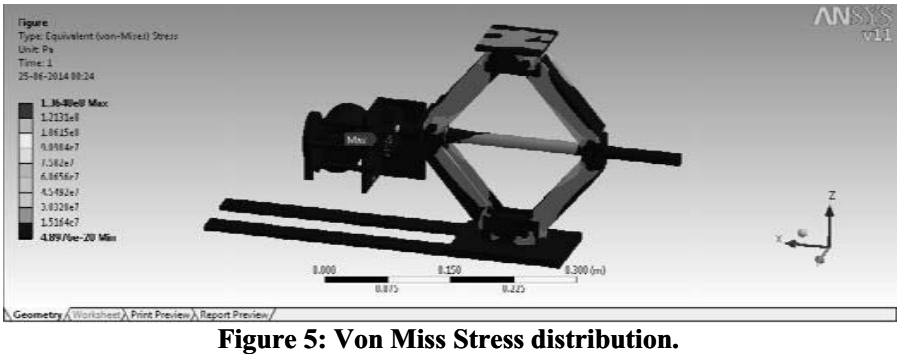

Figure 5: Von Miss Stress distribution.

VI. CONCLUSION

The existing jack was modified by making small alteration and making use of an electric motor to drive power screw, connecting gear with the pinion mounted on the motor shaft. The automobile 12V battery source operates prime mover (motor), to facile load lifting easier. The power screw is rotated through its gear when electrical power flows through it. The advantages of this jack is it will save time, be faster and easier to operate and requires less human energy and additional work to operate. There by effectively curb the problems associated with Ergonomics - which is a fundamental concept of design process.

Considering all available car jacks in the market, this prototype can be improved by a few modifications on the features and design. The objectives are to design a car jack that is safe, reliable and able to raise and lower the level, to develop a car jack that is powered by internal car power and automated with buttons system.

Based on the testing and results from the analysis, it is considered safe to use Jack car work under certain specifications. Furthermore the torque supplied on the system is more than enough to lift a car weight around 1200 kg. There are certain weak point that can be improved based on gear, motor and design.

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Design & Fabrication of Automatic-Pneumatic Pipe Cutting Machine

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Abstract-Cutting machine is one of the principal machines in industry. There is continuous development of sophisticated machines and modern techniques are implemented for economical manufacturing of products. At the same time, care should be taken that there has been no compromise made with quality and accuracy.
In the age of automation, machine become an integral part of human being. By the use of automation machine prove itself that it gives high production rate than manual production rate. Today, automation has powerfully entered in the industrial manufacturing process in order to get identical and accuracy of each product by reducing the human involvement. Automatic pipe cutting machine is one of such machine use for mass production and aim at reducing the human involvement in order to increase the productivity and accuracy of the product. New machines and techniques are being developed continuously to manufacture various products at cheaper rates and high quality. Automatic pneumatic pipe cutting machine uses a pneumatic circuit for cutting of PVC pipes which, ultimately reduces the total time required for the complete cutting operation and increases the production rate..
Keywords- Sequential pneumatic circuit, Proximity sensor , Pneumatic motor, Pipe cutting.

I. INTRODUCTION

Now a days products are required to be produced on mass scale which, ultimately reduce the production cost. For that purpose different techniques are developed. Today, automation has powerfully entered in the industrial manufacturing process in order to get identical and accuracy of each product by reducing the human involvement. Automatic production is carried out for mass production which aims at reducing the manufacturing cost of a product. Automatic pipe cutting machine is one of such machine use for mass production and aim at reducing the human involvement in order to increase the productivity and accuracy of the product. Pneumatic systems form the most primitive and distinct class of mechanical control engineering. They are classified under the term 'Fluid Power Control', which describes any process or device that converts, transmits, distributes or controls power through the use of pressurized gas or liquid. In a pneumatic system, the working fluid is a gas (mostly air) which is compressed above atmospheric pressure to impart pressure energy to the molecules. This stored pressure potential is converted to a suitable mechanical work in an appropriate controlled sequence using control valves and actuators. Pneumatic systems are well suited for the automation of a simple repetitive task. The working fluid is abundant in nature and hence the running and maintenance cost of these systems are exceptionally low. All fluids have the ability to translate and transfigure and hence pneumatic systems permit variety of power conversion with minimal mechanical hardware.
Conversion of various combinations of motions like rotary-rotary, linear-rotary and linear-linear is possible. The simplicity in design, durability and compact size of pneumatic systems make them well suited for mobile applications. These features make them versatile and find universal applications including machines, aerospace technology, production and assembly of automotive components (power steering, chassis and engine assembly), CNC machines, food products and packaging industry, bomb deployment units and fabrication process of plastic products.

1.1 Problem Statement

The conventional pipe cutting machines has the following steps which are to be followed for cutting the pipes:
Manually cutting of the pipe using the stopper method.
The handling of pipe manually at the time of cutting.

It requires man for fitting of the pipe for cutting and removing the pipe from the fixture but the conventional method has lot of disadvantages. Some of them are:
Time consuming: For fitting and adjusting of pipe require more time as it is handle manually.
Less accuracy: As all process is handling by manually, so there are more chances of occurring human error. Thus the accuracy of the process is reducing.
More labour required: It requires more labor for carried out operation, it result in more human resource and more labor cost.
To overcome these problems development of Automatic pneumatic pipe cutting machine is done.

1.2 Objectives

1. To reduce the man power.
2. To maintain the accuracy in pipe cutting process.
3. To perform the most rigid operation with high speed cutting.
4. To develop automation unit for the drill so that m/c can easily be adopted in today's automated plants.
5. To fulfill need of mass production in shortest possible time.

1.3 Methodology

This project consists of pneumatic cutter which is mounted on top sides M.S. sliding structure on upper stand. In between two plates the cutter is mounted at the middle of the frame. One double acting cylinder is attached at the upper frame to give depth to the cutter when compressed air is supplied and another double acting cylinder is attached to the lower frame to hold the pipe for cutting When we insert the pipe in jaw and push the button then, the compressed air is supplied through compressor using solenoid DCV to hold the job using holding fixture for first job holding sequencing operation.
After the job holding takes place then the pneumatic cutter is switched ON & vertical cylinder gives cutting depth to the motor with pneumatic compressed air , cutting performance is affected by compressed air pressure & condition. When pipe cutting is done the limit switch turns OFF the Solenoids DCV to stop the supply of compressed air.

II. THE ADVANTAGES OF PNEUMATIC SYSTEMS:

Pneumatic control systems are widely used in our society, especially in the industrial sectors for the driving of automatic machines. Pneumatic systems have a lot of advantages.

(I) High effectiveness
Many factories have equipped their production lines with compressed air supplies and movable compressors. There is an unlimited supply of air in our atmosphere to produce compressed air. Moreover, the use of compressed air is not restricted by distance, as it can easily be transported through pipes. After use, compressed air can be released directly into the atmosphere without the need of processing.

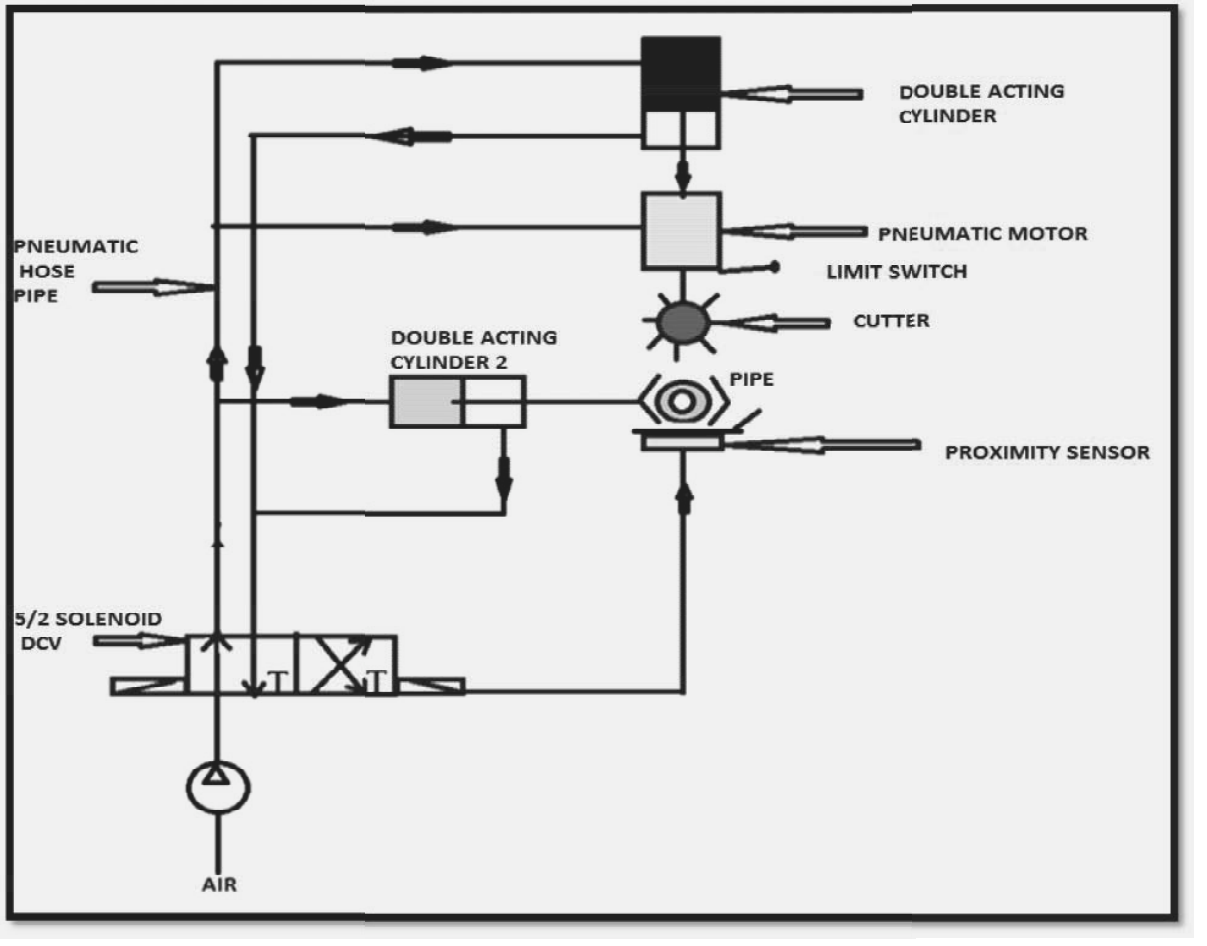
(II) High durability and reliability
Pneumatic components are extremely durable and cannot be damaged easily. Compared to electromotive components, pneumatic components are more durable and reliable.

(III) Simple design
The designs of pneumatic components are relatively simple. They are thus more suitable for use in simple automatic control systems.

(IV) High adaptability to harsh environment
Compared to the elements of other systems, compressed air is less affected by high temperature, dust, corrosion, etc.

(V) Safety
Pneumatic systems are safer than electromotive systems because they can work in inflammable environment without causing fire or explosion. Apart from that, overloading in pneumatic system will

only lead to sliding or cessation of operation. Unlike electromotive components, pneumatic components do not burn or get overheated when overloaded.



(VI) Easy selection of speed and pressure

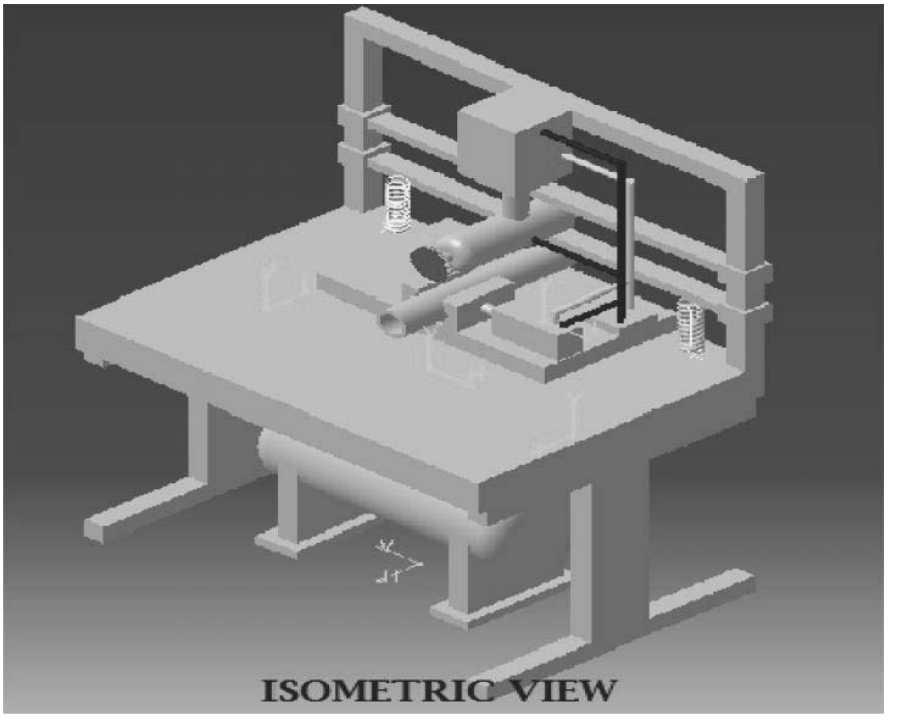
The speeds of rectilinear and oscillating movement of pneumatic systems are easy to adjust and subject to few limitations. The pressure and the volume of air can easily be adjusted by a pressure regulator.

(VII) Environmental friendly

The operation of pneumatic systems does not produce pollutants. The air released is also processed in special ways. Therefore, pneumatic systems can work in environments that demand high level of cleanliness. One example is the production lines of integrated circuits.

(VIII) Economical

As pneumatic components are not expensive, the costs of pneumatic systems are quite low. Moreover, as pneumatic systems are very durable, the cost of repair is significantly lower than that of other systems.



III. APPLICTION

- It is used for cutting of PVC pipes.
- It is used for obtaining pipes with variable dimensions.
- It is used for making billets as raw materials for further machining operations.
- It is used cut thin hollow metal pipes.

IV. CONCLUSION

The manual pipe cutting machines have several disadvantages including less production, increase in machine downtime, dependency on workers to a large extent. All these drawbacks are overcome by the automatic pneumatic pipe cutting machine. Industries are acquainted by automation and hence this pipe cutting machine will find many applications in several industries in coming decades.

V. FUTURE SCOPE

- Automatic feeding of pipe as per requirement through programming.
- Reuse of the pressure energy of the exhaust air for increasing the efficiency of the system.
- Using same type of system for sheet metal , wires etc

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Study of Automotive Manufacturing and Material Handling Systems for Assembly Line Simulation: A Research Perspective

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Abstract - Engineers and analysts using simulation have found it valuable for evaluating the impact of capital investments in equipment and physical facility and of proposed changes to material handling and layout. They have also found it useful to evaluate staffing and operating rules and proposed rules and algorithms to be incorporated into production control systems, warehouse-management control software, and material-handling controls. Managers have found simulation useful in providing a "test drive" before making capital investments, without disrupting the existing system with untried changes. Methodology adopted includes Modeling Downtimes and Failures, Effect of Downtime on Queuing and Simulation to predict system throughput. During Analysis of Station Utilization, throughput will be between 364.5 and 366.8 and is below the design throughput, 390 Product per shift. During Analysis of Potential System Improvements, the model configuration that increases throughput by 25.5 or better and has the smallest total buffer capacity with capacities of (3, 3, 2.2, and 2) for Buffers 2 to 6, respectively.

Key Words - Simulation, Automotive Manufacturing, Material Handling Systems, Assembly Line.

Nomenclature

TTF-Time to failure
TTR-Time to repair
MTTF-Mean time to failure
MTTR-Mean time to repair
Spread-(+/-)
CI- Confidence interval
CRN-Common random number

I. INTRODUCTION

Manufacturing and material-handling systems provide one of the most important applications of simulation. Simulation has been used successfully as an aid in the design of new production facilities, warehouses, and distribution centers. It has also been used to evaluate suggested improvements to existing systems. Should the model simulate each conveyor section or vehicle movement, or can some be replaced by a simple time delay? Should the model simulate auxiliary parts, or the handling of purchased parts, or can the model assume that such parts are always available at the right location when needed for assembly?

1.1Models of Manufacturing Systems

Models of manufacturing systems might have to take into account a number of characteristics of such systems, some of which are Physical layout, Labor(Shift schedules/Job duties and certification), Equipment(Rates and capacities),Breakdowns (Time to failure/Time to repair/Resources needed for repair),Maintenance(PM schedule/Time and resources required/Tooling and fixtures), Workcenters (Processing/Assembly/Disassembly), Product(Product flow/ routing/resources needed for Bill of materials),Production schedules(Made-to-stock/Made-to-order/Customer orders/Line items and quantities),Production control(Assignment of jobs to work areas/Task selection at work centers/Routing. Decisions) , Supplies (Ordering/Receipt and storage/Delivery to work

centers),Storage(Supplies/Spare parts/Work-in-process (WIP)/ Finished goods),Packing and shipping(Order consolidation/Paperwork/Loading of trailers).

1.2Models of Material Handling Systems

In manufacturing systems, it is not unusual for 80 to 85% of an item's total time in system to be expended on material handling or on waiting for material handling to occur. This work-in-process (WIP) represents a vast investment, and reductions in WIP and associated delays can result in large cost savings. Therefore, for some studies, detailed material-handling simulations are cost effective. In some production lines, the material-handling system is an essential component. For example, automotive paint shops typically consist of a power-and-free conveyor system that transports automobile bodies or body parts through the paint booths. In warehouses, distribution centers, and flow-through and cross-docking operations, material handling is clearly a key component of any material-flow model. Manual warehouses typically use manual fork trucks to move pallets from receiving dock to storage and from storage to shipping dock. More automated distribution centers might use extensive conveyor systems to support putaway, order picking, order sortation and consolidation.

1.2.1 Subsystems for Models of material-handling systems:

Conveyors (Accumulating/Non-accumulating/Indexing and other special purpose/Fixed window or random spacing/Power and free), Transporters (Unconstrained vehicles (e.g., manually guided fork trucks)/Guided vehicles (automated or operator controlled, wire guided chemical paths, rail guided)/Bridge cranes and other overhead lifts),Storage systems(Pallet storage/Case storage/Small-part storage (totes)/Oversize items/Rack storage or block stacked/Automated storage and retrieval systems (AS/RS) with storage—retrieval machines (SRM)).

The major goals of manufacturing-simulation models are to identify problem areas and quantify system performance. Common measures of system performance include the following:

a) Throughput under average and peak loads:
b) System cycle time (how long it takes to produce one part);
c) Utilization of resources, labor, and machines;
d) Bottlenecks and choke points;
e) Queueing at work locations;
f) Queueing and delays caused by material-handling devices and systems;
g) WIP storage needs;
h) Staffing requirements;
i) Effectiveness of scheduling systems;
j) Effectiveness of control systems.

Often, material handling is an important part of a manufacturing system and its performance. Non-manufacturing material-handling systems include warehouses, distribution centers, cross-docking operations, baggage-handling systems at airports and container terminals. The major goals of these non-manufacturing material-handling systems are similar to those identified for manufacturing systems.

Some additional considerations are the following:

a) How long it takes to process one day of customer orders;
b) Effect of changes in order profiles (for distribution centers);
c) Truck/trailer queueing and delays at receiving and shipping docks;
d) Effectiveness of material-handling systems at peak loads;
e) Recovery time from short-term surges (for example, with baggage-handling).

II. BACKGROUND

The objective of this study was to examine to what extent ergonomics simulations of manual assembly tasks correctly predict the real outcomes in the plants and if recommended measures originating from ergonomics simulations are taken into consideration. 155 ergonomics simulation cases were used in the study and all cases were performed by nine simulation engineers at Volvo Car

Corporation in Gothenburg. The evaluations of the ergonomics conditions of the simulated tasks were done by six professional ergonomists working at Volvo Car Corporation in Gothenburg [1].

Reiter and Freitag shows flexible Manufacturing Systems over Reconfigurable Systems towards Autonomous Manufacturing Systems. These paradigm shifts are driven by changing market demands and the corresponding requirements to the manufacturing systems. To remain competitive, one of the major characteristics of future manufacturing companies is their changeability [2].

The work of Agrawal studied that balancing the work load among the machines will indirectly enable to reduce the inventory and will also help in multi-machine tending by the operators [3]. Caputo et al. described the Ergonomic optimization of a manufacturing system work cell. In the demanding global marketplace, ensuring that human factors are comprehensively addressed is becoming an increasingly important aspect of design [4]. In job shops, jobs spend 95% of their time in nonproductive activity; much of the time is spent waiting in queue and the remaining 5% is split between lot setup and processing as demonstrated by Askin and Standridge [5]. Job shops and flow lines cannot meet today's production requirements where manufacturing systems are often required to be reconfigured to respond to changes in product design and demand. As a result, cellular manufacturing (CM) emerged as a promising alternative manufacturing system identifying similar parts and grouping them together into families to take advantage of their similarities in design and manufacturing explained by Selim et al. [6].

CM involves the formation of part families based upon their similar processing requirements and the grouping of machines into manufacturing cells to produce the formed part families investigated by Barve et al.[7]. The use of general- purpose machines and equipment in CM allows machines to be changed in order to handle new product designs and product demand with little efforts in terms of cost and time. So it provides great flexibility in producing a variety of products as explained in recent reviews by Chalapathi [8]. The tenet of CM is to break up a complex manufacturing facility into several groups of machines (cells), each being dedicated to the processing of a part family. Therefore, each part type is ideally produced in a single cell. Thus, material flow is simplified and the scheduling task is made much easier. As reported in the survey by Wemmerlov and Johnson [9]. The survey affirms that the greatest reported benefits from CM appear along the dimension of time (manufacturing lead time and customer response time). Thus, CM represents a logical choice for firms whose strategy is time-based competitive manufacturing.

Pasupuleti evaluated the performance measures like the make span, mean flow time, mean lateness and mean tardiness are used to evaluate the considered dispatching rules. The method gives the sequence of parts to process on each machine and the total schedules for all the operations of the parts. In all situations, where traditional machines are used for operations on parts, concurrent formation of part-families and machine-cells is necessary [10]. In these situations part route-sheets can provide all the details like: sequence of operations, setup and processing times, and number of units to be produced. The number of machines available initially may also be known. The effectiveness of the method depends upon the quantity and accuracy of the information available studied by Karuna et al. (2012). Arora et al. studied many current cellular manufacturing applications are running in a non optimal environment and their performance could be improved by optimizing the parameter. But from the available literature most of the cell formation techniques/algorithm does not discuss the optimal size of the cell and the optimal number of cells, should be formed for a given problem. The techniques required to investigate the effect on different performance measures if the number of cell / cell size/composition of cells varied [11].

Presently Indian automobile manufacturer are using Advanced Production Technologies (APTs) include all technologies that are used in all steps from computer designing level up to computerized integration of machine and equipment during production as research by Suleyman (2010). Some of the Assumptions suggested by Aryanezhada et al. for CMS design phase in auto industry such as (1) production volume of each component depends on demand for final product and it is identified based on the production volume of higher level components,(2) each parent item could have any number from a type of its children, (3)both machining and assembly operations are just accomplished in one cell and each cell is limited by a lower bound and an upper bound,(4)intra-cell and inter-cell movement times of each component and duration times for setting up and performing machining operations are given,(5)the setup times on each machine are specified based on the precedence of parts [12].

Kulak et al. studied parameter that to be consider for performance evolution based on axiomatic design principles are raw material stock (days of inventory), Lead time (days), Scrap rate (%), Throughput (units pairs) ,Overtime (hours/week) , WIP (days inventory) , Material move distances (m) [13]. Huawei et al. observed that to realize rapid design of CMS layout, integrated method of logical and physical layout has more advantages than traditional layout design. Simulation models will be embedded in enterprise planning and scheduling tools in a manner that will be transparent to the users [14]. The capability to integrate simulation with manufacturing and enterprise systems and the expected benefit from this integration has led to the acquisition of several simulation vendors by system integrators and enterprise software vendors studied by Jeffrey [15].

Minimizing investment cost is important, but the issues of productivity and product quality are equally important since they will affect the operation cost. The right time is when planning a new manufacturing system for a part family or a product family line with several variants that are expected to change in the next 10–15 years, and the market is volatile, making it hard to forecast demand estimated by Yoram and Moshe [16]. A simulation study not only can help engineers discover better options for developing efficient equipment, but also can save time and money from mistakes in redesign and re-fabricating equipment in comparison with conventional methods that for the most part were based on engineering experience of Minh and Soemon [17].

Tillal and Ray proposed a SIMAN/CINEMA IV is suitable for detailed modeling while SIMFACTORY II.5 is more suitable for conceptual modeling) [18]. Razman and Ali studied the global financial crisis which shows that automotive manufacturing is complex. In the manufacturing approaches over the past few years, assembly has been a key issue and it seems simulation models are usually tailored to address a narrow set of industrial issues [19]. Chryssolouris et al. (2009) investigated that Computer simulation offers the great advantage of studying and statistically analyzing what–if scenarios, thus reducing overall time and cost required for taking decisions, based on the system behavior. Proper analysis by Khusna et al. of facility layout design could improve the performance of production line such as decrease bottleneck rate, minimize material handling cost, reduces idle time, raise the efficiency and utilization of labor, equipment and space [20].

Simulation store attribute values and indicate queuing levels at an individual product level. Discrete event simulation is shown to be much more than an exercise in quantitative analysis of results by Greasley [21]. Iqbal and Hashmi prepared a Virtual factory layout helps in evaluating plant layout before actually building them and assists in avoiding the cost involved in doing physical re-layout. By virtual factory layout, a designer can have feel of the actual setting of the factory, easy to visualize, understand and evaluate. Re-location of the machine can be done such that the material handling cost reduced as well as the bottleneck removed [22]. Reductions in manufacturing throughput time can generate numerous benefits, including lower work-in-process and finished goods inventory levels, improved quality, lower costs, and less forecasting error (because forecasts are for shorter time horizons). More importantly, reductions in manufacturing throughput time increase flexibility and reduce the time required to respond to customer orders as demonstrated by Danny [23]. Currently available methods for sequence generation assume sequential tasks. Consideration of assembly hierarchy and parallel assembly allows other none sequential sequence choices which may lead to simplified sequence generation and innovative system configurations. Design of reconfigurable assembly systems by incorporating both machines and people can lead to cost effective system flexibility and scalability stated by Hu et al. [24].

Willem and Jalal find need to refine the search for which critical operations (bottlenecks) cycle time would need to be reduced further, rather than an a prior shortening of cycle time settings (robot welding times), some of which are non-bottleneck operations that will not affect average daily output [25]. Guidelines such as reducing number of cycles, density and decision points are recommended to reduce manufacturing systems layout complexity. Six complexity indices, based on the physical structural characteristics of the layout, have been introduced and formulated. They are layout density, path, cycle, decision points, redundancy distribution and magnitude indices considered by Elmaraghy et al. [26].

Due to the high degree of abstraction (flexibility) or the clearly confined problem setting (decentral planning) the works better integrate with each other. A future challenge will be to better integrate the approaches and the domains of research. This will allow for better complying with the requirements of industry. In showing similarities and differences between existing works and

planning tasks, the review aims at contributing towards a common understanding of production management in the automotive industry [27]. Saghafianl and Jokar considered the objective function of minimizing overall inter-cell and intra-cell flow costs instead of minimizing the number of inter-cell movements/costs and the integrative and simultaneous determination of cell formation and their layout instead of using sequential approaches [28]. Nikoofarid and Aalaei proposed approach minimizes holding and backorder costs and manages machines and workers over a certain planning horizon. Also, the role and function of dynamic virtual cellular manufacturing systems is addressed so that no physical changes in the system resources available are necessary and only the virtual cell boundaries change to meet the demand values in different periods [29].

Thottungall and Sijo suggested that the optimal layout strategy for the company is a combination of product line layout and process layout. The flow of the product being manufactured is indicative of a production line layout. This is because the materials and partly completed equipment flows from one workstation to the next. The workstations are not located in such a manner as to facilitate straight line flow throughout the facility. The material may flow back to a workstation at the beginning of the process. This aspect of the flow through the facility is the reason for the combination of the different layout types[30].

III. METHODOLOGY

3.1 Modeling Downtimes and Failures

Unscheduled random downtimes can have a major effect on the performance of manufacturing systems. Scheduled downtime such as for preventive maintenance or periodic downtime such as for tool replacement also can have a major effect on system performance. But these downtimes are usually (or should be) predictable and can be scheduled to minimize disruptions. In addition, engineering efforts or new technology might be able to reduce their duration. There are a number of alternatives for modeling random unscheduled downtime, some better than others:

a) Ignore it.
b) Do not model it explicitly, but increase processing times in appropriate proportion.
c) Use constant values for time to failure and time to repair.
d) Use statistical distributions for time to failure and time to repair.

Time to failure can be measured in a number of different ways:

a) by wall-clock time;
b) by machine or equipment busy time;
c) by number of cycle times;
d) by number of items produced.

3.2 Effect of Downtime on Queuing

In Plant, a single machine that processes a wide variety of parts that arrive in random mixes at random times. Data analysis has shown that an exponentially distributed processing time with a mean of 7.5 minutes provides a fairly accurate representation. Parts arrive at random, time between arrivals being exponentially distributed with mean 10 minutes. The machine fails at random times. Downtime studies have shown that time-to-failure can be reasonably approximated by an exponential distribution with mean time 1000 minutes. The time to repair the resource is also exponentially distributed, with mean time 50 minutes. When a failure occurs, the current part in the machine is removed from the machine; when the repair has been completed, the part resumes its processing.

When a part arrives, it queues and waits its turn at the machine. It is desired to estimate the size of this queue. An experiment was designed to estimate the average number of parts in the queue. To illustrate the effect of an accurate treatment of downtimes, the model was run under a number of different assumptions. For each case and replication, the simulation run length was 100,000 minutes.

Table1 shows the average number of parts in the queue for six different treatments of the time between breakdowns. For each treatment that involves randomness five replications of those treatments and the average for those five replications are shown.

Case A ignores the breakdowns. The average number in the queue is 2.31 parts. Across the 5 independent replications, the averages range from 2.05 to 2.70 parts. This treatment of breakdowns is not recommended.

Case B increases the average service time from 7.5 minutes to 8.0 minutes in an attempt to approximate the effect of downtimes. On average, each downtime and repair cycle is 1050 minutes, with the machine down for 50 minutes. Thus the machine is down, on the average in the long run, 50/1050 = 4.8% of total time. Thus, some have argued that downtime has approximately the same effect as increasing the processing time of each part by 4.8%, which is about 7.86 minutes. Therefore, an assumed constant 8 minutes per part should be (it is argued) a conservative approach. For this treatment of downtimes, the average number of parts in the queue, over the five replications, is about 3.26 parts. Across the 5 replications, the range is from 2.81 to 4.03 parts. (Note that the variability as shown in the range of values is very small compared to the other cases.)

Table1. Average Number of Parts in Queue for Machines with Breakdowns

Case	1st Rep	2nd Rep	3rd Rep	4th Rep	5th Rep	Avg Rep
A. Ignore the breakdowns	2.36	2.05	2.38	2.05	2.70	2.31
B. Increase service time to 8.0	3.32	2.82	3.32	2.81	4.03	3.26
C. All random	4.05	3.77	4.36	3.95	4.43	4.11
D. Random processing. deterministic breakdowns	3.24	2.85	3.28	3.05	3.79	3.24
E. All deterministic						0.52
F. Deterministic processing, random breakdowns	1.06	1.04	1.10	1.32	1.16	1.13

The treatment in Case B might be appropriate under some limited circumstances, but, as was discussed in a previous section, it is not appropriate under the assumptions of this example.

The proper treatment, shown as Case C, treats the randomness in processing and breakdowns properly, with the assumed correct exponential distributions. The average value is about 4.11 parts waiting for the machine. Across the 5 replications, the average queue length ranges from 3.77 to 4.43 parts. The average number waiting differs from that of Case B by almost one part.

Case D is a simplification that treats the processing randomly, but treats the breakdowns as deterministic. The results average about 3.24 parts in the queue. The range of averages is from 2.85 to 3.79 parts, quite a reduction in variability from Case C.

Case E treats all of the times as deterministic. Only one replication is needed, because additional replications (using the same seed) will reproduce the result. The average value in the queue is 0.52 parts, well below the value in Case C. or any other case for that matter. Above study shows that ignoring randomness is dangerous and leads to totally unrealistic results.

Case F treats arrivals and processing as deterministic, but breakdowns are random. The average number of parts in the queue at the machine is about 1.13. The range is from 1.04 to 1.32 parts. For some machines and processing in manufacturing environments, Case F is the realistic situation: Processing times are constant, and arrivals are regulated-that is, are also constant. The reader is left to consider the inaccuracies that would result from making faulty assumptions regarding the nature of time to failure and time to repair. There can be significant differences between the estimated average numbers in a queue, based on the treatment of randomness. The results using the correct treatment of randomness can be far different from those using alternatives.

3.3 An Assembly-Line Simulation

Simulation to analyze the system's performance, specifically to predict system throughput (Product per 8-hour shift on the average).

One of the potential improvement is adding buffer space for holding work-in-process (WIP) between adjacent workstations. So to develop a simulation model and conduct an analysis, primary objective is to predict throughput (completed Product per shift on the average) for the given system design and to evaluate whether it meets the desired throughput. In addition, should throughput be less than expected, the team wants to use the model to help in identifying bottlenecks, gaining insight into the system's dynamic behavior and evaluating potential design improvements. The proposed production line has six workstations and a special rack for WIP storage between adjacent stations. There are four manual stations, each having its own operator, and two automated stations, which share a single operator. The six stations perform production tasks in the following sequence:

Station 1: initial manual station begins final assembly of a new Part
Station 2: manual assembly station
Station 3: manual assembly station
Station 4: automatic assembly station
Station 5: automatic testing station
Station 6: manual packing station

At each manual station, an operator loads a Part onto a workbench, performs some tasks, and on completion unloads the Part and places it into the WIP storage for the next workstation. The operator takes 10 seconds and 5 seconds for the loading and unloading tasks, respectively. The WIP storage racks between each pair of adjacent stations have limited capacity. If a station completes its tasks on a Part but the downstream rack-is full, the Part must remain in the station, blocking any further work. In the initial design, the WIP storage racks have the capacities shown in Table 2. (By assumption, the WIP storage preceding Station 1 is always kept full at 4 units; since it is assumed to always be full, its specific capacity plays no role.) The system design with capacities given in Table 2 is called the Baseline configuration.

From time to time, a tool will fail, causing unscheduled downtime or unexpected extra work at a manual or automated station. In addition, all operators are scheduled to take a 30 minute lunch break at the same time. Work is interrupted and resumes where it left off after lunch. This interrupt/resume rule applies to operator tasks including assembly work, parts re-supply and repairs during a downtime. At the automatic stations, a machine performs an assembly or testing task. The automatic stations might have unscheduled (random) downtimes but they continue to operate during the operator's lunch break. One operator services both machines to load and unload Product (10 seconds and 5 seconds, respectively). After being loaded, a machine processes the Part without further operator intervention unless a downtime occurs. At all stations, the operator performs repairs as needed whenever the station experiences a downtime.

Table 2. Capacity of WIP Storage Buffers for Baseline Configuration

Rack Before Station	1	2	3	4	5	6
Buffer Capacity	4	2	2	2	1	2

Table 3. Assembly and Parts Re-supply Times

Station	Assembly per Part (Seconds)	Part Number	Parts Re-supply Time (seconds per Batch)	No. of Parts per Batch
1	40	A	10	15
		B	15	10
2	38	C	20	8
		D	15	14
3	38	E	30	15
4	35			
5	35			
6	40	F*	30	32

*At station 6, the part number (F) represents the shipping containers.

Table 4. Assumptions and Data for Unscheduled Downtimes

Station	TTF	MTTF (Minutes)	TTR	MTTR (Minutes)	+/-	Expected Availability
1	Exponential	36	Uniform	4	1	90%
2	Exponential	4.5	Uniform	0.5	0.1	90%
3	Exponential	27	Uniform	3	1	90%
4	Exponential	9	Uniform	1	0.5	90%
5	Exponential	18	Uniform	2	1	90%

Table 3 gives the total assembly time and parts re-supply times for each station, plus the number of parts in a batch. The assembly time for the manual stations is assumed to vary by plus/minus 2 seconds (uniformly distributed) from the times given in Table 3 Parts re-supply time does not occur for each Part, but rather after a batch of parts has been assembled onto the Part. The machines at stations 4 and 5 do not consume parts.

Each station is subject to unscheduled (random) downtime. Manual stations 1-3 have tool failures or other unexpected problems. The automatic stations occasionally jam or have some other problem that requires the assigned operator to fix it. Station 6 (packing) is not subject to these downtimes. Table 4 shows time to failure (TTF) and time to repair (TTR) distributional assumptions and the assumed mean time to failure (MTTF), mean time to repair (MTTR) and spread (+/-) of repair times. For example, at Station 1, repair time is uniformly distributed with mean 4.0 minutes plus or minus 1.0 minutes-that is, uniformly distributed between 3.0 and 5.0 minutes. Failure can only occur when an operator or machine is working; hence, TTF is modeled by measuring only busy or processing time until a failure occurs.

The primary model output or response is average throughput during the assumed 7.5 working hours per 8-hour shift. The model also measures detailed station utilization, including busy or processing time, idle or starved time (no parts ready for processing), blocked time (part cannot leave station, because downstream WIP buffer is full), unscheduled downtime, and time waiting for an operator. Station starvation occurs when the operator and station are ready to work on the next Part, the just-completed Part leaves the station, but upstream conditions cause no Part to be ready for this production step. In short, the upstream WIP buffer is empty.
Station blockage occurs when a station completes all tasks on a Part, but cannot release the part because the downstream WIP buffer is full. For both starvation and blockage, production time is lost at the given station and cannot be made up.

When an operator services more than one station, as does the operator servicing Stations 4 and 5, it is possible for both stations to need the operator at the same time. This could cause additional delay at the station and is measured by a "wait for operator" state. Blockage, starvation and wait-for-operator at each station will be measured in order to help explain any throughput shortfall, should it occur, and to assist in identifying potential system improvements.

3.4 Pre-simulation Analysis

A pre-simulation analysis, taking into account the average station cycle time as well as expected station availability (90%), indicates that each station, if unhindered, can achieve the desired throughput. This initial analysis is carried out as described in this section. From the assumed downtime data, the team was able to estimate expected station availability under the (ideal) assumption of no interaction between stations. The expected availability shows each station's individual availability during working (non-lunch, non-break) hours, assuming that the operator can always place a completed Part into the downstream rack storage and the next Part is ready to begin work at the station. Expected availability is computed by MTTF/(MTTF+MTTR),

or expected busy time during a downtime "cycle" divided by the length of a downtime cycle (a busy cycle plus a repair cycle) and is given in Table 4. This calculation ignores certain aspects of the problem including the parts re-supply times and any delay caused by having only one operator to service both Stations 4 and 5. The design goal for the modeled system is 390 finished Product per 8-hour shift. After taking lunch into account, each shift has up to 7.5 hours of available work time. With unscheduled (random) downtime expected to be 10% of available time, this further reduces working time to 0.90 x 7.5 hours = 6.75 hours. This implies that the station with the slowest total cycle time must be able to produce 390 Product in the available 6.75 hours. Therefore the total cycle time per Part at each station must not exceed 6.75 hours/390=62.3 seconds.

Now, total cycle time consists of assembly, testing or packing time, and parts re-supply time (as given in Table 3), plus Part loading time of 10 seconds and unload time of 5 seconds. Parts re-supply is not taken on every Part, but rather after a given number of Products corresponding to using all parts in a given batch of parts. For example, using the values in Table 3 for Station 1, parts re-supply will take 10 seconds every 15 Product for Part A, plus 15 seconds every 10 Product for Part B, for a total time on the average of 10/15 + 15/10 seconds per Part.

Using this information, the (minimum) total cycle time for each station is estimated in Table 5. These pre-simulation estimates indicate, first, that each theoretical cycle time is well below the requirement of 62.3 seconds. Secondly, they indicate that Stations 1 and 2 are potential bottlenecks, if there are any.

Table 5. Estimated Total Cycle Time at Each Station

Station	Formula to Estimate Cycle Time (Seconds)	Estimate (Seconds)
1	10 +40+5 + 10/15+15/10	57.2
2	10+38+5+20/8+15/14	56.6
3	10+38±5+30/25	54.2
4	10+35+5	50.0
5	10+35+5	50.0
6	10+40+5+30/32	55.9

As the simulation analysis will later show Station 1 experiences blockage due to Station 2 downtime and Station 2 occasionally experiences starvation due to downtime at Station 1 and blockage due to downtime at Station 3. The blockage and starvation conditions reduce the available work time below the calculated 90%; hence, for the Baseline Configuration, they reduce the design throughput well below the desired value, 390 Product per shift. In summary, a pre-simulation analysis although valuable, at best can provide a rough estimate of system performance. As the simulation will show, ignoring blockage and starvation gives an overly optimistic estimate of system throughput.

IV. RESULTS AND DISCUSSION

Using the simulation model the first experiment was conducted to of the system as designed. After 10 replications of the model, each having a 2-hour warm-up or initialization followed by a 5-day simulation (each day being 24 hours). A 95% confidence interval was computed for mean throughput per shift:

95% CI for mean throughput: (364.5, 366.8), or365.7 ± 1.14.

With 95% confidence, the model predicts that mean (or long-run average) throughput will be between 364.5 and 366.8 Product per 8-hour shift with the system as designed. This is well below the design throughput, 390 Product per shift.

4.1 Analysis of Station Utilization

At this point, focus is on shortfall in throughput, small WIP buffer capacity and the resulting blockage and starvation. The same model was used to estimate detailed workstation utilization in hopes that it would provide an explanation of throughput shortfall. Table 6 contains 95% confidence-interval estimates for the first five workstations for percent of time down, blocked, starved, and waiting for an operator. (Waiting for operator affects only stations 4 and 5, as these two stations share one operator. The other stations have a dedicated operator. In addition to the utilization statistics in Table 6, the operators have a 30-minute lunch per 8-hour shift, representing 6.25% of available time.)

Table6. Detailed Station Utilization for Baseline Configuration

Station	% Down	% Blocked	% Staved	% Wait for Operator
1	(8.8,9.6)	(11.4,12.5)	(0.0.0.0)	(0.0,0.0)
2	(8.2,8.4)	(8.0,8.8)	(4.9.5.6)	(0.0.0.0)
3	(7.9,8.6)	(9.9,10.4)	(6.1,6.9)	(0.0,0.0)
4	(8.9,9.6)	(2.0.2.8)	(7.5,8.2)	(13.1,14.4)
5	(8.3,9.0)	(0.0,0.2)	(19.4,20.4)	(3.9,4.7)

From the results in Table 6, it appears that blockage and starvation explain some portion of the shortfall in throughput. In addition, another possible explanation surfaces: Station 4 experiences a significant time waiting for the single operator that services stations 4 and 5. This delay at Station 4 could result in a full WIP buffer, which in turn would help explain the blockage at Station 3 preceding it. Percent of time blocked is higher than percent starved for Stations 1 to 3, so it appears that downstream delays could be a significant bottleneck.

Proposed system improvements are:

a. having two operators to service Stations 4 and 5 (instead of the currently proposed one operator):
b. increasing the capacity of some of the WIP buffers;
c. a combination of both.

The expense of additional WIP storage space induced the team to desire to keep total buffer space as small as possible and to require an additional operator only if absolutely necessary while achieving the design goal of 390 Product per shift.

4.2 Analysis of Potential System Improvements

To evaluate the addition of an operator and larger WIP buffers, the model was revised appropriately to allow these changes and a new analysis was conducted. In this analysis, the capacity of each WIP buffer for Stations 2-6 was allowed to increase by one unit above the Baseline value given in Table 2. In addition, the effect of a second operator at Stations 4 and 5 is considered. These possibilities result in a total of 64 scenarios or model configurations. (Why?) Making 10 replications per scenario results in a total of 640 simulation runs.

Common Random Number techniques used to facilitate the analysis and to implement it with proper synchronization, each source of random variability was identified and assigned a dedicated random-number stream. In this model, processing time TTF and TTR are modeled by statistical distributions at each of the six workstations. Therefore, a total of 18 random-number streams were defined, with 3 used at each workstation. In this way, in each set of runs, each workstation experienced the same workload and random downtimes no matter which configuration was being simulated. For a given number of replications the CRN technique, also known as correlated sampling, is expected to give shorter confidence intervals for differences in system performance. The model configurations with the most improvement in system throughput compared with the Baseline configuration are shown in Table 7.

Table 7 Improvement in System Throughput for Alternative Configurations

Number of Operators Stations 4 &5	Buffer Capacities						Increase in Mean Throughput per Shift (Compared to Baseline)		
	Buffer 2	Buffer 3	Buffer 4	Buffer 5	Buffer 6	Total	Ave. Diff.	CI Low	CI High
2	3	3	3	2	2	13	31.7	30.3	33.1
2	3	3	3	2	3	14	31.7	30.4	33.0
2	3	3	2	2	3	13	30.0	28.6	31.3
2	3	3	3	1	3	13	29.8	28.6	31.0
2	3	3	2	2	2	12	29.7	28.1	31.3
2	3	3	3	1	2	17	29.5	28.1	31.0
2	3	3	2	1	3	12	26.6	75.4	27.9
2	2	3	3	2	2	12	26.6	25.1	28.1
2	2	1	3	2	3	13	26.6	25.0	28.1
2	3	2	3	2	3	13	26.5	25.0	28.0
2	3	2	3	2	2	12	26.4	25.3	27.5
2	3	3	1	1	2	11	26.3	25.1	27.5

These configurations were chosen for further evaluation because each shows a potential improvement in throughput of approximately 25 units or more-that is the lower end of the 95% confidence interval is 25 or higher. The values shown for "Ave Diff." represent the increase in throughput compared to the Baseline configuration. Recall that the Baseline throughput was previously estimated with 95% confidence, to be in the interval (364.5. 366.8). Being conservative, the engineering team would like to see an improvement of 390 - 364.5 = 25.5 Product per shift. The top six configurations in Table 7 have a lower confidence interval larger than 25.5 and hence are likely candidates for achieving the desired throughput. Interpreted statistically: The lower end of the confidence interval is larger than 25.5, so the results yield a 95% confidence that mean throughput will increase by 25.5 or more in the top six configurations listed in Table 7. Note that all the most improved configurations include two operators at Stations 4 and 5. The simulation results for configurations with one operator (not shown here) indicate that a 390 throughput cannot be achieved with one operator, at least not with the buffer sizes considered. Some configurations can be ruled out because a less expensive option achieves a similar throughput. Consider for example the first two configurations in Table 7. They are identical except for Buffer 6 capacity. Since WIP buffer capacity is expensive, the smaller total buffer capacity will be the less expensive option. Clearly, there is no need to expand from 2 to 3 units at Buffer 6. The "Total" column can assist in quickly ruling out configurations that do no better than a similar one with smaller total buffer capacity.

The model configuration that increases throughput by 25.5 or better and has the smallest total buffer capacity is the fifth one in Table 7, with capacities of (3, 3, 2.2, and 2) for Buffers 2 to 6, respectively.

V. CONCLUSION

In Assembly-Line Simulation include assembly lines for automotive parts and automobile bodies and any number of other assembly operations with a straight flow and limited buffer space between workstations. Similar models and analyses may also apply to a job shop with multiple products, variable routing, and limited work-in-process storage. From the results, it appears that blockage and starvation explain some portion of the shortfall in throughput. Station blockage occurs when a station completes all tasks on a Part, but cannot release the part because the downstream WIP buffer is full. For both starvation and blockage, production time is lost at the given station and cannot be made up. Throughput time reduction is confusing task due to the large number of factors that can be changed and the interactions between them. This paper illustrates the basic factors that

determine MTTP and explains why each factor impact occurs. This framework provides an easy-to-use tool that managers can use to determine a course of action to reduce MTTP in their own plants.

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Analysis and Inverse Design using Computational Fluid Dynamics

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Abstract - Computational fluid dynamics (CFD) is a simulation tool, which uses powerful computer and applied mathematics to model fluid flow situations for the prediction of heat, mass and momentum transfer and optimal design in industrial processes.The sleek & beautiful aircraft roles down the run away, takes off & rapidly climbs out of sight within a minute, this same aircraft has accelerated to hypersonic speed; still within atmosphere. Its powerful supersonic engine continues to propel aircraft with velocity near 26000 ft/s orbital velocity and vehicle simply coasts into low earth orbit. The physical aspects of any fluid flow are governed by the fundamental principle as Newton's second law (Navier-Stokes equations).

Keywords: Gaussian surface, Grid generation, Flux, Lift and Drag.

I. INTRODUCTION

"There are two kinds of persons in this world, the reasonable one and the unreasonable one. The reasonable person adapts himself to the surrounding. The unreasonable one adapts the surrounding to suit him. So eventually all the progress depends on the unreasonable person." **-George Bernard Shaw**.
Computational Fluid Dynamics (CFD) has grown from a mathematical curiosity to become an essential tool in almost every branch of fluid dynamics, from aerospace propulsion to weather prediction. CFD is commonly accepted as referring to the broad topic encompassing the numerical solution, by computational methods, of the governing equations which describe fluid flow, the set of the Navier-Stokes equations, continuity and any additional conservation equations, for example energy or species concentrations. The attraction of the subject is twofold. Firstly, the desire to be able to model physical fluid phenomena that cannot be easily simulated or measured with a physical experiment, for example weather systems or hypersonic aerospace vehicles. Secondly, the desire to be able to investigate physical fluid systems more cost effectively and more rapidly than with experimental procedures [1]. In design and development, CFD programs are now considered to be standard numerical tools, widely utilised within industry.

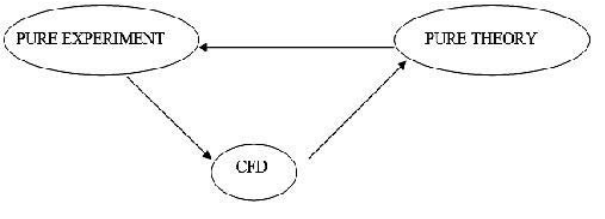

Fig: 1 Concept of CFD.

1.1 CFD Components:-

- Human being who inspects and interprets their results.
- Scientific knowledge expressed mathematically
- Software which expresses problem in scientific terms
- Hardware which performs calculations dictated by the software

II. COMPLETE SYSTEM OF THE NAVIER-STOKES EQUATIONS

In the previous sections, we have separately derived the conservation laws of mass, momentum and energy. For this purpose, we go back to the general conservation law for a vector quantity, which is expressed by Eq. (1). For reasons to be explained later, we will introduce two flux vectors, namely $\vec{F_c}$ and $\vec{F_v}$. The first one $\vec{F_c}$ is related to the convective transport of quantities in the fluid [2]. It is usually termed vector of convective fluxes, although for the momentum and the energy equation it also includes the pressure terms pn Eq. (2) and p (v.n) Eq. (3), respectively. With all this in mind and conducting the scalar product with the unit normal vector n, we can cast Eq. (2) together with Equations (3), (4) and (5) into

$$\frac{\partial}{\partial t}\int_\Omega \vec{W}\, d\Omega + \oint_{\partial\Omega}(\vec{F_c} - \vec{F_v})ds = \int_\Omega \vec{Q}\, d\Omega \qquad \text{Eq. (1)}$$

The vector of the so-called conservative variables $\vec{W}$ consists in three dimensions of the following five components

$$\vec{W} = \begin{bmatrix} \rho \\ \rho u \\ \rho v \\ \rho w \\ \rho E \end{bmatrix} \qquad \text{Eq. (2)}$$

For the vector of convective fluxes we obtain

$$\vec{F_c} = \begin{bmatrix} \rho V \\ \rho u V + n_x p \\ \rho v V + n_y p \\ \rho w V + n_z p \\ \rho H V \end{bmatrix} \qquad \text{Eq. (3)}$$

With the contra variant velocity V - the velocity normal to the surface element dS - being defined as the scalar product of the velocity vector and the unit normal vector, i.e.,

$$v \equiv \vec{v}\cdot\vec{n} = n_x u + n_y v + n_z W \qquad \text{Eq. (4)}$$

Governing Equations

The total enthalpy H is given by the formula (5). For the vector of viscous fluxes we have with Eq. (4)

$$\vec{F_v} = \begin{bmatrix} n_x T_{xx} + n_y T_{xy} + n_z T_{xz} \\ n_x T_{yx} + n_y T_{yy} + n_z T_{yz} \\ n_x T_{zx} + n_y T_{zy} + n_z T_{zz} \\ n_x \theta_x + n_y \theta_y + n_z \theta_z \end{bmatrix} \qquad \text{Eq. (5)}$$

Where,

$$\theta_x = uT_{xx} + vT_{xy} + wT_{xz} + k\frac{\partial T}{\partial x}$$

$$\theta_y = uT_{yx} + vT_{yy} + wT_{yz} + k\frac{\partial T}{\partial y}$$

$$\theta_z = uT_{zx} + vT_{zy} + wT_{zz} + k\frac{\partial T}{\partial z}$$

are the terms describing the work of viscous stresses and the heat conduction in the fluid. Finally, the source term reads

Eq. (6)

In the case of a Newtonian fluid, they describe the exchange (flux) of mass, momentum and energy through the boundary dR of a control volume R, which is fixed in space. Applying Gauss's theorem, Eq. (1) can be re-written in differential form. In some instances, for example in turbo-machinery applications or geophysics, the control volume is rotating (usually steadily) about some axis. In such a case, the Navier-Stokes equations are transformed into a rotating frame of reference. As a consequence, the source term Q has to be extended by the effects due to the Coriolis and the centrifugal force [3]. In other cases, the control volume can be subject to translation or deformation. This happens, for instance, when fluid-structure interaction is investigated. Then the Navier- Stokes equations have to be extended by a term, which describes the relative motion of the surface element dS with respect to the fixed coordinate system.

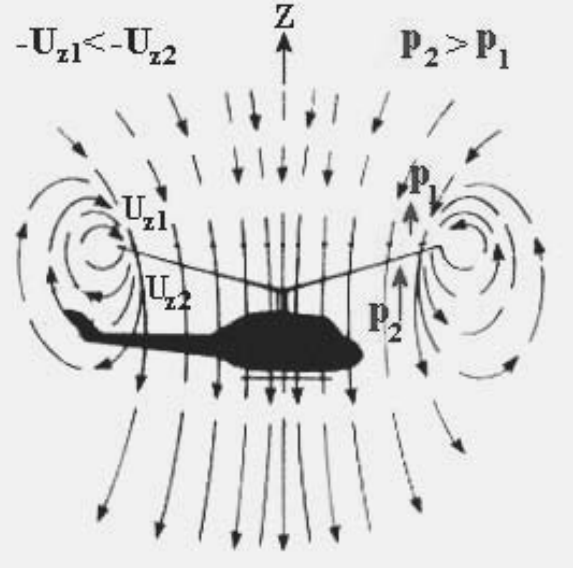

Fig: 2. Helicopter Airflow

The lift for helicopter can be derived from Eq. (2) of the Navier-Stokes Equations in a similar way (as for the aeroplane) with the role of u_x and u_z interchanged because the airflow pattern is different. Thus for $u_z >> u_x$, Eq. (2) becomes:

$u_z [d(u_z)/dz] = - (1/\rho) dp/dz$ ---------- (7)

Integrating Eq. (7) yields:

$\{\rho [(-u_{z2})^2 - (-u_{z1})^2]\} / 2 = (p_2 - p_1)$ ---------- (8)

where u_z is negative as it is pointing toward the negative z direction. It has a form similar to Eq. (8) for the aeroplane. Computation for the lifting force follows exactly the same line as developed previously.

III. GRID GENERATION

In CFD, the domain is divided in to some shapes, such as triangles or quadrilaterals; and assumption is made that flows properties are constant within individual cell, but they do vary cell to cell. This task is called as great generation [4]. The set of cells are called grids or meshes.

Grids must satisfy the following properties:

- Cells must be simple in shape (say triangle or rectangle in 2D)
- Cells must completely cover the given domain,
- No two cells must overlap,
- Cells must convex in shape.

Two general approaches are available to deal with complex geometries;

(i) STRUCTURED GRID.

(ii) UNSTRUCTURED GRID.

3.1 STRUCTURED GRID:-

In structured three dimensional grid, one can associate with each computational cell an ordered triple of indices (i,j,k).Thus if Ni, Nj, Nk are number of cells in i, j, k, index directions respectively, then the number of cells in entire mesh is Ni * Nj * Nk. Additionally it is seen that each interior vertex is sheared by eight neighbouring cells.

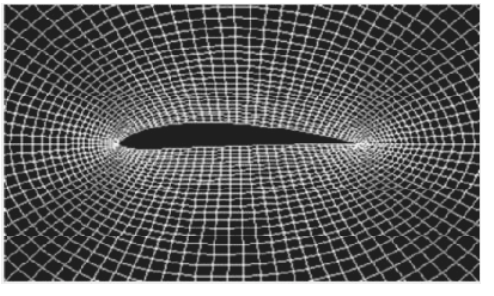

Fig: 3. Structured Grid

3.1.1 O-Grid:-

Another commonly used grid generation method for airfoils and other external flow (where the fluid flows around the outside of a solid body as opposed to inside it) is known as an O-grid. This method involves specifying the computational points on the surface and allowing the grid to grow out and away from the surface.

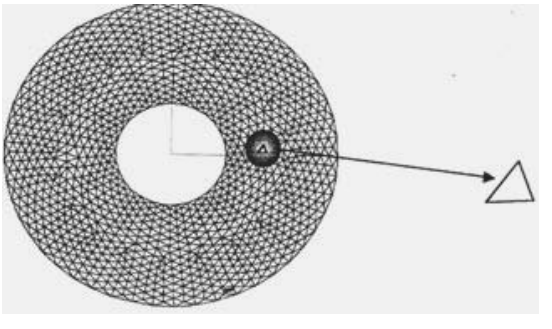

Fig: 4. O-Grid with Triangular Domain (Magnified)

3.1.2 H-Grid:-

The H-grid is one of the simpler grids to generate. It is useful for flows that can be contained roughly within a four-sided container. These are usually internal flows where the fluid is moving within solid walls. The following is an example of an H-grid describing the geometry for flow within a duct with a contraction as shown in Fig. (5) and fig. (6).

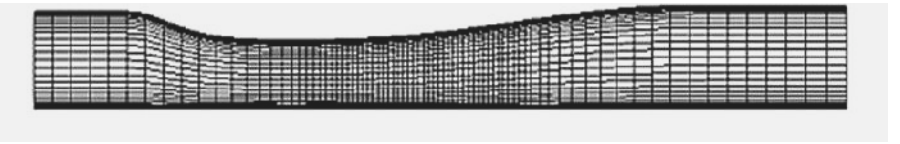

Fig: 5. H-GRID (Grid Generation)

Fig: 6. H-GRID (Simulation)

3.2 UNSTRUCTURED GRID:-

Another method of grid generation, called unstructured grids, involves a triangular layout of the computational points. There are several advantages of using unstructured grids. One advantage is that the technique tends to work better on complex geometries. This is because if all the grid points were shown simultaneously it would be impossible to distinguish the flow field in question as shown in Fig 7. A popular type of unstructured grid consists of tetrahedral element.

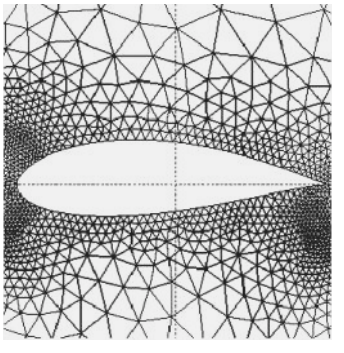

Fig: 7. Unstructured grid

These grids tend to be easier to generate than those composed of hexahedral elements, but they generally have poorer numerical accuracy.

IV. SIMULATION

The computing times for a flow simulation depend on;

- The choice of numerical algorithms and data structures
- Linear algebra tools, stopping criteria for iterative solvers
- Discretization parameters (mesh quality, mesh size, time step)
- Cost per time step and convergence rates for outer iterations
- Programming language (most CFD codes are written in FORTRAN)
- Many other things (hardware, vectorization, parallelization etc.)

Advances in airfoil shape are constantly being made and modern CFD techniques have made the process much faster [5]. This eliminates the need for physically testing every candidate and focuses on the best potential ones as shown in Fig 8.

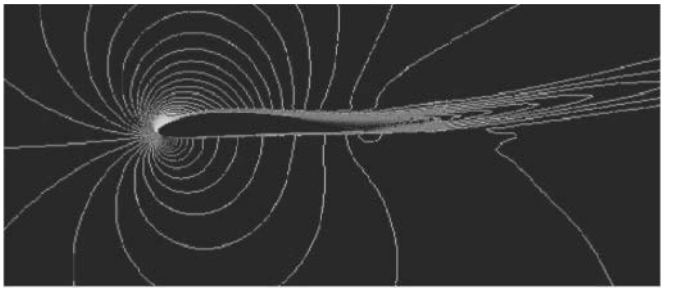

Fig: 8. Simulation of Airfoils (SUBSONIC SPEED)

The blue "cool" colours indicate low speed flow and the red "hot" indicate high-speed flow. As expected, the upper surface shows higher speed flow, which provides the low-pressure lift for an airfoil. The wake also indicates low pressure that contributes to the airfoil drag as shown in Fig9.

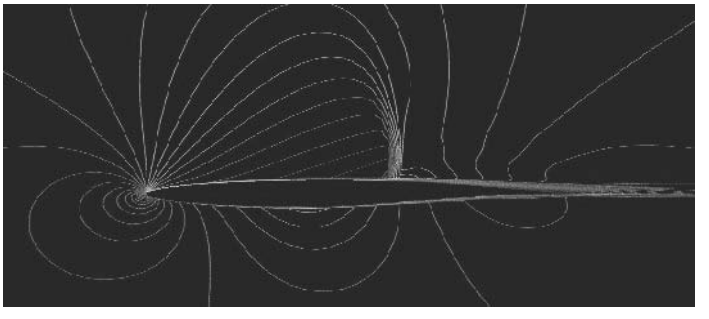

Fig: 9. Simulation of Airfoils (TRANSONIC SPEED)

This image is of an airfoil at transonic speed, meaning that both subsonic and supersonic flow is present about the airfoil [6]. This usually happens when the flow decelerates from supersonic to subsonic speed.

V. APPLICATIONS

5.1 Aerospace Applications:-

Today, CFD is used to calculate three dimensional flow fields over real airplanes. Such complete flow field calculations over entire airplane configurations is a major step in enhancing the overall airplane design process.

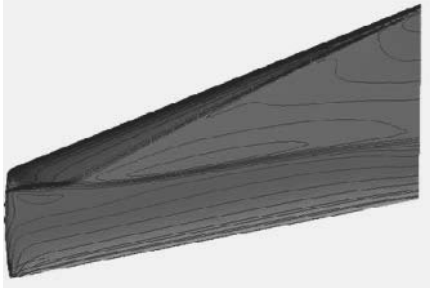

Fig: 10. The image shows the pressure contours on the upper surface of a wing.

CFD results can be used to optimize the variation of airfoil size and shape at different sections of the wing in order to insure that the wing is producing lift efficiently and also maintains structural stability [7].

5.2 High-Speed Vehicles:-

Computational simulations are used frequently in the development of high-speed vehicles such as rockets, spacecraft and hypersonic aircraft. Hot exhaust gas of the engines would be very expensive to simulate in a wind tunnel test, and so CFD computations are the only practical way of getting results for complex flows.

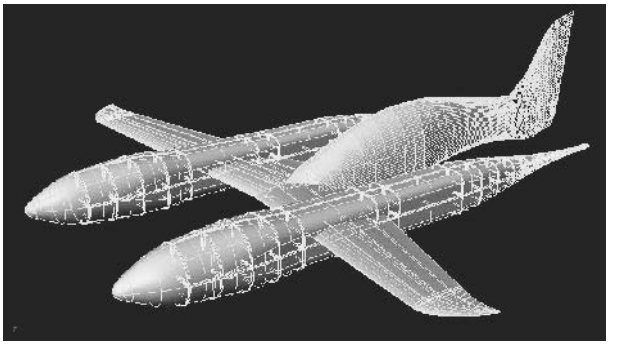

Fig: 11. Simulation of aircraft

The above image fig. (11) is a simulation of a hypersonic aircraft. Solutions on the surface and at particular slices away from the aircraft are shown. These aircraft possible design in a wind tunnel would be prohibitively expensive.

5.3 Lift and drag of aircraft:-

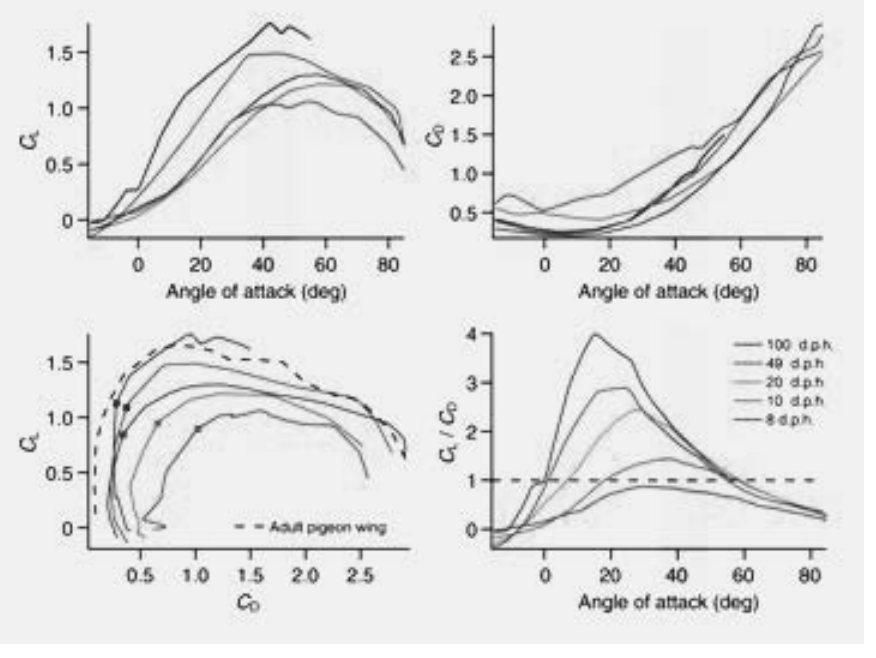

Fig: 13. Lift and Drag of Aircraft in Accordance to Angle of Attack

Ontogenetic trends wing performance at in vivo Reynolds numbers: (i) coefficient of lift (C_L) versus angle of attack (α); (ii) coefficient of drag (C_D) versus α; (iii) C_L versus C_D; and (iv) C_L/C_D versus α. In vivo angles of attack (α) are indicated by shaded areas; maximum L:D ratios are indicated by squares in (iii).

VI. CONCLUSION

CFD is a new "third dimension" in fluid dynamics, equally sharing the stage with the other dimensions of pure theory and pure experiments i.e. CFD enables the user to get a 3-dimensional virtual reality not only visually but supported by computations which otherwise would be very complex to solve. It has reduced research time to nearly about one-fourth of previous time. Also it allow to study the various aspects of very complex and huge applications like aero plane, rocket, submarine etc on computer without physically testing them in wind tunnel (which is impossible). Hence it save millions of rupees in design aspect and also increases the performance of the various fluid related appliances. In future, with more efficient and developed computer technology CFD will become the basic necessity of industries.

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Design of Multi sliding Tool to Increase in Productivity of Lock Plate- A Review

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Abstract-The objective of project to increase productivity, reduce material handling cost, labour cost, eliminate operations, reduce raw material consumption and manufacturing time of lock plate with help of multi sliding machine tools design. Now days which are done by stamping with help of compound tools on mechanical press. To achieve these objectives we will design new 3D tool with the help of UG NX software.

Keywords-Multi-sliding machine, Lock Plate, UG NX software, Increase Productivity, Raw material

I. INTRODUCTION

A four-slide, also known as a multi slide, multi-slide, or four-way, is a metalworking machine tool used in the manufacture high volume of small stamped components from bar or wire stock. The stamping press is described most simply as a horizontal press which uses cams to control tools. This machine is used for progressive or transfer stamping operations.Many people familiar with fourslide or multi sliding machines believe that it can do everything a punch press can do for small components. To put it simply, a fourslide machine is a stamping plant in itself.Progressive die uses in punch press to blank out metal parts and stampings, a slide machine goes a step further. Small strip cut are made in the metal strip, with the addition of slides, cams, stock straighten and slides feedsthese cuts into and around the strip, complicated shapes, forms and secondary operations can be completed before the final part is ejected from the machine. Though the complicated tooling, and may seem a bit expensive at first, often the amount savings in piece price by eliminating costly secondary operations can be quickly make up for high tooling cost.The raw materialfour-slides used in usually limited by its formability and not the machine capabilities. Usually the forming characteristics and bending radiallyare the most limiting factors. The mostly used materials are: Low-carbon cold rolled steel, Spheroid zed cold rolled spring steel, type 300 and 400 stainless spring steels,Beryllium-copper alloys, Copper alloys.

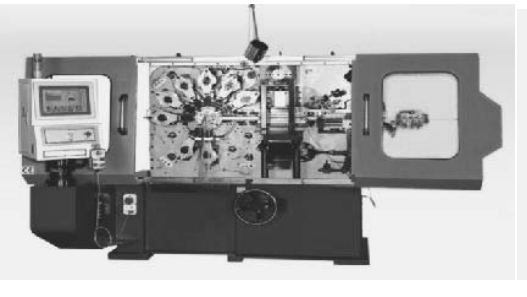

Fig.1 Multi sliding Machine

Fig.2 Power Press

II. LITERATURE REVIEW

Literature review shows that considerable amount of researches have been reported in experimental, modeling and analysis of air bending. The following relevant areas are reviewed: (a) Sheet metal bending and mechanics of spring back and bend force, (b) modeling of bending process and (c) Interstitial Free

steel sheet. Clear and credible reviews of previous important literatures are briefly discussed here. A number of researches have been carried out on the performance of bending processes. Sheet metal bending is one of the most widely applied sheet metal forming operations. The understanding of the bending mechanics is aimed at obtaining two kinds of information important for industrial applications. KhooSuiyang, XieLihua, Zhao Shengkui and Man Zhihong et al [1] In this paper, multi surface sliding cooperative control scheme is presented and new multiple sliding surfaces are proposed. It is proven that, for the setup that each agent is described by a chain of integrators, where the last integrator is perturbed by a bounded disturbance; leader–follower consensus can be achieved on these sliding surfaces if the communication graph has a directed spanning tree. Also, sliding variables can be driven to the sliding surfaces in fast finite time by the non-smooth control law. The fast finite-time Lyapunov stability theorem, the terminal sliding control technique, and the adding a power integrator design approach are used in our proposed control. Simulation results demonstrate the effectiveness of the proposed scheme.

Kim Hong Seok and KocMuammer et al [2] presented a rate independent anisotropic plasticity model accounting the Bauchinger effect and applied in FE forming and spring back analysis. investigated the effect of temperature gradient on the final part quality of lightweight materials and the stress distribution of the blank elements was compared to gain a fundamental understanding of the spring back mechanism in warm forming. They also predict spring back and bend allowance simultaneously in air bending process. The statistical design can be used to obtain as much information as possible from a minimum number of experiments. Over many decades the bending of sheets and their spring back has been studied by analytical approach and many useful results have been obtained. However, much less attention has been paid to the case of bending of sheets and spring back through statistical approach. Delivering reliable, high quality products at a low cost has become the key factor for survival in today's global economy. For this fact, the prediction of spring back of the product at the design stage is very essential. Designing for quality is cheaper than trying to inspect after production. So, new philosophy, technology and advanced statistical tools must be employed to design the products of high quality at low costs. Response surface methodology is a collection of mathematical and statistical techniques which is useful for modeling and analysis of engineering problems.

Daniel Lepadatu, AbdessamadKobi, Xavier Baguenard, Luc Jaulin et al [3] In manufacturing process, the quality of final products is significantly affected by both product design and process variables. However, historically tolerance research primarily focused on allocating tolerances based on product design characteristics of each component. This work proposes to expand the current tolerance practices, and presents a new optimization method of tolerance mechanical systems using interval computation for the prediction of system response. The proposed methodology is based on the development and integration of three concepts in process optimization: mechanical tolerance, response surface methodology, and interval computation method. An industry case study is used to illustrate the proposed approach.

Harlow Gary et al [4] described the probability modeling to estimate variability in the dimensions of a component and the effect of stress-strain behavior; the model parameters and the statistical variability in material properties on spring back transformed into desirability function.

Perduijn and Hoogenboom et al [5] derived a simple explicit bending couple curvature relation for small and larger curvatures and they verified the model with experimental results. The second is an estimation of the bend force for selection of press capacity, strength analysis and design of dies.

Vallance and Matlock et al [6] studied the friction behavior of zinc-based coated sheet steels and laboratory scale friction analysis techniques that involve sheet sliding over cylindrical dies also introduced a new test procedure for the bending under tension friction test. Reviewing the literature, it is found that a researcher has been studying the 10 phenomenon of spring back for nearly six decades. There have been diverse efforts to evaluate and/or decrease spring back in the sheet metal forming industry for a long time.

III. RESEARCH GAP

MD Industries is one of the popular manufactures in small Machining as well as sheet metal components like washers, shims, shafts etc. Sheet metal parts are manufactured by stamping root, because of complexity and functional requirement of part, designer has to introduce number of tools which result into more time for manufacturing, high labour cost and low productivity. The major advantage of the four-slide machine is its ability to complete all of the operations required to form the component from start to

finish. Moreover, it can handle certain parts that transfer or progressive dies cannot, because it can manipulate from various axes. Due to this flexibility it reduces the cost of the finished part because it required less machines, setups, and handling. Also, because only one machine is required, less space is required for any given component. As compared to standard stamping presses the tooling is usually inexpensive, due to the simple tools design. A four-slide can commonly produce 20,000 to 70,000 finished parts per 16-hour shift, depending on the number of operations per part; this speed commonly results in a lower cost per part. Finally, this machine is only feasible to usage on high volume parts because of the long lead time required to set up the tooling.

IV. NEED OF INVESTIGATION

We have taken the one part to study following parameters:-
Part Name-Lock Plate
Lock Plate is used in Cummins engine for locking purpose.
Lock plate is manufacture by stamping root in three stages which is explain as below,

1. **Blanking of outer profile and inner diameter piercing Operation** :-

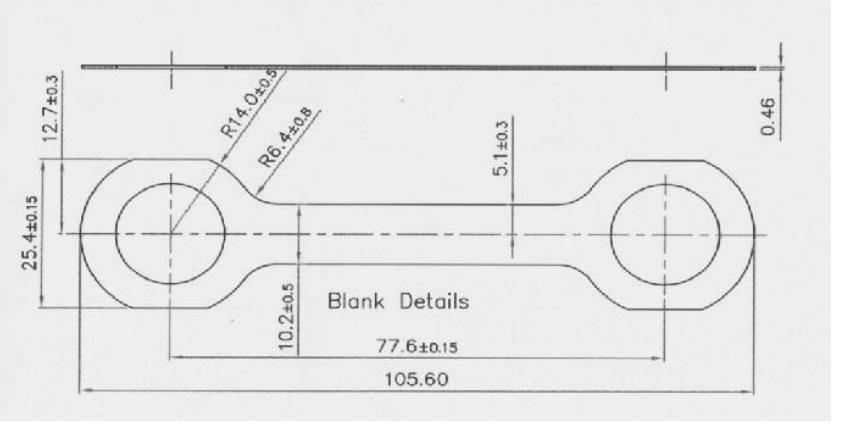

Fig. 3 Banking and Pricing

2. **ID forming** :-

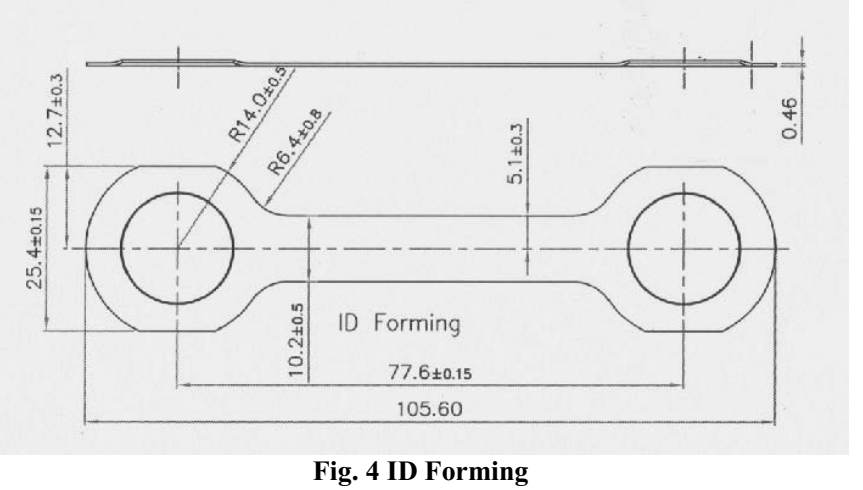

Fig. 4 ID Forming

3. **Bending Operation** :-

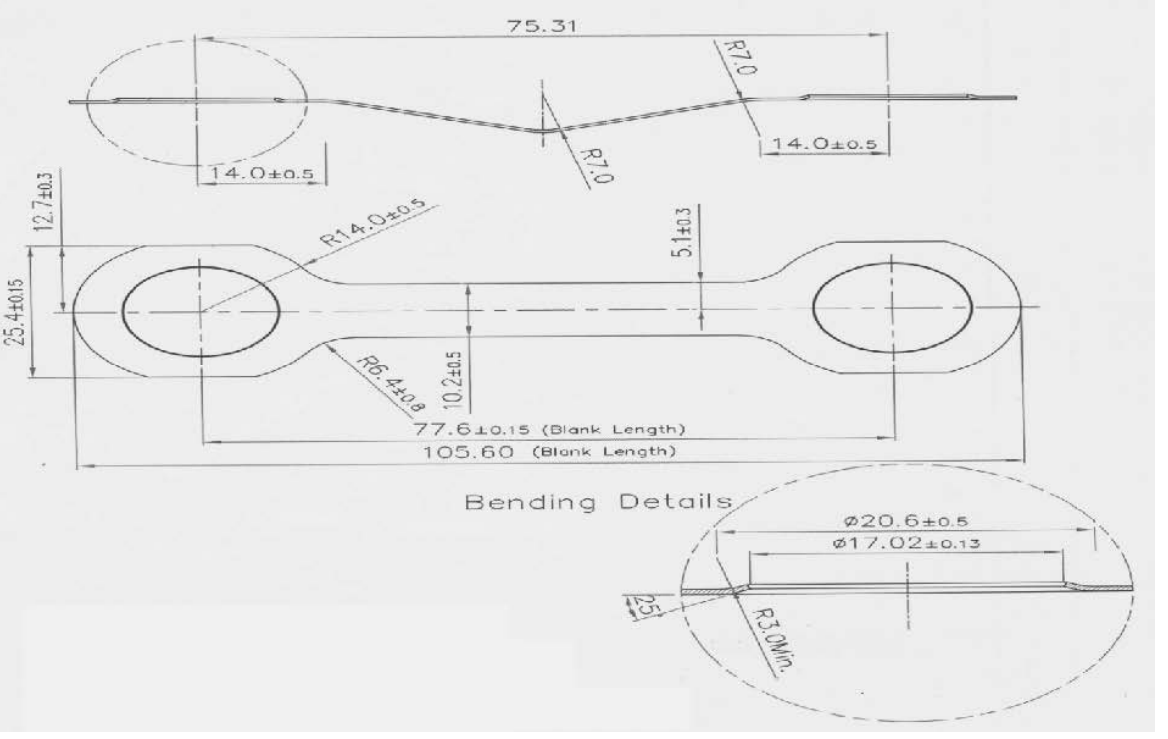

Fig. 5 Bending Operation

To eliminate above operation and convert it in to one stage we have to introduce new multi sliding tool.

V. OBJECTIVE

- To reduce raw material consumption.
- To productivity should be increased more than the stamping.
- To reduce material handling cost.
- To reduce labour cost.
- To eliminate operation.
- To reduce manufacturing time.

VI. METHODOLOGY

While the problem is being investigated on distinct fronts, this discreet work has been focus on new tooling & cam design which will help to increase the productivity and many more advantages. Possible design options would be deal with in the context of exact problem and the feasible solution is expected to be arrived through limited number of iterations. Only the critical area to be concern would be studied for the work and suitable solutions can be found out while concluding the work. Practically recommended solution will reduce cost of part and increase the productivity.

VII. ADVANTAGES

No other solution or result offers a more comprehensive or powerful toolset for product development. NX delivers:

1. Advanced solutions for conceptual design, 3D modelling and documentation.
2. Multidiscipline simulation for structural, thermal, motion, flow multi physics and optimization applications.
3. Complete part manufacturing solution for tooling, machining and quality inspection.

VIII. EXPECTED OUTCOME

Partially recommended solution will be achieved following points:

1. Increase in productivity.
2. Reduce raw material consumption.
3. Reduce labour cost.
4. Eliminate operations.
5. Reduce material handling.

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Design of Delinter Machine Grate for High Removal Lint- A Review

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Abstract- The objective of this project is to design of the delinter machine grate for increasing productivity, quality of lint, minimizing friction between saw grates and saw blanks, uniform shape and length of grate. To achieve these objectives by new design of delinter machine grate and analyze the new design of grate by mechanical software's. New design of grate, it will may be result in uniform in shape and length of grate, minimizing chances of burning linter, quality of lint will increase. A cottonseed delinting machine mechanically delints the cottonseed by a rotating brush system. There are 200 saw blanks, 201 grates are used in delinter machine. The burning of linter due to friction between saw blanks and grates. By using new design of grate the friction between saw blank and grate will be minimize and quality of lint will increase.
Keywords- Delinter machine; grates; saw blanks; lint; cotton seeds.

I. INTRODUCTION

Delinter machine is part of cottonseed processing plant. Delinter machine removes lint from cotton seeds as shown in fig.1. A cottonseed delinting machine mechanically delints the cottonseed by a rotating brush system. There are two processes used for delinting cottonseed, firstly is mechanically and second acid delinting process. Mechanically delinted is the most common form of delinted seed available in the feed trade. Delinted seed retains about 1-2% residual linters which usually appear on the surface of the seeds. Acid delinting is a process that completely removes all linters. This process is used for the production of planting seed. At certain times during the year, quantities of culled, or leftover planting seed, become available to the feed trade. Such types of planting seeds may be hazards caution stress of soul kind of chemical.

Fig. 1 DelinterMachine

After ginning some amount of lint remains on the seeds, which are input of delinter machine. The machine also provides for the recovery of the linter after separation from the cottonseed. The movement and path of travel of the cottonseeds during the delinting process is controlled to ensure a high degree of efficiency in the removal of the linter. First seeds apassed throughfeeder. The cottonseed gets trapped in between grate and saw blank.

Fig. 2 Grate

Grate plays very important role in delinting machine as shown in fig.2.During delinting process the cotton gets stuck to brush roll. The brush roll is rotating in clockwise direction, while the saw blank is rotating in opposite direction of brush roll. During delinting process the grates is help to trap the cotton seed in gap of saw blank and grate. With the help of the nozzle, linter is suck to the lint cleaner machine and the black seeds are fall down in underground conveyor and are passed to next process. I.e. Seed cleaning process

II. LITERATURE REVIEW

After studying the literature it can be concluded that a lot of work has been done in the field of delinter machine.

Prof. R. B.Salwe et.al [1] developed cost effective for automation for delinting machine and study low cost systems, for the treatment of cotton seed to remove lint from cottonseeds. A low cost automation system for removal of lint from cottonseed is to be designed and developed. The setup consists of stainless steel drum with stirrer in which cottonseeds having lint is mixed with concentrated sulphuric acid. So lint will get burn. This lint free cottonseed treated with lime water to neutralize acidic nature. After water washing this cottonseeds are used for agriculture purpose.

Thomas c. wedegaertneret.al [2] studied Systems and methods for removing material, e.g., linters, from seeds, e.g., ginned cottonseeds, are provided. The systems and methods involve rotating the seeds in a rotatable drum having a plurality of longitudinal brushes. The centrifugal force created by the rotation of the drum and the plurality of longitudinal brushes urge the seeds against an interior surface of the drum that is lined with a brush insert. In this way, work is performed that removes the material from the exterior of the seeds. The material is removed using reduced. Pressure and the processed seeds are removed. The system may include a brush insert that is easily removed from the rotatable drum.

Ugwuet.al [3] worked on optimization and performance evolution of cotton seed delintingmachine.The machine was modified by introducing three pulleys with diameters as 250mm, 200mm and 120mm, which produced rotor speeds of 550rpm, 600rpm and 650rpm respectively. The rotor speeds were then used to test the designed machine and its efficiency were evaluated. The belt and pulley were used to transmit power from the electric motor to the shaft of the cotton seed delinting machine unit. The designed machine was operated by a 2hp electric motor. The performance test was carried out using three different feed rates at three different speeds which include 550rpm, 600rpm and 650rpm, using 5g, 6g and 7g weight of feed rates of the cotton wool with their seeds. Each one was replicated five times. The results showed that the efficiency of the machine was high at 7g feed rate, which was 79.93% and the speed does not influence the efficiency of the machine. The statistical analysis [ANOVA] for the effect of speed of the rotor and feed rate on the capacity and performance of the evaluated machine at 5% probability level was computed. The result of the analysis confirms that feed rate was significant processing parameter that affects machine efficiency.

M. K. Sharma [4] studied on new trends in cotton ginning and cotton seed processing. The optimum utilization of all ingredients of cotton i.e. fiber, cotton seed, cotton stalk has become thenecessity for survival in the competitive field of cotton growing and processing. The reduction of electrical power cost and to mechanize the operations in a way that manpower component is reduced to the minimum for complete cotton value processing chain has become necessity due to scarcity of manpower and increase in the price of electricity rates in different countries. The continuous efforts are being made to address these issues by the manufacturers and scientific community and various new equipment's / systems have been introduced in the recent year in the journey of modernization / improvement of various operations in the cotton ginning and cotton seed processing.
Thomas c. wedegaertneret.al [5] developed Systems and methods for removing linters from ginned cottonseeds are provided. The systems and methods involve rotating the cottonseeds in a rotatable drum having a plurality of longitudinal brushes. The centrifugal force created by the rotation of the drum and the plurality of longitudinal brushes urge the cottonseeds against an interior surface of the drum that is lined with a flexible abrasive member. In this way, work is performed that removes the linters from the cottonseeds. The linters are removed using reduced pressure and the processed seeds are removed.

III. RELEVANCE AND SIGNIFICANCE

There are many types of machines used in cotton seed processing plant. Delinter machine play very importance role in cotton seed processing plant. Delinter machine convert white seeds into black seeds.Grate play very important role in delinting process. Grates purpose is to trap the cotton seed in gap of saw blank and grate. Delinted linter is used in currency paper. Lint play very important role in day today life. Higher capacity of lint removal, higher output and excellent quality of lint is desired.

IV. NEED OF INVESTIGATION

The current design of the grates doesn't provide the highest capacity lint removal; Quality of lint along with problem of burning of lint.Detailed analysis of the grate is also required to determine the losses.

Following problems occurs in delinter machine:-

- Friction between grates and saw blanks.
- Chances of Burning of lint.
- Low Quality of lint.
- White seeds in output of delinter machine.
- Output of delinter machine decreases.
- Shape and length of grates are not in uniform length.

A) Burning of lint:-

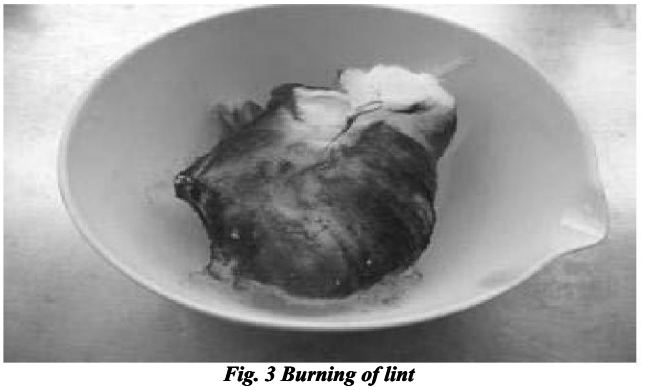

Fig. 3 Burning of lint

There are many chances of burning lint due to friction between saw blanks and grates. Quality of lint and output of delinter machine decreases due to burning of lint. Sufficient gap between grate and saw blank is required.

B) Grates:-

Following fig. shows that, grates are not in uniform shape and length.

Fig. 4 Grates

Due to not in uniform grates shape and length, which result in seeds falling directly to the conveyor. Highest capacity lint removal, higher output and excellent quality of lint is desired.

V. OBJECTIVE

- To modify design of grate.
- To improve production of grate in manufacturing machine.
- To minimize friction between grate and saw blank to avoid burning of linter.
- To increase quality of lint.
- To obtain uniform length and shape of grates.
- To obtain highest capacity lint removal.
- To provide best solution for implementation

VI. METHODOLOGY

While the problem is being investigated on different fronts, this dissertation work would focus on the new design grate, which will help to minimize the friction between saw blankand grate, the chances of burning of lint will minimize and Quality of lint can be increase. The above objectives may be achieved by grate die or changes in special bending machine.

VII. EXPECTED OUTCOME

New design of delinter machine grate will help for no friction between saw blanks and grates and no chances of burning lint.Highest capacity lint removal, Quality of lint and production in delinter machine will increase. It will help for increasing capacity tons per day.

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"Tie Rod Analysis Using FEA and use of buttress & acme threads"
Tie rod analysis in automobile

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Abstract— Automobile Tie rod analysis carried out using FE tool for finding out its load carrying capacity and deformation. As most of cases tie rod fail due to static loading and reaction forces from road. If stresses and vibration causing due to it are excessive system may fails. So it's necessary to identify structural behavior. This paper on analysis on structural analysis using FEA tool and analysis of failure strength of acme and buttress thread used in tie rod on M.S.rod results of tensile rupture experiments tie rods having Buttress and Acme thread to determine ultimate load as well as deformations. The results of these experiments suggest the least number of turns of the thread engagement for prevent the breakdown of threaded mild steel ties.
Keywords- FEA, Modal FEA, Forces coming on tie rod.

I. INTRODUCTION

Tie rod of Steering system connects center link to the steering knuckle in conventional suspension system and rack to the steering knuckle in McPherson suspension system. Tie rod generally gets force from rack and transfer it to the steering knuckle to turn the wheels. Tie rod is a circular rod with threaded part, Outer end and inner end. Tie rod is mostly made up of alloy steel. Failure of tie rod may cause instability of vehicle and can cause an accident. So it's important to check the strength of tie rod. The load coming on tie rod is mostly compressive. The efforts required where car is moving are comparatively less with stationary car. The working strength of the tie rod is that of the product of the allowable working stress and the minimum cross-sectional area .If the threads are cut into a cylindrical rod that minimum area can be found at the root of the thread. Rods are often made thicker at the ends and this then means that the tie rod does not become weaker when the threads are cut into it.Tie rods are connected at the ends in various ways. But it is desirable that the strength of the connection should be at least an equal strength to that of the rod. The tie rod transmits force from the steering center link or the rack gear to the steering knuckle. This will cause the wheel to turn. Failure of tie rod may occur due to improper material selection, poor design, fatigue load and wear of tie rod. Also the indications given by the tie rod before failure is very less so it can be risky.

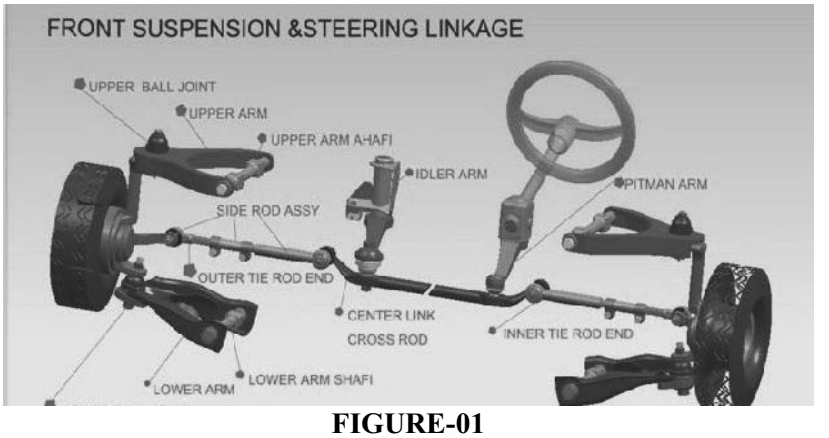

FIGURE-01

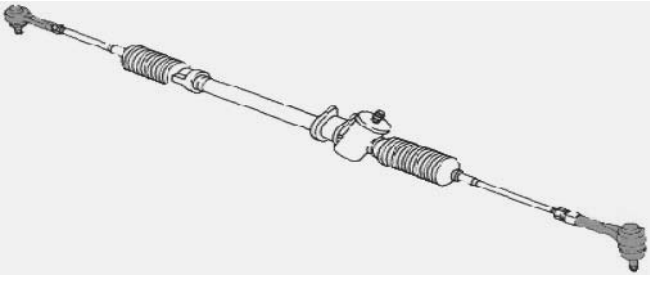

FIGURE-02

II. NEED OF ANALYSIS-

The overall purpose of Tie-rod is to transmit the motion from steering arm to steering knuckle and sustain the forces and vibrations caused by bumps from tires due to uneven road surfaces .The key areas for modification are identified. The main task in this study is to find the deformation and stresses induced in the Tie-rod. The load coming on tie rod is mostly compressive. The working strength (Maximum load carrying capacity P= σ.A) of the tie rod is that of the product of the allowable working stress and the minimum cross-sectional area. Tie rod is a circular rod with threaded part, Outer end and inner end. Shear and bending failure occurring in the engaged thread teeth on a tie rod in service, if the threads are cut into a cylindrical rod that minimum area can be found at the root of the thread. Rods are often made thicker at the ends and this means that the tie rod does not become weaker when the threads are cut into it. Tie rods are connected at the ends in various ways. But it is desirable that the strength of the connection should be at least an equal strength to that of the rod.Suraj Joshi et al [1] concluded from their work that in order to minimize the probability of shear and bending failure occurring in the engaged thread teeth on a steel tie rod in service, the number of engaged thread turns should be kept as low as possible. A.H. Falah et al [2] the primary cause of failure of the tie rod was likely material deficiency. Failure of tie rod may cause instability of vehicle and can cause an accident

III. FE-MODEL SIMULATION

Finite Element Analysis (FEA) is an important engineering tool used to assist in approximating and verifying how a component will react under various external and internal loading conditions.

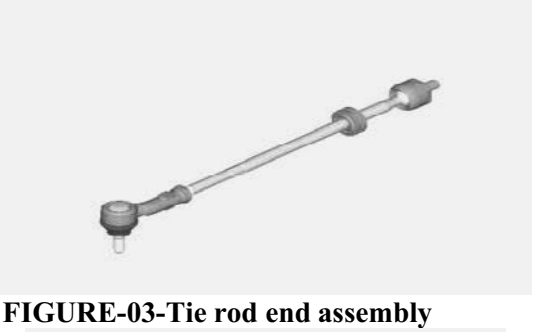

FIGURE-03-Tie rod end assembly

FIGURE-04 -Mesh of Tie rod assembly

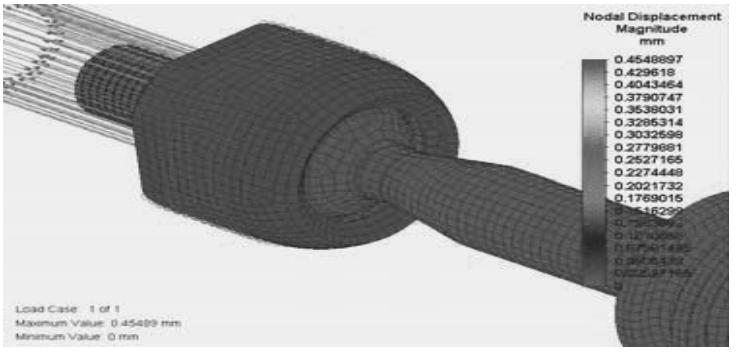

Figure-05-FEM model displacement

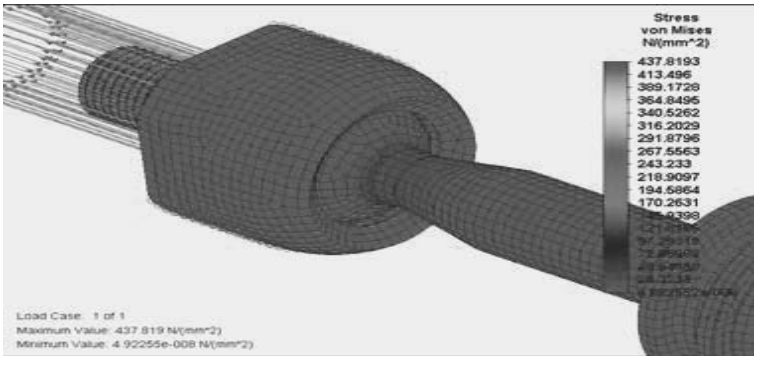

Figure06.-FEM model stres distibution

The result of simulation by FEA shown in the fig.5 and 6 Numerical calculations is performed with aid of the FEM (software Algor). All necessary input information regarding FEM analysis is shown below. Maximum stress value is lower than ultimate stress the component area shown in red is subjected to high stress due to minimum area cause due to threading.

IV. Use of buttress &acme threads

Analysis of thread strength necessary for structural safety, various thread are available now a day in this article we are going to analyses buttress and acme threads.

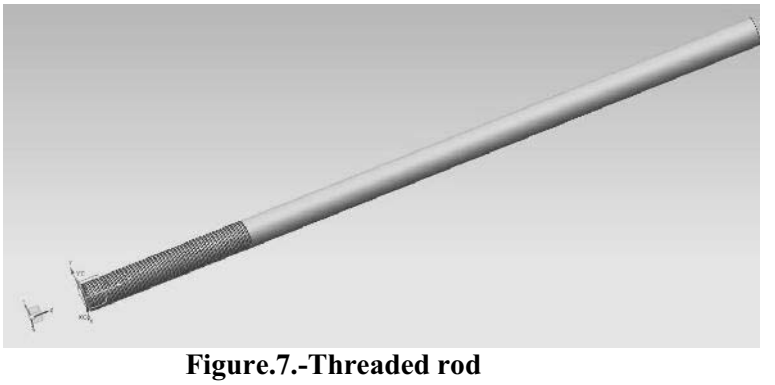

Figure.7.-Threaded rod

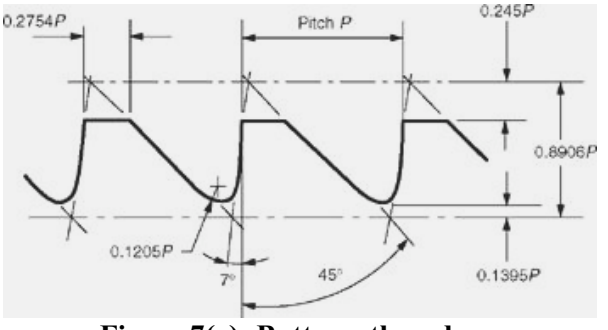

Figure.7(a).-Butteres thread

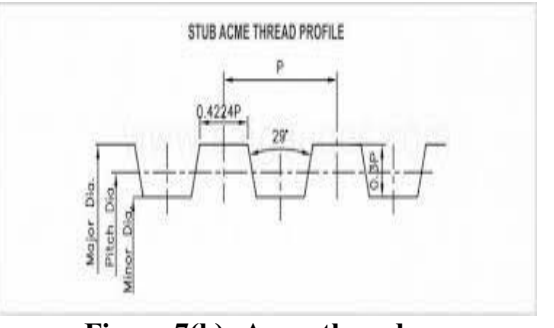

Figure.7(b).-Acme thread

V. Thread testing-

Tensile tests were conducted for two, three, four, five and six engaged thread turns, and in order to consecutive specimens.

(a) **Butteres thread testing**:

I) (For five and six engage thread pulling force are 150kN and 167kNand tie road form neck before failure The internal thread teeth on sleeve and the external thread teeth on the tie rod body were still engaged. In five threads and six Threads the break position was occurred in 10turns and 18 turns) in both cases the break is away from the end. These shows buttress thread steel tie rod having less strength to bare the load on five and sixth engaged thread turn position.

II) The critical value was occurred on the four engaged thread position. Where the damaged portion of the tie rod body in thread position is more than fourth thread is engaged. In case of buttress threads to maintain the safe position four engaged thread is considered. Otherwise the failure position occurs at the fifth and sixth threaded connection.

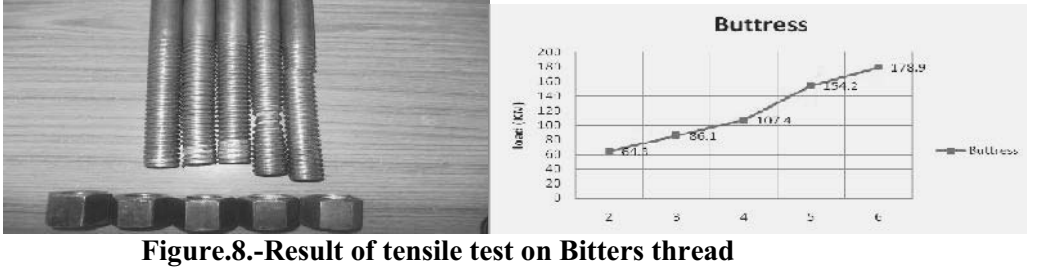

Figure.8.-Result of tensile test on Bitters thread

(b) Acme thread:

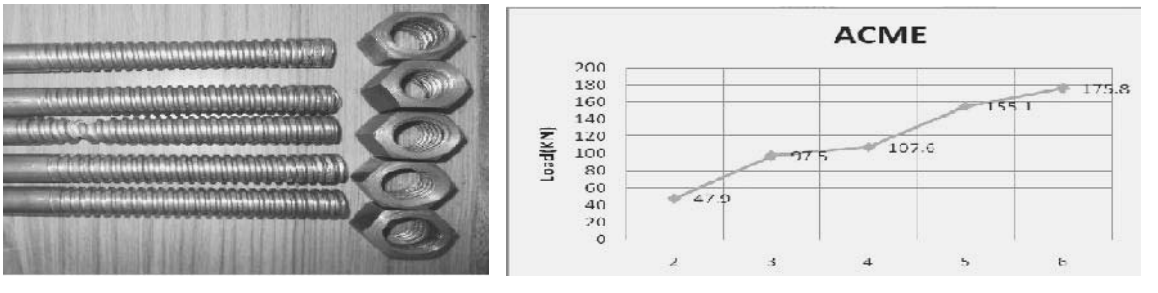

Figure.9.-Result of tensile test on Acme thread

When acme thread are tested for two ,three and four turns failure found on threaded tie rod failure in shear and pull occur on threaded tie rod, Whereas for six turns strength at breaking is 162kN at breaking with neck formation observed, The internal thread teeth on sleeve and the external thread teeth on tie rod were

still engaged in good condition In six threads the break position was occurred in 18 turns in this case the break position is placed away from the end face These Shows acme thread steel tie rod having less strength to bare the load on sixth engaged thread turn position. The critical value was occurred on the five engaged thread position. Where the damaged portion of the tie rod body in thread position is more than five threads is engaged. In case of acme threads to maintain the safe position five engaged thread is considered. Otherwise the failure position occurs at the sixth threaded connection.

VI. CONCLUSION

1. Tie rod fails at junction of thread as threaded area having minimum area.
2. If threads numbers are engage more than tie rod will fail by formation of neck
3. From the presented results we can conclude that the distribution of deformation and stress do Not exceed the upper limit value and that there are neither damages nor surface defects after performed tensile test.Using FEM made possible to predict the whole tensile test of tie rod assembly.

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Modification of Grub Screw and Cam Plate for Reduction of Failure in PMC Threading Machine

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Abstract- In today's age, high complex and invested machines need to be properly examined or maintained in order to increase or maximize their availability. The prime motive of the PMC clamping unit is to clamp or unclamp the API pipes in the industry for threading operation, but it comes along with failure of the bolt or grub screw due to the shear stress acting on it for many reasons . The purpose of this study is to find the cause for failure of the bolt using analytical analysis and bring up alternatives so that the failure of the components can be eliminated or reduced to a greater extent. We can achieve the objective, if we can reverse the operation of clamping of pipes through jaws corresponding to the push and pull of the hydraulic cylinder, then we can increase the maximum allowable stress of the grub screw to reduce failing.
Keywords: - PMC machine, Clamping Unit, Shear Stress, Grub Screw.

I. INTRODUCTION

Modern Industries uses high level of automation with complex machines. The function of automation is to achieve higher production rate with better quality. Therefore machines must remain in operating condition in order to achieve the desired result or goal [1]. The API section of steel industry produces the steel pipes used in the petroleum industry worldwide. The PMC machine is an extremely expensive machine comprising of different linkage system, hydraulic cylinders and pistons that is primarily used by the industry for threading purpose. This project mainly focuses on the analysis of the root causes of failures of the clamping unit and modifications made into it to reduce the machine downtime. The failures are observed in the connection of the extension rod and the grub screw due to multiple reasons. The ultimate load carrying capacity of a connection will be governed by one of many possible failure modes including; bearing, end pull-out, net section fracture, bolt shear, block shear rupture, etc. Failure may be single load yielding or more commonly cyclic load fatigue fracture & is closely related to the design. Fatigue failure caused due to the action of shear stress in direction perpendicular to the area of the bolt leads to the breakage of the welded connection of the extension rod and the grub screw (bolt) [2]. In this study all these stresses are being analytically analysed so that feasible modifications can be made to reduce the cyclic failures to an extent

II. PMC THREADING MACHINE

Threading is the process of creating a screw thread. There are many methods of generating threads, including subtractive methods, deformative or transformative methods, additive methods and combinations thereof. PMC threading machine is one of such expensive machine which carry out the process of threading in the industry on the large API steel pipes. It comprises of different linkage system, hydraulic cylinders and pistons working together in the complex machining process. The clamping unit of this machine comprises mainly cam plate, grub screw, hydraulic cylinder, jaws for clamping the pipe. Different linking mechanisms as shown in fig1 are used to transmit the motion of cam roller to the jaws for clamping the pipes.

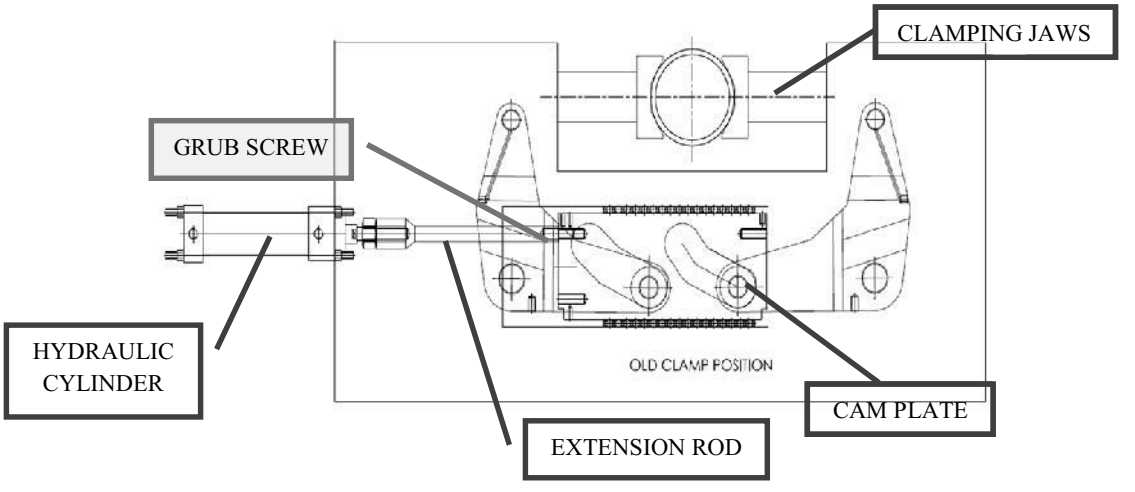

Figure 1. **PMC Threading Machine**

- **CAM PLATE**

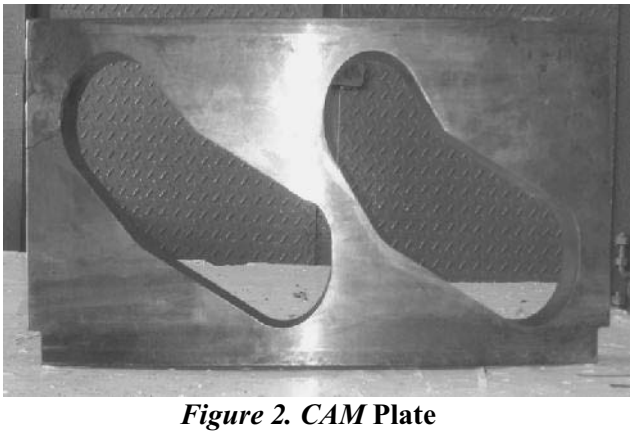

Figure 2. CAM **Plate**

Figure 3. Grub Screw

In threading machine, cam plate is one of the main component of the clamping unit which comprises of two slots in which cam roller rolls and the linking system transmit the reciprocating motion of the connecting rod to the linear motion of the jaw.

- **GRUB SCREW**

In threading machine, fig. 3 shows the grub screw. Grub screw is the extension part of the connecting rod which is in contact with the cam plate. The bolt or grub screw has external threads which mesh with the internal threads of the holes of the cam plate. The hydraulic cylinder which exerts tensile force on the cam plate results into the shearing stress leads to failure of the screw.

III. TENSILE LOAD CORRESPONDING TO CLAMPING OF PIPE

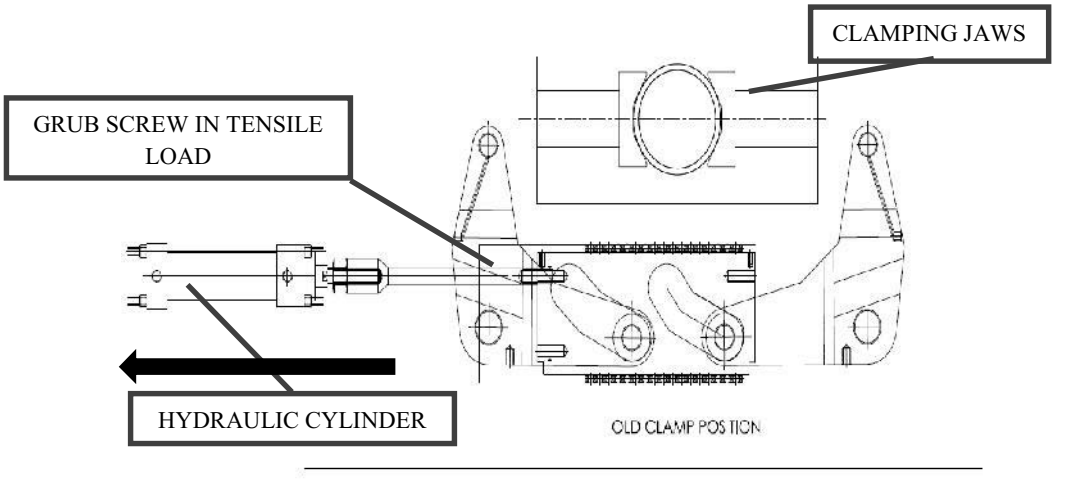

Figure 4. Cam Plate in Original Position

- **Force calculations**

We know that the hydraulic cylinder exerts the tensile force on the grub screw, so considering the pressure of the hydraulic system to be 5Mpa and the dimensions of the hydraulic cylinder, we find out the hydraulic force on the bolt

- **Hydraulic Force (Tensile)**

$$= P \times \prod \times \frac{1}{4} \times (100^{2} - 45^{2}) \qquad = 5 \times \prod \times 1/4 \times 55 \times 145 \qquad = 31.3\,KN$$

- **Tensile stress on the cross sectional area of the bolt by hydraulic cylinder**

$$\sigma = \frac{F}{A} \qquad F = 31.3KN \qquad d = 15.798$$

$$\sigma = \frac{(31.3 \times 1000 \times 4)}{(\pi \times 15.798^{2})}$$

$$= 158.6\,Mpa$$

- **Shear stress at thread root**

$$\tau_1 = \frac{P}{\pi \times b \times n}$$ Where b = Width of the thread section at the root.

$$\tau 1 = \frac{31.3 \times 1000}{\pi \times 15.798 \times 2.54 \times 9}$$ =27.6 MPa

From Peterson Stress concentration Factors for whit worth threads,

Ktg = 3.85 . . . .(stress concentration factor with the nominal stress based on gross area)

$\tau \max = \tau nom \times Ktg$ =27.6× 3.85 =106.26MPa

Thus , the maximum allowable shear stress in the bolt due the interference of the external threads of the grub screw and the internal threads of the cam plate if the clamping of the pipes through the jaws is acquired when hydraulic cylinder pulls the cam plate is 106.26 MPa.

IV. COMPRESSION LOAD CORRESPONDING TO CLAMPING OF PIPES

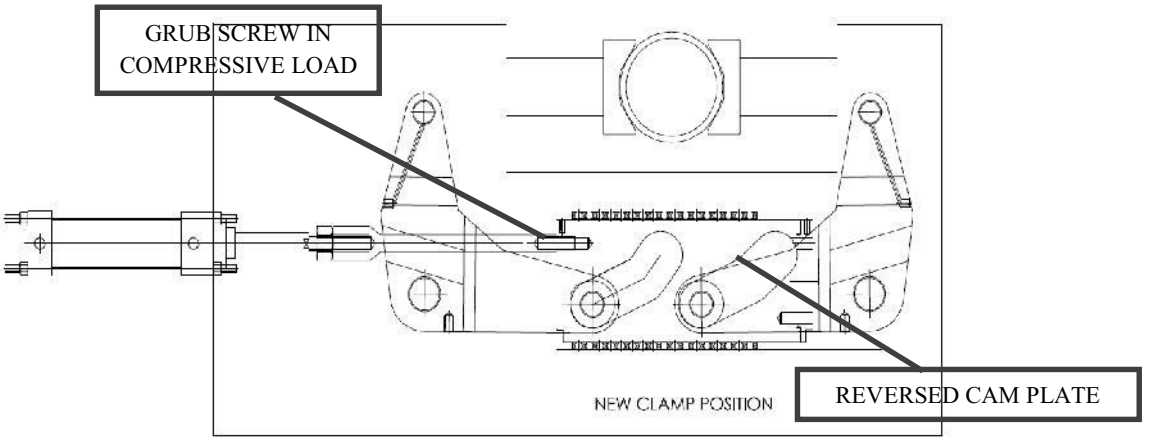

Figure 5: Cam plate in Reversed Position

- **Force calculation**

Hydraulic force (external)

$$= \frac{P \times \pi \times 1 \times 100^2}{4} \quad = 39.25\text{kN}$$

Shear stress at thread root

$\tau_2 = \frac{P}{\pi \times b \times n}$ Where b=Width of the thread section at the root.

$\tau 2 = \frac{29.25 \times 1000}{\pi \times 15.798 \times 2.54 \times 9}$ =34.6MPa

From Peterson Stress concentration Factors for whit worth threads,

Ktg=3.85 . . . (stress concentration factor with the nominal stress based on gross area)

$\tau \max = \tau nom \times Ktg$ =34.6× 3.85 =133.24 MPa

Thus, the maximum allowable shear stress in the bolt due the interference of the external threads of the grub screw and the internal threads of the cam plate if the clamping of the pipes through the jaws is acquired when hydraulic cylinder pushes the cam plate is 133.24 MPa.

ACTUAL SHEAR STRESS OF BOLT

Now we need to find out the actual shear stress on the grub screw (bolt) due to the misalignment of the plate, so we consider the deflection of bolt as 0.1 mm and calculate the force on the bolt perpendicular to the cross sectional area of the bolt.

Material: En24- Hardness=26-30HRC, Tensile strength=850-1000N/mm^2, Yield stress=680 N/mm^2

Deflection $\delta = \frac{PL}{AE}$ L=length of the bolt=32mm, Bolt diameter=19mm

A= Area of bolt= $\frac{\pi \times d^2}{4} = \frac{\pi \times 19^2}{4}$ =283.528 mm^2

E= Modulus of Elasticity=200GPa δ =0.1 mm

$$0.1 = \frac{P \times 32}{283.528 \times 200 \times 1000} \qquad \text{P} = 177205 \text{ N} = 177.205\text{kN}$$

$$\tau = \frac{P}{A} = \frac{177205}{283.528} = 625\text{N/mm}^2$$

Thus we can notice that actual shear stress on the bolt (625 units) is just less than the yield stress of the bolt material (680).

V. CONCLUSION

From the above result, we have noticed that actual shear stress on the bolt (625 units) is just less than the yield stress of the bolt material (680) so by reversing the cam plate we can increase the maximum allowable shear stress of the bolt and also avoid the point load scenario of the bolt. Due to which the fatigue failure in grub screw and cam plate is reduce and also machine downtime is reduced.

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Improving Stereolithography Resolution

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Abstract-Stereolithography is the first Additive Manufacturing (AM) technique developed & considered as a base for many techniques employing light to solidify the photopolymer resin. This paper provides brief information on stereolithography (SLA) process which uses a UV laser beam to solidify photopolymer resin. It reviews various strategies used to improve anisotropic resolution in both vertical & horizontal direction, by reducing polymerized layer thickness, avoiding local degradation of vertical resolution and improving lateral resolution of SLA process. It also reviews the evolution of polymerized layer thickness with irradiation time for fixed value of irradiation flux (210 mW/cm) for five different monomers.

Keywords- Additive Manufacturing; Micro-stereolithography; SLA resolution; Photopolymer resin;Photopolymerization;Polymerized layer thickness; Photoinitiator.

I. INTRODUCTION

The first Additive Manufacturing (AM) technique developed is the Stereolithography (SLA) & it's one of the several methods used to create solid objects from liquid photopolymer resin. The term stereolithography was coined by Charles (Chuck) W. Hull when he patented the process in 1986. SLA process is one of the several AM techniques, used to produce objects by curing photopolymer resin layer-by-layer using an ultraviolet (UV) laser beam. The photopolymer resin is a material in liquid form used in SLA process.

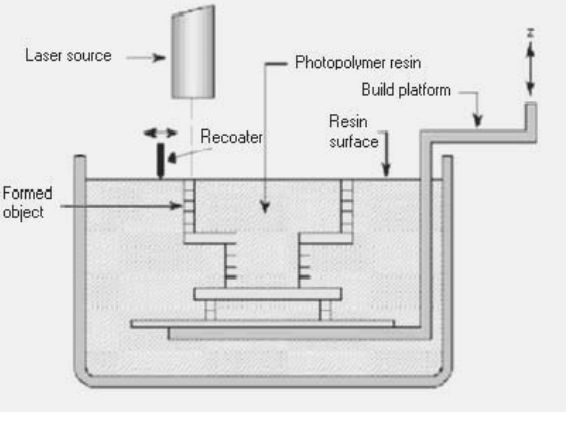

Fig. 1 Stereolithography Apparatus [1]

Fig.1 shows the apparatus used in stereolithography process. It has four main parts: a tank filled with liquid photopolymer resin, a table or a platform to hold the built object, an Ultra Violet laser beam system & computer to control the motion of platform & laser beam. In the initial act of SLA process, a thin layer of photopolymer resin is exposed to a laser beam which hardens or cures the resin by tracing cross-section of the first layer, results in printing first layer of the object. As soon as, the first layer of resin gets cured, the platform moves down, exposing a new layer of fresh liquid resin to UV laser beam. This beam again traces the cross section of the second layer & once the second layer gets cured, it immediately sticks to the cured layer underneath of it, this process repeats until the final object forms inside the liquid resin.SLA process related more precisely to microstereolithography (micro-SLA) because both, SLA & micro-SLA resembles the samemanufacturing principle, but micro-SLA carries out process improvements which result in a better resolution.

The first ever development in micro-SLA happened in 1993 & efforts have taken to modify the SLA process to get better resolution. SLA process which based on the superimposition of layers, resolution, precision & surface roughness are anisotropic. The average resolution is in the range of 150 μm in the three directions. Specifically, the vertical resolution (along the vertical build axis) depends on the thickness of the superimposed layers, whereas the lateral resolution relies on the dimension of the light beam (UV laser beam) used to cure shape of a given layer, at the resin surface.

II. IMPROVING STEREOLITHOGRAPHY RESOLUTION

There are different factors which affect the inherently anisotropic resolution of SLA in both vertical & horizontal directions [2].

2.1 Reducing thickness of the layers

Even if the objects made by superimposition of layers, the vertical resolution of SLA does not relate to the layer thickness of fresh resin admitted on the surface of the previously cured layers. Also making thinner layers of fresh liquid resin on the surface of the last cured layer won't improve the vertical resolution, but it depends on the light penetration depth inside the liquid photopolymer resin. Thus, the ideal case will be the light should be confined to the surface and not penetrate deep into the medium. Still, if light penetrates deep into the resin, the polymerization process will start & will solidify resin, resulting in thicker cured layers which will badly affect SLA resolution.
The photopolymerization phenomenon (free radical or cationic polymerization) where polymer grows by the chain reaction & this chain reaction starts when the photopolymer resin absorbs a fixed amount of photons with sufficient energy results into polymerized (cured) layer.

$$e = \frac{1}{\alpha c}\ln\left(\frac{t}{t_0}\right), \text{ witht} = \frac{T}{\alpha c F_0} \qquad 2.1$$

The equation 1 shows the evolution of the thickness of the cured layer with irradiation time. Where, e is polymerized layer thickness (μm), α is the Napierian coefficient of molar extinction for the photoinitiator (L/mol m), c isthe photoinitiator concentration in resin (mol/L), $t_0$is the threshold irradiation time required to begin the photopolymerization reaction (s), t is the irradiation time (s), T is the irradiation threshold value (photons/m^3), and $F_0$is the light flux reaching the surface of the resin (photons/m^3s).

According to Zissi et al. who measured this evolution of thickness with irradiation time at fixed value of irradiation flux (210 mW/cm), for five different monomers with a 0.4mol/L concentration of same photoinitiator DMPA (a,a-dimethoxy-a-phenylacetonephenone).

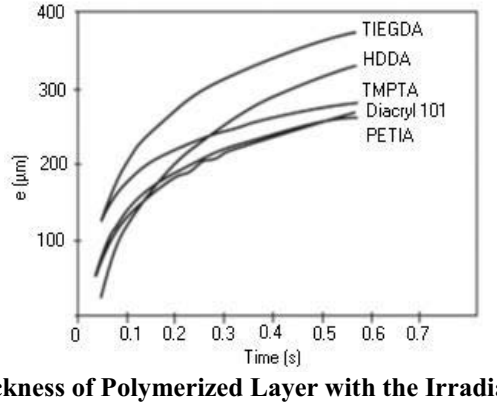

Fig. 2 Evolution of Thickness of Polymerized Layer with the Irradiation Time in SLA for Five Monomers [3]

Tri(ethyleneglycol)diacrylate (TIEGDA), 1,6-hexanediol diacrylate (HDDA), trimethylopropane triacrylate (TMPTA), pentaerythritol triacrylate (PETIA), and 2, 29-bis[4-(methacryloxy-ethoxy)phenyl]

propane (Diacryl 101) these are the five different monomers used. Fig. 2 shows the evolution of the polymerized layer thickness with the irradiation time showing the good agreement of the equation 1 with the experimental results, provided that the resins should not undergo the photobleaching, else the relation will be no more logarithmic.
Depending on the contribution of terms present in the equation 1 to the polymerized layer thickness shows two ways to improve the vertical resolution:

2.1.1 Irradiating resin for a short duration, close to the threshold irradiation time

Reduction in the polymerized layer thickness achieved by irradiating photopolymer resin for the time slightly more than the threshold irradiation time required for starting the polymerization reaction. In that case, equation 1 reduces to following:

$$e \cong \frac{1}{\alpha c}\frac{t-t_0}{t_0} \qquad 2.2$$

Using this technique to reduce the layer thickness appears to be simple & an efficient way to produce thinner layers, but it has more drawbacks than benefits. First, a small change in irradiation time results in the significant change in the layer thickness makes accurate control of layer thickness as an extremely tough job. Second, layers obtained by this method have poor mechanical properties.

2.1.2 Using reactive media having a small optical thickness

When the irradiation wavelength falls onto the photosensitive resin having strong the absorption property, the light restricts to the surface of the resin and resulting into the minimum layer thickness, irrespective of the irradiation duration. Then the equation 1 simplifies to the following:

$$e \cong \frac{R}{\alpha c}, \text{ with} R = \ln\left(\frac{\alpha c F_0 \tau}{T}\right) \qquad 2.3$$

Where τ is a small variation in irradiation time induces small changes of R when $\tau \gg t_0$. In that case, the layer thickness described by term $\mu=1/\alpha c$, calledthe optical thickness strongly depends on the absorption property of the resin.
There exist two ways to produce a resin with a minimum optical thickness. First, an addition of photoinitiator or a photosensitizer into the resin increases reactivity and reduces optical thickness, as photoinitiator becomes more absorbent for irradiation wavelength shown in Fig. 3(a). Second, the addition of neutral absorbers, nonreactive chemicals, once added to the resin, strongly absorbs the light at the irradiation wavelength and dissipates the corresponding energy that does not interfere with the polymerization reaction. Thus, the addition of neutral absorbers reduces the energy available to start the photopolymerization reaction, results in a reduction of the optical thickness of the resins shown in Fig. 3(b). But, it has the serious drawback that it reduces the reactivity of resin.

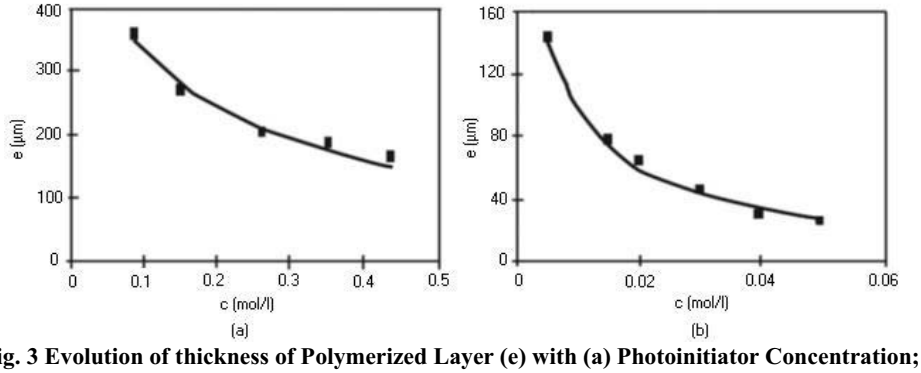

Fig. 3 Evolution of thickness of Polymerized Layer (e) with (a) Photoinitiator Concentration; (b) Neutral Absorber Concentration [2]

Zissi et al. [3] demonstrated how cure depth of resin drastically reduced by addition of small amount of inert UV dye (2-(2-hydroxy-5-methylphenyl)benzotriazole, also called Tinuvin P). Since then, many preferred to use neutral absorbers, derived from Tinuvin family, for cure depth adjustment.
Bertsch and Renaud analytically described the relation between polymerized layer thickness and irradiation time, when neutral absorbers added to the resin and presented equation 4:

$$e = \frac{1}{\alpha c + \alpha_N c_N} + \ln\left(\frac{t}{t'_0}\right), \text{ with } t'_0 = \frac{(\alpha c + \alpha_N c_N)T}{\alpha^2 c^2 F_0} \qquad 2.4$$

Where, α_N is the Napierian coefficient of the molar extinction of the neutral absorber (L/mol m), c_N is the neutral absorber concentration (mol/L), and t'_0 is the threshold irradiation time required to start photopolymerization phenomenon after adding neutral absorbers (s).Zabti [1] experimentally demonstrated the effect of the addition of the neutral absorber on the mechanical properties such as surface roughness, density, and accuracy of acrylate-based resin components produced by micro-SLA and J. W. Choi, et al., showed that the addition of the light absorber Tinuvin 327^{TM}into an acrylate-based resin reduces penetration depths and thus cure depths for dynamic mask projection microstereolithography system [4].

2.2 Avoiding local degradations of vertical resolution

SLA techniques depend on an adequate tuning between the irradiation & the absorption wavelength of the resin to effectively control the thickness of each polymerized layer. If the absorption peak of the resin does not match with the irradiation wavelength, the light penetrates deep into the resin and results in the thick polymerized layers. There exist four cases, depending on the reactivity of the resin and light penetration in the medium [2].

- The desirable conditions for photopolymerization reaction, when the resin having a strong reactivity &strong absorption at the irradiation wavelength used, the light will not penetrate deep inside the resin, but restricts at the surface of resin and results in the minimum polymerized layer thickness.
- When the resin has a low reactivity and the strong absorption then the light confines to the resin surface, there will be no polymerization at all. If still polymerization occurs, it will result in the thinner polymerized layers at the resin surface & this happens only when the resin contains a huge concentration of the neutral absorber.
- When the resin has a strong reactivity and low absorption at the irradiation wavelength, the light penetrates deep inside the resin, polymerization begins quickly and results in the thick polymerized layers. For SLA, the thickness of polymerized layer strongly depends on irradiation time thus these conditions stands undesirable.
- When the resin has a low reactivity & low absorption at the irradiation wavelength, the light penetrates deep inside the resin, takes a longer time to start the polymerization reaction, but whenthe reaction starts, the threshold reaches everywhere at the same time and results in unwanted polymerization conditions. These conditions arise when there is the mismatch between irradiation wavelength & the absorption spectrum of resin.

The degradation of vertical resolution in SLA occurs due to z-overcure error, also called "Print-through" phenomenon and occurs when irradiating the resin close to its threshold value or using the resin with low light absorption for the producing objects with overhanging structures. In this case, after building the first layer of the overhanging structure, a small amount of light penetrates the resin underneath of it, but not enough to reach the threshold value; result in the local sensitization of the resin. Building additional layers on the top of the overhanging structure causes more energy to deposit below of it. Once the polymerization threshold reaches in the sensitized area, unpredictable structure grows below the first polymerized layer of that overhanging structure, results in the local degradation of the vertical resolution and worsens features of the object to be produced. By using the resin with high absorption & a strong reactivity, z-overcure error can be solved.

2.3 Improving the lateral resolution

The strategies used in the SLA process to improve the vertical resolution have not much impact on the lateral resolution. As shown in Fig. 4(a), the addition of the photoinitiator makes the resin more reactive, reduces the threshold energy needed to begin the photopolymerization process and increases the polymerized width (l) leading to the slight decrease in lateral resolution. Exactly Opposite happens after the addition of the neutral absorber because the reactivity of resin decreases shown in Fig. 4(b).

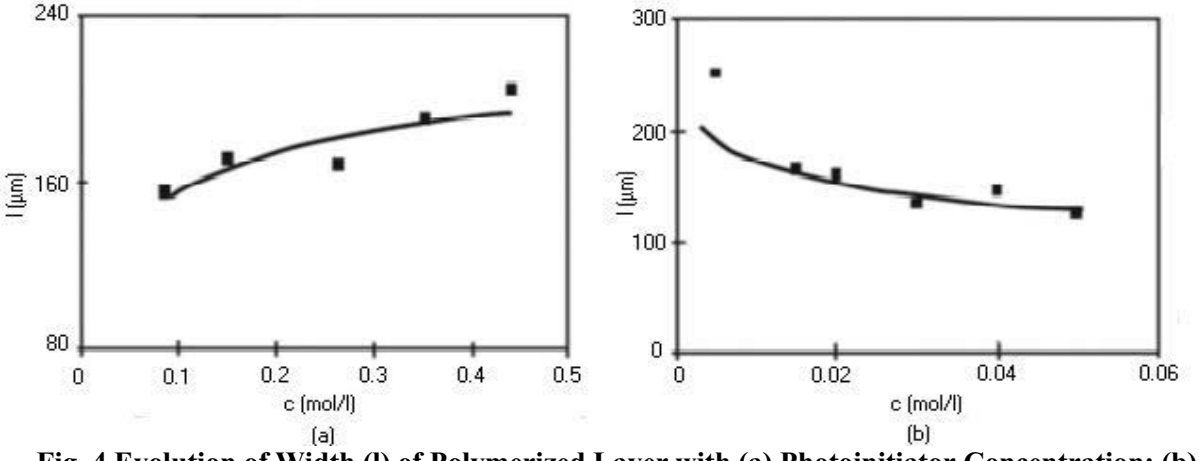

Fig. 4 Evolution of Width (l) of Polymerized Layer with (a) Photoinitiator Concentration; (b) Neutral Absorber Concentration [2]

In the SLA process, the laser beam scans the surface of the resin to produce polymerized layers. The laser beam diameter & accuracy of the scanning system determines the smallest feature of the object and lateral resolution of the SLA process as well.

III. CONCLUSION

Improving the SLA resolution in both lateral & vertical direction using above strategies provides good results. To improve the vertical resolution by the exposing resin for the duration slightly longer than its threshold value, an addition of photoinitiator & neutral absorber reduces the thickness of polymerized layer to a much extent. Choosing the resin having a strong reactivity & strong absorption avoids the local degradation of vertical resolution. But the addition of photoinitiator increases polymerized layer width consequently decreases the lateral resolution and addition of neutral absorber decreases resin reactivity thereby increasing the curing time. In the case of scanning micro-SLA machines, lateral resolution depends on laser beam diameter & accuracy of laser beam system.

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Microstereolithography: Concepts and Methods

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Abstract- Microstereolithography (Micro-SLA) is a fabrication process emerged from the 3D printing industry. The first attempt in manufacturing micro level objects was made in 1993. Different researchers around the world have developed micro-SLA machines since then. All the micro-SLA systems are based on the fabrication of parts by UV light incited layer-stacking. Micro-SLA incorporates an integral curing approach creating complex 3D micro-objects. These objects can be used in the fields of microsystems, microfluidics, and micro-robotics. The most promising application field of this technology is still the rapid prototyping that faces an increasing demand of high-resolution small-size prototypes. The paper reviews the prime micro-SLA processes developed until now.
Keywords-Additive manufacturing Microstereolithography; Collective Microstereolithography; Photopolymerization

I. INTRODUCTION

The advance of Additive Manufacturing (AM) techniques has significantly improved the ability to fabricate structures with precise geometries. These techniques include fused deposition modeling, selective laser sintering, stereolithography, etc. Originally, AM techniques were developed to create prototypes in the process of product designing and development. The ability of AM to create an object from a computer-aided design within hours significantly speeds up the product development. Stereolithography, being the first commercially available AM technique, was developed in 1986 by 3D systems [1]. Stereolithography is especially versatile with respect to the scales at which objects can be built: submicron-sized structures and the freedom of designing structures.
Micro-SLA is related to rapid prototyping technologies, more precisely to Stereolithography (SLA), allowing the manufacturing of 3D objects by layer-by-layer curing of a photopolymer resin with an ultraviolet (UV) laser [2]. Concepts and apparatuses of micro-SLA were developed by various research teams mostly in an academic context.
In this paper, we review the major Microstereolithography processes. The principles of operation of the micro-SLA technique are discussed.

II. CONCEPTS

Microstereolithography (micro-SLA) is a microfabrication technology that is different from the techniques commonly used for the manufacturing of Micro Electro Mechanical System (MEMS) components [3]. Micro-SLA is undoubtedly the one among all microfabrication techniques developed up to now, that can manufacture small objects with the most intricate details and high-resolution complicated shapes. Micro-SLA is also known as micro-photo-forming, spatial forming, optical forming, microstereophotolithography, 3D optical modeling etc. corresponding to design variations in the apparatuses [4]. However, all these machines allow building high-resolution, small-size 3D objects, by polymerization of a liquid resin into a solid polymer. Micro-SLA technique can be classified into three major categories: Scanning micro-SLA, Projection micro-SLA, Submicrometer micro-SLA.

2.1. Scanning Micro-SLA

The first micro-SLA machines based on scanning principle were presented in 1993. One machine was presented byIkuta and Hirowatari[5] and another byTakagi and Nakajima[6].

2.1.1. Constrained surface technique or fixed surface method

The solidification of the photopolymer occurs always on the fixed boundary between the window and the resin. This technique is based on a vector by vector tracing every layer of the object with a light beam. The light beam is tightly focused on the photopolymer through a transparent window.No scanning mirrors are used to deflect the light beam.

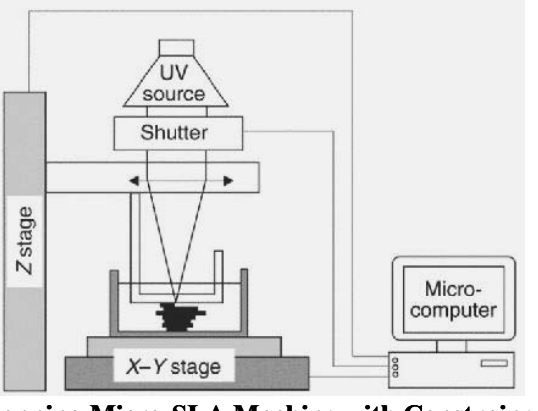

Fig. 1 Schematic of Scanning Micro-SLA Machine with Constrained Surface Technique

The vector by vector fabrication is obtained using x-y translation stages to move either the whole optical system targeting the light beam on the resin surface or the photopolymer container in which the object is made while the focus point remains fixed [7]. The light beam occulted with the help of the shutter during translation without polymerization or when a new layer is made. The system uses glass window to persist the liquid to avoid the problem of spreading the fresh photopolymer on the already polymerized part of the object.The main disadvantage of this method is the polymerized object sticks to the transparent window. This adhesion can lead to a partial or total destruction of the object during the manufacturing process.

2.1.2. Free surface technique

The main differences between constrained surface and free surface based techniques are method of polymer curing and build orientation [8]. To avoid the problem of the object sticking to the window, many research teams promoted scanning micro-SLA processes where resin gets polymerized at the free surface of the liquid resin. In this process, the vector by vector fabrication is obtained by moving the photopolymer container with x-y-z motorized translation platform.The optical system targets the beam of light statically on the resin surface. Such types of machines are easier to build but it is difficult to control the thickness of the deposited resin layer. The rhelogical properties of photosensitive resin and the geometry of the last layer affect the time to get fresh layer of resin.

The first paper on scanning microstereolithography with the free surface technique was described in 1994 by Zissi et al [4]. Fresh layer of resin was obtained on the surface of the object under construction by immersing the object in resin container and bringing back close to the surface. To obtain stable beam intensity and small size spot, Laser was used instead of a lamp. The photopolymer used by them contained low viscosity monomer1,6 hexanediol diacrylate (HDDA) and conventional UV initiator. A scrapping device was used by Kobayashi for actively spreading resin over the previous layer instead of waiting for gravity force for leveling [9].

2.1.3. Collective manufacturing using optical fibers

With the micro-SLA techniques, objects are generallyfabricated one object at a time because of limited build area. This is the major drawback for a micro-SLA system.Collective micro-SLA process was developed byIkuta et al. in 1996 which allows collective manufacturing of small size components [10].

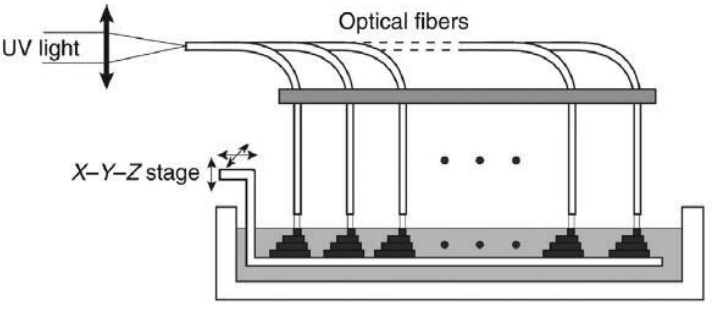

Fig. 2 Schematic diagram of Collective Micro-SLA

The system presented by Ikuta et al. uses 5 single mode optical fibers as shown in Fig. 2, which are used to focus UV light beam in five different locations on the free surface of photopolymer. The optical system is held stationary and the vectors constructing layers are achieved by scanning the resin container using x-y-z-stages under computer control. Five objects with same geometry can be built simultaneously with this setup [4].

2.2. Projection Micro-SLA

Projection micro-SLA process is different than conventional AM processes that work on the vector by vector manner. The components used as dynamic pattern generator are the key components. 3D computer aided design (CAD) files obtained by CAD modeling software are oriented (if needed), scaled and sliced uniformly along the chosen plane (generally XY plane).The slices are converted into bitmap image filesand used to operate dynamic pattern generator, beginning with the cross section corresponding the bottom of the object. The pattern generator shapes the beam coming from the source of light so that it comprises the image of the layer to be built.The image is focused on the surface of photopolymer to selectively cure the irradiated area and a thin layer of cured resin of required shape is obtained.The first layer of the object to be fabricated is cured at the surfaceof a platform [11]. Once the solidification of a layer is complete, the already polymerized part is immersed in the resin container, deep enough so that polymerized surface is totally covered with fresh resin. It is then lifted up to a certain height, such that there remains a layer of resin between the surface and the last polymerized layer. The same sequence of operations is performed until the object is completed.The polymerized layers are stacked to one another by the interpenetrating polymer networks. The completed object is taken out of the resin container and washed with suitable solvent.

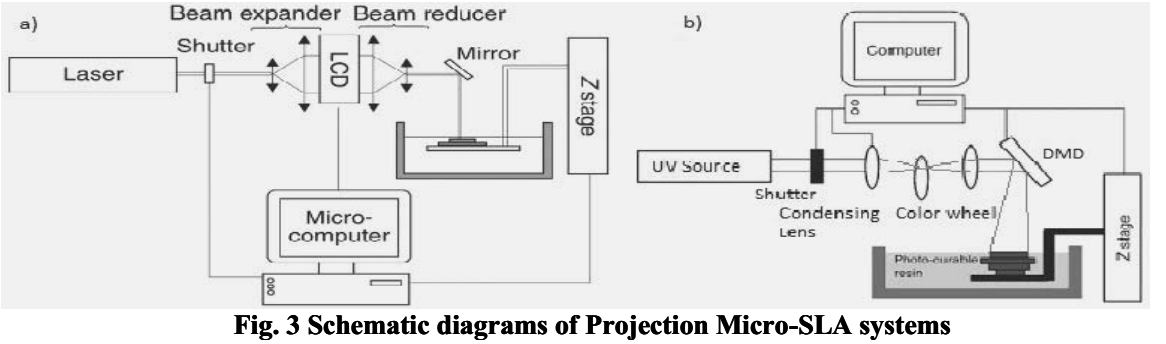

Fig. 3 Schematic diagrams of Projection Micro-SLA systems

Projection micro-SLA show advantages compared to Scanning micro-SLA. The light flux density incident on resin surface while projecting the image pattern of a complete layer is low,compared to accurately

focused light beam at a single point. Unwanted curing due to thermal effect will not take place in projection-SLA. Projection-SLA is fast because the irradiation and solidification of a complete layer are done in a single step,irrespective of pattern complexity.

2.2.1. Liquid Crystal Display(LCD) as a dynamic mask

Projection micro-SLA with LCD as a dynamic mask was first demonstrated in 1995 by Bertsch et al. The LCD used in first micro-SLA was archaic, could only be used with visible light and not with UV light [12]. photopolymer resin sensitive with visible light wavelengths had to be developed. Argon ion laser with 515nm wavelength was used as a light source. A complex optical system was added to eliminate speckle effect to get the light with a uniform intensity and to redistribute laser light irradiation from a Gaussian to a top-flat profile. Specific resins sensitive to green light wavelength were formulated. Such resins undergo photobleaching at the time of photopolymerization, controlling thickness of the polymerized layers is difficult in such cases.
A polysilicon thin-film twisted nematic LCD was irradiated with 351.1nm argon ion laser by Farsari et al.Gaussian irradiance distribution was reshaped to rectangular irradiance using diffractive optical elements.Epoxy-based commercial SLA resins were used as the machine was operated in UV [13].

2.2.2. Digital Micromirror Device (DMD) as a dynamic mask

DMD technology is owned by Texas Instruments. DMD is a Microelectromechanical system which works as a light switch. It consists of several hundred thousand microscopic mirrors arranged in a rectangular array which are actuated by electrostatic forces. The number of mirrors corresponds to the resolution of the screen. Mirrors reflect the light towards the absorbing area. Black and white pixels are sufficient micro-SLA applications for manufacturing objects layer by layer.The maximum available resolution of the image using DMD is 2560x1600.The major advantage of using DMD is development of high resolution projection micro stereolithography [11]. DMD has higher contrast compared to LCDs and can be used to get wider range of wavelengths.
The first micro-SLA machine with DMD as a pattern generator is developed by in 1998 Bertsch et al. A metal halide lamp with adequate optical filters was used to irradiate UV light on the resin. Different acrylate-based resins sensitive to 515nm or 410nm were used. Later, the machine was modified to work with 365nm UV light.
Zheng et al. developed projection micro-SLA machine which works on 'step and repeat' method.Polymerization of each layer is achieved through multiple exposures, resulting to larger polymerized layers. The system allowed to build bigger objects with same resolution.Emami et al. developed a new SLA process to build large objects with good resolution. DMD is moved continuously in X and Y and the images are projected continuously. This Scanning-projection SLA method eliminates the limitation of projection-SLA systems in which size of object is limited by size of dynamic pattern [14].

2.3. Submicrometer micro-SLA

Instead of manufacturing layer by layer at the surface, the object is manufactured directly inside the reactive medium. resin. It eliminates the need to spread the layer of fresh resin over the object under construction, which potentially speeds up the fabrication. There is no need for support structures [16]. Freely movable components and assembled objects can be made easily. Submicrometer micro-SLA processes were developed in two manners, either on two-photon photopolymerization or one photon under the surface to build objects with a submicrometer resolution.

2.3.1. Two-photon micro-SLA

Two photon absorption occurs when combined energy of two photons exceeds the transition energy between the ground and excited state. It is an optical nonlinear phenomenon which takes place at sufficiently high level ofirradiance. Two-photon absorption rate is proportional to the square of the

intensity of incident light. The quadratic dependence on the intensity of the light confines the absorption to an area at the focal point. The power of light source should be extremely high as the rate of two-photon transition is very high.

The first machine based on two-photon photopolymerization was presented by Maruo et al. in 1996 [15]. Mode-locked Ti:sapphire laser emitting at 770 nm light source was used. A photopolymer, transparent to 770nm light, based on urethane acrylate oligomers and monomers was used. This photopolymer did not attenuate the light beam and the incident light can be focused inside the photopolymer without polymerization at the surface of the resin. The object was manufactured by moving the photoreactor in vertical direction. Kato et al. presented collective manufacturing using two-photon micro-SLA. Simultaneous fabrication of almost 200 microstructures was achieved using microlens array for multifocal photopolymerization[16].

2.3.2. Single photon micro-SLA

Single photon micro-SLA was used in similar manner as two-photon micro-SLA to execute local photopolymerization of resin under the surface. Tightly focused irradiation is weakly absorbed in photopolymer. Intensity of light is sufficiently low and polymerization will take place only at the focal point. Oxygen is dissolved in the resin to inhibit the polymerization in the out-of-focus region where intensity of light us adequately low. The resin with nonlinear behavior in response to light intensity is used. The first machine working on single photon polymerization was developed by Maruo and Ikuta[16].

III. CONCLUSION

Micro-SLA technologies are versatile with respect to the scale at which object can be built and freedom of design of the structure. Micro-SLA processes can be effectively used to fabricate real 3D complex objects which are difficult to manufacture by conventional machines. Different research teams have contributed to explore different ways to modify the micro-SLA processes using a distinct range of components: optical elements, irradiation configuration, different light sources etc. Different resins were formulated dedicated to these technologies. Though Scanning micro-SLA is widely used, Projection micro-SLA is gaining significant amount of interest of researchers. Some of the micro-SLA techniques are combined to collectively fabricate objects with good resolution.

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Numerical Analysis of Fluid Flow Induced Vibration of Pipes – A Review

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Abstract- The current research paper deals with the effects of vibration due to internal fluid flow in a pipeline. The flow of a fluid through a pipe can impose pressures on the walls of the pipe causing it to deflect under certain flow conditions. The deflection of the pipe may lead to structural instability of the pipe. Mathematical model of pinned – pinned pipe carrying fluid has been developed. The partial differential equation of motion governing the lateral vibrations of the pipe is employed to develop the stiffness matrices corresponding to two of the terms of the equations of motion. The Equation of motion includes a mixed-derivative terms. As for boundary condition, namely simply-supported pipe is considered.

Keywords- Structural instability, flow induced vibration, Mathematical model, Stiffness matrix, Structural inertia.

I. INTRODUCTION

Vibration and noise problems due to fluid flow occur in many industrial plants. This obstructs smooth plant operation. This leads to significant maintenance and repair costs. Flow-related vibration phenomena are generally known as 'flow-induced vibrations' (FIV). The term 'flow-induced vibration and noise' (FIVN) is used when flow-induced noise is present. It is fairly evident that the fluid force acting on an obstacle in flow will vary due to the flow unsteadiness and that the varying force, in turn, may cause vibration of the obstacle. In case of piping connected to reciprocating fluid machines, for example, the oscillating (fluctuating) flow in the piping generates excitation forces causing piping vibration.

Flow induced vibration of pipes has been a subject of considerable research in the last four decades. By using the flow induced vibration we can develop electromagnetic energy. In the oil field development and production, fluid flow is an extremely important parameter which determines the transmission characteristics of the oil production structural failure due to flow induced vibration is a common problem affecting performance and reliability of heat exchangers. Under certain conditions fluid flow inside a pipe can initiate vibrations of the pipe. If the vibration intensity is large enough pipes can strike against each other or against their supports causing structural fatigue or complete failure. Flow induced vibration also occur in transcontinental oil pipelines causing damage of support structure or cracks of the pipelines leading to costly shut down. As the pipes are widely used in many industrial fields, flow-induced vibration analysis of pipes conveying fluid has been one of the attractive subjects in structural dynamics. It is well known that pipeline systems may undergo divergence and flutter types of instabilities generated by fluid-structure interaction.

In many situations where machines are operating and fluids are transported. Pipe system are responsible for the transmission of noise, e.g. in buildings, ships, power plants, process plants, etc. Excessive vibrations may lead to fatigue and cause damage to vital parts of installations.

Fluid pulsations may also cause incorrect reading of flow meters and other control devices and the wastage of money and time also.The monitoring of pulsations or vibrations can be valuable to diagnose those problems.

So that there is a scope to investigate the response of a structure due to combined loading of fluid, fluid inertia and structural inertia. Hence in the present study an attempt will be made to investigate the factors influencing flow induced vibration.

II. LITERATURE REVIEW

Determination of flow induced vibration of pipelines due to an internal flow becomes a subject of considerable importance. Literature reflects studies related to flow induced vibrations in the last four decades. On the basis of aim and objective the literature review is as follows,

The fast Fourier transform FFT is used to investigate the structural dynamic characteristics and the internal fluid transient properties. The wave characteristics, divergence stability and dynamics of the viscous elastic pipelines conveying internal flow are examined by Lee et al.[1] using the spectral element method. Small perturbations with respect to the steady state values of inner fluid velocity and pressure is considered to make the governing equations to be linear. In the spectral element model the governing differential equation of motion is transformed into the frequency-domain by using the discrete Fourier transformation theory. The internal flow velocity at which the divergence instability occurs is derived in an analytical form. A spectral element model is developed by Lee and Park [2] for the uniform straight pipelines with an internal unsteady fluid. Four coupled pipe-dynamics equations are derived in terms of the transverse displacement, the axial displacement, the fluid pressure and velocity and then liberalized them. We consider steady-state flow-induced vibration problem in pipe conveying an internal flow with constant velocity. The self-excited flexural vibration of a pipe due to an internal flow with constant velocity was investigated by Biswas and Ahmed [3]. Afterward, Gorman et al. [4] included the effects of radial shell vibration and initial axial tension on Lee's pipe-dynamics model. Most of the earlier studies are related to investigations about inner transient flow with time-varying velocity, which are reviewed at first here. Coupled pipe-dynamics equations for the axial, radial, and lateral vibrations of the pipeline as well as for the transients of unsteady internal fluid pressure and velocity were the subject of studies by Lee and Kim [5] and Lee et al.[6].The first attempt in flow-induced vibration study was done by Ashley and Havilland [7].The practical vibration problems of heat exchanger tubes in power plants and nuclear reactors were the subject of many studies as other aspects of this field. The finite elements models and also other numerical methods are frequently used for these studies. For want of space, we review the studies which are only based on the analytical methods.

III. MATHEMATICAL MODELING

2.1 Equations of Motion for Flow

Consider a pipe of length L, modulus of elasticity E, and its transverse area moment I. A fluid flows through the pipe at pressure p and density at a constant velocity v through the internal pipe cross-section of area A. As the fluid flows through the detecting pipe it is accelerated, because of the changing curvature of the pipe and the lateral vibration of the pipeline. The vertical component of fluid pressure applied to the fluid element and the pressure force F per unit length applied on the fluid element by the tube walls oppose these accelerations. Referring to figures (2.1) and (2.2), balancing the forces in the Y direction on the fluid element for small deformations, gives

$$F - \rho A(\frac{\partial^2 y}{\partial x^2}) = \rho A(\frac{\partial}{\partial t}' + \vartheta\frac{\partial}{\partial x})^2 \quad (2.1)$$

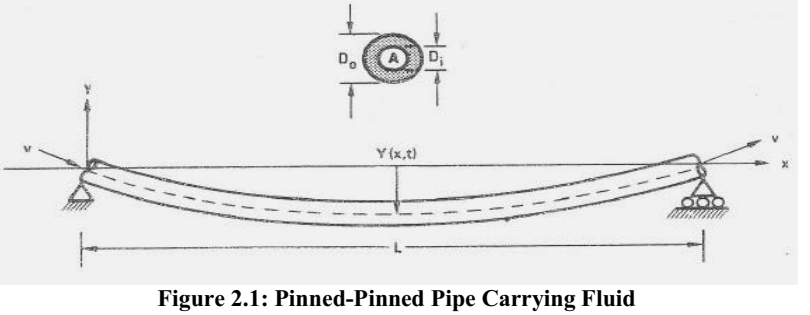

Figure 2.1: Pinned-Pinned Pipe Carrying Fluid

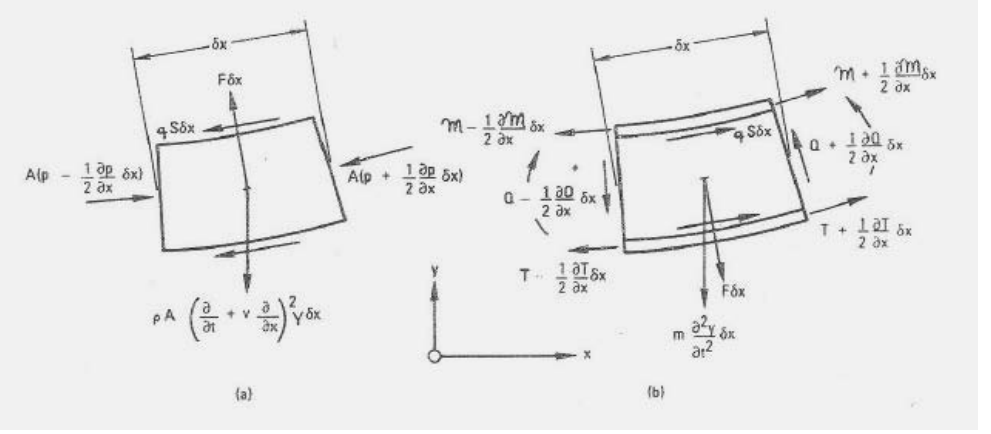

Figure 2.2: Pipe Carrying Fluid, Forces and Moments acting on Elements (a) Fluid (b) Pipe

2.2 Finite Element Model

Consider a pipeline span that has a transverse deflection Y(x, t) from its equilibrium position. The length of the pipe is L, modulus of elasticity of the pipe is E, and the area moment of inertia is I. The density of the fluid flowing through the pipe is ρ at pressure p and constant velocity through the internal pipe cross section having area A. Flow of the fluid through the deflecting pipe is accelerated due to the changing curvature of the pipe and the lateral vibration of the pipeline. From the previous section we have the equation of motion for free vibration of a fluid converting pipe:

$$EI\frac{\partial^4 y}{\partial t^4}+\rho A\upsilon^2\frac{\partial^2 y}{\partial x^2}+2\rho A\upsilon\ \frac{\partial^2 y}{\partial x\ \partial t}+M\frac{\partial^2 y}{\partial t^2}=0 \tag{2.2}$$

The Element stiffness matrix for a beam element is given by

$$[K^e]=\frac{EI}{l^3}\begin{bmatrix}12 & 6l & -12 & 6l\\ 6l & 4l^2 & -6l & 2l^2\\ -12 & -6l & 12 & -6l\\ 6l & 2l^2 & -6l & 4l^2\end{bmatrix} \tag{2.3}$$

2.3 Matrix Formation

In order to form a Global Matrix, we start with a 6x6 null matrix, with its six degrees of freedom being translation and rotation of each of the nodes. So our Global Stiffness matrix looks like this:

$$K_{Global}=\begin{pmatrix}0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0\end{pmatrix} \tag{2.4}$$

We shall now build the global stiffness matrix by inserting element 1 and element 2 of element stiffness matrix into the global stiffness matrix. We get,

$$K_{Global} = \frac{EI}{l^3}\begin{pmatrix} 12 & 6l & -12 & 6l & 0 & 0 \\ 6l & 4l^2 & -6l & 2l^2 & 0 & 0 \\ -12 & -6l & (12+12) & (-6l+6l) & -12 & 6l \\ 6l & 2l^2 & (-6l+6l) & (4l^2+4l) & -6l & 2l \\ 0 & 0 & -12 & -6l & 12 & -6l \\ 0 & 0 & 0 & 2l^2 & -6l & 0 \end{pmatrix} \quad (2.5)$$

When the boundary conditions are applied to a simply supported pipe carrying fluid, the 6x6 Global Stiffness Matrix formulated in eq (2.5) is modified to a 4x4 Global Stiffness Matrix. It is as follows;

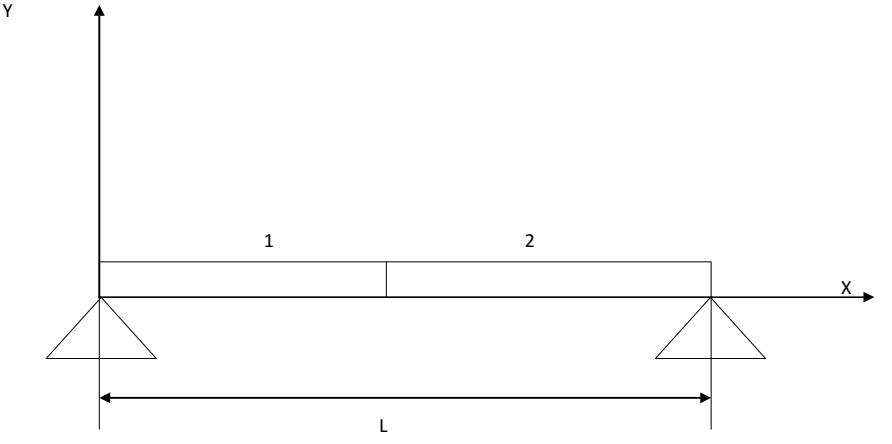

Figure 3.1: Representation of Simply Supported Pipe Carrying Fluid

$$K_{Global} = \frac{EI}{l^3}\begin{bmatrix} 4l^2 & 6l & 2l & 0 \\ -6l & (12+12) & (-6l+6l) & 6l \\ 2l^2 & (-6l+6l) & (4l^2+4l^2) & 2l^2 \\ 0 & 6l & 2l^2 & 4l^2 \end{bmatrix} \quad (2.6)$$

Since the pipe is supported at the two ends the pipe does not deflect causing its two translational degrees of freedom to go to zero. Hence we end up with the Stiffness Matrix shown above.

IV. SUMMARY

- This paper deals with the numerical analysis of flow induced vibration in pipes considering the effects of vibrations due to flow in a pipeline. Finite Element model for a pipe is studied and developed it for vibration analysis of a Pipe Carrying Fluid. And, then implemented the above developed model to Simply Supported Pipe configuration which Carries Fluid.

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NOMENCLATURE

F : Pressure Force in newton (N)
ρ : Density in kg/m^3
A : cross sectional area of pipe in inches
L : Length of pipe in (m)
Y : Direction of fluid element in m
E : Modulus of Elasticity in N/m^2
I : Moment of Inertia in kg.m^2
V : velocity in m/s
M : Mass in kg

Review: SWOT Function Deployment To Maintenance Strategy

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Abstract- The increasing global competitiveness has deliver the design of plant and machinery more sophisticated and complex. The maintenance reason has gotton to be essential and its responsibility has expanded. SWOT (Strength, Opportunity, Weakness, and Threats) analysis is one of the approaches to undertake a more structural analysis to formulate the best study. The study demonstrates that "Competition" and "Increment in expectation of Customers". This structured method involved in a project or business venture. In this scenario the task of maintenance is handling more efficiently. If the maintenance strategies are formulated and assessed using a well structure path. This information helps the maintenance management team carry out the trade of exercise effectively. The implementation the approach would ultimately lead to higher productivity with requisite amount of product quality. Also every unit must be aware of their Strength, Opportunity, Weakness and Threats. To succeed in any field, weakness must be taken through strength and threats must be transferred into opportunities.
Keywords- SWOT Analysis, maintenance strategy, deployment, customer need

I. INTRODUCTION

SWOT analysis can help you determine if it's a good enough idea to move forward. Through precise analysis, you can escape costly mistakes. The aim of SWOT analysis is to identify the extent to which the modern strategy of an organization and capable of dealing with the modification taking place in the business environment. A SWOT also can be considered a high-level uncertainty management tool. By taking both an internal and external judgment of capabilities, resources and influences, an bureau will be able to identify what elements are within their business model to address, and what element could potentially impact operational activities or program directions.

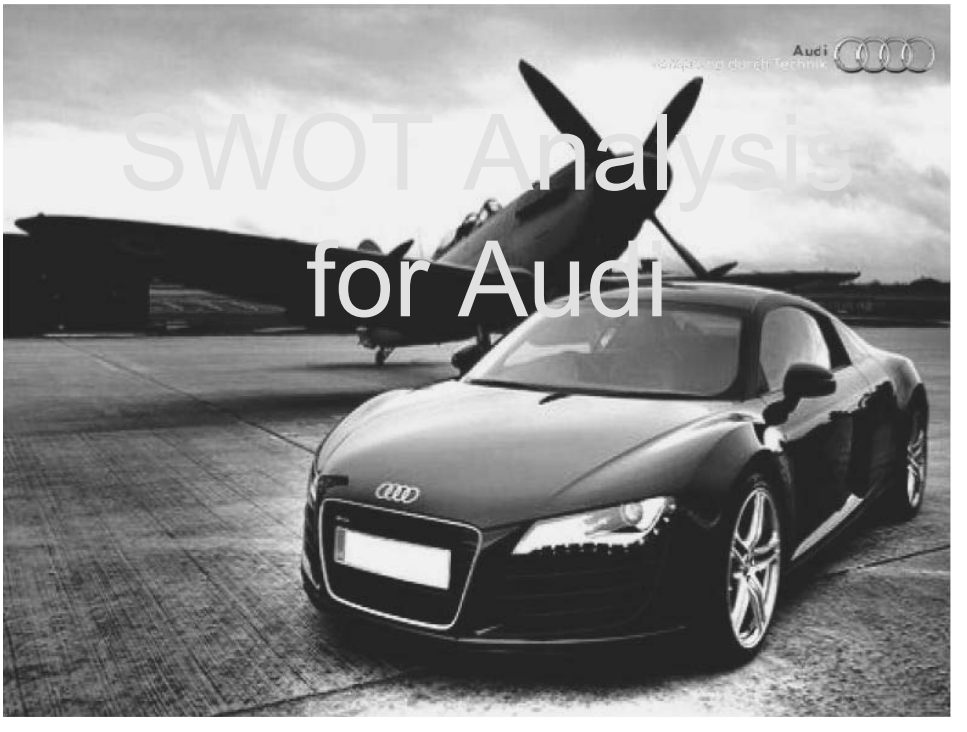
II. SWOT ANALYSIS

The SWOT Analysis is a business analysis technique. In which organization can change for each of its items, sevices, and markets on the deciding on the best way to achive future growth. for completion of swot analysis should help to decide which market segments offer you best opportunities for success and production improve over the life cycle of your product or service. SWOT analysis can help associations in their strategic arranging process, and in coordinating their capacities and assets to the aggressive environment in which it does its operations. SWOT examination is a dynamic part of an association's business and administration improvement process. It involves the gathering of data relating to external and internal components which might affect the association's advancement. [1]

III. SWOT ANALYSIS EXAMPLE

The Audi AG - SWOT Investigation organization profile is the key hotspot for top-level organization information and data. Audi AG - SWOT Investigation looks at the organization's key business structure and operations, history and items, and gives synopsis examination of its key income lines and technique. Audi is a Germany-based organization, which outlines and delivers cars. With its two brands Audi and Lamborghini, the Audi is dynamic both in the premium and supercar fragments. It is headquartered in Ingolstadt, Germany and utilized 58,011 individuals. The organization recorded incomes of E29,840 million ($41,615.8 million) amid the monetary year finished December 2009 (FY2009), a decay of 12.7% diverged from FY2008. The decrease in incomes was because of consistently prompted downturn in

vehicle deals, combined with lower motor deals in FY2009. The working benefit of the organization was E1,604 million ($2,237 million) amid FY2009, a diminishing of 42.1% contrasted with FY2008. The net benefit was E1,300 million ($1,813 million) in FY2009, a lessening of 40.3% appeared differently in relation to FY2008. Degree of the Report - Gives all the critical data on Audi AG required for business and contender knowledge needs - Contains an investigation of the major interior and outer variables influencing Audi AG as a SWOT investigation and also a breakdown and examination of driving item income surges of Audi AG - Information is supplemented with subtle elements on Audi AG history, key officials, business portrayal, areas and backups and in addition a rundown of items and administrations and the most recent accessible articulation from Audi AG Motivations to Buy - Bolster deals exercises by comprehension your clients' organizations better - Qualify forthcoming accomplices and suppliers - Stay up with the latest on your rivals' business.[2]



SWOT Analysis framework

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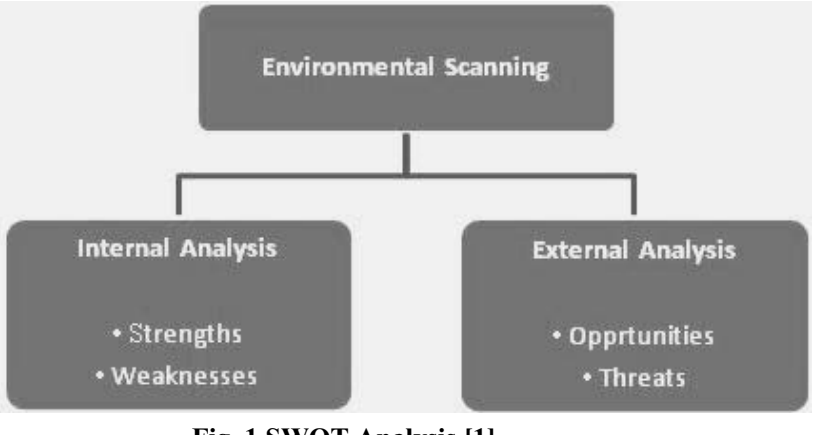

Fig .1 SWOT Analysis [1]

2.1 INTERN ALANAYSIS-

The internal analysis of your organization should involved in its culture, expertise ,resources and great quality inside of the commercial center. The initial two letters in a phrase, S (Strengths) and W (Weaknesses), refer to internal factors.
[1] Financial resources, such as funding, sources of salary and investment opportunities
[2] Physical assets, for example, your organization's area, facilities and elements are Human resources, such as employees, volunteers and target group of audiences
[3] Access to natural assets, trademarks, patents and copyrights
[4] Modern processes, such as programs, office chains of importance and programming frameworks

2.2 EXTERNAL ANALYSIS-

External factor influence and affect environment your association works in ,its business sector ,biological community, and of the third parties involved. External factors typically reference things your organization don't control, such as:
[1] Market features, like new products and technology or shifts in gathering of people needs - Economic patterns, for example, nearby, national and international financial features such as
[2] Financing, for example, donations, governing body and different sources
[3] Demographics, such purpose as audience's age, race, gender and civilization
[4] Relationships with suppliers and partners
[5] Political, environmental and economic regulations

2.1.1 Strengths-
[1] Extensive ranging and multidisciplinary research
[2] Teams able to implement test environments
[3] Strong process ability and systemic thinking
[4] Good industry cooperation and structure
[5] One Centre of major, one Strategic Centre for Science, Technology and automation in the field

2.1.2 Weaknesses-

[1] Incomplete structure publishing research results
[2] Weak researcher mobility and other risk
[3] Early stages of research career hammered by inadequate supply of dissertation opportunities utilization of funding opportunities offered by EU and other foreign flexibility programmes

2.2.1 Opportunities-

[1] Creating critical mass and rising exposure through concurrent effects of institution of Finland, Tekes and EU funding
[2] Utilizing the ability to react rapidly research into rising themes and needs Increasing universal research participation
[3] New university agreements on association

2.2.2 Threats-

[1] Loss of production chains reducing the number of research topics
[2] Culture trumps technology among young people, makes student contracting more difficult
[3] Ever tighter budgets due to economic uncertainty
[4] Financing directed at existing themes
[5] Research range trimmed based on performance indicators

IV. MATCHING AND CONVERTING

There are two simple methods of utilizing result of the SWOT analysis is 'matching 'and 'converting'. **3.1.1Matching** is used to detect competitive advantages matching the strengths to opportunities. Ex. In the 1980s UK clothing retailer Marks and Spencer had a heavy presence in the high street and a client construct that purchased in light of the base of quality rather than price. M&S were able to leverage these strengths to effect the opportunity to sell high-quality food and beverages to its consumer. **3.1.2Converting** is to apply change over weaknesses or threats into strengths or opportunities. An example of conversion strategy is to find to modern markets. If the threats or weaknesses cannot be converted a company should attempt to stay away from them.

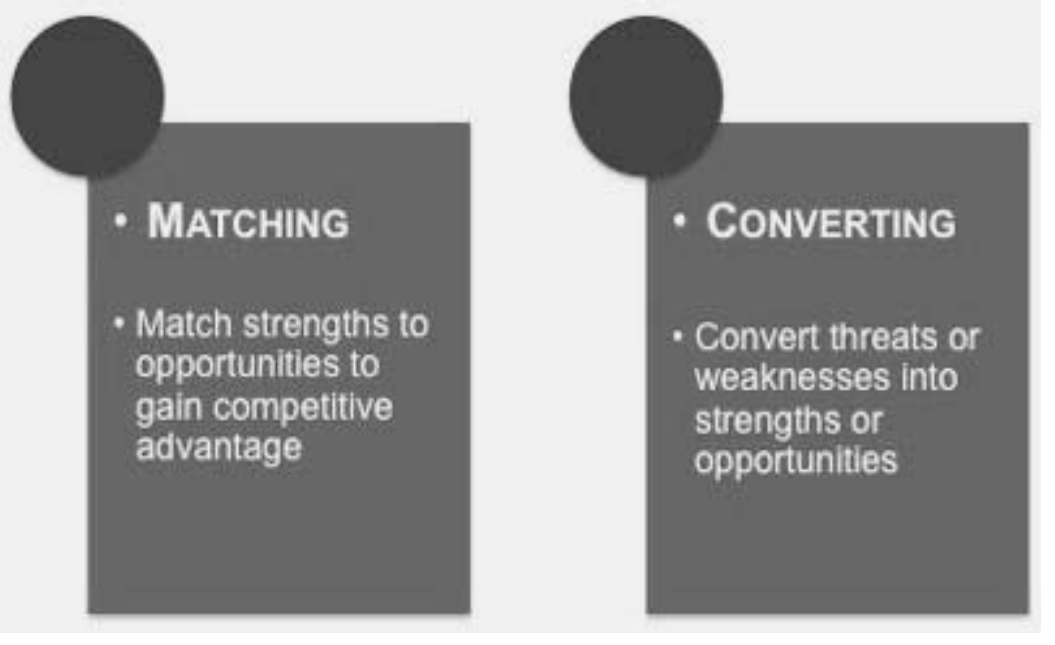

Fig. 2 MATCHING AND CONVERTING

V. Benefites of SWOT Analysis in Businesses-

[1] The main benefit of SWOT Analysis is no cost - anyone who understands your business can perform a SWOT analysis.
[2] It provides Builds organization's strengths.
[3] Using opportunities leads to ways to better a business in the event that they're put to proper use. It's best to prior one's resources
[4] Major benefits of conducting SWOT analysis is that helps you initiate matching and converting strategy.
[5] It helps in showing previous, present and future so that by using previous and current data, future plans can be chalked out.

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Indian Energy Scenario and Role of Renewable Sources for Sustainable Development

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Abstract—Growth and development of country depends on availability of energy with least possible cost. Power should be generated with least possible environmental issues to avoid future ill effect. The present paper reveals energy importance, current situation of power generation in India considering conventional and non- conventional sources and the future of the renewable energies .Work also discuss the trends in energy consumption, growth of the current grid, energy import.More emphasis is given to renewable energy sources as an eco-friendly option to generate power. Benefits arising from renewable energy can be considered in categories like generation of energy, generation of new working post and reduction of environmental pollution which are prime important for India.
Keywords-Power Generation, Energy Use, Conventional Sources, Renewable Sources.

I. INTRODUCTION

The historical as well as present day civilizations of mankind are closely interlinked with energy and in future our dependency upon energy for existence will be increase linearly. Energy is associated with physical substance but it is not a substance itself. Energy has become most important necessity to accomplish our day to day task. In today's era, energy is an irreplaceable element, playing leading role in making life easy and comfortable.The speedy growth of power capacity and a subsequent rise in demand can be accredited to several factors like Economic development and increasing affluence, growing rate of urbanization, increase per capita energy consumption, broadening access to energy in the country

As far as energy reserves in India are concern, conventional recoverable energy resources and its production are tabulated as shown in the table 1; India has fairly large reserve of coal. Although India's reserves of coal are large, there are number of problems which need to be noted. Such as, Indian coal has high ash content as much as 30-40%. This high ash contents add cost of transportation, burden on coal handling equipment. Another problem associated with calorific Value of Indian coal and less availability of coking coal of India. Oil resources are very less in India.

Table 1 Conventional energy resources available in India

Sr No	Energy source	Recoverable resources	Production (per year)
1	**Coal**	28.8 Thousand Mtoe	361 Mtoe
2	**Oil**	800 Million tonnes	38.2 Million tones
3	**Gas**	992 Mtoe	39.6 Mtoe
4	**Geothermal power**	10,000 MWe	

Energy consumption is one of the important tools to understand standard of living of person in the particular country. From figure 1 shows energy consumption for world, china and India. It is important to note that, India's energy use is very less than average energy use by world.

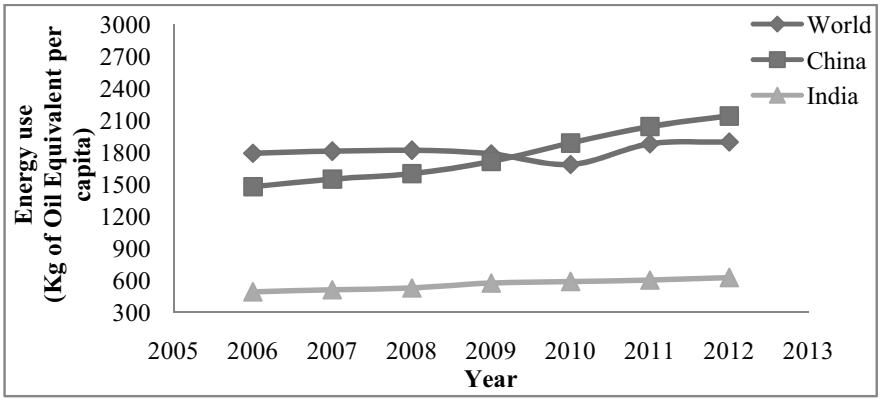

Figure 1 Comparative graph for Energy use (Kg of Oil equivalent per capita)

Being developing country, power requirement of India is high. Figure 2 gives comparative study of fossil fuel consumption (% of Total) for world, China and India. As expected India's fossil fuel consumption (% of Total) rises. Same type of contour is followed by China and world. China's fossil fuel consumption (% of Total) isgreaterwith comparison to India

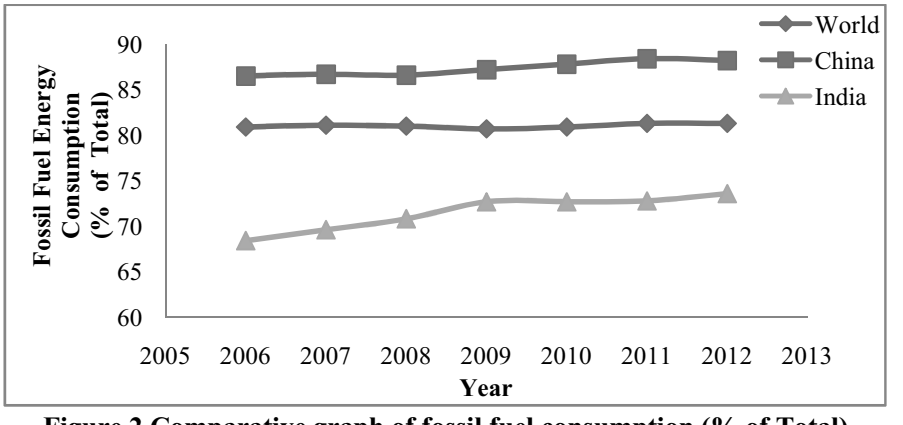

Figure 2 Comparative graph of fossil fuel consumption (% of Total)

Due to limited sources of conventional energy, we have to import energy. Energy import (Net % of energy use in Oil Equivalent) of India is increasing day by day and it warning alarm for India to take corrective action. Net import of India in 2006 was 20.5% which rises to 30.5% approximately in 2012.
Data on installed capacity for generating electrical power and percent contribution of various commercial sources is tabulated below. The installed capacity of India at the time of independence (in 1947) was only 1362 MW, increased to 16664 MW in 1973. The capacity till 31 of November 2015 is 282023.39 MW. It shows impressive growth in installation capacity of India. It is important to note that coal is a dominant source of electricity generation of India. The 60.54 % of total installations use coal as a primary energy source whereas electricity generation by Nuclear power is 2.04 %, which is least in all energy sources.

Table 2 Installed Capacity of Power Generation in India (in MW)(up to the 30th. November 2015)

Sr No	source	capacity	%
1	**Coal**	170737.88	60.54
2	**Gas**	24473.03	8.67
3	**Diesel**	993.53	0.35
4	**Nuclear**	5780.00	2.04

5	**RES**	37415.53	13.26
6	**Hydro**	42623.42	15.11

Based on the preceding survey it is important to note some useful observation. India has large amount of coal available but it is of low quality. Though the demand of energy in India is increasing, India's present power sources are not capable to fulfill the energy demand. India's energy import is continuously increasing which directly effect on the national currency.There is aneed to generate environment friendly power that raises energy efficiency as well as it is sustainable. As conventional sources are limited and has adverse effect on environment in order to fulfill energy demand, development of new and existing energy system is unavoidable. Tremendous research is already in the process of same direction. The primary of alternative energy which hold potential for futurecan be broadly classified as the nuclear option, wind energy, solar energy, biomass, hydro energy and other sources such as hydrogen.

Renewable Energy Sources in India

India has a vast potential of renewable energy resources, and it has one of the largest programs in the world for deploying renewable energy products and systems.India is playing active role in research and development of renewable energy due to Energy security issue, administration support, and climatic change, cost competitiveness of renewable, Favorable foreign investment and significant potential of renewable energyIndia is the only nation in the world to have a dedicated ministry for the renewable energy (Ministry of Non-Conventional Energy Sources, MNES). The ministry works for endorsing renewable energy technologies, creating favorable environment for promotion and commercialization of these technologies. By developing the technologies, it will not only reduce the energy gap but will also create millions of jobs. India is vigorously working on wind, solar, biomass, hydro, geothermal and biogas as alternate sources of energy

Table 3 Progress in renewable energy sources (Up to the 31th December, 2015)

Sr No	Energy Source	Cumulative Achievements	Sr No	Energy Source	Cumulative Achievements
Grid-Interactive Power (MW)			**Off-Grid/ Captive Power (MW)**		
1	**Wind Power**	25088.19	1	**Waste to Energy**	146.51
2	**Solar Power**	4878.87	2	**Biomass**	781.24
3	**Small Hydro Power**	4176.90	3	**Aero-Genrators/Hybrid**	2.67
4	**Bio-Power**	4550.55	4	**SPV Systems**	289.01
5	**Waste to Power**	127.08	5	**Water mills/micro hydel**	17.21

Solar Energy

Solar energy is very a large, inexhaustible, clean renewable resource with zero emission. It has got tremendous potential which can be harnessed using a variety of devices source of energy. India is endowed with vast solar energy potential. India is gifted with tremendous amount of solar energy(5,000 trillion kWh per year) which is a positive sign. Due to thelargeresearch and developments in solar energy,applications are easily available for industrial and domestic use with the added advantage of minimum maintenance. Solar energy could be made financially viable with government tax incentives and rebates.India also established the Jawaharlal Nehru National Solar Mission (JNNSM) in late 2009. The solar technology is organized under the following categories: passive solar day lighting, active heating

and cooling, PV electricity generation, concentrating solar power (CSP) electricity generation. With the Application of the photovoltaic effect;Photovoltaic (PV) solar technologies produce electricity. CSP technologies produce electricity by concentrating direct-beam solar irradiance to heat a fluid, which is then used in a downstream process for electricity generation.There are4680.80 MW of Grid Connected Solar Power Projects As on 30-11-2015

Wind energy

Wind power, was introduced in India very late, in 1990s. Faster technology development and its proper adaptation;in terms of total installed capacity of wind powerIndia is in top 10 countries (rankfifth largest country).The Potential for wind power generation for grid interaction has been estimated at about 1,02,788 MW considering the projects having wind power more than 200 W/sq. m at 80 m hub-height with 2% terrestrialaccessibility in potential areas for setting up wind farms at 9 MW/sq. km. In India's renewable energy industry,more than 70 percentof installed potential is due to Wind energy. Wind power will continue to be the biggest renewable energy sector in India, in terms installed capacities. MNRE invested in the Wind Resource Assessment Program and establishment of the Centre for Wind Energy Technology, which is important Centre for the MNRE's research and development work in the wind energy sector. MNRE have also involved in planning and support for planning, implementation and advancement of wind projects.A wind power project has high potential to generate new job position for skilled as well as unskilled people of India as shown in wind power project of Maharashtra, Haryana state. Wind Power technology are classified asHorizontal Axis Wind Turbine (Residential rooftops, industrial loads and commercial generations),Vertical Axis Wind Turbine (such as Darrieus wind turbine, Giromill turbine,Savonius wind turbine and Twisted Savonius wind turbine) and novel wind technology (KiteGen and MARS). The Indian wind energy scene is cheerful, with a large number of forays being made by MNC's (Multi National Company) such as vestas, gamesa, GE power etc. and with suzlon making abrupt pace in the International market.

Hydropower

Hydropower is a renewable energy resource because it uses the Earth's water cycle to generate electricity. According to report of Ministry of New and Renewable Energy, The total potential for power generation in the India from Hydropower plants is about 20,000 MW. Maximum harnessing of Hydropower is possible with river-based projects and in other States on irrigation canals such as Himalayan States.The first Hydropower plant in India was installed in Sidrapong (Darjeeling) having the capacity of 130 kW in the year 1897.Generally Hydro power projects are broadly classified according to installed capacities as small and large hydro power plant. In India, Small Hydro Power plants are having less or equal to25 MW station capacities. Small Hydro Power plantsare often considered advantageous over large hydro power plant due to construction, maintenance and less environmental and social issue.The government of India has, over the years, taken a number of initiatives to prioritize hydropower development and to attract investments in the sector.

Biomass Energy

Biomass energy is the important source of energy to reduce India's reliance on fossil fuels by utilization of thermo-chemical conversion technologies. Biomass has huge potential in an agricultural economy of India. Biomass is also capable of providing secure energy. In case of energy use of India, biomassderived energy isabout 32% of the total primary energy and more than 70% of the India's population still relays upon biomass for its energy requirements. Generation costs for biomass are similar to those of wind energy. In addition, the increased utilization of biomass-based fuels will be instrumental in safeguarding the environment, development and health improvements in rural areas. Biomass energy could also one of

the encouragements in streamlining the agricultural economy. Biomass provides advantages like reduce the electricity deficiency and provide farmers with trustworthy additional bases of revenue. Biomass energy is the utilization of organic matter present and can be utilized for applications such as to produce heat and electricity, in combination with fossil fuels (co-firing) and it can be used as transportation fuels.

Waste-To-Energy

Indian waste to energy sector is composed to grow at a rapid pace in the years to come. The dual pressing needs of waste management and reliable renewable energy source are creating openings for financiers and project developers in the waste to energy sector. Waste-To-Energyplants offer significantreimbursementsin terms of the ecofriendly electrical powergenerationas well as environmentally sound waste management and disposal. Waste-to-energy amenitiesyieldenvironmentally free renewable energy by utilization of biochemical, physicochemicaland thermochemical methods. Furthermore, waste-to-energy plants are highly efficient in harnessing the unexploited sources of energy from a variety of wastes. The major Advantages for adopting technologies for recovery of energy from urban wastes are to reduce the quantity of waste and net reduction in environmental pollution, besides generation of substantial quantity of energy.

II. CONCLUSION

- India has limited conventional energy sources which are unable to complete energy demand of country hence we have to import fuels on large scale consuming large part of national currency
- Though renewable energy has limitations of acquiring land,development of transmission setup in remote areas, seasonal variability of intensity,large initial development; renewable energy sorces are encouraging sources and available in large quantities in India to meet rapidly increasing demand of electricity
- As India becoming more keen & familiar with renewable power, it is expected to adopt faster and at a much larger scale.

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Exergy Analyses of Irreversible Cycle

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Abstract-Energy is one of the fundamental forms of resource. Energy includes quantity as well quality. All the forms of energy are inter-convertible. Inter-conversions between thermal and mechanical energy has been studied and analyzed in the present work. ***Exergy*** is defined as the energy that can be extracted from a conversion system. When the system is allowed to interact with a large reservoir at some reference state, this work potential is the exergy of the system.
The proposed research is focused on exergy analyses based on technical and economic aspects of such resource conversion systems and to optimize various performance parameters used in these systems by taking finite heat exchange areas and temperature differences in consideration. The objective behind it is to understand the irreversibilities in the conversion systems in order to effectively utilization of energy.

Keywords: Exergy, Anergy, Carnot cycle**.**

I. Introduction

Energy is one of the fundamental resources available to mankind. It transforms itself through certain systems known as conversion systems. Energy is conserved for any evolution in an isolated system and also that entropy increases for any evolution in an isolated system. The energy that can be extracted is extractable energy referred to as exergy. The energy that cannot be extracted or is unavailable is called Anergy. Exergy is energy weighed according to quality.
Energy conversion systems include heat-engines, heat-pumps and refrigerators etc. Performance analysis of such conversion systems with regards to the consumption and generation, especially in power producing devices, has been the single most important objective of research across the globe. Judicious use of energy has been the cornerstone of all the energy policies adopted across the world. Therefore, it is desirable to provide a base for efficient utilization of energy even as new avenues of energy exploration and conservation have come up today.
According to the second law of thermodynamics, the energy is preserved for any evolution in an isolated system but the entropy increases for any evolution. This has been attributed to the irreversibilities in conversion systems. An irreversibility parameter is used to factor the internal reversibilities in the Second law inequality.

II. Literature Survey

In 1824, Carnot [1] proposed a cycle composed of reversible processes which later formed the basis of all the future heat-engine and heat-pump cycles. If the temperatures of hot and cold thermal reservoirs are assumed as TH and TL respectively, the efficiencies of heat-engine and coefficient of performance of heat-pump systems are given as

$$\eta \text{HE} = 1 - \frac{TL}{TH} \qquad 1$$

$$\text{COP}_{\text{HP}} = \frac{TH}{TH - TL} \qquad 2$$

All processes of the system are assumed reversible and taking place in quasi-static fashion.Dincer and Cengel [2] explain that energy, entropy and exergy concepts come from thermodynamics and are applicable to all fields of science and engineering. They provided background for better understanding of these concepts and their differences among various classes of life support systems with a diverse coverage and highlighted the importance of the aspects of energy, entropy and exergy and their roles in thermal engineering.

Further, De Vos [3], Chen and Yan [4] and Gordon [5] discussed the effect of a class of heat-transfer laws on the performance of reversible cycles systematically using a non-zero integer index, n

$$Q = \alpha(T_H^n - T_X^n) \qquad 3$$

(where, n =1 for linear heat-transfer law, n = 4 for the Stefan–Boltzmann thermal radiation law) where heat is transferred from heat source at temperature TH to working fluid at TX and α is a general heat-transfer coefficient.

Gordon [6] illustrated that the optimal operating temperature for solar-driven heat-engines and solar collectors is relatively insensitive to the engine design point. Agnew et al. [7] optimized a reversible Carnot cycle with convective heat transfer and studied the effect of different modes of heat transfer on the efficiency at maximum power conditions. Sahin [8] in his analysis of a solar driven reversible Carnot heat engine assumed radiative heat transfer from the high temperature reservoir and convective heat transfer to the low temperature reservoir. Chen et al [9] took the power output of the cycle as objective for performance optimization of an irreversible regenerated closed Brayton cycle coupled to constant-temperature thermal energy reservoirs in the viewpoint of finite time thermodynamics or entropy generation minimization. They derived the relations between power output and pressure ratio with the heat resistance losses in the hot- and cold-side heat exchangers and the regenerator, the irreversible compression and expansion losses in the compressor and turbine, and the pressure drop loss in the piping.

Andresen et al. [10] considered the effect of friction, thermal resistance and heat leakage to determine the maximum power and maximum efficiency of heat engines with two or three heat reservoirs. Chen et al. [11] determined the optimal working fluid temperatures and heat-transfer areas for an irreversible radiant Carnot heat-engine and found the thermal efficiency at maximum specific power output.

Many researchers [12-20] studied the effect of heat leakage on the performance for several types of heat engines viz. Brayton cycle, Rankine cycle and cycles with sizeable heat leaks with frictional losses. Chen et al [21] performed the theoretical analysis of the performance of a regenerative closed Brayton cycle with internal ireversibilities.

III. IRREVERSIBLE CARNOT HEAT-ENGINE MODEL WITH THERMAL RESERVOIRS OF FINITE HEAT-CAPACITANCE WITH HEAT LEAKAGE

The generalized irreversible Carnot heat-engine working between two thermal reservoirs of finite heat-capacitance and its T-s diagram are shown in figures 1. The following assumptions are made for this model.

3.1 The working fluid flows through the closed system in a steady state condition.

3.2 The cycle consists of two isothermal (2-3, 4-1) and two adiabatics (1-2, 3-4). All processes being irreversible.

3.3 There are external irreversibilities due to heat transfer in the high and low temperature heat-exchangers between the heat-engine and its surrounding heat-reservoirs. Because of the heat-transfer, the working fluid temperatures (T_X and T_Y) are assumed different from the reservoirs' temperatures.

3.4 Counter-flow heat exchangers enable heat-exchange between the working and reservoir fluids.

3.5 There is a constant rate of heat leakage (Q_{LK}) from the heat-source to the heat-sink.

3.6 The reservoirs of finite heat capacities are assumed.

3.7 Both the irreversibilities in the system are present

3.7.1 External irreversibilities due to heat resistances between the working-fluid and the reservoirs.

3.7.2 Internal irreversibilities due to miscellaneous factors such as friction, turbulence and non-equilibrium activities inside the heat-engine. A cycle irreversibility parameter (R) is introduced in the expression to characterize the additional internal miscellaneous irreversibility effect.

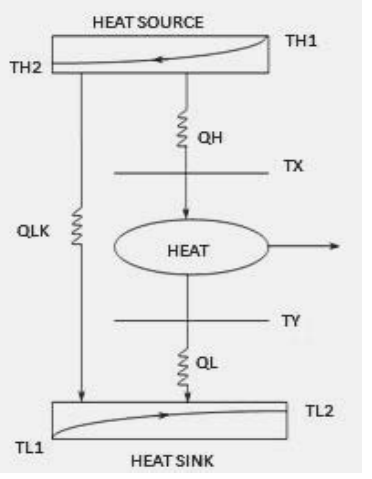

Fig 1 Schematic diagram of an irreversible heat engine

The heat conductance is defined as product of heat-transfer surface area and heat-transfer coefficient. The heat-conductance of the hot and cold side heat-exchangers are κ_H and κ_L respectively. The thermal-capacity rate is defined as the product of mass-flow rate and specific heat of the fluid. The thermal-capacity rate of the hot side heat reservoir is C_H, and the inlet- and outlet-temperature of the heating fluid are T_{H1} and T_{H2}, respectively. The thermal-capacity rate of the cold side heat-reservoir is C_L, and the inlet and outlet temperatures of the cooling fluid are T_{L1} and T_{L2}, respectively. Temperatures of hot and cold side working fluid of the heat-engine are T_X and T_Y respectively.

IV THERMODYNAMIC ANALYSIS

The thermodynamic analyses of generalised irreversible Carnot heat-engine cycle with finite-heat capacitance of the external fluids in the source/sink heat reservoirs is carried out below based on the maximum power and maximum power density. It is done taking into consideration the irreversibility in the Carnot heat-engine cycle due to external as well as internal effects. Counter-flow heat-exchangers are assumed in the analysis. Then the optimization of the *thermal heat conductance ratio has been carried out before the numerical study* performed and results discussed.

The rate of heat-flow (Q_H) from high temperature heat-source to the system is given by:

$$Q_H = C_H(T_{H1} - T_{H2}) = \varepsilon_H C_H(T_{H1} - T_X) \quad (4)$$

Similarly, the rate of heat-flow (Q_L) from system to the low temperature heat-sink is

$$Q_L = C_L(T_{L1} - T_{L2}) = \varepsilon C_L(T_y - T_{L1}) \quad (5)$$

where ε_H and ε_L are, respectively, the effectiveness of the hot- and cold-side of heat exchangers. These are defined below as:

$$\varepsilon_H = 1 - \exp[-N_H] \quad (6)$$

$$\varepsilon_L = 1 - \exp[-N_L] \quad (7)$$

The number of heat-transfer-units, NH and NL are based on the minimum thermal-capacitance rates, that is:

$$N_H = \frac{\kappa_H}{C_H} \text{ and } N_L = \frac{\kappa_L}{C_L} \quad (8)$$

The rate of heat leakage, QLK, from the hot-reservoir at mean temperature THM to the cold-reservoir at mean temperature TLM with thermal-conductance χ is given by

$$Q_{LK} = \chi UA(T_{HM} - T_{LM}) \quad (9)$$

where, the mean temperatures are the arithmetic means of the reservoirs' temperature variations ,

$$T_{HM} = \frac{(T_{H1} + T_{H2})}{2} \text{ and } \quad T_{LM} = \frac{(T_{L1} + T_{L2})}{2} \qquad 10$$

The total heat rate, QHT, transferred from the hot-reservoir constitutes part that is transferred to the hot working-fluid and the part that goes as the heat leakage.

$$Q_{HT} = Q_H + Q_{LK} = \varepsilon_H C_H (T_{H1} - T_X) + \chi UA(T_{HM} - T_{LM}) \qquad 11$$

Similarly, the total heat rate, QLT, transferred to the cold reservoir is, expressed as

$$Q_{LT} = Q_L + Q_{LK} = \varepsilon_L C_L (T_Y - T_{L1}) + \chi UA(T_{HM} - T_{LM}) \qquad 12$$

The power produced by the engine according to first law of thermodynamics is.:

$$W = Q_{HT} - Q_{LT} = \varepsilon_H C_H [T_{H1} - T_X] - \varepsilon_L C_L [T_Y - T_{L1}] \qquad 13$$

The second law for an irreversible cycle is a constraint and requires that:

$$\frac{Q_H}{T_X} \prec \frac{Q_L}{T_Y} \quad \text{and} \quad \frac{Q_H}{T_X} = R\frac{Q_L}{T_Y} \qquad 14$$

where, R is the cycle irreversibility parameter and accounts for all the reasons accounted for the internal irreversibility. These involve those that generate entropy or destroy exergy as power-output from the system is taken. It is defined here as

$$R = \frac{S_3 - S_2}{S_4 - S_1} \qquad 15$$

The optimal values of the working fluid can be obtained at low and high-temperature side respectively with the help of ξ heat-capacity ratio and τ extreme temperature-ratio, defined as,

$$\xi = \frac{C_H}{C_L} \text{ and } \tau = \frac{T_{L1}}{T_{H1}}$$

With substitution, the **Maximum Power (MP)** and maximum efficiency of the system can be evaluated analytically.

Maximum Power Density (MPD) is the ratio of power obtained from a heat-engine to the maximum specific volume in the cycle.

$$W_d = \frac{W}{V_{\max}}$$

The power produced by the engine according to the first law is given by

$$W = Q_{HT} - Q_{LT} = \varepsilon_H C_H [T_{H1} - T_X] - \varepsilon_L C_L [T_Y - T_{L1}]$$

The power density, then takes the form:

$$W_d = \frac{\varepsilon_H C_H [T_{H1} - T_X] - \varepsilon_L C_L [T_Y - T_{L1}]}{V_{\max}}$$

Assuming an ideal gas, the maximum volume (Vmax) in the cycle is V2

$$V_2 = \frac{mR_g T_Y}{p_{\min}}$$

where m is the mass of the working fluid and R_g is the ideal-gas constant. In the analysis, the minimum pressure ($p_{\min}$) in the cycle is taken to be constant. The power density then becomes,

$$W_d = \left(\frac{p_{\min}}{mR_g}\right)\left[\frac{\varepsilon_H C_H [T_{H1} - T_X] - \varepsilon_L C_L [T_Y - T_{L1}]}{T_Y}\right]$$

V. RESULTS AND DISCUSSIONS

NUMERICAL STUDY

Finite-time-thermodynamic analysis has been carried out on irreversible Carnot heat-engine cycle with variable temperature heat reservoirs. The parameters optimized and used for comparison were Power Output and Power Density. During the simulation using Mathcad 14, while varying any one parameter all other parameters are assumed to be constant as given below:

T_{H1}= 1000 K, R= 0.8, τ = 0.2, ξ= 1, χ = 0.05, $C_H = C_L$ = 1 kW/K and $\varepsilon_H = \varepsilon_L$, UA=1kW/K

The observations are shown with the help of graphical representation in Figs. 2-5.

5.1.1 An increase in τ and χ causes the thermal efficiencies to get closer to each other. That is, the thermal efficiency advantage of the MPD conditions over MP conditions ($\Delta\eta = \eta_{mpd} - \eta_{mp}$) decreases with the increase in τ and χ. That is, for τ = 0.2 and χ = 0, η_{mp} = 0.5 while η_{mpd} = 0.574, and for τ = 0.2 and χ=0.05, η_{mp} = 0.421 and η_{mpd} = 0.464 but for τ = 0.5, χ = 0, η_{mp} = 0.209 while η_{mpd} = 0.214. The following above observations can

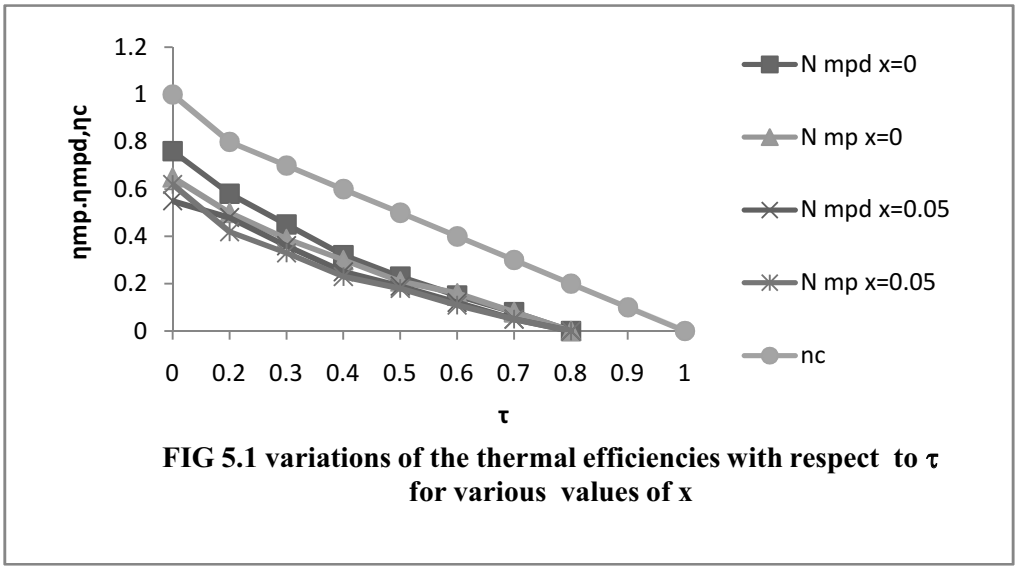

FIG 5.1 variations of the thermal efficiencies with respect to τ for various values of x

5.1.2 The variations of the thermal efficiencies at MP and MPD conditions with irreversible parameter R and heat leakage coefficient χ are shown in Figures 5.2 and 5.3 respectively.

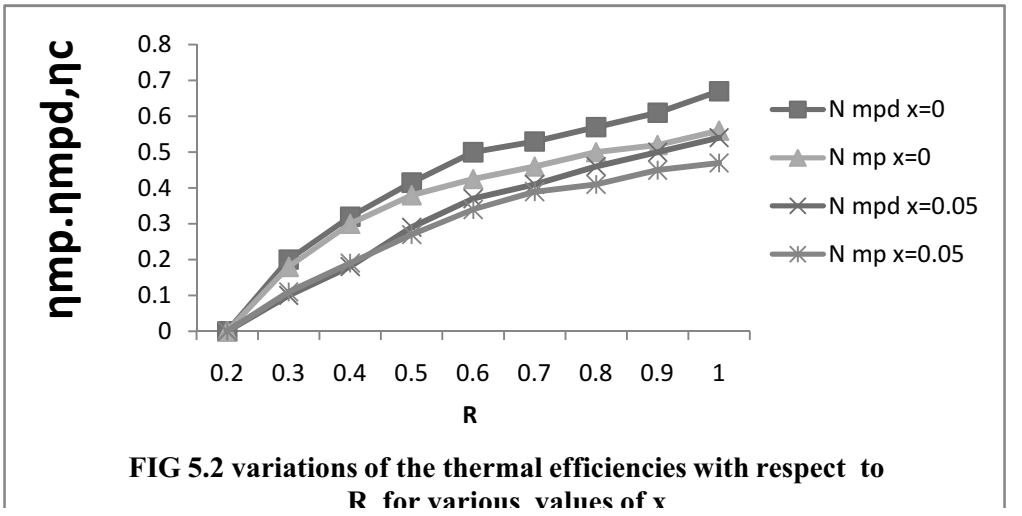

FIG 5.2 variations of the thermal efficiencies with respect to R for various values of x

5.1.3 The variations of the thermal efficiencies at MP and MPD conditions with heat capacity ratio (ξ) for various values of heat leakage coefficient χ are shown in Figure 3.7. For a given value of ξ , as the value of χ increases, value of η_{mpd} decreases, i.e., for $\xi = 0.1$, when $\chi = 0$, $\eta_{mpd} = 0.523$ and when $\chi = 0.05$, $\eta_{mpd} = 0.272$.

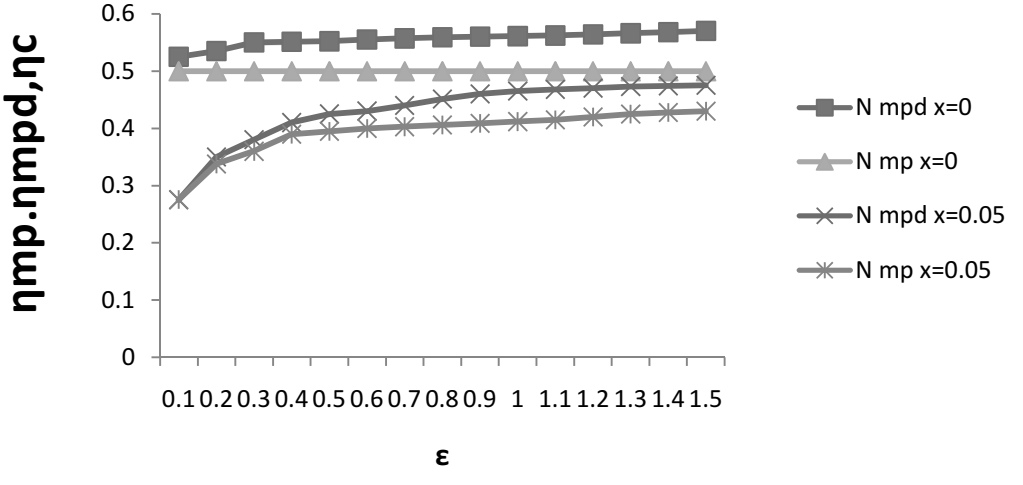

FIG.5.3 variations of the thermal efficiencies with respect to thermal capacitive ratio for various values of x

CONCLUSIONS

A comparative performance analyses have been performed for an irreversible Carnot heat-engine cycle coupled to variable-temperature heat-reservoirs. Power output and Power Density of a Carnot heat-engine cycle has been chosen as the optimisation criteria with the constraints of the Second Law of Thermodynamics and the finite-size of the heat-exchange area. Maximum Power Density (MPD) and Maximum Power (MP) conditions are the basis of comparison. The considered heat-engine cycle is modelled such that it includes the major irreversibilities existing in real heat-engines. The analyses showed that the thermal efficiency at MPD condition is always greater than that at MP conditions meaning the engines designed on MPD criterion is not

only smaller in size but thermally is more efficient compared to one designed on MP conditions. However, this advantage goes on decreasing with the increasing value of internal irreversibility and heat leakage. Hence, it is more important to take precautions to reduce internal irreversibility and heat leakage in the design of heat-engines based MPD conditions when compared the one based on MP conditions. It has also been evaluated that the optimal conductance allocation parameter at MPD conditions is approximately equal to 0.4 and is not affected by heat-reservoir temperature ratio (τ) at the inlet conditions and the irreversibility parameter (R). However, its value at MP conditions does not remain constant and it increases with the value of R.

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A Review on Internally Cooled Liquid Desiccant Air Dehumidifier

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Abstract—Better indoor environmental quality at lower energy consumption and less environmental impact are the goals of researchers working in the field of air conditioning. Liquid desiccant based air conditioning (LDAC) system seems to have good potential as an alternative air conditioning system for achieving above goal. Dehumidifier of an LDAC system is an air-liquid desiccant contacting device responsible for air conditioning. Most of the times, the dehumidifier used in LDAC systems is an adiabatic device. High LD flow rate necessary in such systems increase parasitic power consumption in these systems. An internally cooled dehumidifier cools LD as well as air helping to achieve sensible cooling as well as reducing flow rate of LD. Development and analysis of such a device is a bit difficult and getting more attention only recently. The current work focuses on the internally cooled dehumidifier and presents a review of the work reported in literature. This work provides direction and a good starting point for researchers working in this field.
Keywords-Air Conditioning, Contacting Device, Dehumidification, Liquid Desiccant (LD).

I. INTRODUCTION

Creating good indoor environmental quality with least environmental impact and energy consumption are the major challenges in the field of air conditioning. At present, the most widely used air conditioning systems are based on the vapour compression refrigeration (VCR) system, which is driven by electrical energy. However, the increasing use of air conditioners contributes to energy scarcity and environmental degradation. Alternative air conditioning systems like evaporative cooling, vapour ab/adsorption and desiccant based air conditioning systems are being investigated by researchers to overcome above problems.

Ability to use low grade thermal energy, high density energy storage near ambient conditions, possibility of multi-staging, air washing capability and flexibility in laying the components are some of the favourable features of the LDAC systems. Commonly used liquid desiccants (LDs) are generally aqueous solutions of salts like calcium chloride, lithium chloride and potassium formate. These solutions have high affinity for water vapour at lower temperature and higher concentration. Thus, they can provide dehumidification of air or latent cooling of the space when brought in contact with it in an air-LD contacting device [1]. Hybrid LDAC and VCR systems can cater to sensible as well as latent load more effectively with lower energy consumption as compared to stand-alone VCR systems.

1.1. Principle of Liquid Desiccant Dehumidification

Fig. 1 shows general hardware for desiccant based dehumidification system and common processes for these systems [2]. While the desiccant removes moisture from air on one side in dehumidifier, it needs to reject moisture into ambient in a component called regenerator in order to continue working in a cycle. Sensible cooling accompanies, precedes or follows dehumidification of air as the latent heat of water vapour gets converted to sensible heat in the dehumidification process and is picked up by air as well as LD. Supplementary process of evaporative cooling may be used after dehumidification to reduce temperature of air further. Air and LD are brought in contact with each other for heat and mass transfer in the dehumidifier and the regenerator of LDAC system. So, they are called contacting devices, which are discussed in following sections.

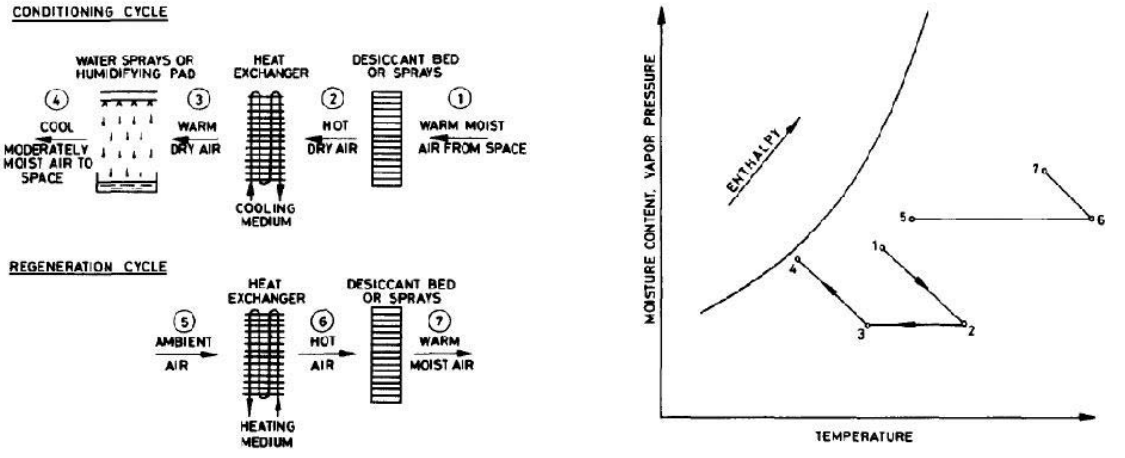

Fig.1 Curves of water vapor pressure at desiccant surface as a function of temperature [2]

1.2. Liquid Desiccant Air Contacting Devices

The contacting devices can have different configurations like packed bed tower, spray tower and falling film columns (Fig. 2). Depending upon whether the cooling is provided inside it or not, the dehumidifier can be categorized as adiabatic or internally cooled dehumidifier.

1.2.1. Packed bed tower

Packed bed tower is the most common type of contacting device for LDAC systems found in literature. The liquid desiccant is sprayed homogeneously on the packed bed with the help of nozzles. LD makes thin film over the packing media over which the air is passed with the help of a fan. Structured packing is more common as compared to random packing due to lower air side pressure drop. Air velocity is kept low, in the range of 1.2 m/s to 4 m/s to avoid entrainment of droplets in the air stream. Packed bed dehumidifier needs wider air passages for air in order to prevent the desiccant from restricting the airflow. This increases the size and cost of equipment. Absolute humidity change in the range of 2 to 11 g/kg is reported in literature [3].

1.2.2. Spray tower

It is an empty cylindrical shell which is made of steel or plastic. Liquid desiccant is sprayed from the top of the vessel with the help of nozzles. This device offers lower pressure drop on air side but the chances of carryover of liquid droplets is high due to finer droplets of LD created to increase surface area of contact. Lower dehumidifier efficiency, in the range of 30 to 60% is reported in literature due to shorter residence time. There is no deposition of scale or dirt in the tower and it is highly suitable for highly viscous solutions [4].

1.2.3. Falling film type contacting device

A downward falling thin film of liquid desiccant is created over multiple parallel surfaces of this device. The air moves in counter or cross-flow from the passages between these surfaces [5]. Low air side as well as LD side pressure drops are the advantages of these devices, but uniform distribution of the fluid over multiple surfaces as well as across the flow cross-section are the major challenges here.

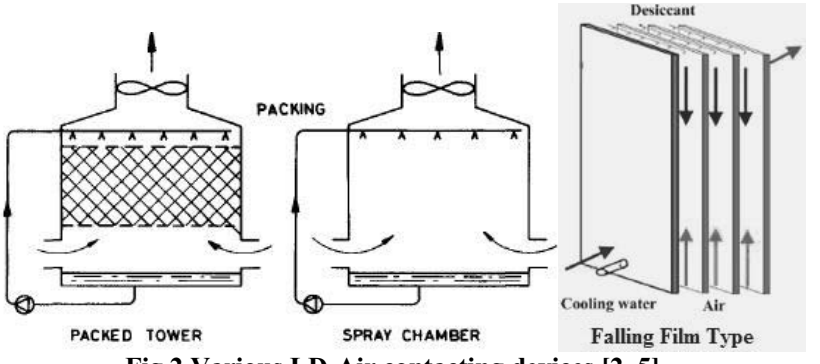

Fig.2 Various LD-Air contacting devices [2, 5]

II. INTERNALLY COOLED DEHUMIDIFIER

In an adiabatic contacting device, as LD absorbs moisture from air and latent cooling converts into sensible heating, the temperature of LD and air rises. As the temperature of LD rises and concentration decreases, the ability of LD to absorb moisture rapidly decreases. A sensible cooling media may be used to cool LD and air inside the dehumidifier [3]. This not only provides total cooling of air in same device, but also widens the concentration range of LD by keeping it at a lower temperature. Such systems can have lower parasitic power consumption due to lower mass flow rate of LD [6].The cooling media in an internally cooled dehumidifier can be cooling tower water, refrigerant, chilled water or ground water. Such an internally cooled dehumidifier may be a plate heat exchanger or a finned tube heat exchanger. Due to complexity of the configuration as well as analysis, the internally cooled dehumidifier is studied less in literature. The heat and mass transfer processes in various configurations of such devices need to be completely understood and characterized.

2.1. Plate Heat Exchanger as Dehumidifier

Khan and Martinez developed a mathematical model to predict the performance of an internally cooled parallel plate absorber with nearly isothermal operation using LiCl as LD [7]. The model was based on the control volume numerical method and the absorber was divided into a finite number of control volumes in the process air flow direction. With counter flow arrangement, return air was cooled and dehumidified to 23°C and 0.009 kg/kg_{da} from process air at 32°C and 0.022 kg/kg_{da} humidity. Chang et al analyzed the performance of a parallel plate cross flow dehumidifier and found that, moisture removal rate in internally cooled dehumidifier was 20% higher than the adiabatic one under the same operating conditions. The effect of flow pattern, especially the flow direction of air to desiccant on the internally cooled dehumidifier performance was numerically analyzed. Adopting the heat and mass transfer model as well as experimental results from the literature, they developed the model to predict the performance of the dehumidifier within 13% accuracy. The results showed that counter-flow configuration of air and desiccant is superior for dehumidification, while parallel flow configuration performs the poorest. They also proved that the internally cooled dehumidifier has better mass transfer performance compared with the adiabatic contacting device with external heat exchanger [8-9].

A 128-plate conditioner was designed to cool and dry3200 m^3/h (1900 cfm) of air from 27.5°C and 0.0120 kg/kg to 25.3°C and 0.0062 kg/kg when it was cooled with 23.4°C water. At this operating conditioner, the desiccant-to-air mass flow ratio (m_l/m_a) was 0.04 and the desiccant was a 39.7% lithium chloride solution. The sensible and latent cooling was 3.0 kW and 15.4 kW respectively. Complete wetting of the plate surfaces was not achieved and the delivered latent cooling was only 55% of the design value. [10]. Yin et al. investigated the behavior of a novel internally cooled counter-current dehumidifier based on the plate-fin heat exchanger (PFHE) by experimentation and found that there was better contact between air and liquid desiccant and the internally cooled PFHE has 13-20% higher humidity ratio (ΔW) change compared to adiabatic contacting device[11].

2.2. Finned Tube Heat Exchanger as Dehumidifier

Khan used a simple NTU-effectiveness method for solving a steady state two dimensional model numerically [12-13].Air was in cross-flow to the desiccant and the cooling water (or refrigerant) was also in cross-flow to the desiccant. Khan estimated the average heat transfer coefficient by using fully developed turbulent flow correlations reported in previous literature [13]. Ren et al. investigated four possible flow arrangements and three types of commonly used liquid desiccants [14]. Their one-dimensional analytical model was considered the variations of heat and mass transfer coefficients, surface wettability and Lewis factor along the height of the exchanger (Fig. 4). Their study however, was confined to the cases where the changes in the solution concentration and the flow rate are relatively small.

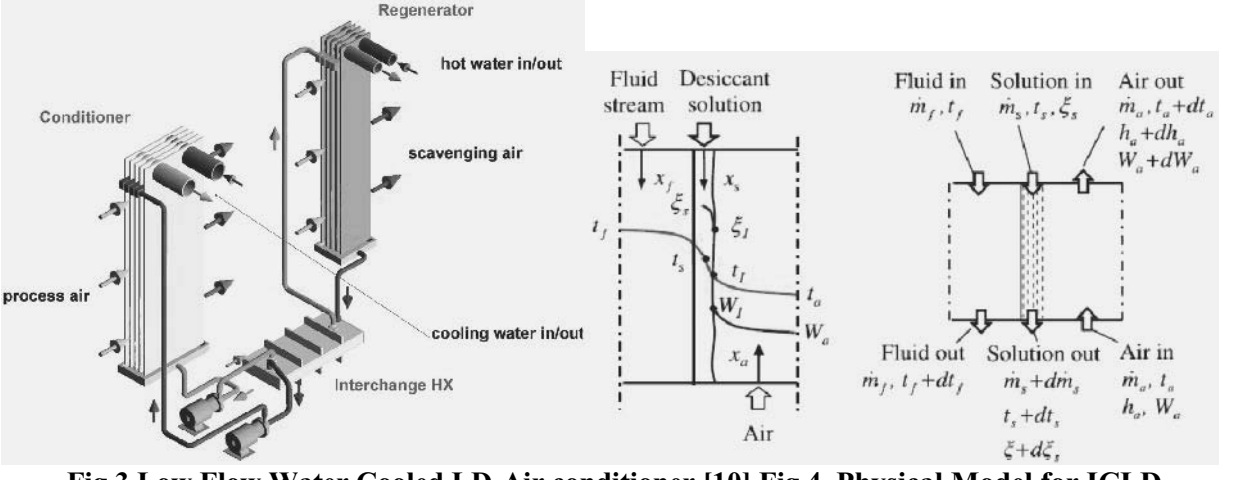

Fig.3 Low Flow Water Cooled LD-Air conditioner [10] Fig 4. Physical Model for ICLD Dehumidifier [15]

A cross-flow fin-tube internally-cooled dehumidifier was designed and investigated by experimentation as well as simulation by Yimo et.al [15]. Influences of various inlet parameters on the dehumidification performance were analyzed to derive empirical correlation for heat transfer coefficient as a function of solution mass flow rate and concentration X_s, pipe outer diameter d_o and conductivity and kinematic viscosity of air at average temperatures and air velocity at the narrowest cross section v_{fmax}. It was predicted that the optimum air flow rate was 0.05 kg/s with mass ratio of 2.8 and the best length in the direction of air flow was 0.3 m. A, B, C and D are constants.

$$h_c = A \times e^{(B-(X_s-30))} \times (C \times (m_s - 0.15) + D) \times \left| 0.297 \frac{K_m}{d_o} \left(\frac{v_{fmax} \times d_o}{\nu} \right)^{0.602} \right| \ldots\ldots\ldots (1)$$

Chung and Wu experimentally tested a U-shape tunnel with eliminators and fin coils as spray-tower absorber operating with tri-ethylene glycol as LD [4, 16]. Both air and LD were introduced at the top of the tower with co-current flow with air. They found that the absorption efficiency increases as the air flow rate decreases, the solution flow rate increases or as the solution temperature decreases (Fig 5). The overall mass transfer coefficient increased with increasing air and solution flow rates, solution concentration and inlet air humidity. Performance of the spray towers with and without fin coils was compared and it was found that the efficiency of the absorber with fin coils was 20-30% higher.

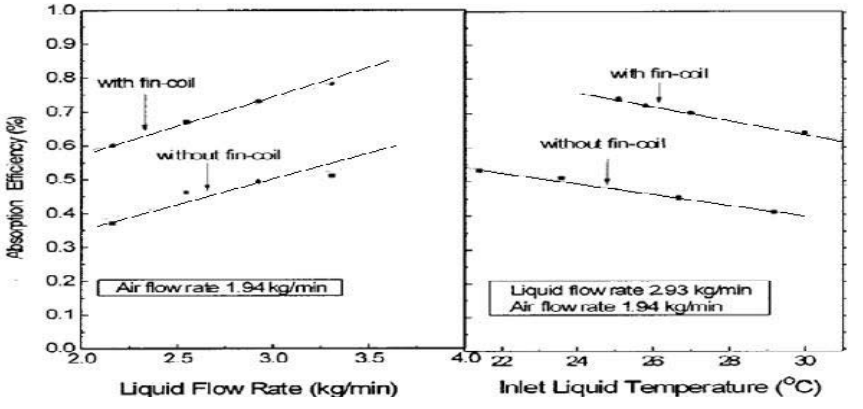

Fig.5 Absorption Efficiency for variations in Liquid Flow Rate and Inlet Temperature [4]

Yamaguchi et al. developed a mathematical model to predict COP of hybrid liquid desiccant air-conditioning system consisting of a liquid desiccant system and a vapour compression heat pump using R407C as refrigerant and coolant [17]. The air was cooled from 30 to 22.2ºC with system COP of 2.71 and the heat pump COP of 3.82.The system could dehumidify 5.9 g/kg$_{da}$ under the conditions of summer. The results of simulation were validated with only one set of experimental results. Mehta and Badrakia could significantly enhance the capacity of cooling water coil for total cooling (32% for water at 22^{o}C when inlet humidity was 20.3 g/kg$_{da}$) by creating LD film over it with marginal increase in electrical power consumption in the system. Latent cooling could be achieved at even at such a high temperature of cooling water [18]. Distribution of LD over the fins was done with the help of a perforated tube, but this was found to be insufficient for good wetting of fins.

Table 1 summarizes the heat and mass transfer performance of the internally cooled LD-Air contacting devices as dehumidifier from literature. Dehumidification effectiveness and moisture removal rate were mainly adopted as indices to describe the combined heat and mass transfer performances.

Table.1 Summary of Review on Internally Cooled LD Air contacting Devices

Reference	Scheme and Methodology	Conclusion
Lavemann, (2006)	Experimental performance, 128-plate heat exchanger as conditioner, LD: 39.7% LiCl	Complete wetting of the plate surfaces was not achieved Latent cooling was only 55% of the design value
Chung and Wu (1998)	Experiments with refrigerant coolant	Mass transfer coefficient using vapour pressure of desiccant solution using Buckingham Pi method
Khan and Martinez, 1998	Cooling fluid air/water, LD: LiCl, coolant water and air, ε-NTU method	Moisture effectiveness and enthalpy effectiveness introduced as number of mass transfer units $NTU_m = \frac{h_m A}{m_a}$ where h_m: mass transfer coefficient
Liu 2009	Mathematical model for all flow directions of LD and air	Introduced concept of number of heat transfer units and mass transfer units based analysis
Yin (2008)	Plate heat exchanger made of stainless steel as dehumidifier/ regenerator, co-current flow pattern for both air and desiccant	Film thickness is not considered Internally cooled system had change in absolute humidity ratio (ΔW) 0.5 g/kg more than that of the adiabatic dehumidification
Ren (2007)	Parallel or counter flow pattern, LiCl, LiBr and 35-40% $CaCl_2$, 1-D differential model solved with Runga-Kutta 4th order integral approach	Considered the effects of solution heat and mass transfer resistances, variations of solution flow rates and non-unity value of Lewis number, incomplete surface wetting

Seiichi Yamaguchiet.al	1-D mathematical model, hybrid system using refrigerant R407C	Considered compressor efficiency and heat exchanger efficiency, only a single run of experiment
Mehta and Badrakia	Used finned tube cooling water coil as dehumidifier, experimental work	Latent heat transfer could be achieved even at cooling water temperatures higher than dew point

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FEA of Titanium Helical Gear Set

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Abstract- The main focusing areas of this analysis are to Modelling the gear without losing its geometry in Pro/engineer software. To analyze and compare the various stresses, strain and safety factors of the model of helical gears made of Titanium alloy using FEM tool ANSYS. Generate the profile of helical gear teeth model to calculate the effect of gear bending using three-dimensional model and compare the results. Performing parametric study to study the effect of varying load on the various stresses, strains on the helical gear model.

Keywords- Helical Gear, FEM, Titanium, stress, strain, directional deformation, gear bending

I. INTRODUCTION

There have been so many research works by so many researchers in the system of gear. Still there is an approach, which is able to determine the deviation in the geometry of helical gear like contact and bending stresses.[1] The main focusing area in helical gears is the dynamic load, noise level during operation, weight, and size that should be lighter and small accordingly.[2] Such type of gears fails at the root of the teeth because of lower bending strength and due to the action of pitting which can be controlled by implementing the correct method for analysis and the modification of the different gear geometry parameters. [3]In view of this approach, the main objective of this analysis is to develop model of helical gear set in meshing and to evaluate the effect of various stresses on gear tooth. The main objective of this analysis is as follow:

1) Modelling the 3 D model of gear set in Pro/engineer workbench.

2) Evaluation and analysis of the various stresses, strain and factors of safety of helical gear set made of Titanium using FEM tool ANSYS.

3) Generate the helical gear set model to calculate the effect of gear bending in teeth,

4) To study the effect of varying load ranging from 1 KN to 10 KN on the various stresses, strains on the Helical gear set.

II. SOLID MODELING AND FEM PAKAGES

2.1 Geometrical Parameter and Material Properties

For generating the solution here ANSYS is used to perform the analysis.
Steps used for obtaining the solution using ANSYS 14.0

1. The geometry of the gear is imported from 3D modeling workbench Pro/Engineer, in IGES format.
2. The element type and materials properties are specified.
3. Next is Meshing.
4. The boundary conditions are applied.
5. The solution is obtained on the basis of input parameters.
6. Finally, the solution is obtained in which is evaluate to obtained results.

2.1 Geometrical Parameters of the Helical Gear

Table.1 Key Specifications of Geometrical Parameters of the Helical Gear

Sr.No	Geometry Name	Gear 1	Gear 2
1	No. of teeth	20	32
2	RPM	10000 rpm	6250 rpm
3	Rotational velocity	1047 rad/sec	655 rad/sec
4	Pitch Diameter	200 mm	320 mm
5	Addendum	220 mm	340 mm
6	Dedendum	180 mm	278 mm
7	Face width	6.67 mm	7.104 mm
8	Helix Angle	20^0	20^0
9	Material type	Titanium alloy	Titanium alloy

2.2 Material Properties

Table 2.ASME, Section II, Part D Material Properties

Sr. No.	Material Properties	Titanium
1	Young's modulus of elasticity (N/m^2) (E)	113.8 x 103 N/m^2
2	Ultimate Tensile Strength	950 x 106 N/m^2
3	Poisson's ratio (υ)	0.287 to 0.381

III. FINITE ELEMENT FORMULATION

For the representation of element here three-dimensional eight-nodded solid element is chosen which is from hexahedral family. The three dimensional eight nodded solid element as shown in Fig.1 has eight nodes which are located at each of the corners and has three translational degree of freedom for each of the node.

3.1 Three-dimensional eight nodded solid element

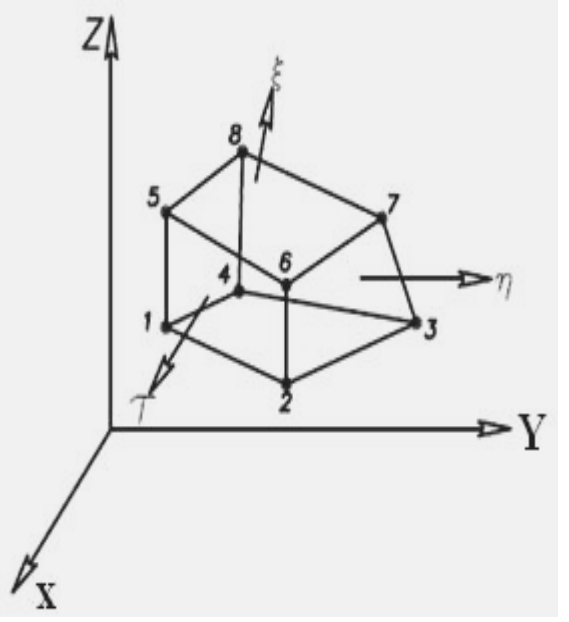

Fig. 1 Cartesian Coordinate System

3.2 Modeling of Helical Gear

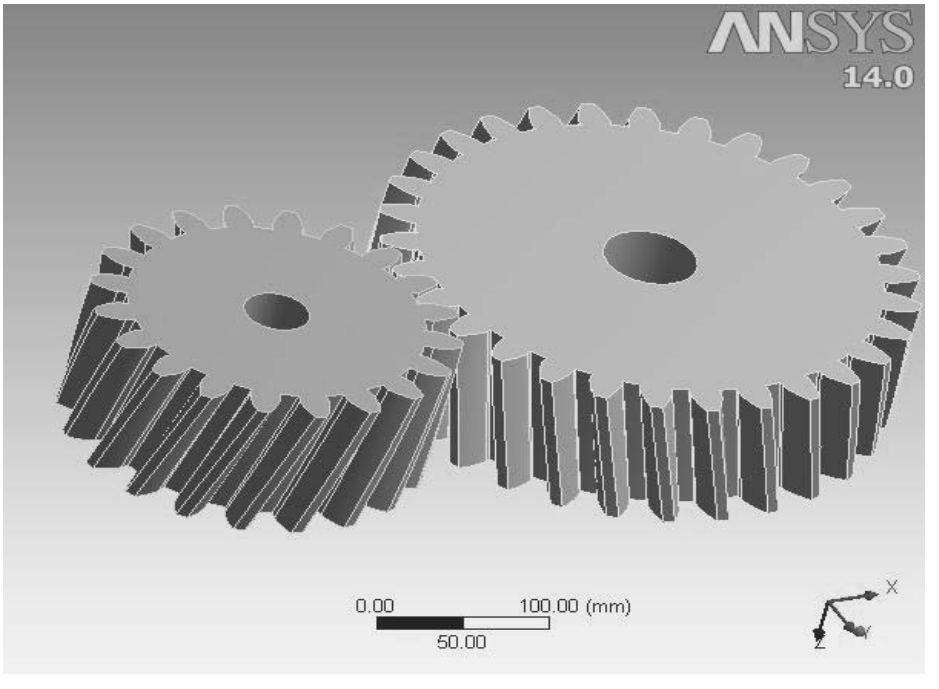

Fig. 2 Imported Model of Helical Gear Set in ANSYS 14 From Pro/E

3.3 Boundary Conditions

As the wheel and pinion is in mesh the contact type analysis is selected in ANSYS. Contact type analysis is a Non- linear type analysis. Among the types of contact available in the ANSYS module, the rough

contact is selected as power is transmitted due to friction between wheel and pinion. As the contact is rough between wheel and pinion the contact surface behaves like spring for such types of contact 'Pure Penalty Method' is chosen from ANSYS module.

3.4 Meshing

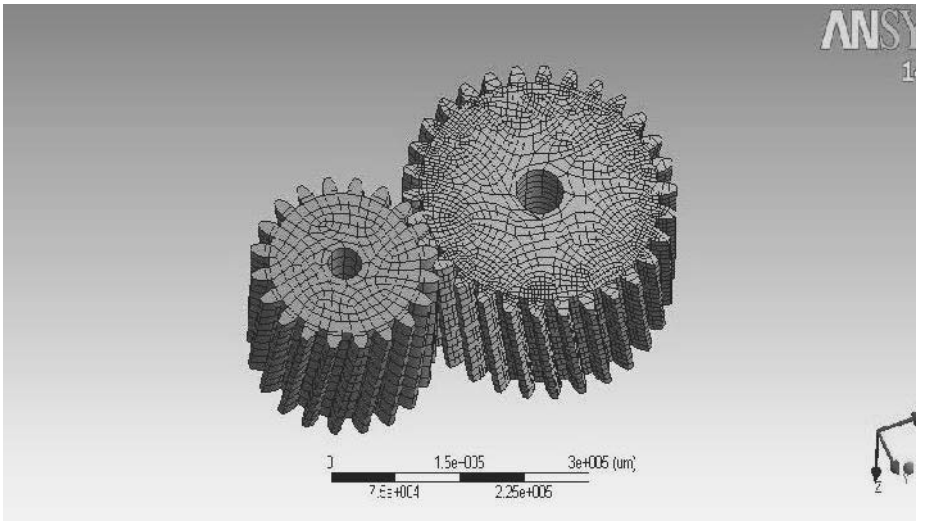

Fig. 3 Mesh 3D Model of Helical Gear Set

IV. ANALYSIS AND RESULT

4.1 Deformation, Stress, Strain, Safety Factor Analysis

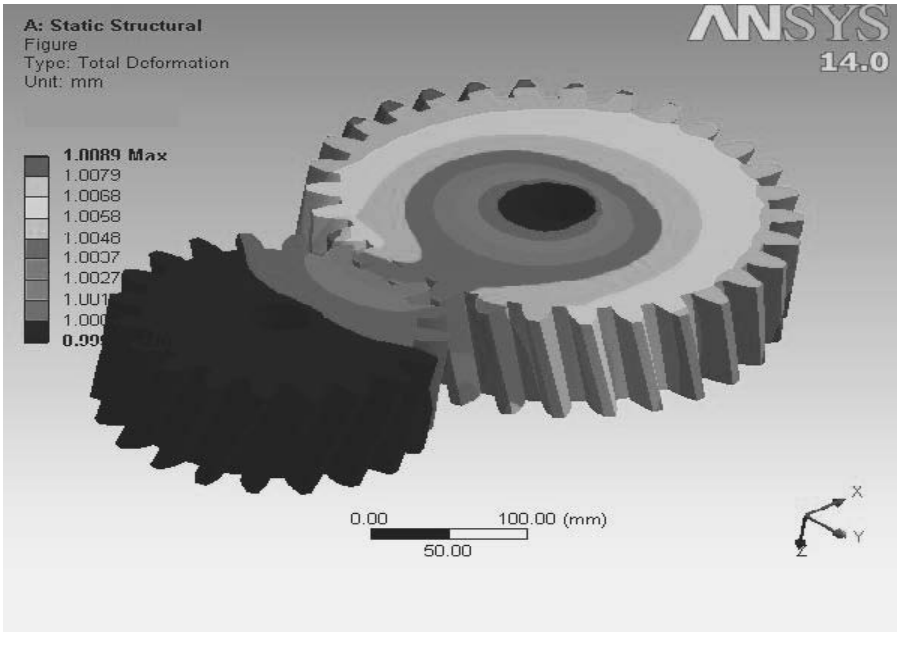

Fig. 4 Total Deformation

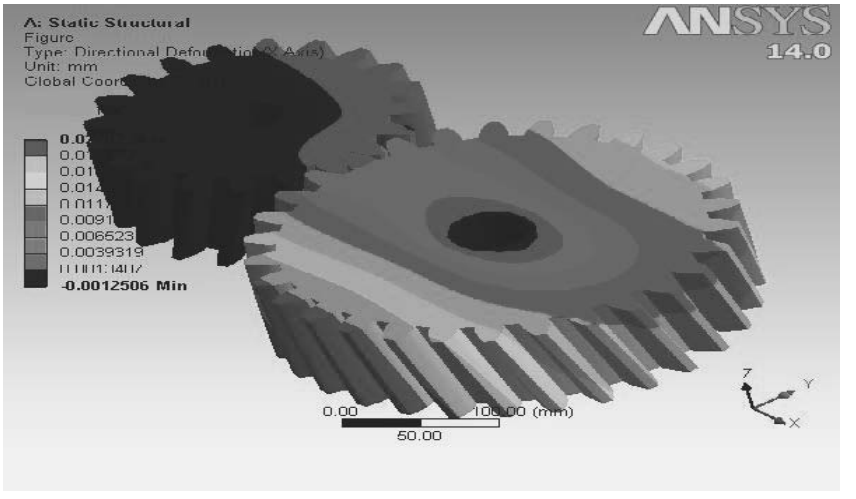

Fig. 5 Directional Deformation (x-Axis)

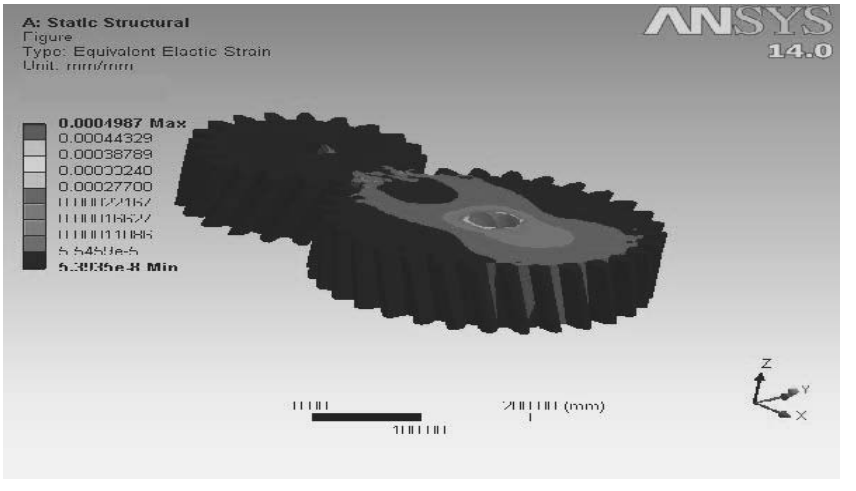

Fig. 6 Equivalent Elastic Strain

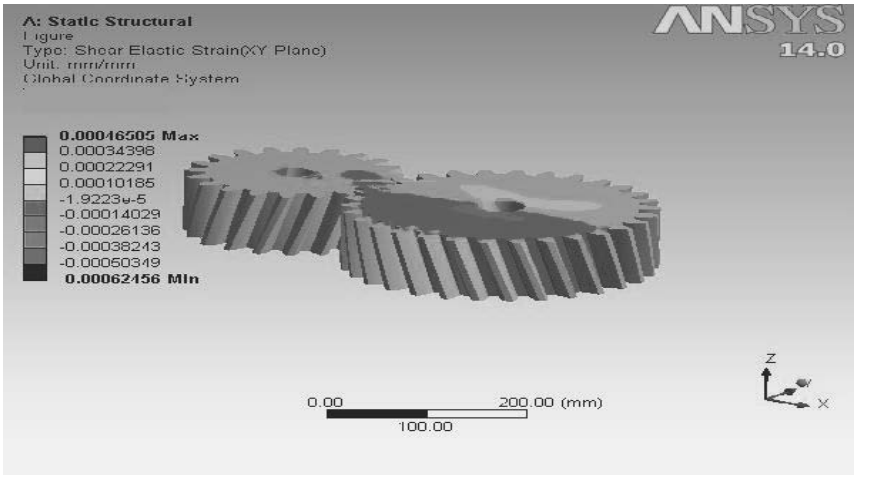

Fig. 7 Shear Elastic Strain (XY Plane)

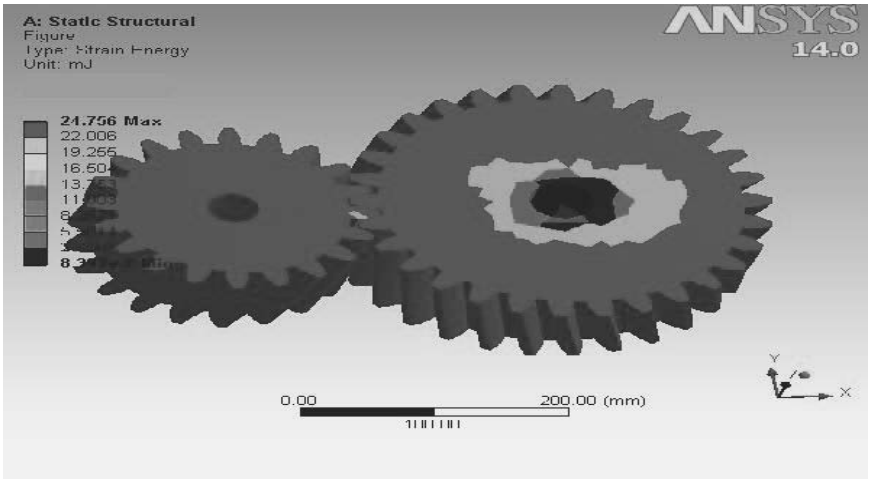

Fig. 8 Strain Energy

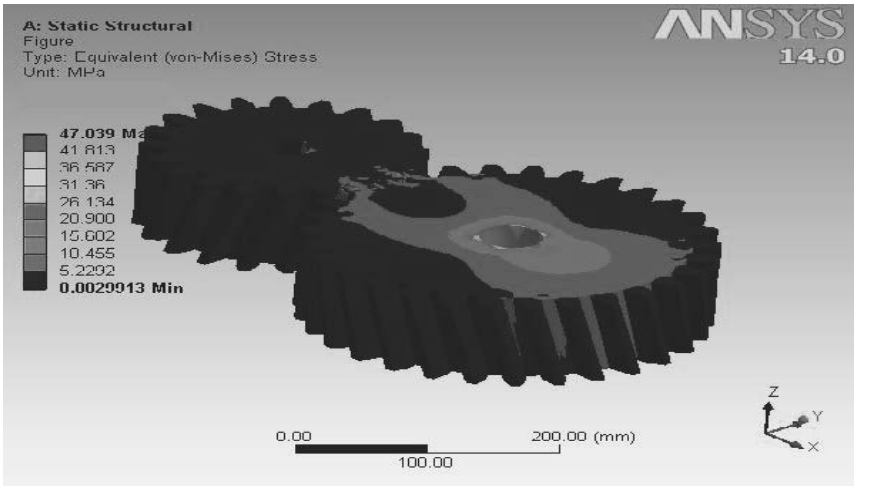

Fig. 9 Equivalent Stress

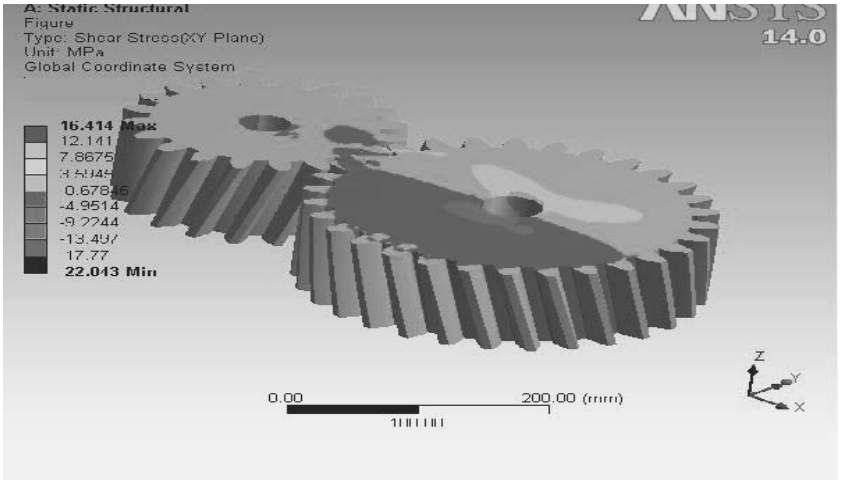

Fig.10 Shear Stress

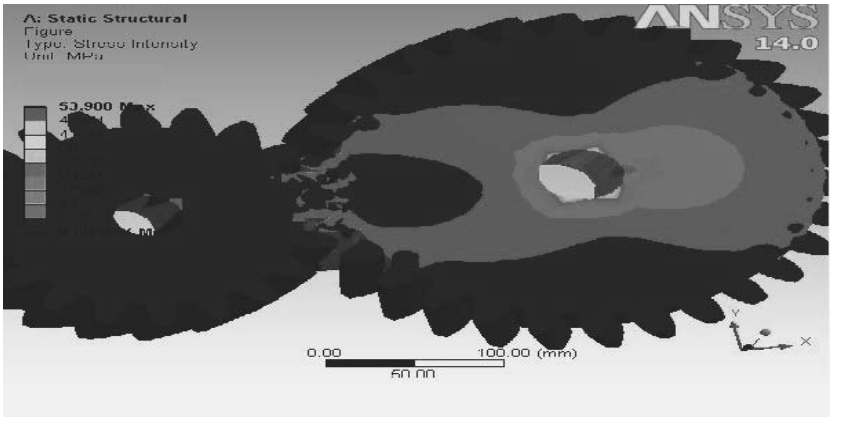

Fig.11 Stress Intensity

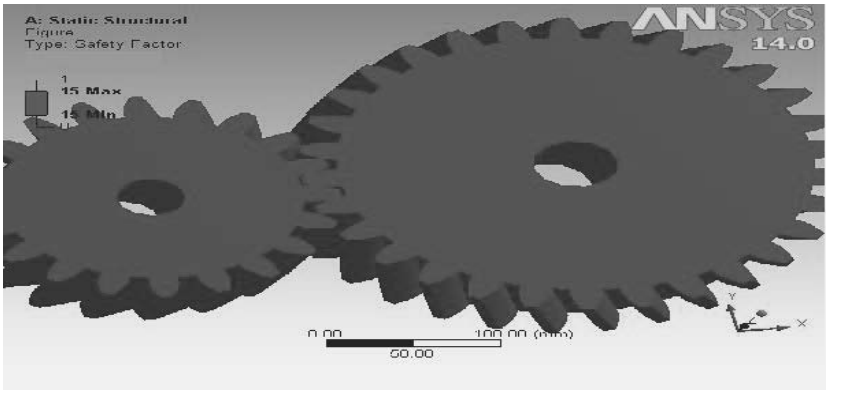

Fig.12 Safety Factor

Table. 3 Analysis Result of Titanium Helical Gear Set

	Titanium Helical Gear	
Name of analysis	Maximum	Minimum
Total Deformation	1.0089 mm	0.99959 mm
Directional Deformation	2.207e-002 mm	-1.2506e-003 mm
Equivalent Elastic Strain	4.987e-004 mm/mm	5.3935e-008 mm/mm
Shear Elastic Strain	4.6505e-004 mm/mm	-6.2456e-004 mm/mm
Equivalent Stress	47.039 MPa	2.9913e-003 MPa
Shear Stress	16.414 MPa	-22.043 MPa
Strain Energy	24.756 mJ	8.393e-007 mJ
Stress Intensity	53.988 MPa	3.437e-003 MPa
Safety factor		> 10

4.2 Deformation, Stress, Strain, Safety Factor Analysis at Varying Load (1KN- 10KN)

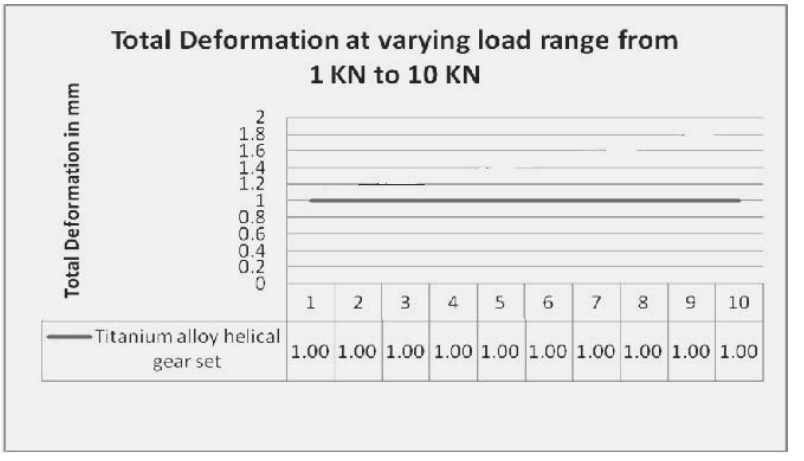

Fig. 13 Graphical Representation of Total Deformation

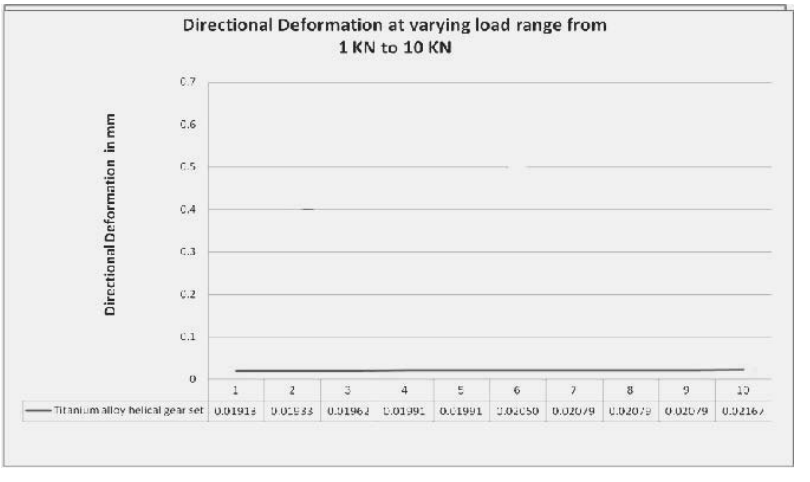

Fig. 14 Graphical Representation of Directional Deformation

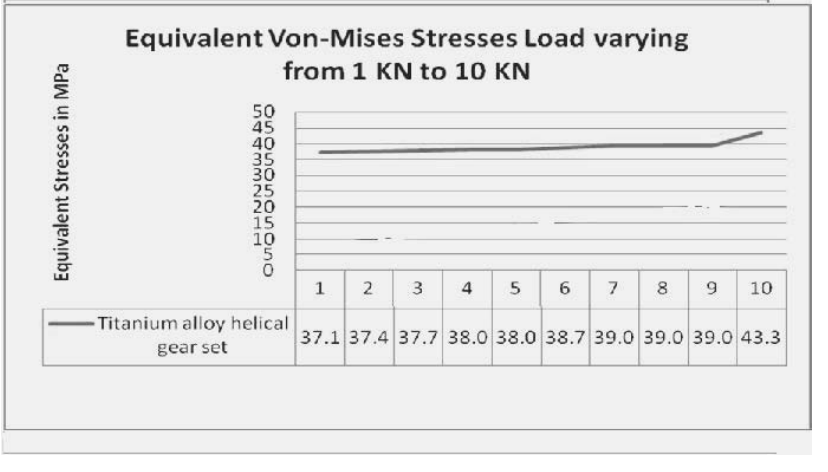

Fig. 15 Graphical Representation of Equivalent Von-Mises Stresses

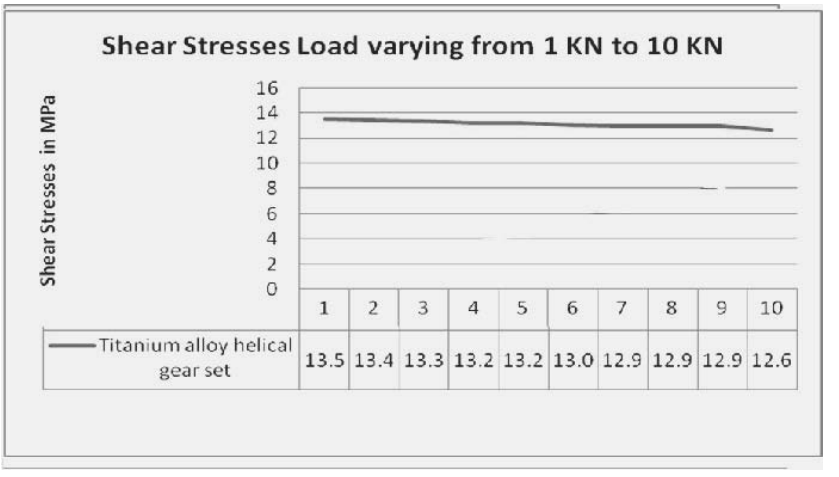

Fig. 16 Graphical Representation of Shear Stresses

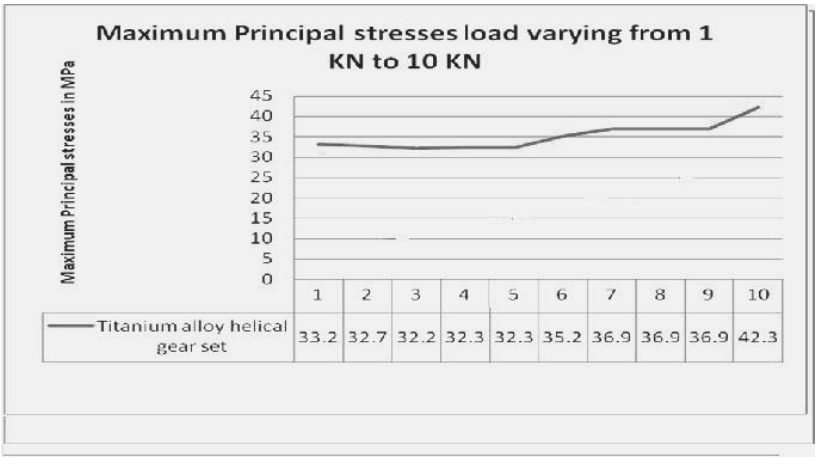

Fig. 17 Graphical Representation of Maximum Principle Stresses

V. CONCLUSION AND FUTURE WORK

1. At varying load the stresses developed in a Titanium gear set are higher.
2. In case of various strain same thing observed.
3. Failure by Pitting that takes place on surface of the gear tooth will be diminish by improving the material hardness.
4. Maximum bending stress can be minimizing by increasing face width.
5. If material strength value is have the prime importance then a gear with larger face width of any required helix angle can select.

Analysis of bending and contact stresses for all types of gears by three dimensional numerical method can be possible. Same FEA analysis can be conducted on the whole gearbox to evaluate mode of failure. The bending and contact stress analysis is possible on the gears which are of composite materials by using three-dimensional FEA.

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Design and Manufacturing of Bicar

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Abstract- As we are using bike instead of car for our daily work, because it is cheapest as compare to car but it also has some limitation such as, it is difficult to travel long distance and travel in rainy season because bike is not giving that much comfort which a car can give. To remove these limitations we need something which can give the comfort of car as well as mileage of bike. That's why it's time to move towards a 'BICAR'.
Bicar is a combination of bike and car. It will go to give the comfort of car with high mileage of bike. Bicar is a small car which needs less space to park, having a low weight and it is very useful in all kind of weathers such as rainy, summer and winter. As handicapped peoples are unable to drive bike as well as car this is a type of bike which is completely balanced like car, thus it can also be useful for handicapped person.
Keywords- Structural analysis, ANSYS, Geared Motor, Chassis.

I. INTRODUCTION

After invention of Bike, Car and Heavy vehicles, the transportation become very easy. Before this invention it is difficult to travel from one place to another place and also require huge time. Thus the vehicle mentioned above reduces the efforts up to large extent. But use of vehicle is not economical because of increasing fuel prices.

II. PROBLEM DEFINITION

Now a day's people prefer bike than car because it is having good mileage which is economical as well as it has low price as compare to car. But this economical vehicle has some limitations such as, it is difficult to travel long distance, it not provides any protection to the rider in rainy, winter and summer season. If the person travels the long distance on bike, he has to suffer the back pain. That's why it's needed to make the product which can fulfill the features of bike and car. Such that it will give comfort of car & the mileage of bike.

III. METHODOLOGY

A. Chasssis

The chassis can be called as skeleton of a vehicle besides its purpose being seating the driver, providing safety and incorporating other sub systems of the vehicle.
After study, I decided to use tubular space frame chassis which is used for the urban car. Since ladder chassis is not strong enough, motor racing engineers have developed a 3-dimensional design which known as tubular space frame. Tubular space frame chassis employs dozens of circular-section tubes (some may use square section tubes for easier connection to the body panels though circular section provides the maximum strength), position in different directions to provide mechanical strength against forces from anywhere. These tubes are welded together and form a complex structure. For higher strength required by high performance sports cars, tubular space frame chassis usually incorporate a strong structure under both doors. Tubular space frame chassis also very strong in any direction compared with ladder chassis and monocoque chassis of the same weight.

B. Cad Model

I design the primary model of chassi in 'CATIA' in which engine is located at back side of driver's seat and balancing mechanism is between seat and engine. Following figure shows the overview of chassi.

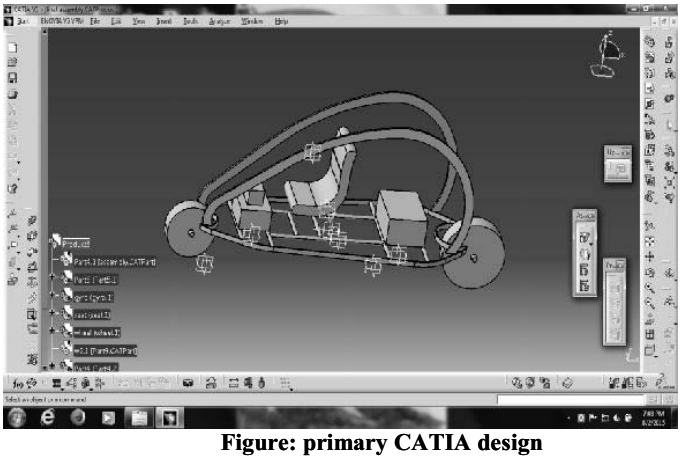

Figure: primary CATIA design

C. Selection of Material for Chassi

Shear stress in the cross section of a shaft is zero at the Centre and increases linearly to the maximum value at the outer surface.
In case of solid shaft, stress in the material near the Centre is very less and hence strength of the material near the Centre is not utilized, in case of hollow shaft there is better utilization of strength of the material. Hence, Hollow circular cross section is economical as compared to that of solid circular cross section.

To reduce the weight of the vehicle and to improve the vehicle's power to weight ratio, Material selection plays an important role.

Thus after analyzing the number of materials I selected Cold Rolled Carbon Steel (CRC). It offers a range of good mechanical properties like high strength, good toughness, good surface finishing, excellent corrosion resistance to atmospheric conditions, good workability, excellent weld ability and widely available.

D. Welding for Chassi

For Welding the pipes of CRC to build chassi 'MIG' welding is selected. Because CRC material is easily get welded by this type of welding and it is cheapest and easily available.

Figure: CRC Welding to build Chassi

E. Specifications of Bicar

The BI-CAR is having following Specifications.

- Ground clearance 1 feet (304.8mm).
- Overall length is 6 feet.
- Width is 850 mm.
- Height is 1850 mm from chasse's lower end.
- The radii of wheel is 1 feet.
- Engine type- Four Stroke 150cc (Bajaj Pulser).
- Mechanism- automatic balancing without gyroscope.
- Numbers of wheels- 4 Wheels(2 Primary and 4 Secondary)
- Number Of seat- Two
- Weight of Bi-Car- Approx 220kg
- Cooling System- Air Cooling System
- Expected Mileage Of Bi-Car- 35 - 40km/lit

F. Balancing Mechanism

For balancing mechanism geared motor is used with scissor jack. Geared motor can easily operated by DC power source with 12 volts, 9 ampere current.

Thus as the speed goes above 30 km/hr, sensors sense the speed and operate the motor to lift the wheels and bicar will run on only two wheels. And as the speed come below the 30 km/hr, sensors again sense the speed and operate the motor to move the wheels in downward direction and then vehicle will run on 6 wheels, thus completely balanced.

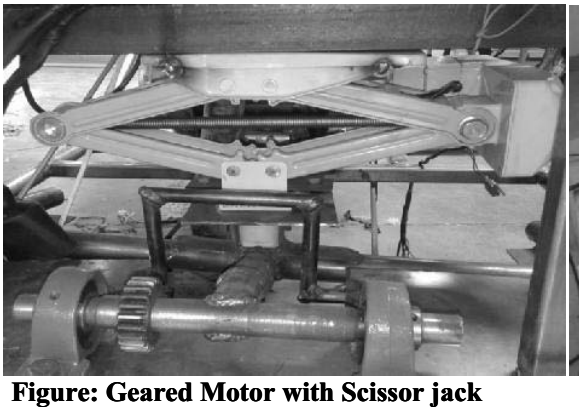

Figure: Geared Motor with Scissor jack

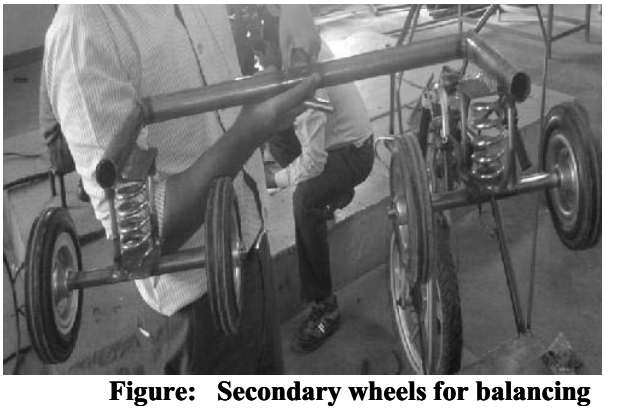

Figure: Secondary wheels for balancing

Figure: Side view of Bicar

IV. EXPECTED OUTCOME

After completion of vehicle it can give the following benefits.

- Everyone (Men & Women) can drive this bi-car. Handicap person also able to drive this vehicle with simple modification.
- In all whether vehicle can be used without any environmental resistance.
- Economical and affordable vehicle.
- Feel of Sporty Car which is economical and affordable.
- The face of a future of transportation.
- Traffic problem can also be solved.
- It provides huge safety to human being as compare to bike.

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Design of Pneumatic Circuit for Automatic Circular CO_2 Welding Machine

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Abstract- Automatic circular CO_2 machine tools are designed and manufactured for specific jobs and such never produced in bulk, such machines are finding increasing use in industries the techniques for designing such machine would obviously be quite different from those used for mass produced machine. A very keen judgment is essential for success of such machines. Circular Co_2 welding process is a very critical welding which is done on cam shaft with different profile cams, to achieve the dimensional accuracy for different cam shaft welding on same platform special purpose machine is required.
Keywords- SPM, Proximity sensor, MIG, Electronic relay, Inching switch.

I. INTRODUCTION

Welding is one of the most important methods of joining of two similar and dissimilar metals with or without application of pressure. The Carbon dioxide welding (CO_2) process is generally accepted as the preferred joining technique and is mostly chosen for welding large metal structures such as bridges, automobiles, aircraft and ships due to its joint strength, reliability, and low cost compared to other joining processes. In the age of automation machine become an integral part of human being. By the use of automation machine prove itself that it gives high production rate at good quality than manual production rate. In competition market everyone wants to increase their production. The engineer is constantly conformed to the challenges of bringing ideas and design into reality. New machines and techniques are being developed continuously to manufacture various products at cheaper rates and high quality.

II. LITERATURE REVIEW

Irfan Sheikh et. al [2] studied the MIG welding parameters are the most important factors affecting the quality, productivity and cost of welded joint, Weld bead size, shape and penetration depend on number of parameters. Lot of research work has been done regarding the effect of variables on the process. The quality of a welded joint is directly influenced by the welding input parameters. Mithari Ranjeet et. al [5] describe the welding Positioner with auto indexing which is very important for mass production industries related with circular welding. As it depends upon the skill of worker to move electrode along the welding line. This special device can rotate the job at fixed rate to assist the welding process for circular components and ensure good profile and homogenous welding. This model has applications in small cylinder welding, compressors, and bottle filling plants etc. Automated welding Positioner machine for circular weld is totally satisfying the requirements. For this system Worm and worm wheel, Commutator motor, Belt drive, Proximity sensor, Ball bearing, Electronic relay, Inching switch, and inputs are required. Bapat Prasad V. et al [7] studied the Special purpose machine tools are designed and manufactured for specific jobs and such never produced in bulk such machines are finding increasing use in industries the techniques for designing such machine would obviously be quite different from those used for mass produced machine. A very keen judgment is essential for success of such machines. A special purpose machine was designed and manufactured at ABC Company which found beneficial in increasing production quantity & reducing manpower. Narayan K.Lalit et. al [3] studied the optimization of process parameters using Response Surface Methodology. Experiments were conducted based on central composite Face Centered Cubic design and mathematical models were developed correlating the important controllable CO_2 welding process parameters like Voltage (V), Travel speed (S) and welding current (I) with weld bead penetration. Boiko Irina et. al [8] worked to find out the influence of the composition of shielding gas on costs of the welding joint. they were looking for different mixtures of shielding gas that is used in MAG welding for non-alloyed steel. For economical estimation of welding

joint following researches were executed: amount of spatter on the welded parts after welding, metallographic research of welding joint, chemical composition analysis, penetration, and calculation of the welding joint. Each composition of the shielding gas provided different results for each parameter during the investigation. This brought us to the conclusion which gas mixture provides the best quality of the welding joint. During research we found out that the choice of separate shielding gas influences the speed of welding. This parameter makes the difference in calculation of the welding joint. There is also lay-out of the components that influence the costs of the welding joint in our research work. . Ganguly Arghya et. al [4] describe a PLC based Control System for Hardening and Tempering Furnace in Heat Treatment Plant as implemented at the Siddheshwar unit for Mahindra Automobiles Limited, which is one of India's largest vehicle manufacturing corporation. The proposed system deals with designing of a PLC based control system for Hardening and Tempering Furnace. The automated process efficiently reduces the man power required for the process and also increases the efficiency of hardening and tempering process of raw steel bits. This paper provides the description of the components implemented for the control system along with the flow of working of various required components. The system is controlled with the help of Messung PLC. Prof. Sawant P.R et. al [9] discuss the case study and comparison of productivity of component using conventional radial drilling machine and special purpose machine(SPM) for drilling and tapping operation. In this case study, the SPM used for 8 multi drilling operation, linear tapping operation and angular tapping operation of TATA cylinder block. In this paper the following studies are carried out 1. Time saved by component handling (loading and unloading), using hydraulic clamping, 2. Increase in productivity both qualitative and quantitative, 3. Less human intervention, indirectly reduction in operator fatigue, 4. Less rejection due to automatic controls, and 5. Increase the profit of company. Patil Kunal V. et. al [6] describe a novel approach of MIG (Metal Inert Gas) Welding as implemented in a control system based SPM at Gabriel which is the largest manufacturer of shock absorbers in India. The function of the SPM is to weld a knuckle bracket on the circular shaft of the shock absorber. It efficiently helps to fully automate the process of Welding. The paper provides the description of the components implemented in the control system along with the flow of working of various components. The system is controlled by means of a Messung PLC.

III. SCHEMATIC VIEW OF SPM

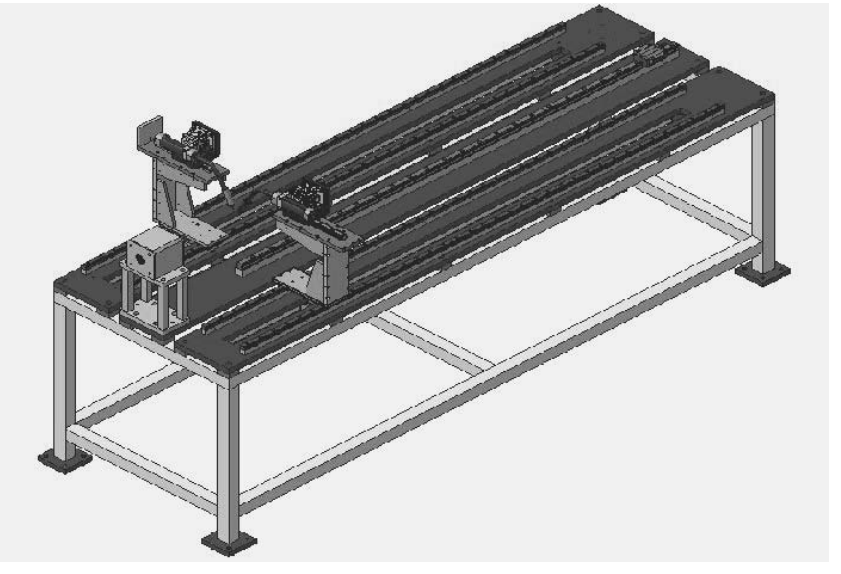


Fig 3.1- Automatic Circular Co2 welding SPM

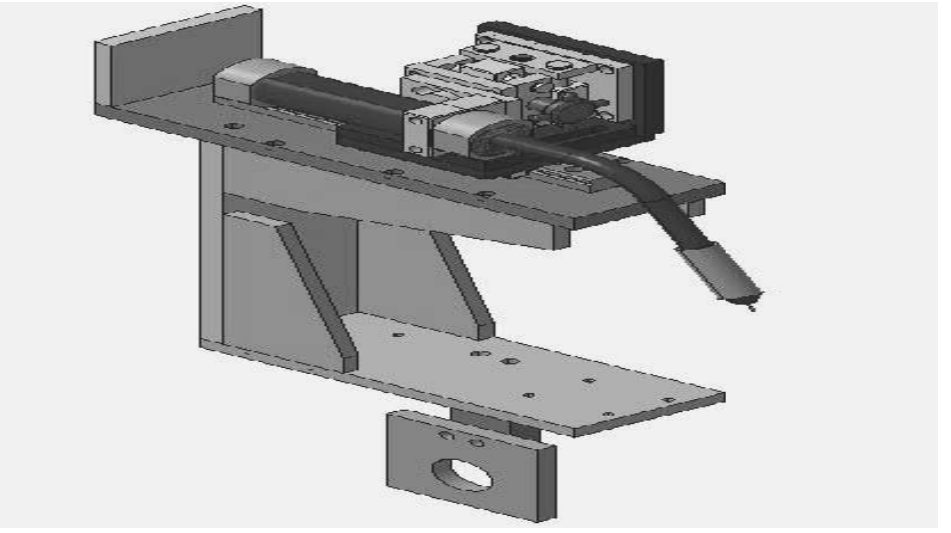
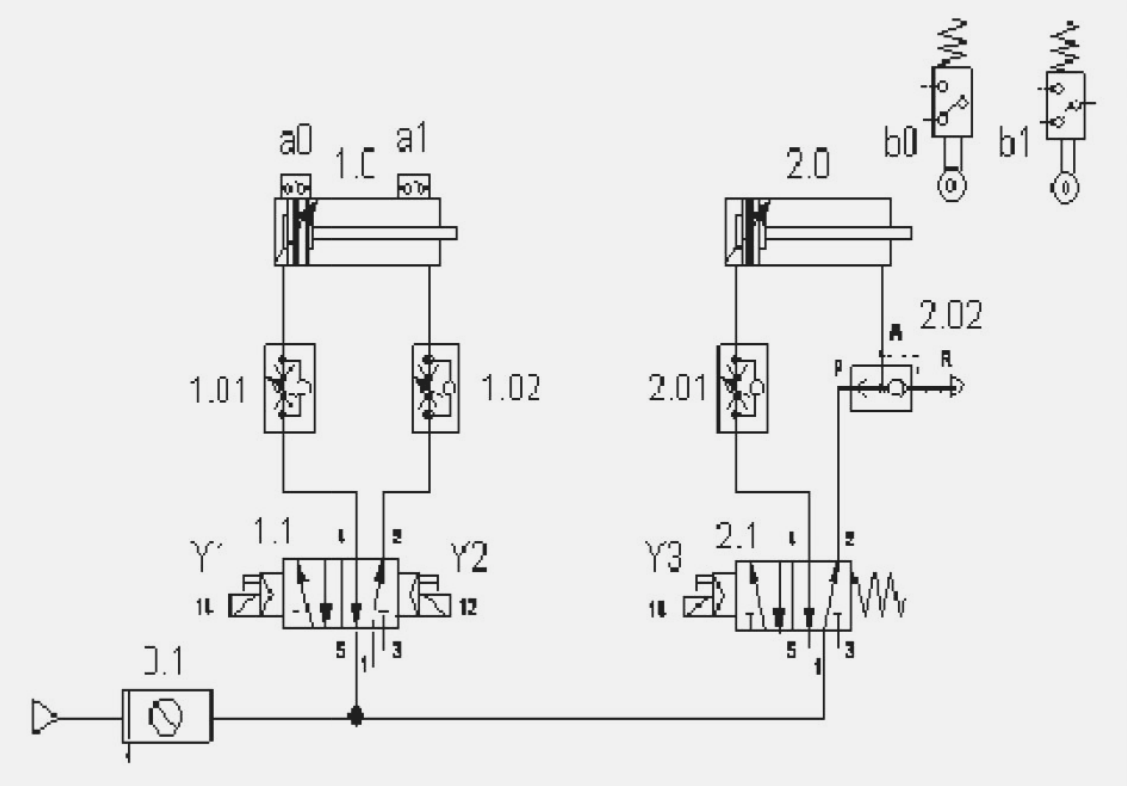


Fig3.2- Co2 Welding Gun for SPM

IV. PNUEMATIC CIRCUIT DESIGN



Sr.No.	Description	Qty
1.0 & 2.0	Compact cylinder	2nos.
A0 & a1	Proximity Sensor	2nos.
1.01 & 2.01	One-way flow control valve	4nos.
1.1 & 2.1	Solenoid valve	2nos.
Y1 & Y3	Solenoid coil	2nos.
0.1	Service unit	1nos.

Fig 4.1- Pneumatic circuit

V. CONCLUSION

The Manual Co2 welding process has lot many limitations and disadvantages like less productivity, inconsistence quality of welding and dimensional inaccuracy, and dependency on operators to large extent. All these disadvantages are overcome by automatic circular co2 welding SPM. Industries are acquainted by automation and co2 welding SPM will find many applications in several industries in coming decades.

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CO_2 Welding Process Optimization By Using SPM

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Abstract-Special purpose machine (SPM) is part of multi-tasking machine. This is new approach to increase the productivity of organization. If we compare between ordinary manual welding machine and special purpose machine in terms of time, costs, number of steps involved, etc. The multi-tasking machine is preferred choice. Technology of SPM is decided upon the principles of minimization of cost, improved productivity and improved quality, better safety etc., which posses with high initial investment, higher maintenance cost etc., Using PLC systems we can synchronize the outcome.
Keywords- SPM, PLC

I. INTRODUCTION

Co2 Welding is one of the most important and critical process of joining of two similar and dissimilar sheet metals with or without application of pressure.The Carbon dioxide welding (CO2) process is generally accepted as the preferred joining technique and is mostly chosen for welding large metal structures such as bridges, automobiles, aircraft and ships due to its joint strength, reliability, and low cost compared to other joining processes.In the age of automation machine become an integral part of human being. By the use of automation machine prove itself that it gives high production rate at good quality than manual production rate. In competition market everyone wants to increase their production. The engineer is constantly conformed to the challenges of bringing ideas and design into reality. New machines and techniques are being developed continuously to manufacture various products at cheaper rates and high quality. SPM is used for Co2 welding in sheet metal. With the help of SPM productivity and quality of part will be increased. It also helps to reduce the cost of welding compare to other type of welding.

II. LITERATURE REVIEW

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III. DESIGN

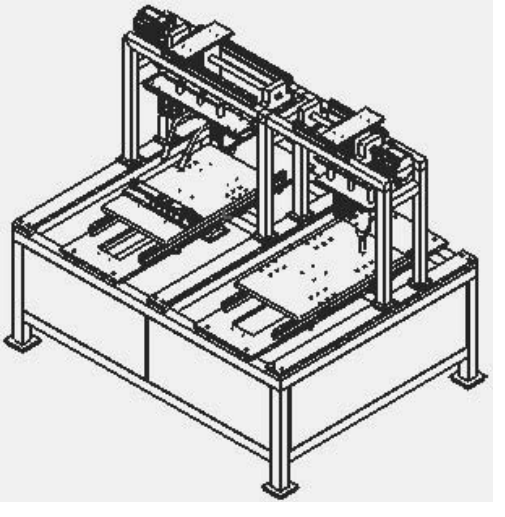

Fig- Co_2 welding SPM

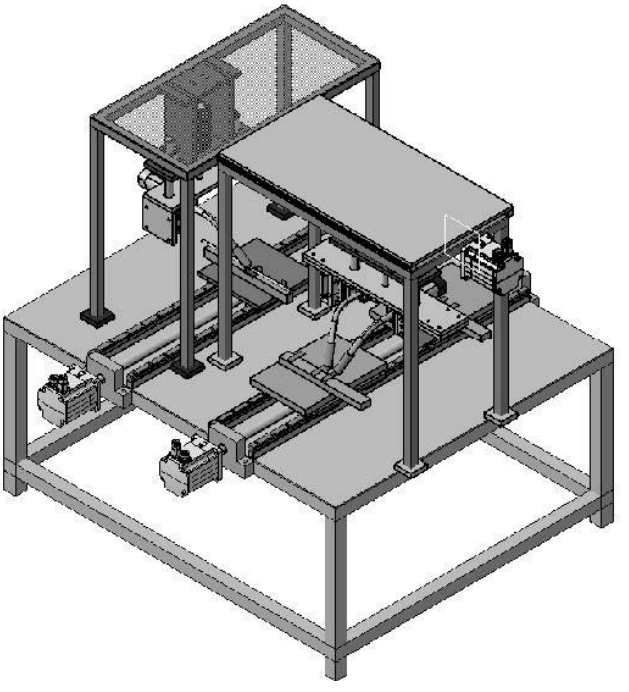

Fig- Co2 welding SPM Isometric View

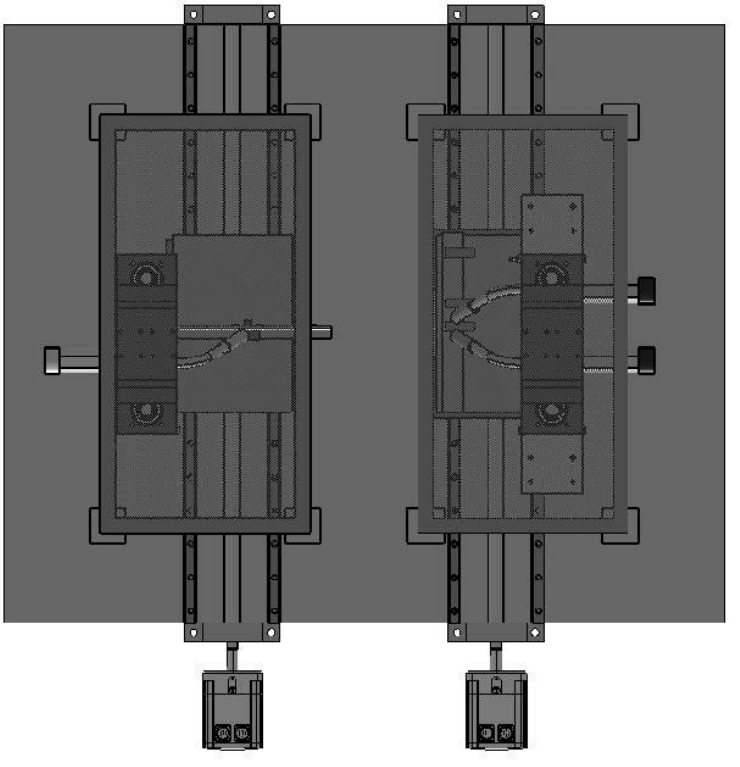

Fig- Actual welding Positions

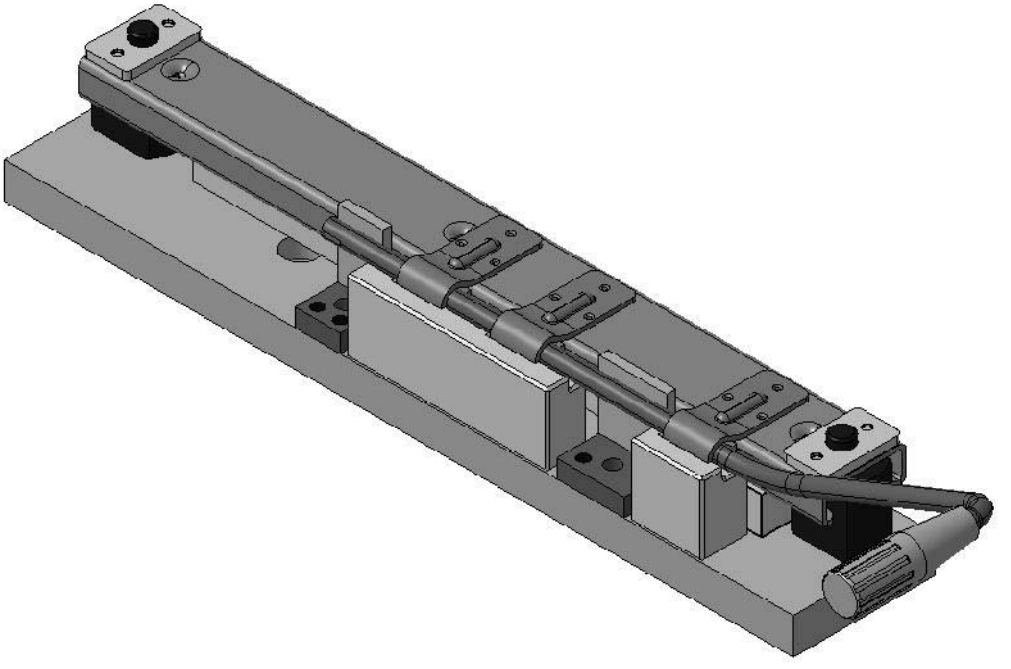

Fig- Part Isometric View-Hinge welding

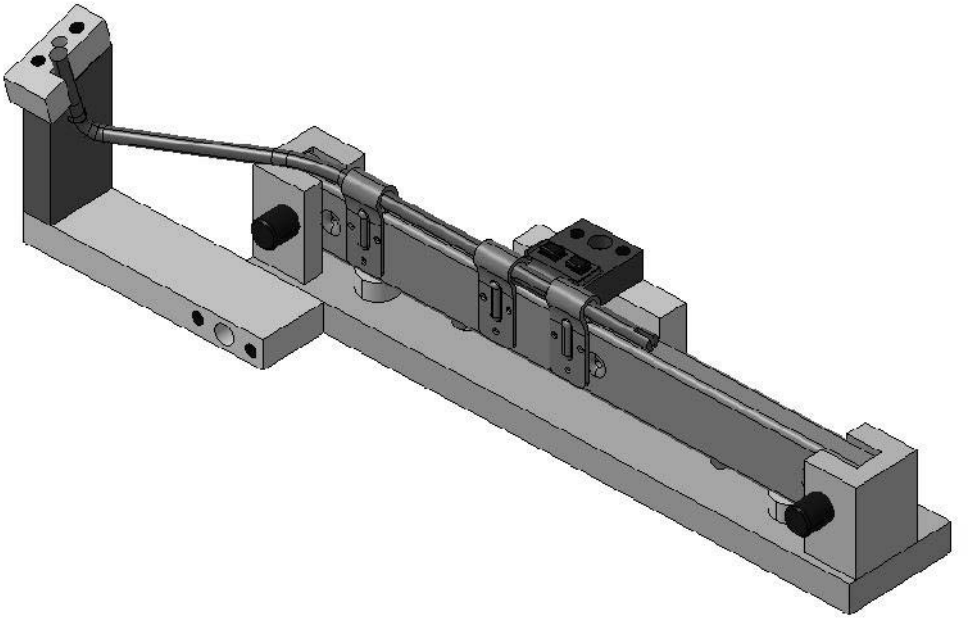

Fig- Part Isometric view-Lock Plate welding

IV. PARAMETER OPTIMIZATION

For Machine No-1 welding Parameters

Parameter	Before	After
Current(Amp)	80 to 120	100 to 130
Voltage(V)	20 to 24	18 to 22
Wire speed(m/min)	30to 40	20 to 30
Wire pressure	2.5	3.5

For Machine No-2 welding Parameters

Parameter	Before	After
Current(Amp)	80 to 120	110 to 140
Voltage(V)	20 to 24	18 to 21
Wire speed(m/min)	30 to 40	20 to 30
Wire pressure	2.5	3.5

V. CONCLUSION

The Manual Co2 welding process has lot many limitations and disadvantages like less productivity, inconsistence quality of welding and dimensional inaccuracy, and dependency on operators to large extent. All these disadvantages are overcome by automatic circular co2 welding SPM. Industries are acquainted by automation and co2 welding SPM will find many applications in several industries in coming decades.

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Numerical Modelling of Friction Stir Welding- A Review

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Abstract—Friction stir welding (FSW) is a solid-state jointing technology, in which the butted plates are heated, plasticized and jointed locally by the plunged probe and shoulder moving along the joint line. The residual stresses due to the thermomechanical performance of the material and the constraint of the welded plates by the fixture are one of main concerns for this process. A prediction of the clamping force applied on the plates during FSW is expected to be helpful in controlling the residual stresses and weld quality. Furthermore, the prediction of the force history in FSW will be beneficial to understand the mechanics of the process and to provide valid models for controlling the process, especially in the case of robotic FSW. Boundary conditions in the thermal modeling and thermomechanical modeling of process also play a vital role in the final temperature profile. The accurate 3D finite element simulation of the Friction Stir Welding (FSW) process requires a proper knowledge of both material and interface behaviors, but friction, the key phenomenon of this process, is quite difficult to model and identify. Friction stir welding is a relatively new welding process, that has significant advantages compared to the fusion process such as joining conventionally non-fusion weldable alloys. Being a solid-state joining process it produces weld with reduced distortion and improved mechanical properties. The aluminum alloys are widely used in different industrial applications such as ship building, aerospace and automobile industries due to their light weight, good mechanical strength and high corrosion resistance.
Keywords-Friction stir welding, Circumventive velocity field, Heat generation.

I. INTRODUCTION

Friction Stir Welding (FSW) is an efficient solid states joining process that have numerous potential applications in many domains including aerospace, automotive and shipbuilding industries, as well as in the military. It combines frictional heating and stirring motion to soften and mix the interface between the two metal sheets, in order to produce fully consolidated welds. One of its main qualities lies in the possibility of joining materials previously difficult to weld, and to offer excellent mechanical properties.[1]. FSW is based on strong couplings of thermo-mechanical phenomena. It induces very complex material motions and large shear forces. The material temperature is raised to about 80% of the melting temperature [2,3].Never the less the simulation of the process will be a further aim, as it is difficult to be numerically modelled due to the complex thermal and material flux occurring during the process, similar to Friction Stir Welding [4,5]. The conventional processes, working with molten phases are characterized by large heat input, which can change the microstructure of the diverse materials. This can provide mixed phases, which are very brittle and hardly formable, as well as hot cracks due to shrinkage during cooling or shape deviation. Contrary to melting joining techniques Friction Stir Welding is characterized as a solid phase welding technology, which was patented in 1991 [6].The probe primary function is to mix the material under the tool shoulder, which can be enhanced by threads. FSW is actually performed in three steps. First, the probe is plunged into the joint formed by the two sheets to be welded, until the shoulder gets in contact. As the tool rotates at a high velocity, the sheets are heated up by plastic deformation and friction. Second, the tool keeps rotating without any translational motion, so the material heating due to friction increases. Finally, the tool moves along the joint line, heats the material further, moves it from the front of the tool, and deposits it behind its trailing edge, producing the weld. This process is illustrated in Fig. 1.

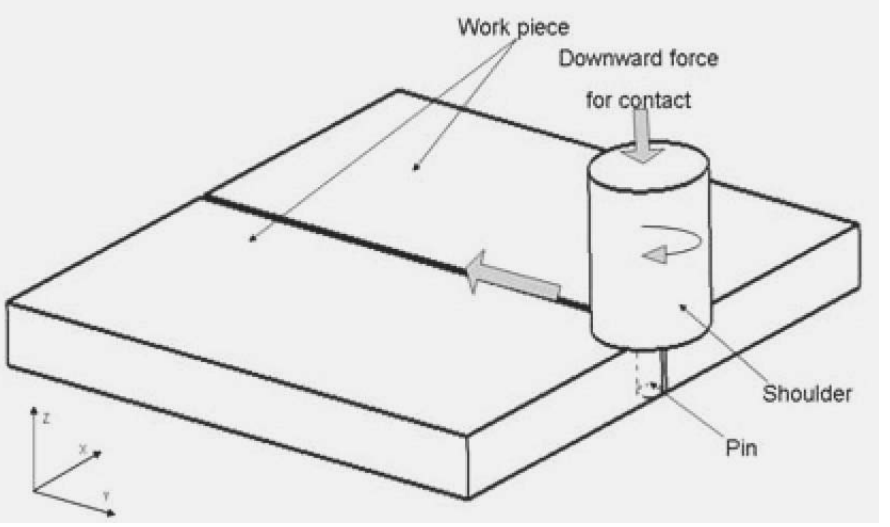

Fig. 1 Schematic diagram of FSW

II. THERMOMECHANICAL MODEL

2.1 Kinematic assumptions -The heat generated at the pin is approximately two percent (2%) of the total heat so therefore tool pin is ignored [7]. In the simulation welds two 304L stainless steel plates (work piece) with a cylindrical shape tool is used in this present work. The welding zone is divided into three parts defined as the flow arm zone for the torsion velocity field, the stirring zone for the "vortex like" velocity field, and the rest of the sheet. All three zones undergo the circumventive velocity field [8].

2.2 Circumventive velocity field

This field describes material flow around the pin like water around a bridge pile [8].

$$\vec{V} = \begin{bmatrix} U_R = V_\infty \left(1 - \frac{r_0^2}{r_i^2}\right) \\ U_\infty = -V_\infty \left(1 + \frac{r_0^2}{r_i^2}\right) \sin\theta - \frac{L}{2\pi r} \\ U_z = 0 \end{bmatrix}$$

Where r_0 is the pin radius, r is the distance to the tool axis and v_∞ (m/s) is the welding velocity. The material circulation L is added to account for partial circumferential dragging of the material due to the rotation of the tool. The angular velocity (s^{-1}) of the material dragged by the pin surface.

2.3 Torsion velocity field

Since friction occurs between the shoulder of the tool and the upper surface of the work piece, it develops a shear strain under the surface. Therefore, a torsion velocity field (centered on the probe axis) is introduced to describe this shearing effect in the flow arm zone [8].

$$\vec{V} = \begin{bmatrix} U_\theta = r\Omega_{surf}\left(\frac{z - z_{flowwarm}}{z_{surf} - z_{flowwarm}}\right) \\ U_r = 0 \\ U_z = 0 \end{bmatrix}$$

Ref. [9] stated that the numerical welding simulation requires a wide range of material properties as input data. Considering the temperature field calculation, the thermophysical properties i.e. density, specific heat capacity and thermal conductivity λ are needed. For the calculation of the distortions and stresses, the thermomechanical properties i.e. yield strength, hardening behavior, Young's modulus, thermal expansion and Poisson's ratio are a prerequisite. Calculation of the thermal conductivity as input for the simulation has been suggested by the equation:

$$\lambda(T) = a(T).\ \rho(T).\ Cp(T)$$

The tensile strain calculation has been suggested using thermal expansion coefficient at room temperature as:

$$\varepsilon = \alpha RT(\Delta T/\Delta t)$$

2.4 Heat generation from the shoulder surface

The heat generation from this segment is [10]

$$dQ = \omega \cdot r \cdot dF = \omega\ r^2\ \tau_{contact}\ d\theta\ dr$$

Where r is the distance from the considered area to the center of rotation, ω is the angular velocity, and r·d and dr are the segment dimensions. Integration of above Equation over the shoulder area from RPT to Rshoulder gives the shoulder heat generation Q1

$$Q_1 = \int_0^{2\pi} \int_{R_{PS}}^{R_{shoulder}} \omega \times r^2 \times \tau_{contact}\, d\theta\ dr$$

$$Q_1 = \frac{2}{3} \times \pi\omega\tau_{contact}\left(R^3_{Shoulder} - R^3_{PS}\right)$$

III. FOOTNOTES

Modeling offers great potential for reducing experimental effort in development of welding parameters, tool design and many other areas and at the same time reduces cost and time. This paper gives idea about basic theory with Kinematic assumptions, Circumventive velocity field, Circumventive velocity field, Torsion velocity field, Heat generation from the shoulder surface.

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Vibration Analysis of Propeller Shaft of Automotive

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Abstract:- Propeller shaft is used to connect gearbox to the final drive gears on vehicle through universal joint and used as drive shaft. A universal joint is the drive to be transmitted through a variable angle. The drive system is an arrangement for transmitting the driving thrust from the road wheels to the vehicle body. The drive is the transmission system between propeller shaft and differential. Differential mechanism is built up into the centre portion of the final drive. In propeller shaft sometimes are developed which result in low performance and sometimes failure. The cracks are developed due to the manufacturing defect like flaws, blow holes & indentation where stresses get concentrated. In recent years investigation of torsional vibration characteristics of the shaft systems transmitting torque, has become important part of the designer's responsibility.
Key Words:- Propeller Shaft, transverse cracks, vibration analysis, Natural Frequency.

I. INTRODUCTION

An automotive propeller shaft is the shaft which transmits the power an rotation from engine gearbox to the differential of rear wheel. It is usually manufactured in two forms single piece & two pieces. We use to preferred single piece propeller shaft which carries torque and subjected to torsion and shear stress equivalent to difference between load and its torque.

A. PURPOSE OF PROPELLER SHAFT:-

The torque produced from the engine and transmission must be transferred to the rear wheels to push the vehicle in forward and reverse direction. The propeller shaft must provide a smooth, uninterrupted flow of power to the rear axles.

B. FUNCTIONS:-

- It transmits torque from the transmission to the differential gear box.
- During running operation, it is necessary to transmit maximum low-gear torque developed by the engine.
- The propeller shafts must also be capable of rotating at the very fast speeds required by the vehicle.

C. VIBRATION ANALYSIS:-

Condition monitoring is the process of monitoring a parameter of condition in machinery, such that a significant change is indicative of a developing failure and to predict the potential failure. Vibration analysis is one of the method of condition monitoring.

This method is classified in to two types as below.

- Time domain method.
- Frequency domain method.

- **The Time Domain**: The time domain refers to a display or analysis of the vibration data as a function of time. The main advantage of this format is that little or no data are lost prior to inspection.

The Frequency Domain: The frequency domain refers to a display or analysis of the vibration data as a function of frequency. The time-domain vibration signal is typically processed into the frequency domain by applying a Fourier transform, usually in the form of a Fast Fourier transform (FFT) algorithm.

II. OBJECTIVES

- To reduce the loosening of part.
- To prevent its fatigue failure.
- To detect the microscopic crack.
-

III. METHODOGY

Initially we select a sample of Sumo Victa. For an elemental analysis, the 3D model of an automobile propeller shaft was designed in CATIA V5.Once model of propeller shaft was ready this modeled propeller shaft is imported in ANSYS 14.5 (Workbench).Then the material properties of propeller shaft must be updated.

1. Preliminary work or collection of necessary data.
2. Sample selection and identification of various dimensions.
3. Draw single piece propeller shaft on CATIA V5.
4. Analysis is doing on ANSYS 14.5.
5. Conclusion will be evaluated.

Boundary conditions:-

Boundary condition for analysis is propeller shaft hinged at two ends.

IV. SIMULATION WORK

Sample Specification:-

- Sample=Tata Sumo Victa
- Overall Length=1100 mm.
- Tube Diameter=62 mm.
- Tube length=970 mm.
- Splines length=130 mm.
- Mass= density*area*length=7850*0.003019*1.1=26.06 Kg.
- Material- Structural Steel

Table 1 : Properties Of Propeller Shaft

2.e+011	0.3	1.6667e+011	7.6923e+010

MODELING AND MESHING OF COMPONENTS:-

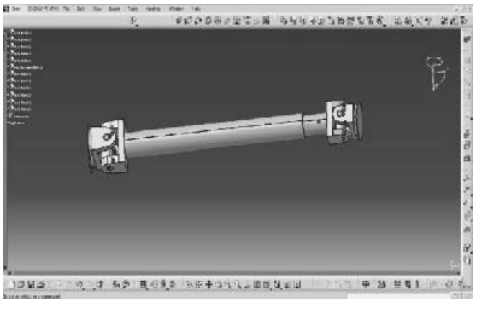

Figure1.1Modeling of Propeller Shaft In CATI

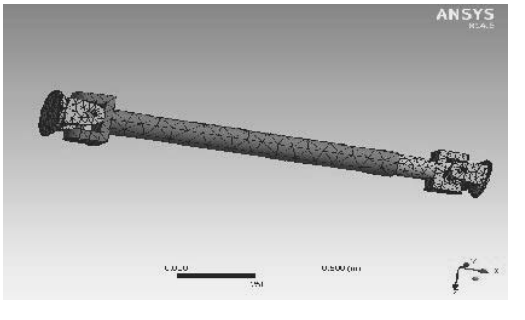

Figure1.2 Meshing of Propeller shaft

The meshing of propeller shaft was carried out using triangular surface mesher method. The total number of elements generated were 4930 and total numbers of nodes generated were 14118.

MODAL ANALYSIS:-

Modal analysis is the study of the dynamic properties of structure under vibrational excitation, applying boundary conditions, modal analysis is performed and the natural frequencies of the system are obtained.

- **Case-1:-** Hinged At Both Ends As Simply Supported Beam.

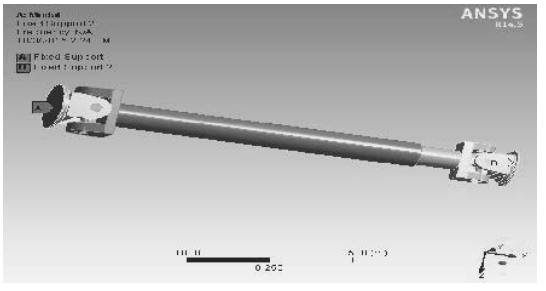

Fig1.3. Propeller Shaft Hinged At Both Ends Hinged As Simply Supported Beam.

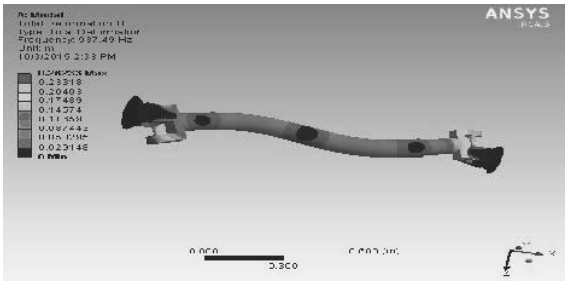

fig1.4.Deformation of Propeller Shaft For Both End

- **Case-2:-** Hinged At Both Ends As Simply Supported Beam with crack.(depth=10 mm.)

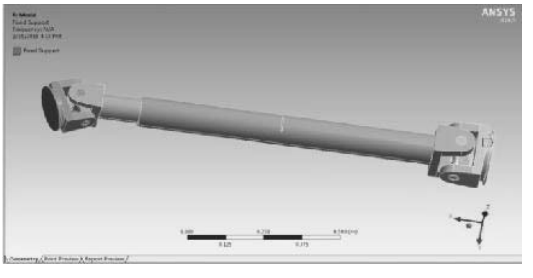

Fig1.5: Propeller Shaft Hinged At Both Ends As Simply supported beam

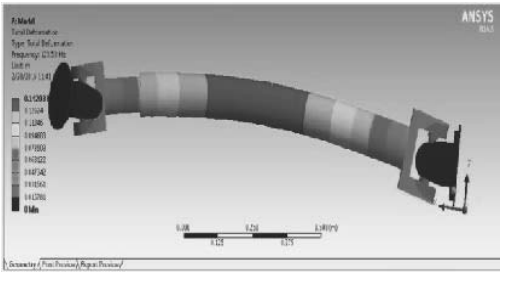

fig1.6: Deformation of Propeller Shaft For crack depth of 10mm

- **Case-3:-** Hinged At Both Ends As Simply Supported Beam with crack.(depth=20 mm.)

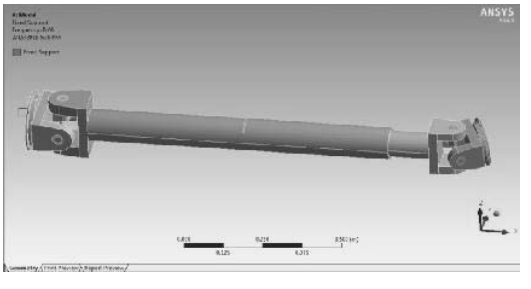

Fig1.7: Propeller Shaft Hinged At Both Ends As Simply Supported Beam.

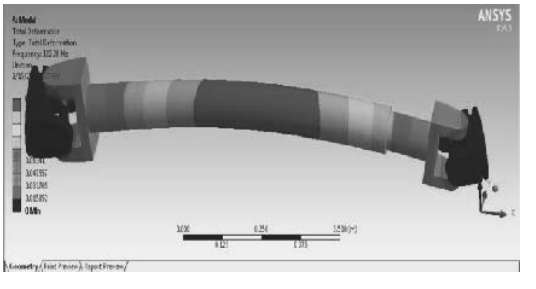

fig1.8: Deformation of Propeller Shaft For crack depth=20mm

RESULT OF ANALYSIS:-

Natural frequencies of uncracked and cracked propeller shafts are given below.

Table1:-uncracked shaft

Mode	Frequency [Hz]
1.	124.53
2.	127.54
3.	232.6
4.	249.05
5.	377.3
6.	391.24
7.	632.12
8.	647.86
9.	921.72
10.	937.49

Table 2:-Cracked shaft of depth=10mm

Mode	Frequency [Hz]
1.	123.53
2.	126.34
3.	216.77
4.	251.77
5.	373.34
6.	383.6
7.	624.81
8.	631.92
9.	909.7
10.	931.97

Table 3:- Cracked Shaft of depth=20mm

Mode	Frequency [Hz]
1.	122.28
2.	126.18
3.	216.47
4.	251.58
5.	373.27
6.	383.25
7.	620.91
8.	630.64
9.	907.
10.	932.29

V. CONCLUSION

The maximum stress point and dangerous areas are found by the deformation produced during the modal analysis of Propeller Shaft. The relationship between the frequency and the vibration modal is explained by the modal analysis of Propeller Shaft. The simulation results show that the natural frequency increases from first mode shape to tenth mode shape and also shows that as the crack depth goes on increasing, natural frequency of crack shaft goes on decreasing for various mode shapes. The minimum frequency was found in first mode shape i.e. 124.53 Hz and minimum deformation occurs in the second mode shape at a frequency of 127.54 Hz. The resonance vibration of system can be avoided effectively by appropriate structure design.

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Design and Fabrication of 'SPM' to Check Welding Strength of Shock Absorber Outer Tube

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Abstract- The higher performance demands of today's vehicles require shocks that stand up to the challenge. Deficient shock absorbers can have an adverse effect on suspension components and tires, and can be extremely dangerous. Outer tube of shock absorber is the important component which contain oil to maintain the required damping characteristic of shock absorber. For the safety of shock absorbers outer tube welds must be properly welded and sustain the certain load. Generally UTM is a used in the industry for weld strength checking but as being destructive test method; it is not possible to check each and every component due to which some defective outer tubes may be supplied and get fitted on vehicle. This causes discomfort and leads to accidents. To overcome the above problem SPM is to design and develop to test welds at Proof load. Proof load is same or more severe than those encountered by the welds in the field. By this way each tube can be checked and defective tubes can be scrap before the materiel is released for use in the field and forestall injury and inconvenience to personnel. The objective of the test is to demonstrate that the outer tube is structurally sound and fit for the use for which it is designed.

Keywords- SPM; Proof load; Shock absorber; Outer tube

I. INTRODUCTION

Special purpose machine are widely used for special kind of operations, which are not economical on conventional machines. Special Purpose Machines (SPM) is not available off the Shelf. It is also not covered in standard manufacturing programs. They are designed and tailor made as per the customer's specific requirements. This is new approach to increase the productivity of organization. Shock absorber is one of the major components used in automobiles. It is used to absorb vibrations when the vehicle is moving. Otherwise those vibrations affect the vehicle and the rider. A suspension built on springs alone would make for an extremely bouncy ride and depending on the terrain an uncontrollable car. Enter the shock absorber, or snubbed a device that controls unwanted spring motion through a process known as dampening. Shock absorbers slow down and reduce the magnitude of vibratory motions by turning the kinetic energy of suspension movement into heat energy that can be dissipated through hydraulic fluid. The use of SPM assures the quality and interchange ability of parts. SPM is a higher degree mechanization in which human participation is replaced by mechanical, electrical, fluid power technologies capable of doing physical and even mental work in a case of CNC machine. SPM minimizes the human errors, human fatigue in repetitive operation etc. and increases the productivity at desired level.

II. COMPONENTS OF SHOCK ABSORBER

Main parts of shock absorber

- Spring
- Damper
- Outer tube
- Upper mount
- Lower mount

From the scope point of view of project we will discuss outer tube

2.1 Outer Tube

In shock absorber outer tube has main function. The manufacturing process of outer tube consist of welding of different parts like lug or spring sheet, bracket or eye ring and end cap to a tube. From the functional requirement of shock absorber these weld must be properly welded and sustain the load of 2000kgf.

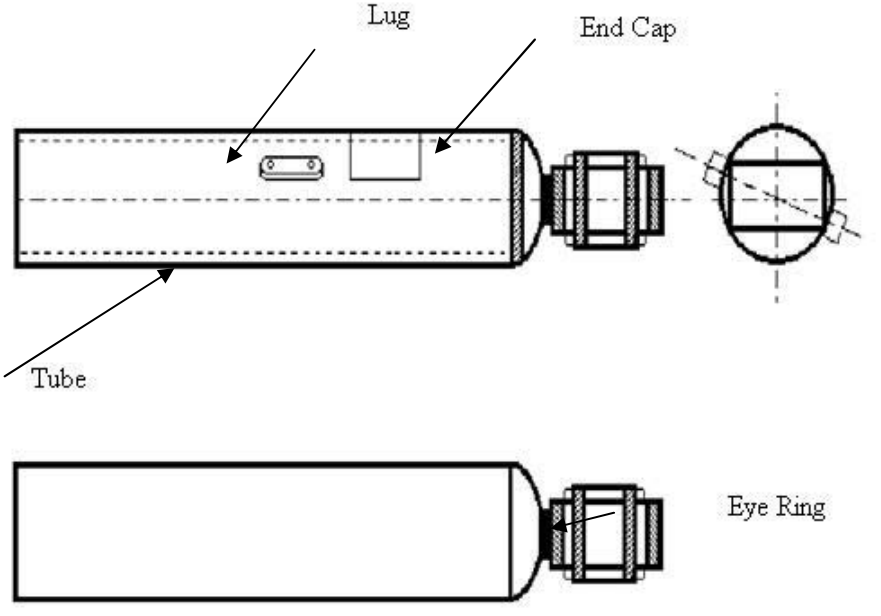

Fig. 2.1: Outer Tube of Shock Absorber

NSK FAB & WELD' Ambad, Nashik, manufactures the outer tube of shock absorber. It is important component which contain oil to maintain the required damping characteristic of shock absorber. From the safety of shock absorber these weld must be properly welded at specified location and sustain the certain load,

Quality characteristics of Outer tube-
Weld strength at Lug welding = 1000 kg
Weld strength at eye ring= 2000 kg
Leakage= No leak

III. INSPECTION METHOD

The UTM is a used in the industry for weld strength checking. At the time of starting of shift two components are checked on the UTM by applying maximum load it can sustain & then after every two hour one component is checked for welding strength.

Problem

The UTM method is well covered in standards and recommended practices, but as being destructive test method; it is not possible to check each and every component. therefore, all the components manufactured in a shift cannot checked for weld strength due to which some defective outer tubes may be supplied and get fitted on vehicle which will cause discomfort and can lead to accidents.

Remedy

To overcome the above problem it is necessary to develop NDT method which can be used to check every outer tube so that defective tubes can be scrap before the materiel is released for use in the field and forestall injury and inconvenience to personnel. Therefore, to ensure the satisfactory performance of a welded joint, welds must be tested by adequate testing procedures. It is an approach for testing the components that involves evaluating the weld without causing damage.

IV. OBJECTIVE

With reference to the above problem, the following objectives are set for this project:

1. To develop NDT method which can be used to check weld joints at proof load so that probability of failure of outer tube is decreased.
2. To decrease human intervention, indirectly reduction in operator fatigue.
3. To validate and implement developed methods.

V. DESIGN OF PROOF LOAD TESTING MACHINE

5.1 Concept of Proof Load

A proof load is a type of quality test designed to ensure that various goods are manufactured in compliance with safety regulations and are capable of maintaining structural integrity during the course of normal use. Some companies actually submit products to a proof load that is slightly above the stress of anticipated usage, just to make sure the goods successfully make it through a proof test. Proof loading is a common means of evaluating quality of all types of goods, ranging from clothing to zippers and fasteners and even various types of electronic equipment. Many companies make sure their proof load efforts are structured to comply with any local or national safety regulations that apply to the products they produce.

Therefore, to avoid the failure of shock absorber, testing of outer tube welds must conducted at the proof load. This is essential, since the failure of a weld can mean severe damage to the components that the product holds together, conducting a proof load test to determine the outer tube are manufactured within the required specifications is imperative. The objective of the test is to demonstrate that the welding of outer tube is structurally sound and fit for the use for which it is designed.

Proof load is the maximum tensile force that can be applied to an outer tube that will not result in plastic deformation of weld joint. In other words, the material must remain in its elastic region when loaded up to its proof load. Proof load is typically between 1/3rd of the maximum strength.
Therefore, proof load= Maximum welding strength

$$Proof\ load = \frac{Maximum\ welding\ strength}{3}$$

$$= \frac{2000}{3}, \text{ Kgf}$$

$$= 666.667 \text{ Kgf.}$$

5.2 Circuit diagram of proof load testing machine

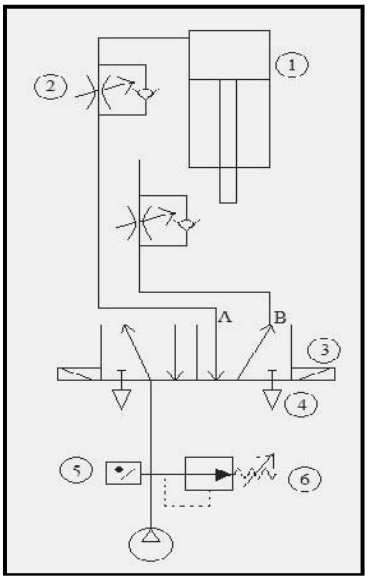

Fig 5.1 – Circuit diagram of proof load testing machine

1. Air cylinder : 1 nos
2. Speed controller : 2 nos
3. Solenoid valve : 1 nos
4. Silencer : 2 nos
5. Digital pressure switch: 1 nos
6. Filter regulator : 1 nos

VI. OPERATION OF PROOF LOAD TESTING MACHINE

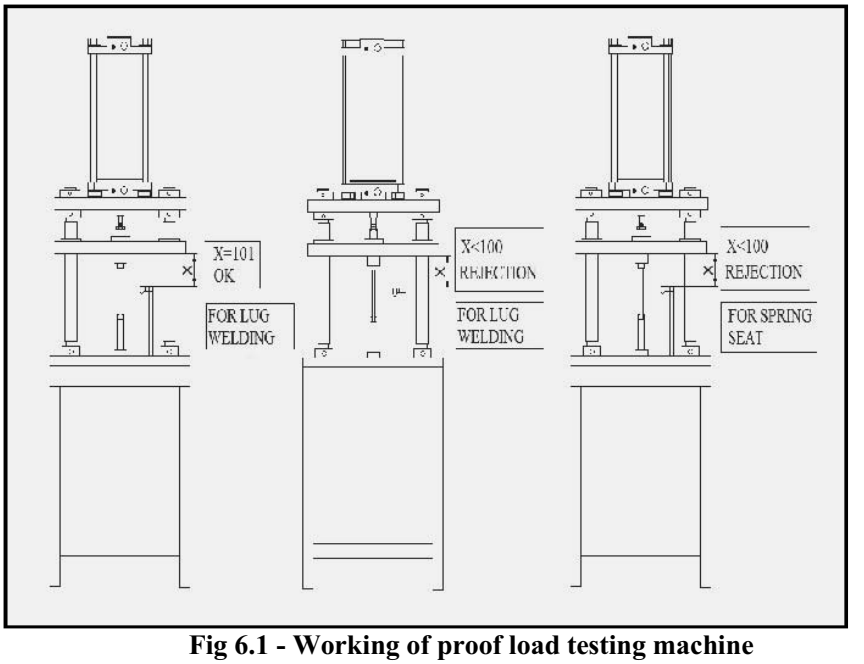

Fig 6.1 - Working of proof load testing machine

(a) Operator to load the component vertically in given cavity.
(b) Press the two hand push button the cylinder will come down.
(c) The cylinder will press component & after set delay it will move up.
(d) The pass or OK indicator will glow.
(e) If the component is fail then the cylinder will move forward and sense the sensor point.
(f) Same output will be picked and fail indicator will glow and mark on component by using pneumatic cylinder.
(g) Then operator has to press the reset button. The cylinder will move upward and ready for further cycle.
(h) Before new cycle start operator must be place the rejected component in rejection bin.

VII. ACKNOWLEDGMENT

The authors of this present work acknowledge the technical support given by NSK FAB & WELD, Nashik

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Review of Leak Detection Methods for Shock Absorber: A Comparative Study of Techniques

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Abstract- High demands are placed on vehicle damping systems. Shock absorbers have to minimize vibrations and post-oscillation in the vehicle body generated by uneven road surfaces. They also have to ensure that the wheels are in constant contact with the road. Both these tasks have a crucial impact on driving safety and comfort. While taut damping characteristics increase driving safety, comfort declines. The reverse also applies: Soft damping increases comfort but reduces safety. To achieve both optimum comfort and optimum safety, sophisticated technical solutions are required. Leakage in shock absorber outer tube can affect the performance of shock absorbers Outer tube of shock absorber is the important component which contain oil to maintain the required damping characteristic of shock absorber. Outer tube must be leak tested to ensure that outer tube is leak proof. This article presents some leak detection techniques and compares their performance with special attention paid to outer tube leakages.

Keywords- SPM; proof load; Shock absorber; Outer tube

I. INTRODUCTION

In Shock absorber, components and systems must be leak tested to ensure that there is no leakages. The three basic functions of leak testing are
1) Determining if there is leakage or not (detection),
2) Measurement of leak rate and
3) Leakage location.

There are many methods and types of test equipment for solving these problems, but unfortunately there is no single technique that fits every situation. Each test method is suitable only for a specific leak rate or for fixed forms and technologies. In most instances where leak detection is used, explicit leak rate measurement is not required, but the system must be able to recognize if the leak rate is above or below a specified level. This reference limit depends on the maximum acceptable leak rate, consistent with the reasonable working life expectation for final products, and, especially in certain countries, on rules and regulations constraints.

This acceptance level is the main parameter to consider when selecting the appropriate method or combination of testing methods. Several other factors must be taken into account as well. In particular, system costs, complexities, environmental impact, reliability, influence of external conditions, operator dependence and user-friendless should all be considered. [1, 3]

II. LEAK TESTING METHODS

A leak can be defined as an unintended crack, hole or porosity in an enveloping wall or joint, which must contain or exclude different fluids and gases allowing the escape of closed medium. Critical leak spots in closed systems are usually connections, gaskets, welded and brazed joints, defects in material, etc. A leak test procedure is usually a quality control step to assure device integrity, and should preferably be a one-time non-destructive test, without impact on the environment and operators. Several leak-testing techniques are available, spanning from very simple approaches to systems that are more complex. The most commonly used leak test methods are underwater bubble test, bubble soap paint, pressure and vacuum decay, and tracer gas detectors (halogen, helium and hydrogen).

In the diagram below, the performance of various leak-test techniques are summarized.

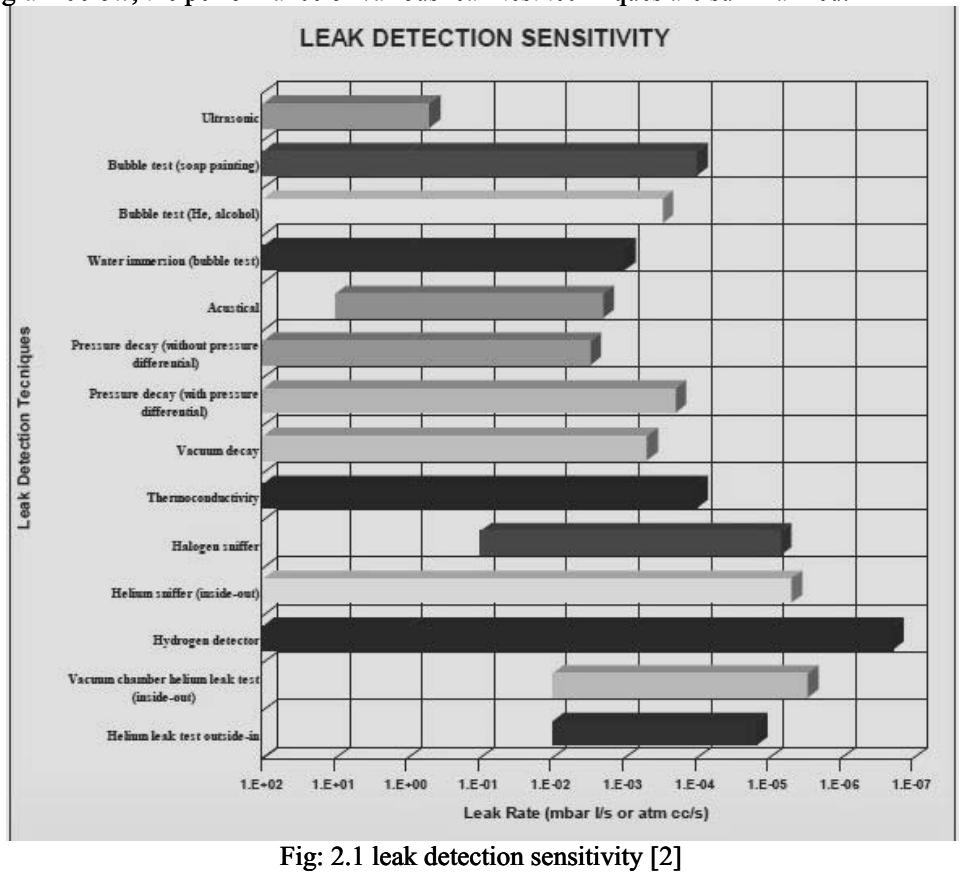

Fig: 2.1 leak detection sensitivity [2]

2.1 Water immersion bubble test method

The water-immersion bubble test, also called "bubble testing" or "dunking", is a traditional and relatively primitive technique of leak detection. It consists of immersing a charged or pressurized part, usually with high-pressure dry air or nitrogen, in a water tank and watching for escaping bubbles. The larger and more frequent the bubbles, the bigger the leakage. Relatively small leaks are possible, but very difficult, to detect.

The main limitation of this method is sensitivity, which is the minimum detectable leak rate. Considering a spherical bubble of radius R, its internal volume V will be:

$$V = \frac{4}{3} \times \prod R^3$$

Let p the pressure inside the bubble and t the time required to form the first bubble, the leak rate Q will be:

$$Q = \left(\frac{P.V}{t} \right)$$

The two key parameters determining the sensitivity of this method are the smallest bubble detectable by the operator and the waiting time for bubble generation. This time must be compatible with the production rate and with operator attention.

Some tricks to can be used improve to this method.

- Increasing the internal pressure in increments may increase the probability of finding a leak and can be less time-consuming in pinpointing the leak.
- A detergent can be added to the water to decrease surface tension, which helps to prevent the leaking gas from clinging to the side of the component.
- Using different gases (e.g. helium) and/or liquids may give some advantages in system performance,

but at a cost disadvantage.

- Hot water in the tank sometimes helps to increase the pressure inside the component or piping system. If dry nitrogen is used, this does not help because nitrogen does not increase its pressure significantly.

In conclusion, this technique does offer less leak detection accuracy in the high volume production applications and, in most cases, leak location and is very economical. However, the disadvantages range from a relatively low sensitivity, high operator dependency and possible part contamination, to fluid waste and the likelihood of having to dry the parts after testing. [4]

2.2 Soap solution bubble test

Instead of submersing the part in water, the pressurized unit to be tested is sprayed with a soap solution and the operator is able to see the bubbles formed by gas escaping from where the leak is. Soap solutions are available in many different types. Some have a brush applicator and others have a dabber (an absorbent ball attached to a stiff wire inside of the cap.) Some brands may even have a spray applicator to quickly cover large areas of tubing in a short amount of time. This is an advantage but is also messy and time consuming to clean up. Some soap solutions even have an antifreeze base to prevent them from freezing in the winter time. Others may have a lower density to make them even more sensitive to very tiny leaks.

This method has a higher sensitivity than water immersion. It allows detection of leaks up to 10-5 mbar · l/s and is suitable for very large systems. This soap solution method is best used when the approximate area where a leak may exist is known. In this case, the soap solution is only used in that specific area to test for and pinpoint a leak. It is the simplest and least expensive method, material wise, known today. However, if the operator does not know where the leak might be, it can be more expensive because of labor costs.

Increasing the gas pressure raises the probability of pinpointing the leak and is less time-consuming. However, for operator safety, the pressure must be limited to 1700 kPa (250 psi).

The soap-solution bubble test is limited by some drawbacks. The area to be sprayed must be a simple and easily accessible surface. On finned pipes or the bottom part of a large heat exchanger, it could be extremely difficult, if not impossible, for the operator to spray the part and watch for a bubble. Moreover, the application is not well suited for high productivity lines. [5]

2.3 Pressure decay test

This method consists of pressurizing the system with a high pressure gas, usually dry air or nitrogen. Then the part is isolated from the gas supply and, after a stabilizing period, its internal pressure is monitored over time. The pressure drop Δp is measured in the time Δt. If the pressure in the system drops fast, there is a large leak present in that component or section of the system. If the system's pressure drops slowly, there is a small leak present. If the pressure remains the same, that component is leak-free. The leak rate Q can easily be computed considering the volume V of the component. That is

$$Q = \left(\frac{\partial P.V}{\partial t} \right)$$

Several external factors, such as temperature variations and mechanical deformations, affect this test. The internal pressure, in fact, depends on temperature, and thermal fluctuations may cause changes in pressure, altering the results. Fortunately, dry nitrogen experiences very little pressure changes when it is exposed to small temperature changes.

Pressure decay proof is a go/no-go test. While it detects the presence of a leak, locating the leak requires the use of other techniques such as soap bubbles, or better, tracer gas detection. This leak testing technique has some advantages. This method will positively identify whether or not a leak exists by monitoring the pressure drop. If any pressure drop occurs, it means a leak is definitely present. Furthermore, this method can be realized completely automatically, so as to avoid operator errors. This procedure is a preliminary leak test that detects large leaks before the final automatic leak test operation using a tracer gas, e.g. helium. This test will detect over 90%, of the defective parts, especially those not brazed correctly.

The disadvantage of this method is that it does not identify where the leak is, only if a leak is or is not present. [2,6]

2.4 Vacuum decay test or Pressure rise test

A vacuum decay test or pressure rise test works in the opposite way of the pressure decay test. This method involves evacuating the part to suitably low pressures and, after stabilizing the pressure, measuring the increase in pressure caused by test media entering the part. Only parts that are able to withstand external pressure can be tested in this way (e.g. thin-walled plastic parts cannot be tested due to the danger of collapsing).

Even if in the vacuum decay test it is not possible to get more than one atmosphere of pressure difference from inside to outside, using some solvents (i.e. alcohol, acetone or similar) exalts the pressure increment due to the solvent entering into the leak. This approach, however, has some shortcomings, such as the possibility of solvent freezing, causing temporary leak-stuffing, or elastomer gaskets becoming damaged by solvents.

With respect to the pressure decay test, this technique has some advantages. This method is less sensitive to temperature changes since the pressure inside the part is lower than atmospheric pressure. Vacuum-meters are usually very sensitive to small pressure changes, so the theoretical sensitivity might be very high.

The vacuum decay method can be realized in a fully automatic procedure and, in this way, it is independent of the operator.

This technique is a "go no-go" test. It detects the total system leak and more than one leak can exist; leak location requires other techniques.

In a vacuum decay test, the unit to be tested is evacuated and its internal pressure is lower than atmospheric pressure. Therefore, this leak testing method will stress the part in the opposite way, if the working condition requires an internal pressure. [5]

2.5 Sniffing

Sniffing" is the simplest realization of an "inside-out" test. The sniffing technique of leak detection utilizes a detector probe or sniffer to sense leaks from a unit previously filled and pressurized with a tracer gas. Before filling the unit with a tracer gas it must be evacuated, so a pumping group, even a small one, is required. This method is very operator dependent. In fact, the probe (or wand) is moved over the part and detects the leak as it passes over that leak. The speed, distance from the part and the probe sensitivity determine the accuracy of leak detection. However, the cost of the tracer gas may be significant and, in case of a particularly expensive gas, the use of a suitable gas recovery and reclaim system should be considered, further increasing the overall costs.

Disadvantages include a high chance of missing leaks due to operator dependency, fragile equipment in rugged environments, and rejecting good parts (because of the inability to quantify the leak). Some sniffers and the relevant detectors require periodic maintenance to assure proper functioning, since they

are complex systems composed of vacuum pumps, mass spectrometer and vacuum fittings. Electronic detectors, without moving parts, are very profitable. Some detectors are sensitive to other gases than the tracer used. Therefore, when using these sensors, attention to the chemical environmental conditions is required.

The minimum leak rate measurable by a sniffer is the concentration of the tracer gas in the working area, a value known as "background level." This level may change during the production cycle and increases due to leaking units. Relating to the tracer gas used, in case of a big leak in the part under test, a lot of tracer gas escapes from it and may remain for a long time in the working area, strongly affecting the subsequent tests causing rejection of good parts. It is good practice to use a preliminary leak testing system to reject parts with gross leakages. It is possible to integrate this preliminary test, (i.e. a pressure decay test) in the tracer gas-filling machine, in order to simplify the equipment.

It is important to note that sniffing techniques are local methods, allowing testing of single points. Each of the tested points can have a leak below the sniffing sensitivity, but the overall leakage may be above the acceptance limit. As a result, the test is successful, but the part is defective. Global tests, such as vacuum chamber inside-out and outside-in methods, avoid this problem. [6, 7]

III. CONCLUSION

The growing demand for components and systems with fewer acceptable losses is the industry trend, due to several compelling market demands, such as economic requirements, environmental protection specifications, safety constraints and quality products requirement. The end result is stricter quality controls for leak testing. Researchers, technicians, scientists, producers etc., working with hermetically closed elements and vessels, vacuum or only tight seals have to become familiar with measurements and location of leaks. Remarkably, this technical field is nearly unknown even in engineering and important project organizations. A brief analysis of some of the most commonly used leak detection techniques, with particular reference to the automobile industry were presented. Every methodology has advantages and disadvantages; the right choice is a trade-off between them and the production requirements. For the choice of the test methodology that will be used, it is necessary to accurately consider all admitted leak limits and all the other factors, not only the technological requirements, but also the corporate image, regulation developments and the new requirements of the market.

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Optimization of Turning Parameters for Better Surface Finish and Material Removal Rate on EN9: A Literature Review

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Abstract- In this review paper, a survey on critical controllable turning parameters for the CNC lathe machines like speed, feed ,depth of cut, tool geometry, cutting environment, tool material, work material etc. which affect desired output like material removal rate , surface finish , cutting tool wear, work temperature are studied. There is a need of optimization of turning parameters and determining most significant parameters. Taguchi and ANOVA are widely used techniques for optimization and which parameters are most significant respectively. The aim of this review paper is to study the critical parameters and their effects on the response. The aim of the present study is to evaluate the best process to satisfy the quality and productivity.
Keywords- Turning, Material Removal Rate, Surface Roughness, Taguchi Technique, ANOVA

I. INTRODUCTION

Turning is widely accepted material removal process used to manufacture the parts which containing the operations like plain / cylindrical turning, step turning, taper turning, boring, counter boring, facing, chamfering, threading, drilling , reaming etc. The quality of the surface plays a very important role in the performance of turning as a good – quality turned surface significantly improves fatigue strength, corrosion resistant or creep life. The surface generated during turning is affected by different factors such as vibration, spindle run-out, cutting tool geometry, spindle speed, feed and other parameters. The most important interactions, that effect surface roughness of machined surface are between the feed and depth of cut, and between feed and spindle speed. Surface roughness is affected negatively if the applied force is increased. Surface roughness at the same feed rate becomes higher when a small nose radius is used. Technological parameter plays very important role on surface roughness.

There is a need of a tool that should allow the evaluation of the surface roughness before machining of the part and which, at the same time, can easily be used in the production floor environment contributing to the minimization of required time and cost and the production of desired surface quality. In order to obtain better surface finish, the proper setting of cutting parameters is crucial before the process takes place. Several factors influence the final surface roughness in CNC lathe turning operation. The final surface roughness might be considered as the sum of two independent effects: 1) the ideal surface roughness is a result of the geometry of cutting tool and feed rate, 2) the natural surface roughness is a result of irregularities in the cutting operation. MRR is an important control factor of turning operation. The non-linear nature of turning process has compelled to engineers to search for more effective methods to attain optimization. It is therefore imperative to investigate the turning behavior of different materials by changing the turning parameters to obtain optimal results. Process modeling and optimization are the two important issues in manufacturing products. The selection of optimum parameters like depth of cut, feed and spindle speed , tool nose radius, turning environment are very important issues for turning process on CNC lathe machine. Taguchi technique offers simple and systematic optimal design at relatively low cost.

Table1: Summary of Literature Review

Sr. No	Author Name	Type of Operation & Machine Used	Material Used	Tool Used	Input Process Used	Input Parameter	Output Parameter	Results/Significant Parameters
1	B Kumar agurubaran et al.(2013)	Turning , CNC lathe	EN9 Steel	Tungsten Carbide Inserts	Taguchi Design of Experiment	Feed Rate and Depth of Cut	Surface Finish, MRR	Surface Roughness, MRR
2	Amit Phogot et al.(2013)	Turning, Lathe Machine	Mild Steel	HSS	DOE, RSM	Spindle Speed, Depth of Cut, Feed Rate, Tool Nose Radius, Cutting Environment.	Surface Finish	Application/use/limitations of RSM
3	Maharhi Patel et al.(2013)	Turning, CNC Lathe	EN9	Tungsten Carbide	Taguchi, ANOVA	Cutting Speed, Depth of Cut, Feed Rate	Surface Finish, MRR	Surface Roughness and MRR increases with speed.
4	Hardeep Singh et al.(2013)	Turning, Centre lathe	EN9	HSS, Infrared Thermometer	Force Components, Mean plot	Spindle Speed, Feed Rate, Depth of Cut	Workpiece Temperature Optimization	Feed
5	Kaushal Pratap Singh et al.(2014)	Turning, CNC Lathe	EN9 Alloy Steel	Tin coated Tungsten Carbide tool	L18,O A, S/N ratio and Analysis of Variance (ANOVA)	Spindle Speed, Feed Rate, Depth of Cut, Nose Radius, Cutting Environment	Surface Finish, MRR	Improved Surface Finish and MRR
6	Jayesh Patel et. Al.(2014)	Turning, CNC Lathe	EN9 Steel	Coated (Tin) Carbide Tool	Regression Analysis, ANOVA	Side Rake Angle, Feed, Depth of Cut	Surface Roughness	Feed Rate
7	Narinder Gupta et al.(2014)	Turning, CNC lathe	EN9	CNMG Carbide	Metal Working Fluid Applicator.	Speed, Feed, Depth of Cut and Environment	Surface Roughness, Workpiece Surface Temperature	Cutting Fluid
8	Mr. Prateek Harinkhere et al.(2015)	Turning CNC, Lathe	EN9 Forging	Carbide Insert Tool	Taguchi Orthogonal Array Design Method, Design of Experiment	Depth of Cut, Feed Rate, Cutting Condition, Nose Radius.	MRR, Surface Roughness, Avg. Chip Thickness, Tool Vibration, Tool Flank Wear, Cutting Temp.	Surface Roughness, Production Time, Cutting forces, MRR
9	Ashish Bhateja et al. (2013)	Turning, CNC Lathe	EN 24 Alloy	Tungsten Carbide	Taguchi Analysis using Statistical Approach	Speed , Feed Rate and Depth of Cut	Surface Roughness, Tool Wear Rate & (MRR)	TNMG (triangular) has the leas value of tool wear (TWR),

10	Mohamed Khaisar et al.(2014)	Turning	EN9	Coated Carbide Insert	Taguchi's L8 Orthogonal Array, Regression Analysis.	Speed, Feed and Depth of Cut	Tool Wear, Vibration	Know how to tool flank wear progresses towards failure.
11	A.M. Badade et al.	Boring	EN9	Cemented Carbide Insert	ANOVA, Taguchi L9	Spindle Speed, Feed, Depth of Cut and L/ D ratio	Surface Finish, M/c Time	Feed followed by Spindle Speed
12	Kaushal Pratap Singh et al.	Turning	EN9 & Aluminium	Carbide Tool	ANOVA, Taguchi	Cutting Speed, Feed Rate and Depth of Cut	Cutting Speed, Feed Rate and Depth of Cut	Depth of Cut and Speed a significant parameters affecting hardness of the material.
13	Divyangsingh N Rana et al.(2014)	Turning	Stainless Steel Solid Bar	1.Carbide, 2.Ceramic 3. CBN	Design of Experiments	Cutting Speed, Depth of Cut and Feed Rate	Surface Roughness	CBN Tool gives more finish
14	Jagadale Amitkumar Hanamantrao et al.(2014)	Turning	EN9	Sandvik Inserts (CNMA & CNMM)	ANOVA	Cutting Speed, Depth of Cut	Surface Roughness	Wiper Cutting Insert has a better performance.
15	Anand S. Shivde et al. (2014)	Turning	EN8	Carbide Cutting Tool	Taguchi's L9 Orthogonal Array design	Spindle Speed, Depth of Cut, Feed	Surface Roughness and Tool Tip Temperature	Improved Surface Finish.
16	Neeraj Saraswat et al.(2014)	Turnin	Mild Steel		ANOVA, Taguchi Method	Spindle Speed, Depth of Cut, Feed	Surface Roughness	Improved Surface Finish.
17	Upinder Kumar Yadav et al. (2012)	Turning, CNC lathe	AISI 1045	Tungsten Carbide	ANOVA, Taguchi method	Cutting Speed, Feed rate, Depth of cut	Surface Roughness	Feed Rate
18	Er. Manpreet Singh et al. (2014)	CNC lathe machine	Review on machining of different materials with CNC			Depth of cut, Feed and Speed	Surface Roughness	For: Surface Roughness: Speed ; for MRR: DOC
19	Mihir T. Patel et al. (2014)	CNC lathe machine	Review on machining of different materials with CNC			Depth of Cut, Feed and Speed	Surface Roughness, MRR	Surface Roughness: Speed, Feed and Depth of Cut,

							For MRR DOC, Feed and Speed
20	Rangan ath M.S. et al. (2013)	CNC Lathe Machin e	Review on machining of different materials with CNC			Depth of Cut, Feed and Speed	Surface Roughness	Cutting Speed followed by Feed Rate and Depth of Cut.
21	Rangan ath et al. (2015)	Centre Lathe	Aluminium (6061)	HSS	ANO VA, Taguc hi	Cutting Speed, Feed and Depth of Cut	Surface Roughness	Cutting Speed
22	Kishan Dhamel iya et al. (2014)	CNC Lathe	Mild Steel	HSS (Sandvik CNMG)	ANO VA, Taguc hi	Cutting Speed, Feed and Depth of Cut	Surface Roughness	Spindle Speed
23	Prof. P.D. Kamble et al. (2015)	CNC Lathe	EN8	Tungsten Carbide	Taguc hi DOE	Speed, Feed, Depth of Cut, Cutting Condition, Nose Radius.	Surface Roughness, MRR	Spindle Speed

II. CONCLUSION

From the above literature review summary we found that the researchers had taken spindle speed, feed rate and depth of cut as input turning parameters and in some cases turning environment, tool tip temperature and cutting tool nose radius. Material Removal Rate, Surface Roughness and cutting tool wear as output parameters. After studying the above literature review inferences can be concluded that for Material Removal Rate the most significant parameters were depth of cut, feed rate and spindle speed. The least significant parameter was cutting tool nose radius. Whereas feed rate was most significant parameter for surface roughness followed by depth of cut. For cutting tool flank wear speed, depth of cut and feed rate were significant factors. We also found that taguchi gives systematic approach and efficient method for the optimum operating conditions.

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