

# A LOW ENERGY, HIGH PERFORMANCE MULTIPLIER USING $DM^2$ ADDER

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## ABSTRACT

*This project presents a multiplier. This multiplier is designed using Dual Mode Square adder. The dual mode square adder has low energy dissipation also yield high performance. As it works in dual mode operation it works with less delay. Dual mode adder simplifies the usage of dual mode addition in a pipelined processor, while further reducing the computation energy compared to dual mode adder implementation, the proposed multiplier with dual mode square adder can achieve less area, high speed, less propagation delay time.*

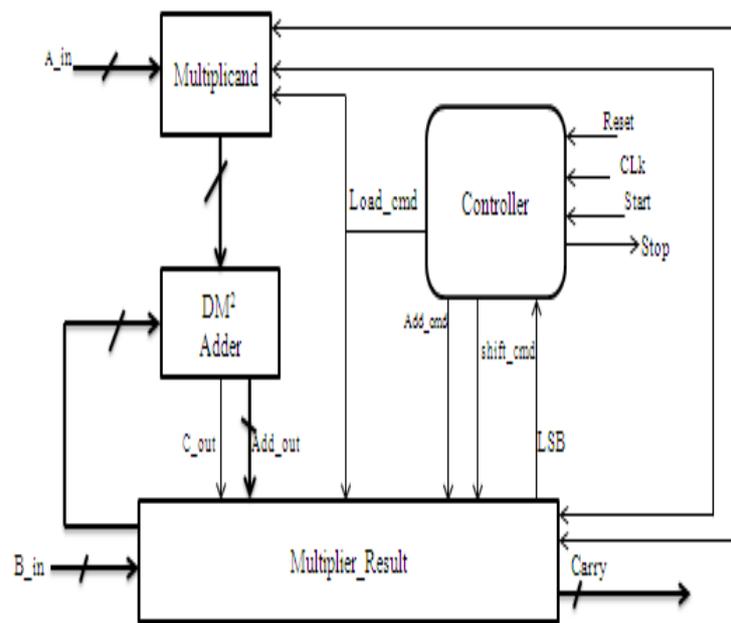
**Key Words:**  $DM^2$ , DMADD, DML, LSB, VHDL.

## I. INTRODUCTION

The multiplier is designed in the way that it yields low energy and high performance. The design was implemented using the mixture of both behavioral design and rtl design. The multiplier has a controller to control the circuit. This controller circuit will command other modules. The multiplier circuit will multiply the value given by the multiplicand circuit. The dual mode square adder will perform the addition operation. This dual mode square adder is a combination of two technology *dual mode adder and dual mode logic*. The first method is *dual-mode addition* (DMADD). It takes advantage of the carry probability to perform low-power addition and leading to a considerable energy reduction of up to 50% compared to conventional designs. However, it requires some pipeline modifications to support multi-cycle addition. The second method is a logic gate topology called *dual mode logic* (DML) comprising static and dynamic operation modes within the same gate.

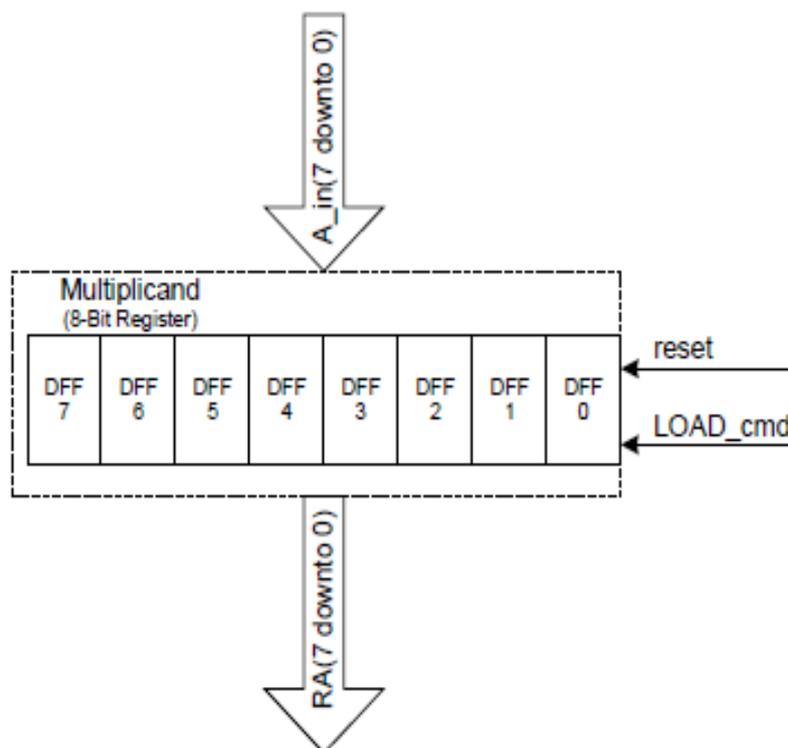
## II. BLOCK DIAGRAM

The Multiplier is constructed using the essential parts in Fig1. It consists of controller, multiplicand,  $DM^2$  adder and multiplier result. The controller is the heart of circuit that controls the circuit using the START and STOP Signal. Multiplier is generally preferred in Digital signal processing, CPU the Central Processing Unit. Multiplier with less area occupation and high delay is a challenging task. But the proposed method reduces the delay and increases the performance of Multiplier as the adder included is Dual Mode Square Adder. This  $DM^2$  adder has high performance and less delay which in turn make the multiplier to achieve the required result.



**Fig 1. Block Diagram of Multiplier**

The controller will receive the start signal then it will load the values in the multiplicand and multiplier result's shift register. The controller works by add and shift logic. The multiplicand and DM<sup>2</sup> adder will pass the value to multiplier result. Then the multiplied value will be achieved through the output from multiplier. The dual mode square adder works in two ways 8 bit Ripple Carry adder and two 4 bit carry select adder.



**Fig 2 Multiplicand Block Diagram**

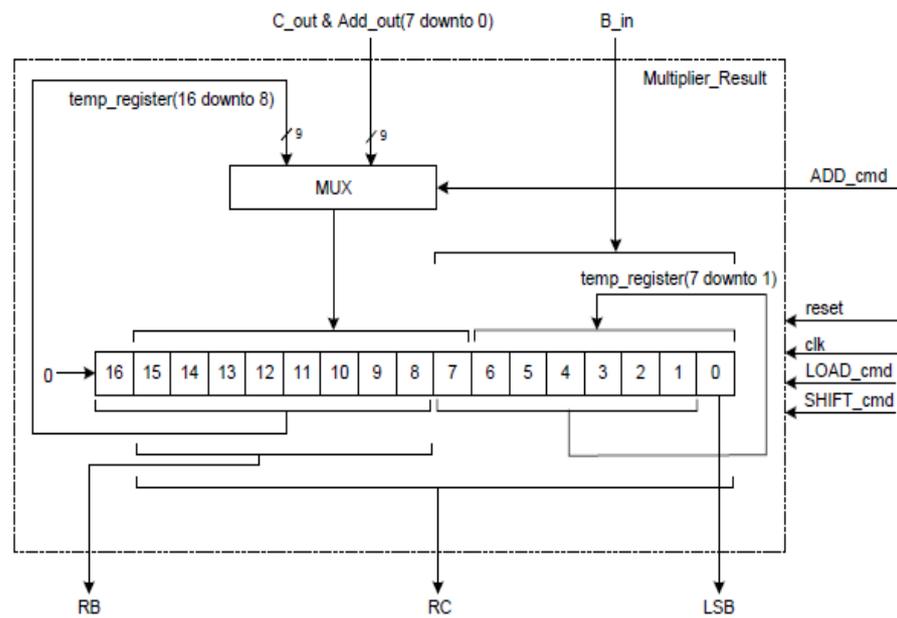


Fig 3 Multiplier Register

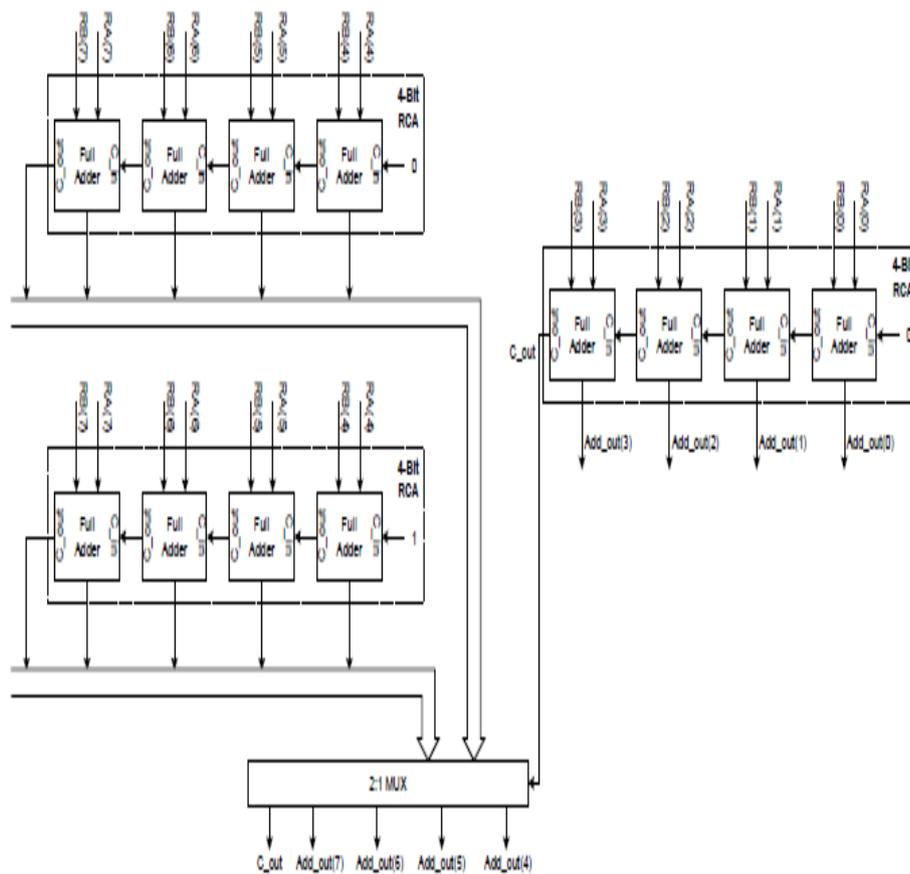
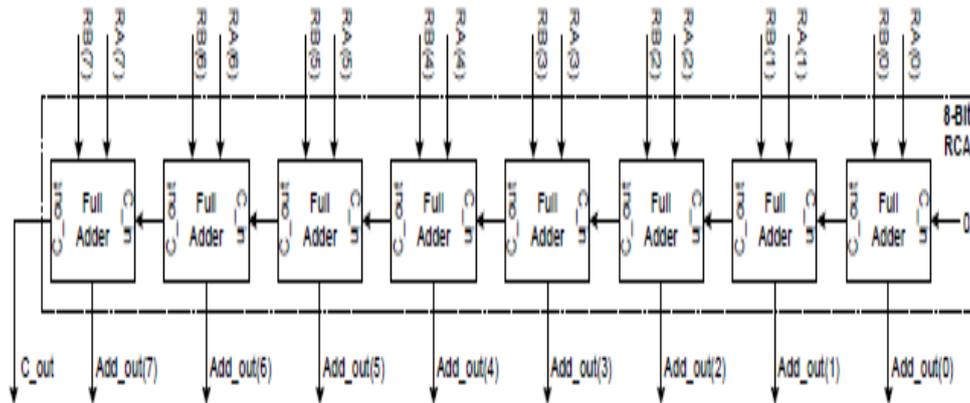
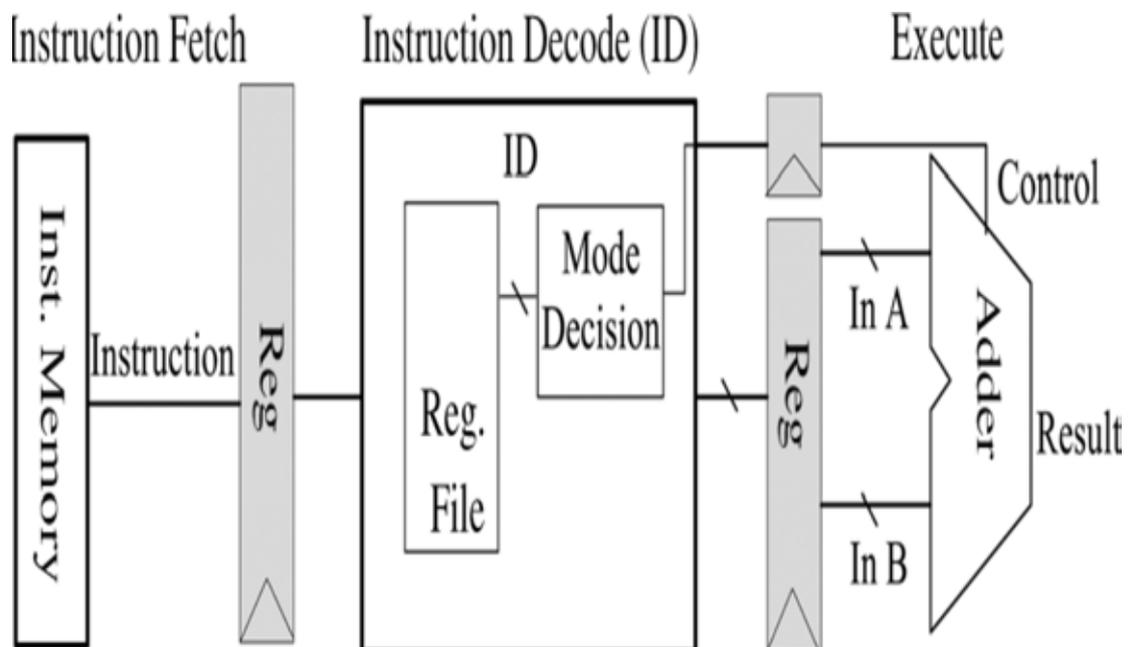


Fig 4 Carry Select Adder



**Fig: 5 Ripple Carry Adder**

The 8-bit ripple carry adder is composed of 8 individual full adders connected in a chain. In this case, the carry out of each full adder is the carry in of the following full adder. The limiting speed factor in this approach is the delay from the first full adder to the outputs of the final full adder. In order to try and improve the speed of the adder, consequently enhancing the overall speed, the carry-select adder was also implemented and compared to the original ripple carry adder. The carry-select adder is composed of three 4-bit adder to its carry out which controls the ripple carry adder blocks whereby the carry out of the first ripple carry adder selects which of the other two ripple carry adders to send to the output. In this case the limiting factor is the delay from the input of the first 4-bit ripple-carry multiplexer.



**Fig.3 Dual Mode Square Adder**

**III. SIMULATION AND TIMING**

The controller is synchronous to the clock and transitions through the various states occur on the rising clock edge. Upon entering the initialize state, the LOAD\_cmd is generated. During each test state, the LSB is sampled. If the LSB was high, the add state is entered and the controller generates the ADD\_cmd. The input, A\_in, is only loaded into the register on the rising edge of the LOAD\_cmd signal and remains in the register until the next time the LOAD\_cmd signal is asserted. If the Multiplier\_Result receives a SHIFT\_cmd without a prior ADD\_cmd, the register will be shifted logically to the right. If the ADD\_cmd precedes the SHIFT\_cmd, bits 1 to 7 of the register will be placed into positions 0 to 6 while the 9 inputs bits from the adder will be placed into positions 7 to 15 of the register. This is essentially equivalent to storing the adder results and then shifting the entire register.

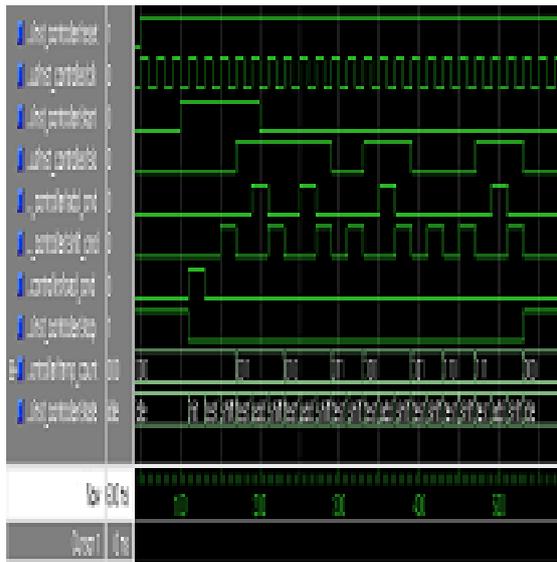


Fig 4 Multiplicand



Fig 5. Control

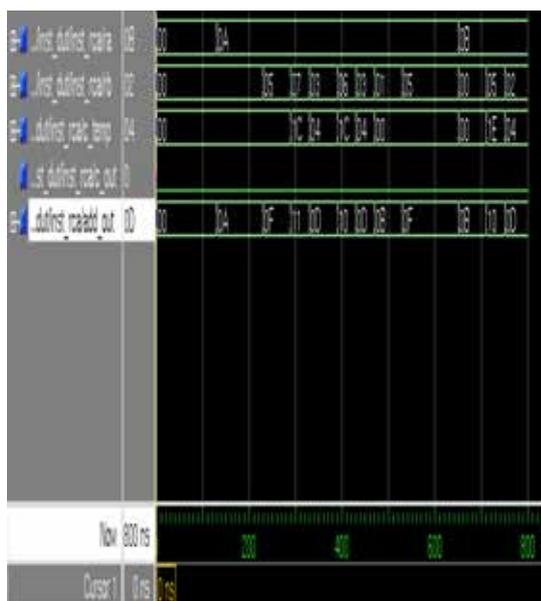


Fig 6 Multiplier Result

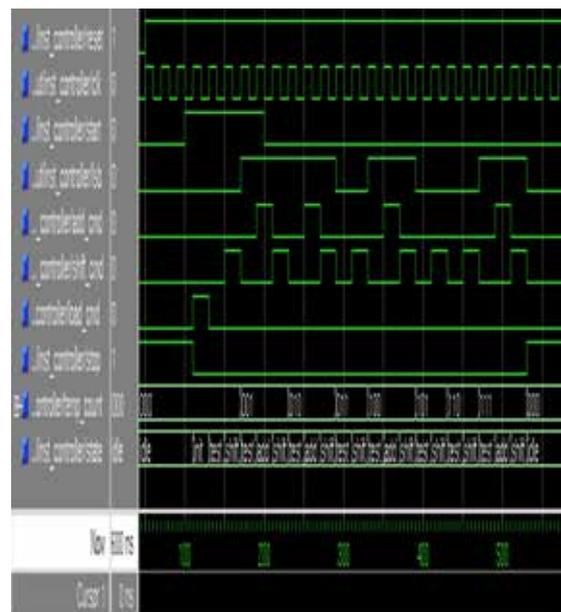


Fig 7 Ripple Carry Adder

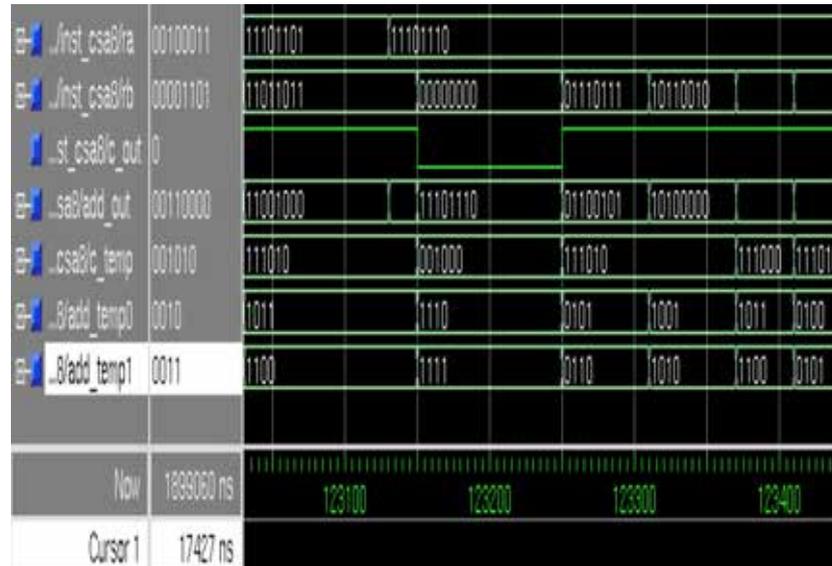


Fig 8 Carry Select Adder

#### IV. CONCLUSION

The goal of the project, to design multiplier using the  $DM^2$  adder, was achieved. The multiplier was designed, coded in VHDL and simulated using the appropriate caddence tools. As an added value to the project, several designs were implemented in order to compare speed and area. Designs were also synthesized using various targets. The place & route for the modules are going on. As mentioned, the energy dissipation is reduced and performance is increased.

#### V. NOMENCLATURE

$DM^2$  – Dual Mode Square Adder.

VHDL – V (VHSIC- Very High Speed Integrated Circuit) Hardware Description Language

LSB – Least Significant Bit

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# EFFICIENT KNOWLEDGE BASED SYSTEM FOR LEAF DISEASE DETECTION AND CLASSIFICATION

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## ABSTRACT

*There are many decision support systems available in plant protection for small holder's family farmer. Some are commercial. Some were developed as experiments and have been offered to the public. For plant protection we have systems that forecast, optimize interventions and help diagnose the problem. Forecasting systems obtain data from a variety of sources including automated weather systems, past data and epidemiological models. Plant diseases cause significant reduction in both quality and quantity of agricultural products. Automatic detection of plant diseases may prove benefits in monitoring large fields of crops. The proposed system will automatically detect the symptoms of diseases as soon as they appear on plant leaves. It is an efficient disease diagnosis system that focuses on plant disease identification by processing acquired digital images of lemon leaves. These images are made to undergo a set of pre-processing methods for image enhancement. The enhanced image is segmented and canny edge detection used to extract the region of interest i.e., diseased portion. Later, a satisfying set of visual features from the region of interest are extracted by applying histogram for detecting diseases accurately. The advisory helps farming community in effective decision making to protect their crop from diseases and increase its productivity. There by, the proposed approach improves crop yield and uplifts the economy of farming community.*

**Keywords: Classification, Canny Edge Detection, Extraction, Threshold, Segmentation.**

## I INTRODUCTION

India is a cultivated country where large number of people's life based on agriculture. Farmer has huge range of diversity to select suitable crops. The farming of different crops for optimum yield and quality product is highly important. It can be improved with the help of technological support. The lemon is a small evergreen tree native to Asia Lemons was the primary commercial source of citric acid before the development of fermentation based processes. Lemon is sedative and antispasmodic used for medicinal purposes. The main cause for the disease is the leaf of the lemon tree. Most of the disease on lemon tree is based on leaf. The previous system is an automated system for recognizing plant species based on leaf images. Plant leaf images corresponding to three plant types, are analyzed using two different shape modelling techniques, the first based on the Moments-Invariant (M-I) model and the second on the Centroid-Radii (C-R) model. The system has used a method for the extraction of shape, color and texture features from leaf images and training an neural network classifier to identify the exact leaf class. The main problem is misclassification and less accurate. So that the farmers couldn't

identify the disease at initial stage. Here, the Research work develops the advance computing environment to identify the diseases using infected images of lemon leaf. Images of leaves are taken from digital camera, smart phones and processed using image growing and software can provide the exactly differentiate the difference of colour present on these leaves and depending upon that difference the further compare with database stored image features, then the part of the leaf sport has been used for the classifying and testing the leaves for detecting disease. The technique evolved into the system is both Image processing technique .Technique would classify the disease based on threshold value and intimate the farmer about the disease and its remedies.

### 1.1image Analysis in Agriculture

#### Image Analysis can be useful for the following purposes

1. To identify diseased leaf.
2. To measure affected area by disease.
3. To find out the boundaries and color of the affected area.
4. To determine size & shape of leaf.
5. To identify the Object correctly.

### 1.2 Types of Lemon Tree Diseases

**Citrus canker** caused by a bacterial pathogen, is a serious disease of most citrus varieties. Citrus canker is highly contagious and can be spread rapidly by wind-driven rain, lawnmowers, and human movement. Citrus canker can be controlled by copper fungicides. **Citrus greening** is one of the most destructive diseases of citrus. Citrus greening is caused by systemic phloem inhabiting bacterium. Citrus greening bacteria are transmitted by the citrus psyllid. good care of trees including irrigation, weed control, soil-applied fertilizer, foliar nutrition, and effective psyllid control may keep the trees productive. **Greasy spot** spores germinate on the underside of the leaves, penetrate the leaf tissue, and cause cellular swelling resulting in blister formation on the lower leaf surface Leaves are susceptible once they are fully expanded and remain susceptible throughout their life. The prays are needed to control greasy spot. The first spray should be scheduled in May-June and the second in July-August. Thorough coverage of the underside of leaves with copper fungicides plus oil is important and necessary for the control of greasy spot. **Citrus leafminer** The hatching citrus leaf miner larvae enter the leaf tissue and begin feeding beneath the epidermal (surface layer) cells. The Citrus leaf miner generally does not noticeably affect growth and yield of mature trees. Biological control through natural enemies and the introduced parasitoid wasp makes a significant contribution in suppressing the problem. However, young trees are vulnerable to severe leafminer damage because of frequent leaf flushes. **Citrus black spot** is a fungal disease caused by *Guignardia citricarpa*. This Ascomycete fungus affects citrus plants throughout subtropical climates, causing a reduction in both fruit quantity and quality. **Anthracnose** is a primary colonizer of injured and senescent tissue.. The disease is especially troublesome on fruit that are harvested early and degreened for over 24 hours because ethylene stimulates the growth of the fungus.

## II RELATED WORK

Automatic detection of plant diseases is an important research topic as it may prove benefits in monitoring large fields of crops, and thus automatically detect the diseases from the symptoms that appear on the plant leaves. This enables machine vision that is to provide image, process control and classify the diseases to intimate the farmers about the disease and its remedies. The objective of this paper is to concentrate on the plant leaf disease detection based on the features of the leaf and classify the disease. K.S.Raghuvanshi et al.[1] attempted to automatically grade the disease on the Pomegranate plant leaves. The paper proposes an image processing methodology to deal with one of the main issues of plant pathology i.e disease grading. The results are proved to be accurate and satisfactory in contrast to manual grading and hopefully take a strong leap forward in establishing itself in the market as one of the most efficient and effective process. Radhiah Binti Zainon [3] has developed a prototype system for detecting the paddy disease which are Paddy Blast Disease, Brown Spot Disease, Narrow Brown Spot Disease. All the paddy sample will be passing through the RGB calculation before it proceed to the binary conversion. Then, all the segmented paddy disease sample will be convert into the binary data in excel file before proceed through the neural network for training and testing. Consequently, by employing the neural network technique, the paddy diseases are recognized about 92.5 percent accuracy rates. Human sight error can be eliminate when determine the paddy disease.Helly et al. [4] developed a new method in which Hue Saturation Intensity (HIS) - transformation is applied to the input image, then it is segmented using Fuzzy C-mean algorithm. Feature extraction stage deals with the color, size and shape of the spot and finally classification is done using neural networks Al-Bashish et al. [6] developed a fast and accurate method in which the leaf diseases are detected and classified using k-means based segmentation and neural networks based classification. This neural network classifier could successfully detect and classify the diseases with a precision of around 93%. S. Arivazhagan et al.[7,] has developed four main steps are first a colour transformation structure for the input RGB image is created, and then the green pixels are masked and removed using specific threshold value followed by segmentation process, computing the texture features using colour co-occurrence method for the useful segments, finally the extracted feature are passed through the classifier. Support vector machines are a set of related supervised learning method used for classification and regression. The detection accuracy is improved by SVM classifier. The two class problem is then extended to multi class problem where the detected leaf diseases are then classified into various categories. By this method, the plant diseases can be identified at initial stage itself and the pest control tools can be used to solve pest problems while minimizing risks to people and the environment. Bauer et al.[8] has developed a Automatic classification of leaf diseases is done based on high resolution multispectral and stereo images. Sugar beet leaves are used in this approach. Segmentation is the process that is carried out to extract the diseased region and the plant diseases are graded by calculating the quotient of disease spot and leaf areas. Jayamala K. Patil et.al[11] has developed method advances in image processing for detecting plant leaves diseases for increasing throughput & reducing subjectiveness arising from human experts in detecting the plant disease its is very speed and accurate. Hence there is a scope for working on development of innovative, efficient & fast interpreting algorithms

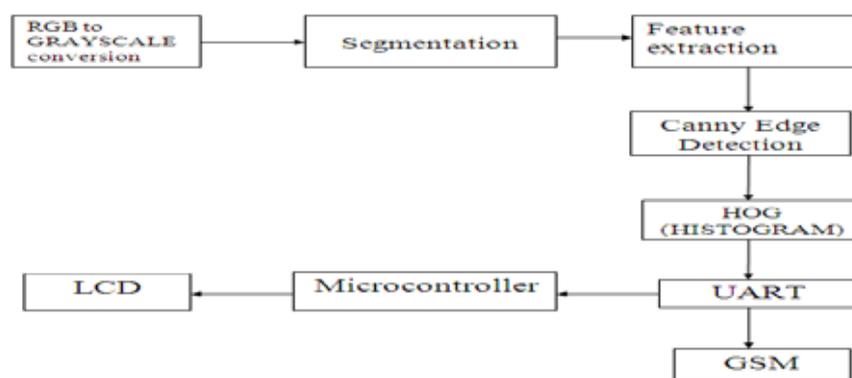
### 2.1 Existing System

Plant leaf recognition using neural network classifiers is an automated system for recognizing plant species based on leaf images. Plant leaf images corresponding to three plant types, are analyzed using two different

shape modelling techniques, the first based on the Moments-Invariant (M-I) model and the second on the Centroid-Radii (C-R) model .Here they have used a method for the extraction of shape, color and texture features from leaf images and training an neural network classifier to identify the exact leaf class selection of proper image input features to attain high efficiency with less computational complexity. Neural networks are used as classifiers for discrimination. This work has been implemented using the image processing and neural network toolboxes Useful for quick and efficient classification of plant species. Used by the forest department to classify the plant species.

### III EFFICIENT KNOWLEDGE BASED SYSTEM

The proposed system is to automate the detection of disease in lemon leaf in order to easily find the diseases so that farmers need not check manually and randomly. This system reduces their effort. Some times some disease can't be found in manual detection and by using some techniques. If we keep an automated efficient knowledge based system , all diseases can be easily found by capturing image of the picture continuously and comparing it with the database which is known as classifiers used to find the defect in all parts of the leaf. The captured images in RGB format is converted to gray scale using MATLAB conversion. The gray scale images are segmented into binary images using gray level threshold segmentation. Feature extractions of segmented leaves are done using canny edge detection. Then by using histogram algorithm the threshold value of the leaf can be calculated. The threshold value is compared with normal threshold values of the leaf stored in classifiers. By using the value we can easily say that the leaf is infected or not. The threshold value of normal leaf ranges between 30-32, if it is infected the value differs from this value. Now classification occurs, a database is created which is called classifiers in MATLAB. In the classifiers we will store the disease name with the threshold value and remedy. If it's infected, then alarm will be generated in order to intimate the owner about the disease occurrence. We use LCD, it is used for the display of the disease name and remedy to the owner. Thus the system is used for automatically detecting and classifying diseases which are occurring in lemon leaf



**Figure 1: Block Diagram of Proposed Work**

#### 3.1 The step by step procedure of the proposed system

1. RGB image acquisition
2. Convert the input image from RGB to Grey scale format.
3. Masking the green pixels

4. Removal of masked green pixels
5. Segment the components
6. Obtain the useful segments
7. Computing the features using canny edge methodology
8. Evaluation of texture statistics
9. Obtain Histogram for various textures
10. Compare it with Threshold values
11. Send values through Serial communication to Microcontroller
12. Generate SMS based on disease affected on leaf to owner
13. Display Remedies for affected disease in LCD

## **3.2 Proposed Work**

### **3.2.1 Image acquisition**

The RGB colour images of lemon leaf are captured using a camera. The digitization and storage of an image is referred as the image acquisition. After the image has been obtained, various methods of processing can be applied to the image to perform the many different vision tasks required today. However, if the image has not been acquired satisfactorily then the intended tasks may not be achievable, even with the aid of some form of image enhancement. All the images are saved in the JPEG format.

### **3.2.2 Image Pre-Processing**

Pre-processing task involves some procedures to prepare the images enhancement. Pre-processing images commonly involves removing low frequency background noise, normalizing the intensity of the individual particles images, removing reflections, and masking portions of images leaf image is in RGB colour format. The RGB image is converted to a gray scale image.

### **3.2.3 Segmentation**

Image segmentation refers to the process of partitioning the digital image into its constituent regions or objects so as to change the representation of the image into something that is more meaningful and easier to analyze, the image segmentation based on gray-level threshold segmentation is adapted and the binary image is obtained.

### **3.2.4 Feature extraction**

General descriptors such as number of the object, area of the shape object, width and length of the object, and area of image, are important characteristics to describe its shape. Those characteristics are used to extract feature in the RGB space, in which the colour at each pixel is represented as a triplet  $(R, G, B)$ , where  $R$ ,  $G$  and  $B$  are respectively the red, green, and blue value from a colour image capturing device. The features correspond to color characteristics are the mean and variance of the gray level of the red, green and blue channel of the spots; and other features correspond to morphological and geometrical characteristics of the spots. By using segmentation technique it is easy for us to extract the features of disease leaf of the image. The image analysis here focuses on the shape. Feature extraction has done using canny edge detection algorithm

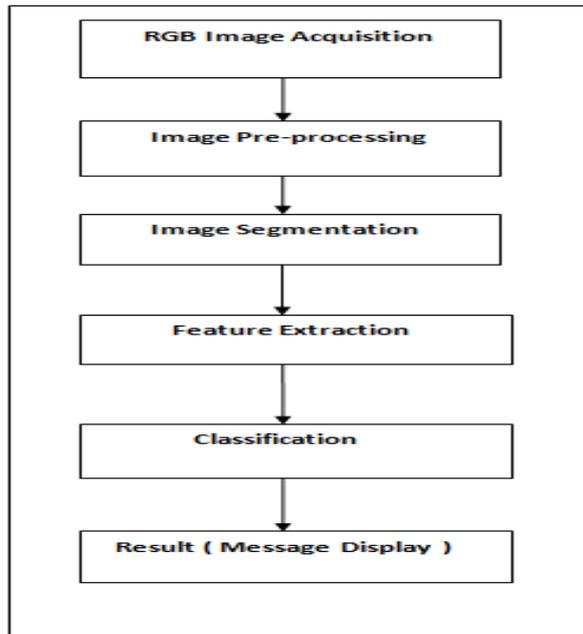


Figure 2: Flow Of Proposed Work

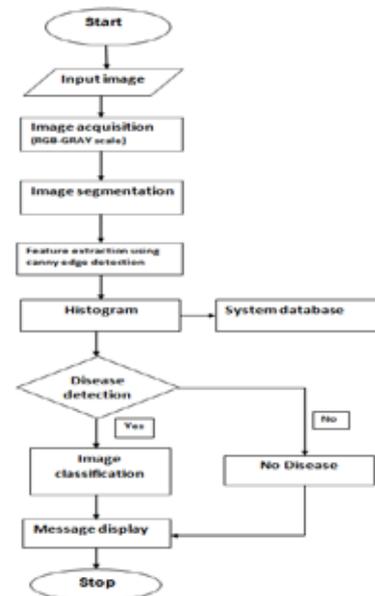


Figure 3: Disease Detection Process

### RGB-Gray Conversion

$$G = \text{rgb2gray}(Z)$$

$$\text{Gray} = 0.2989 * R + 0.5870 * G + 0.1140 * B$$

### 3.2.5 Classification

Images are classified by comparing to the database image based on affected threshold value the leaf disease is identified. If the leaf is infected, specific disease name and remedy is send to the owner as well as displayed in LCD.

### 3.3 Canny Edge Detection

The Canny edge detector is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images .The general criteria for edge detection includes

1. Detection of edge with low error rate, which means that the detection should accurately catch as many edges shown in the image as possible
2. The edge point detected from the operator should accurately localize on the centre of the edge.
3. a given edge in the image should only be marked once, and where possible, image noise should not create false edges.

The algorithm work includes this process:

1. **Smoothing:** Blurring of the image to remove noise.

The equation for a Gaussian filter kernel with the size of  $2k+1 * 2k+1$  is shown as following:

$$H_{ij} = \frac{1}{2\pi\sigma^2} * \exp\left(-\frac{(i-k-1)^2 + (j-k-1)^2}{2\sigma^2}\right)$$

2. **Finding gradients:** The edges should be marked where the gradients of the image has large magnitudes. The computed edge strengths are compared to the smoothed image

$$G = \sqrt{G_x^2 + G_y^2}$$
$$\Theta = \text{atan2}(G_y, G_x).$$

Where:  $G_x$  and  $G_y$  are the gradients in the x- and y-directions respectively

**3. Non-maximum suppression:** Only local maxima should be marked as edges.

The purpose of this step is to convert the “blurred” edges in the image of the gradient magnitudes to “sharp” edges. The algorithm is for each pixel in the gradient image:

- i. Round the gradient direction  $\theta$  to nearest  $45^\circ$ , corresponding to the use of an 8-connected neighbourhood.
- ii. Compare the edge strength of the current pixel with the edge strength of the pixel in the positive and negative gradient direction. I.e. if the gradient direction is north ( $\Theta = 90^\circ$ ), compare with the pixels to the north and south.
- iii. If the edge strength of the current pixel is largest; preserve the value of the edge strength. If not, suppress (i.e. remove) the value.

**4. Double thresholding:** Potential edges are determined by thresholding. The Canny edge detection algorithm uses double thresholding. Edge pixels stronger than the high threshold are marked as strong; edge pixels weaker than the low threshold are suppressed and edge pixels between the two thresholds are marked as weak.

**5. Edge tracking by hysteresis:** Final edges are determined by suppressing all edges that are not connected to a very certain (strong) edge.

### 3.4. Experimental Result

Threshold calculation:

```
I1= imread('leaf.jpeg');  
thresh = graythresh (I1);
```

The input image is digitised and masked to get clear RGB format. The RGB image is converted into gray scale image.



Figure 4: Image of lemon leaf

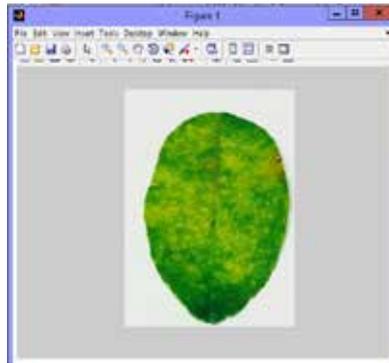


Figure 5: rgb image acquisition

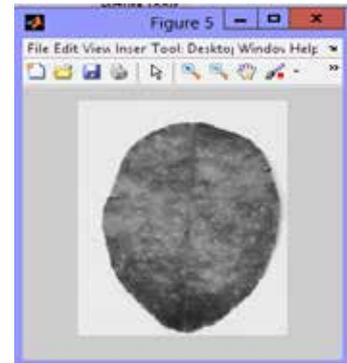


Figure 6:gray scale image

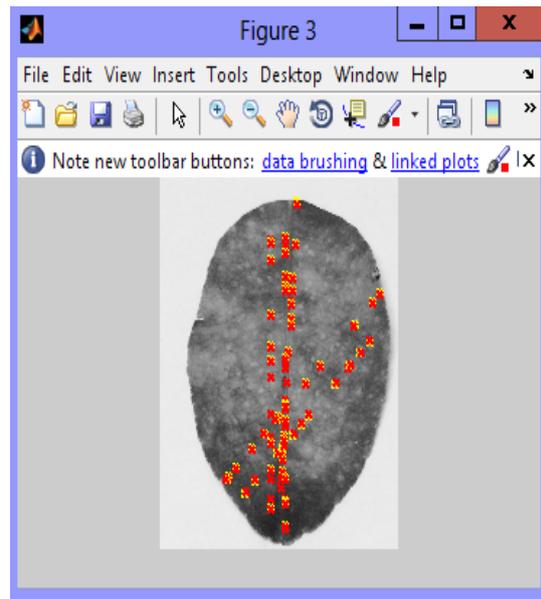
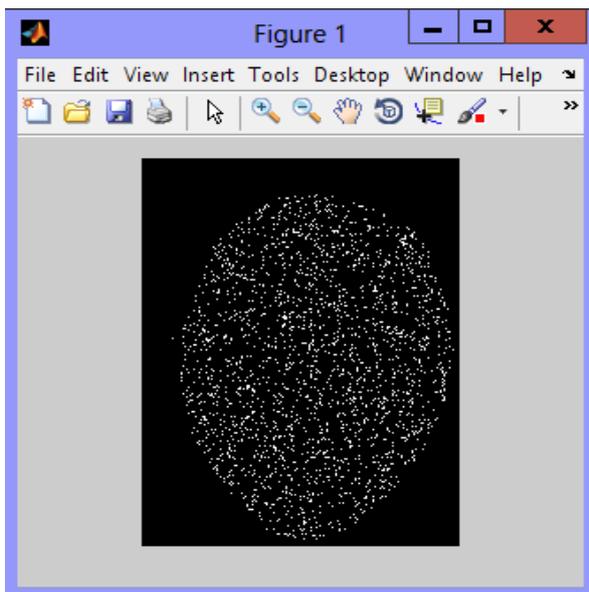


Figure7: feature extraction using canny edge detection Figure 8: identification of diseased area and change.

Later the image is segmented into binary image using gray level segmentation. Feature is extract to detect the diseased portion of leaf. The graph defines amount of diseased area and variation in the leaf.

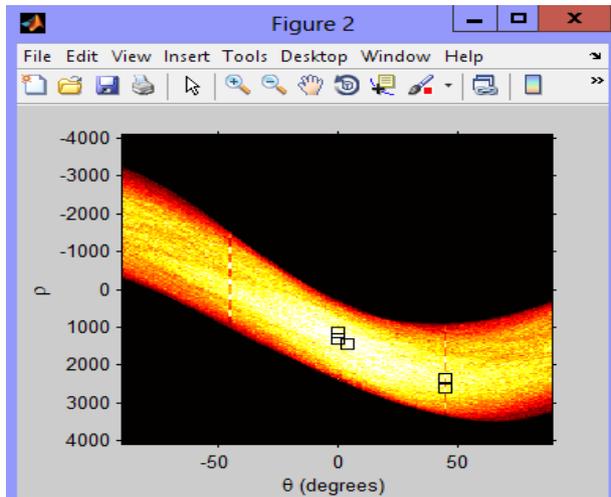
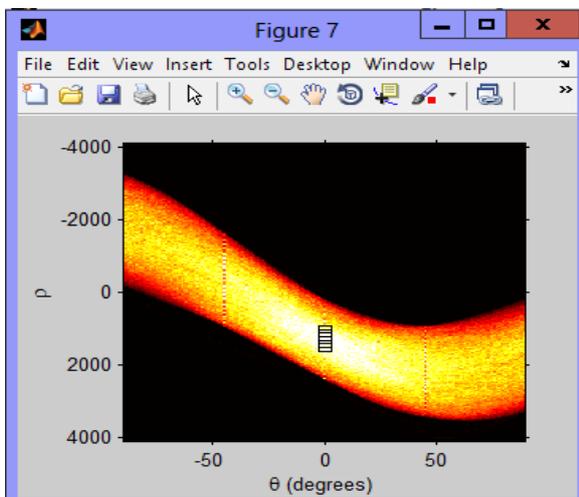


Figure 9: Histogram Plot Inclination of Normal Leaf Figure 10: Plot Inclination of Diseased Leaf.  
Threshold value is calculated .based on database table; the leaf is classified and identified the disease



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# PRODUCTION AND APPLICATION OF CELLULASE ENZYME FOR BIOPOLISHING OF COTTON

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## ABSTRACT

*In this study an attempt has been made to study the effect of enzyme on biopolishing of cotton. Cotton fabric was subjected to biopolishing using enzyme commercially available. An attempt has also been made, to synthesize cellulase enzyme from microbe and evaluate their suitability for biopolishing of cotton fabrics as against the commercial enzyme. The performance of enzyme treated fabric has been compared with that of singed sample. The biopolished samples were subjected to various tests like breaking strength and fabric weight, thickness, drape and abrasion resistance.*

**Key Words:** *Singeing, Bio Polishing, Enzymes, Cellulase*

## I. INTRODUCTION

Textile industry is the most diverse and dynamic segment of all manufacturing industries. Industrialization is no doubt a must for economic prosperity, but it is at the same time detrimental to the overall quality of life, due to encroachment on nature beyond its sustainable level. The results are devastating, affecting human life, flora and fauna, (Nayak 2006). In the present competitive market, environmental awareness is a must for each industry, in order to keep alive its own prospect and diversification. The Indian textile industry has great potential besides great challenges. It must maximize its strength and minimize its weakness. Environmental issues were overlooked all these years. However, due to increasing awareness of the polluting nature of the textile effluent, combined with increased strict legislation and consumer interest for eco-friendly products, social pressure is increasing on the textile processing industries, to use environmental friendly chemicals and processing techniques, especially for export market which will be otherwise rejected.

Biotechnology, the process of application of living organisms and their components to industrial products and processes, is making fast inroads in textile industry. Its application in the manufacturing and processing of textiles is essential to protect the earth from the damaging effect of pollution. Enzymes are natural products, generated from renewable resources that are easily and completely biodegradable. They pose no threat to the environment. Enzymes accomplish their work quietly and efficiently without leaving any pollutant behind.

Today, the demand for cellulosic fabrics is increasing, as they are eco-friendly, biodegradable and also available in abundance. Cotton has a remarkable place in the field of apparel, accounting for more than fifty per cent of the textile produced all over the world. Cotton is still the 'King of fibres' and the world's leading textile fibre.

Cotton makes very comfortable skin contact fabric, because of its absorbency, good heat and electrical conductivity, (Sinha et al., 2006).

One of the first process that is carried out in most finishing is singeing or burning off of the fibres that extend from the surface of the fabric. Singeing is carried out for the purpose of removing the loose hairy fibres protruding from the surface of the cloth, thereby giving it a smooth even clean looking face, (Sayed et al., 2001). Biopolishing is an enzymatic process done to replace singeing. It may be carried out at anytime during wet processing, but is most conveniently performed after bleaching. Cotton fabric very often shows harsh handle and stiff appearance. The surface of the fabric is not smooth because of the small protruding micro fibrils, after a short period of wear, pilling also appears on the garment surface giving it an unappealing look , ( Yadav et al.,2004).The problem can be eliminated by removing them using treatment such as singeing or enzymatic biopolishing. Singeing involves the risk of scorching the fabric. Biopolishing is absolutely safe and efficient as it is carried out under mild chemical and physical conditions with accurate control, Kalidas and Selvakumar (2003). Cellulase enzymes hydrolyze the micro fibrils protruding from the fabric surface, weaken and break them easily off the main fibre, thereby yielding a fibre surface smoother than it was before. The appearance of the fabric changes giving less fuzz and pilling, increased lustre, better fabric hand and increased durable softness. (Lal 2001)

An investigation is made to evaluate the relative merits and demerits of the singeing and bio polishing process.

## **II. METHODOLOGY**

### **2.1. Material**

Plain weave 100 % cotton (95x42), 40'S count

### **2.2. Enzyme Production From Fungal Source**

From literature survey, it was observed that cellulase could be used to hydrolyze the micro fibrils, protruding from the fabric surface, weaken and break them easily off the main fibre. Hence efforts were taken to synthesize the same from fungal source.

### **2.3. Fungal Media**

Fungal agar weighing 3.5g was mixed thoroughly in 100ml of sterile water. The pH was adjusted to 6.5. The contents were autoclaved for 45 minutes and cooled. 0.2 microgram of antibacterial antibiotic was added for preservation and dispensed into sterile Petri dishes and test tubes.

### **2.4. Isolation of Fungus From Sample Source**

Soil was collected from college canteen. One gram of soil sample was added to 1 ml of sterile water blank. The sample was serially diluted up to the dilution of  $10^{-8}$  for each dilution. From the above liquor  $10^{-5}$  diluent was selected.

### **2.5. Culture Preparation**

Diluted soil was inoculated on fungal media plates using streak plate method and incubated at 28 ° C for 48 hours and examined everyday for colony formation.

## 2.6. Identification of Fungal Strain

From the fungal media, it was noted that, there were many species present. After preliminary screening, the fungi *Chaetomium globosum* was selected for the production of cellulase based on its activity.

## 2.7. Preparation of Culture Media For *Chaetomium Globosum* For Production of Cellulase

The growth media for *Chaetomium globosum* was prepared using Calcium carbonate-35 g, Sodium nitrate-2g, Magnesium sulphate -0.5g, Potassium chloride -0.5g, Potassium hydrogen phosphate - 12g, Ferric sulphate-0.01g, Potassium di hydrogen phosphate -0.14g, Yeast extract -0.02g, Agar -15g, Wheat bran- 0.1g. The pH was adjusted to 7.2 along with an antibiotic tetracycline and was autoclaved. The strain was subcultured. The inoculated cultures were incubated at 50° C for 144 hours (six days) and were examined every day for colony growth.

## 2.8. Submerged Fermentation and Cellulase Enzyme Extraction

The submerged fermentation was prepared by mixing the media as mentioned in media preparation without agar and 30 ml was distributed in 250 ml conical flasks along with wheat bran. Cellulases are said to be inducible enzymes. They are produced only when cellulose is present in the media, Hanjay and Rees (1969). The organism from cultured plates were cut and transferred to the submerging medium in the flasks, which was kept in a shaker and agitated for 144 hours (six days). The enzyme was extracted by centrifugation and ultrafiltration.

## 2.9. Measurement of Cellulase Enzyme Activity

Enzyme activity was expressed in international units (IU), as micromoles of glucose produced per minute, Shukla et al.,(2005). The filter paper activity as described by Mandells et al., (1977), was measured by the release of reducing sugar produced in 60 minutes from mixture of 0.5 ml diluted enzyme, 1 ml of acetate buffer and 50 mg of Whatman No. 1 filter paper incubated at 55° C.

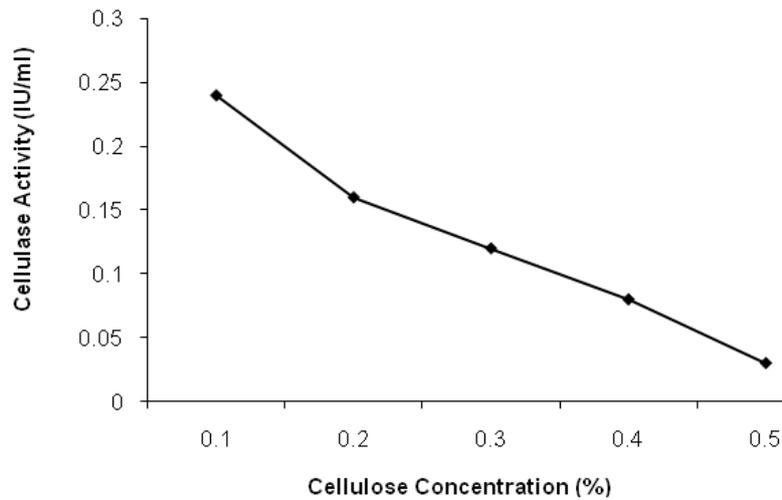
## 2.10 Purification of Enzyme

The crude broth was purified by ammonium sulphate precipitation method.

## III. OPTIMISATION OF CELLULASE PRODUCTION

### 3.1 Effect of Cellulose (Wheat Bran) on Production of Cellulase

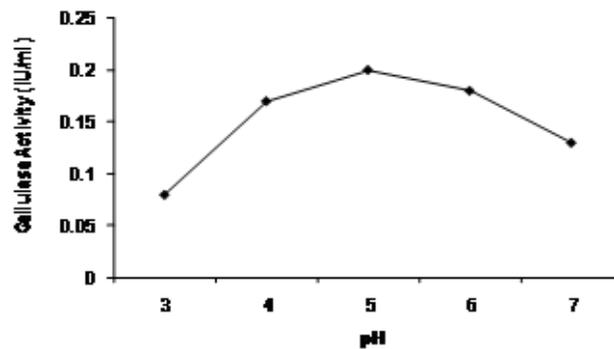
The effect of different concentration of wheat bran medium on production of cellulase was evaluated. Wheat bran in the medium was varied from 0.1 to 0.5 % and the flasks were incubated up to 144 hours. From the figure it may be observed that the maximum production of cellulase in terms of activity is obtained with 0.1% cellulose concentration.



**Figure 1: Optimisation of Cellulose Concentration for Cellulase Production**

### 3.2 Effect of Ph on Production of Cellulase

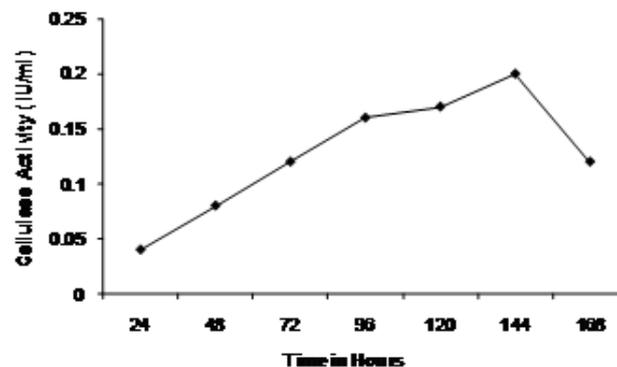
The pH values of the mixture were varied from 2 to 6. Optimum was reached at pH 5 and pH values below or above declined enzyme activity.



**Figure 2: Optimisation of pH for Cellulase Production**

### 3.3 Effect of Time on Incubation and Production of Cellulase.

The time of incubation for enzyme production was varied from 24 hours to 168 hours. Production of enzyme was found to increase gradually up to 144 hours and thereafter it decreased.



**Figure 3: Optimisation of Reaction Time for Cellulase Production**

#### **IV. BIOPOLISHING**

To suit the objectives of the study, it was decided to give biopolishing using commercially available enzymes, synthesizing similar enzyme from microbes and utilizing them for biopolishing and to singe the cotton as in practice in processing units for purpose of comparison

##### **4.1 Biopolishing With Commercial Enzyme**

The biopolishing liquor was prepared by dissolving Ezysoft super (1 %) and Zywet NIS , a non ionic wetting agent (0.2 %) in soft water with material liquor ratio as 1: 15 . pH of the solution was adjusted to 4.5 with acetic acid using a digital pH meter and placed in a drum washer at 55 degree centigrade . Mechanical action aids the removal of loosened material from surface, leaving the fibres smooth, Diller et al., (2002). Hence drum washer was used.

Samples were run for 45 minutes. The temperature was then raised to 75°C to inactivate the enzyme. The samples were removed and rinsed thoroughly in soft water.

##### **4.2 Bio Polishing With Synthesized Enzyme**

###### **4.2.1 Pilot Study**

A pilot study was carried out to choose the most efficient and effective concentration and temperature at which the enzymes are most effective. Each process was carried out in the temperature range of 60, 70 and 80°C. Concentration was varied as 0.5,1 and 2%. For the pilot study, each sample weighing 10 gms were taken with the additives, material liquor ratio and time constant.

###### **4.2.2 Actual Study**

Biopolishing effects were produced using acid cellulases 1 % in the presence of wetting agent 0.2 % at a pH of 4.5 to 5 at 60° C on a drum washer, for a period of 30-45 minutes. The fabric was washed thoroughly followed by rinsing.

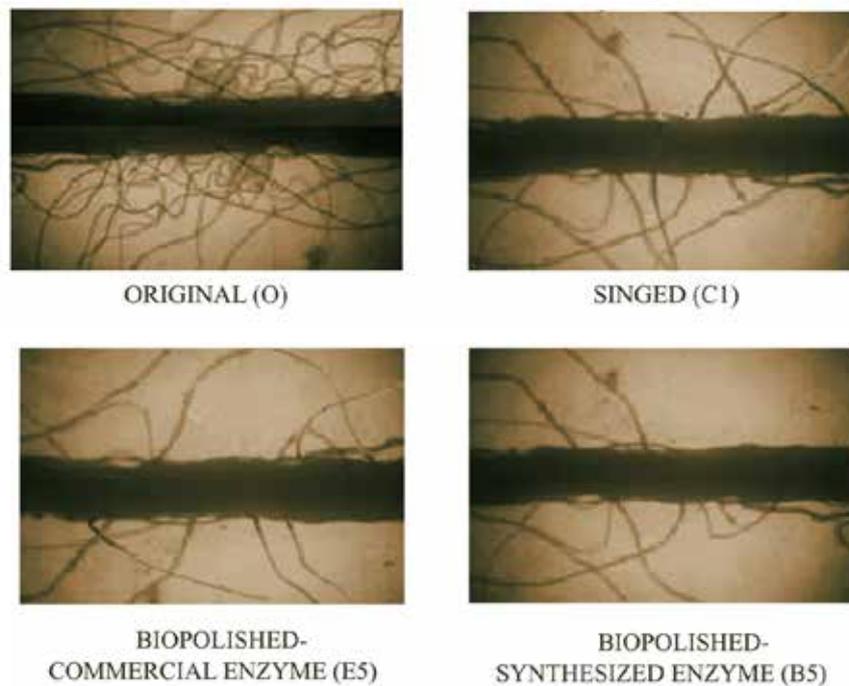
##### **4.3 Singeing**

The Greige cloth was subjected to singeing by passing it over open flame and quenching immediately in water to extinguish sparks of flame.

#### **V. RESULTS AND DISCUSSION**

##### **5.1 Analysis of Sample**

Microscopic appearance, weight, tensile strength, thickness, stiffness, abrasion resistance and drape were analysed



**Plate 1: Microscopic Appearance Of Singed And Biopolished Yarns**

### 5.2 Fuzz Removal

The microscopic appearance of the untreated original sample had prominent hairiness, Singeing by the conventional method had reduced this number. Bio polishing further reduced the fuzz.

### 5.3 Physical Tests

A reduction in fabric weight, tensile strength, thickness, Stiffness, abrasion resistance was observed after biopolishing compared to the original sample however Drape coefficient increased after biopolishing

## VI. CONCLUSION

It may be concluded that conventional method of singeing given to cotton can be replaced with biopolishing as the results are encouraging. Though enzymes are available commercially, they suit mainly large scale processing industries owing to their high cost and availability in standard quantities only. Attempts to synthesize similar enzymes from microorganisms are highly encouraging, as they are cost effective and prepared to meet the requirements. The performance of enzyme treated samples is comparable to that of conventional ones.

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# COMPARISON OF CONVENTIONAL WATER TREATMENT TECHNOLOGIES WITH SOIL BIOTECHNOLOGY

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## ABSTRACT

Water security is one of the major concerns all over the world. It's commonly said that the issue for the rise of the III world war could be water. Many water bodies in India have been adversely polluted or even converted to nallahs (eg, the Nazafgarh Nallah was earlier a river namely Sahibi). Out of many reasons, the main reason form this pollution is that 40% of the untreated wastewater is directly disposed into rivers. Many industries in India are facing problems in either installing or maintaining water treatment plants. The reason could be any but the result is that the major water resources are being heavily polluted depriving the citizens of clean water. A solution to this problem is to recycle the waste water and reuse it. There are many technologies (such as Activated Sludge Process, Up flow Anaerobic Sludge Blanket process etc.) existing which can efficiently treat the waste water and make it fit for discharge into natural water bodies or even to meet the daily water demands.

This work compares the conventional technologies with the innovative Soil Biotechnology (SBT) developed at IIT Bombay. The performances of sewage treatment plants based on activated sludge process (ASP) and SBT, and effluent treatment plants based on rotating biological contactor (RBC) and SBT were compared. The parameters observed were BOD, COD, TDS and TSS. The economic and environmental aspects were also taken into consideration.

**Keywords:** *ASP, BOD, COD, SBT, Yamuna*

## I INTRODUCTION

Water is always on the top priority while setting up a civilization or township and stays the same throughout the lifetime. With the current trends of population growth (1.9% per year), the Planning Commission, Government of India has estimated that the water demand will increase from 710 BCM (Billion Cubic Meters) in 2010 to almost 1180 BCM in 2050. Hence the concept of using less is difficult to practice because of the unavoidable requirements of the growing population and the need of the hour is to recycle. The concept of recycling is not new, technologies like ASP, UASB, RBC etc. are used on a large scale by many government organisations and private industries. Our aim was to understand the reason of bypassing untreated effluents to rivers like Yamuna especially by the organisations which have their own treatment plants. Hence, we visited the HUDA sewage

treatment plant in Gurgaon, Combined effluent treatment plant in Okhla, sewage treatment plant of AAI in Lucknow and ETP at the factory of Saurav Chemicals Ltd. in Chandigarh. During the visits the samples of treated and untreated water were collected and the feedback of the operators and the owners were recorded.

It was mainly to identify the problems faced in operating the plants based on conventional technologies and how it can be overcome by using SBT.

### 1.1 Comparison of STPs

The HUDA sewage treatment plant located in sector 9, Gurgaon, Haryana has a capacity to treat 50 MLD of wastewater. It is based on the activated sludge process which requires inlet chamber, screens, grit chamber, primary settling tank, aerators and final settling tank playing their usual roles. To maintain a smooth operation of the plant, the sludge has to be removed and managed on a regular basis as it is produced in bulk. The aerators installed are running at very high rpm consuming grate amount of electricity. There is a foul smell throughout the plant which is a reflection of the grey water around. The location of the plant is far away from the habitation at one corner of the city. There is a dedicated team of staff for operating and maintaining the plant.

On the contrary, the sewage treatment plant of AAI at the Lucknow airport based on SBT is located adjacent to the terminal building. The SBT process requires an ozoniser to eliminate the foul smell, tanks to store untreated and treated water and a bioreactor where the treatment actually takes place. All these are connected using pipes of required diameter along with valves. The aesthetic appearance of the plant is like a garden with no moving parts as in ASP. The plant is maintained by a gardener who doesn't carry any burden of managing the sludge. His only work is to maintain the green plants and regulate the valves.

The samples of the effluent and influent were collected from both the plants and tests were carried out in the laboratory at ITMU, Gurgaon. The results have been recorded in Table 1.

**TABLE 1- Comparison of performance parameters of ETPs**

	ASP		% age removal	SBT		% age removal
	Influent	Effluent		Influent	Effluent	
BOD	279	28	89.96	280	24	91.42
COD	1440	180	87.50	680	80	88.23
TSS	410	42	89.75	195	20	89.76

### 1.2 Comparison of ETPs

The ETP at the factory of SCL based on SBT, handles 10kld of water which is used in cooling tower after treatment. It is very much functional in the same premises where the workers are doing their jobs. The plant has a similar set up as discussed above which is operated by an odd employ of the factory.

In contrast, the combined effluent treatment plant (CETP) of Okhla industrial area based on physico-chemical processes (involves Screening + Grit Removal + Flow Equalization + Physico-Chemical Treatment+ Dual Media Filtration+ Activated carbon Adsorption) installed by DSIIDC with the objective to collect the effluent of all the industries running in Okhla region and treat it before disposing it to any surface or ground water source. This step was taken because the industries were facing problem in dedicating a large area of their factory campus to set up a treatment plant and that too an isolated one as all conventional technologies demand a place away from human habitat. Even if some industries agree to install an ETP, then operational cost, time and requirement of skilled labour to maintain and operate it was a problem.

The Central Pollution Control Board has reported that the CETP not just of Okhla but also of other regions are not able to meet the mentioned standards and hence not serving the purpose for which they were installed.

The results of the samples collected from the ETPs have been compiled in table 2.

**TABLE 2- Comparison of performance parameters of ETPs**

	PHYSICO-CHEMICAL		% age removal	SBT		% age removal
	Influent	Effluent		Influent	Effluent	
BOD	260	32	87.69	219	18	91.78
COD	3500	256	92.68	4156	218	94.75
TDS	2740	2290	16.42	2520	1995	20.83

**FIGURE 1- Aesthetic appearance of ASP and SBT plant**



**Elements of HUDA Treatment Plant based on ASP**



**SBT Plant at Lucknow Airport**

## II CONCLUSION

1. There is not much difference in the performance efficiencies of SBT and conventional technologies.
2. The capital cost is almost similar for SBT and ASP (around 1.5cr for 1MLD).
3. The operational and maintenance cost for ASP is Rs.9/cum and Rs.4/cum for SBT.

4. With time, the efficiency of SBT increases as the microbial layer adapts to the environment whereas for other technologies, old plants need more maintenance and in some cases the effluent quality also deteriorates.
5. SBT provides primary, secondary and tertiary treatment all in a single green unit open to atmosphere which is odourless, simple to operate, easy to maintain (even by a gardener) and could be set up within the area of habitation. On the other hand, for other technologies, separate level of treatments are required that too under the supervision of a skilled labour and all the conventional plants are required to be set up in an area away from habitation as they produce foul smell and harmful by-products.
6. The same technology of SBT applies for Sewage treatment Plant, Effluent Treatment Plant, Grey Water Treatment and other Water Treatment Plant. Out of the conventional technologies, if one is suitable for a STP then it may not be efficient for an ETP i.e. the choice is based on the purpose. In a SBT plant only the dimensions and the media proportion varies.
7. In all, SBT is an innovative, eco-friendly, economic and sustainable concept for water treatment.
8. If a decentralised SBT plant is proposed and installed for all respective industries and housing societies in Delhi NCR region then the pollution of river Yamuna can be prevented to a great extent without spending much of money and manpower.

### III ACKNOWLEDGMENTS

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# DOWNSIZING OF GASOLINE ENGINES

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## ABSTRACT

*In order to meet commitments in terms of vehicle CO<sub>2</sub> emission reduction for the whole fleet of cars for the year 2008, engine research and development is today exploring several fields. From CO<sub>2</sub> point of view, Gasoline engines suffer from a handicap in comparison to Diesel engines. Reduction of size of gasoline Engine(downsizing) appears to be a promising way to improve engine efficiency and is subject to extensive research. Having a look to the long term, the aim should be to reduce by half the engine displacement volume. Calculating results from a vehicle simulation illustrates that even a so extensive downsizing will not be enough to bring the entire gasoline fleet to the requested CO<sub>2</sub> levels. It would just be sufficient to reach the targeted levels for year 2008 for a mid-class vehicle powered by a downsized 0.8 litre engine instead of a current 1.6 litre gasoline engine. Reduction of CO<sub>2</sub> emission is in that case about 18% in warm engine conditions. Then, further improvements have to be achieved in terms of engine specific fuel consumption, especially for bigger cars*

**Keywords:** Gasoline, Downsizing

## I. INTRODUCTION

Because it is a major cause of global warming, the concentration of carbon dioxide (CO<sub>2</sub>) in the air is today of great concern. Transport represents 20 to 25% of the CO<sub>2</sub> release in the atmosphere and this share tends to increase. A part of the automotive industry has taken into account the absolute necessity to reduce the CO<sub>2</sub> emission of the vehicles.

The European Car Manufacturer Association (ACEA) has for example entered into a highly ambitious undertaking the commitment is that CO<sub>2</sub> emission of the future vehicles:

Ø Averaged on the whole production of the signatories will reach: 140 g/km of CO<sub>2</sub> in year 2008, and perhaps 120 g/km of CO<sub>2</sub> in year 2012.

The reduction in the CO<sub>2</sub> emission of the vehicle will be essentially achieved thanks to an increase in efficiency of the engine and of gear. Of course, other features of the vehicle may be improved such as aerodynamic drag, mass, resistance of the tyre but to a lesser extent.

Several ways are today explored by the engine researchers for the reduction of the fuel consumption of the engines. As far as the gasoline engines are concerned, the tested technologies are for example:

- Ø Stratified combustion thanks to the development of in-cylinder
- Ø Direct injection technology;

- Ø Variable valve process, from simple variable timing camshaftup to fully electronic control of the valves (*camlessengine*);
- Ø Variable compression ratio
- Ø Reduction in the engine size (downsizing)

Downsizing is today considered as a promising way to increase fuel economy with a good cost to benefit ratio. The challenge is here to reduce the engine displacement volume while keeping the same performance in terms of torque and power than the initial larger engine, and simultaneously to ensure an improvement in engine efficiency. Downsizing of gasoline engine is already an industrial reality. During last years, several car makers have presented 1.8 l to 2.0 l turbocharged engines. The performances of these engines are typically the ones of naturally aspirated engines with 2.5 l displacement. The reduction of fuel consumption is typically about 10%. The second generation of downsized engines is today the object of extensive research. Target is to reduce by half the displacement of the engines and also to consider the downsizing of smaller engines than the upperclass engines with 2.5 l displacement or more. This paper explains the concept of downsizing using aturbocharger coupledwith gasoline direct injection and illustrates the potential of downsizing in the very near future.

## **II. CONCEPT OF DOWNSIZING**

Most of the time, and especially when the vehicle is driven at a constant speed, the engine is run under low load conditions. This leads to poor engine efficiency especially for conventional existing gasoline engine for which load is controlled by a throttle. Throttling generates pumping losses and reduces efficiency.

A larger engine with a smaller version, with a lower displacement. The downsized engines of tomorrow will have fewer, smaller cylinders, so the volume swept by pistons as they pump up and down inside is reduced. This will reduce friction, thermal losses and the mass moved, boosting fuel economy and cutting carbon dioxide emissions. Diesel engines have already undergone aggressive downsizing – up to 40% – over the last decade and more stringent emissions legislations see this trend moving over to petrol engines. Consumers want to drive more fuel-efficient vehicles, but not at the expense of engine performance. Innovations from components suppliers have been crucial in ensuring that power is not lost in the process.

## **III. AVOIDING POWER LOSS**

Despite having a lower displacement, the performance of a downsized engine can be maintained by injecting more air into its combustion chamber to burn additional fuel. This is made possible by turbocharging, which provides the engine with the mass of air needed to ensure highly efficient and clean combustion.

In 2008, Bosch teamed up with Germany based Mahle to form Bosch Mahle Turbo Systems to develop modern turbocharging systems for new petrol in passenger cars and commercial vehicles. Progress since then has been rapid. A turbocharger developed by the joint venture has recently been fitted into Mahle's three-cylinder petrol engine. The engine can produce 160 horsepower and 286 Nm from a displacement of only 1.2 litres, matching the performance of a conventional engine twice its size.

#### IV. TURBOCHARGING

In both, petrol and diesel vehicles, the turbocharger comprise two assemblies:

1. A centrifugal compressor powered by a turbine that is driven by the engine's exhaust gases (see Figures 1 and 2). Hot exhaust gases flow through the turbine's wheel blades,
2. Accelerating the turbine and driving the compressor.

These turbines are made from high temperature resistant nickel alloys, and can withstand temperatures in excess of 1000°C and accelerate to speeds upwards of 280,000 revolutions per minute .The compressor itself comprises an impeller and a diffuser, housed in the compressor casing. The precision-milledaluminium alloy impeller draws in air, accelerating it to a high velocity before forcing it towards the diffuser. The diffuser slows the fast-moving air, raising the pressure and temperature in the compressor housing, and compressing the air before it is directed to the engine. To prevent the turbocharger from overcharging at high engine speeds – and also to maintain torque at lower engine speeds – the flow of exhaust gases through the turbine and compressor is carefully controlled. In a petrol engine, at high engine speeds, a waste gate is opened to divert part of the exhaust gas flow away from the turbine. This decreases pressure in the compressor housing and preventsovercharging.Meanwhile at low engine speeds, the waste-gate will close so that the entire exhaust flow can drive the turbine and the compressor. These turbochargers arealso designed to provide 'over-boost,' a temporary, excessive increase in pressure for when, say, the driver is accelerating

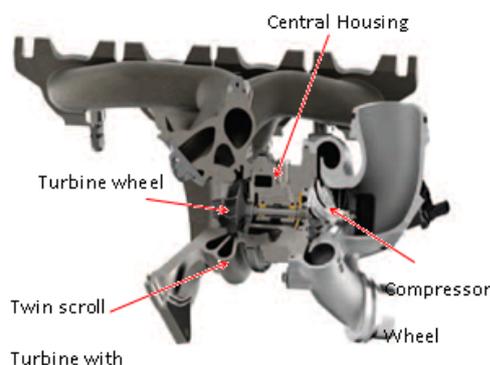


Figure 1

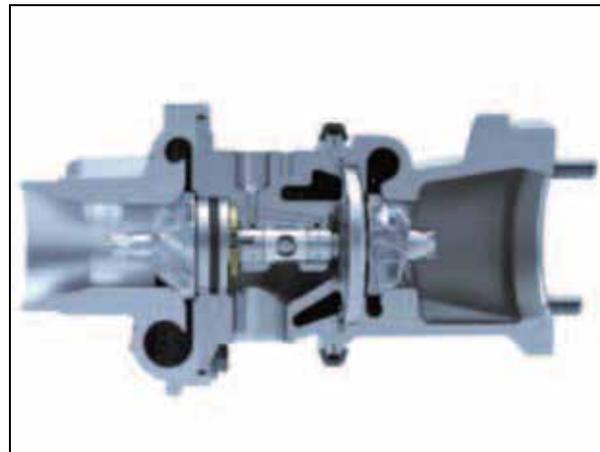


Figure 2

#### V. GASOLINE DIRECT INJECTION

Gasoline direct injection often means stratified operations. This kind of engine operation allows fuel consumption gains at part load due to pumping and thermal loss reduction. Nevertheless, after-treatment of NOx emissions in an oxidising environment leads to a fuel penalty. It is alsodifficult to carry out this after-treatment especially because of the very low sulfur level required in fuel for NOx traps. Consequently, gasoline direct injections engines do not fully benefit from their high efficiency in running at stratified conditions and consumption gains on vehicles are limited to 10% or 12%.Homogeneous stoichiometric conditions present lots ofadvantages. After-treatment can be easily achieved without too expensive systems and applications of this

combustion mode on current naturally aspirated engines shows high volumetric efficiency and compression ratio in comparison with intake port injection. Gasoline direct injection engine has a lower knocking sensitivity.

## VI. OPERATION OF THE TURBO SYSTEM

The hot exhaust gases drive the turbine wheel of the turbocharger which is connected to the compressor wheel of the turbocharger by a cast steel shaft. The turbine wheel drives the compressor wheel which thereby compresses the air which is allowed to pass through the charge air cooler. This high density air is then passed in the engine thereby improving the volumetric efficiency of the engine.

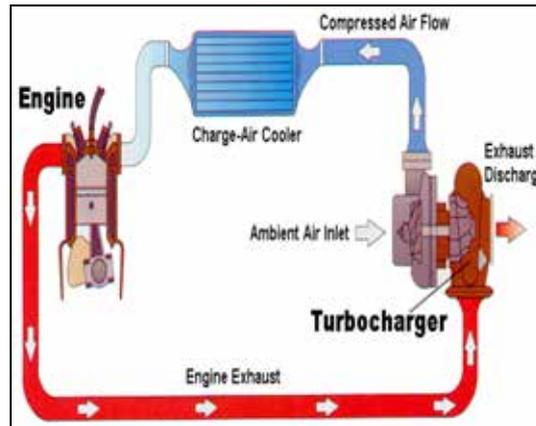


Figure 3.

## VII. TURBOCHARGING CONFIGURATIONS

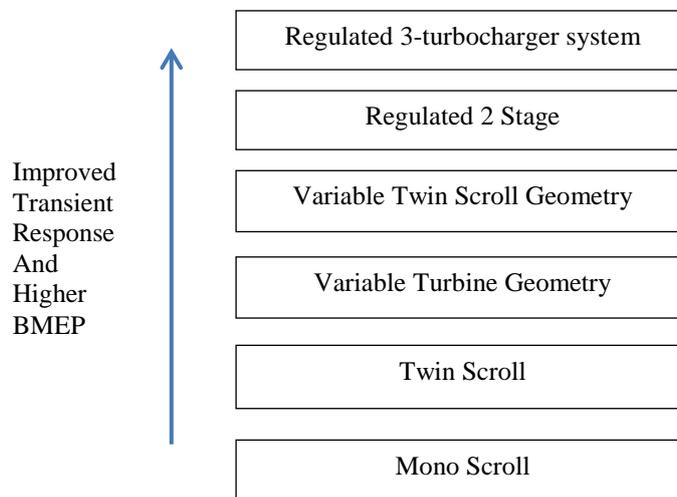


Figure 4

## VIII. ADVANTAGES

- Ø Turbocharger improves the volumetric efficiency of naturally aspirated engine.
- Ø The power/displacement ratio is increased considerably with implementation of turbocharger.
- Ø More power can be drawn from the existing naturally aspirated engine
- Ø Reduction in the CO<sub>2</sub> emissions thereby reducing the harmful effects of global warming.

## **IX. LIMITATIONS**

- Ø Turbo lag: Turbochargers especially large turbochargers take time to spool up and provide useful boost.
- Ø Power Surge: In some applications, reaching the boost threshold can provide almost instantaneous power surge causing instability of cars.
- Ø Oil Requirement: Turbochargers get very hot and often tap into engine's oil supply. This causes additional plumbing and demands more oil.

## **X. CONCLUSION**

This paper illustrates that the use of turbocharger can bring effective improvement in fuel economy. The downsizing of an engine can be brought into the effect by installation of a turbocharger along with direct injection technology thereby reducing the CO<sub>2</sub> and NO<sub>x</sub> emissions.

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# A PRACTICAL APPROACH OF CMOS INTEGRATED CIRCUITS WITH PC TOOLS DSCH2 AND MICROWIND 2

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## ABSTRACT

The present paper introduces the design and simulation of CMOS integrated circuits, in PC tools DSCH and MICROWIND Version 2.6. Which will helpful for users not only analysis of VLSI subject but also research and practical approach from circuit to simulation.

## I. INTRODUCTION

This paper summarized varies of MOS device structure device modeling, simulation at logic and layout levels which include the CMOS Inverter, the 2D and 3D views, the comparative design in micron and deep-submicron technologies, the basic logic gates (AND, OR, XOR, complex gates), the arithmetic functions (Adder, comparator, multiplier, ALU) also the latches and memories.

### 1.1 About Dsch (Version 2.6)

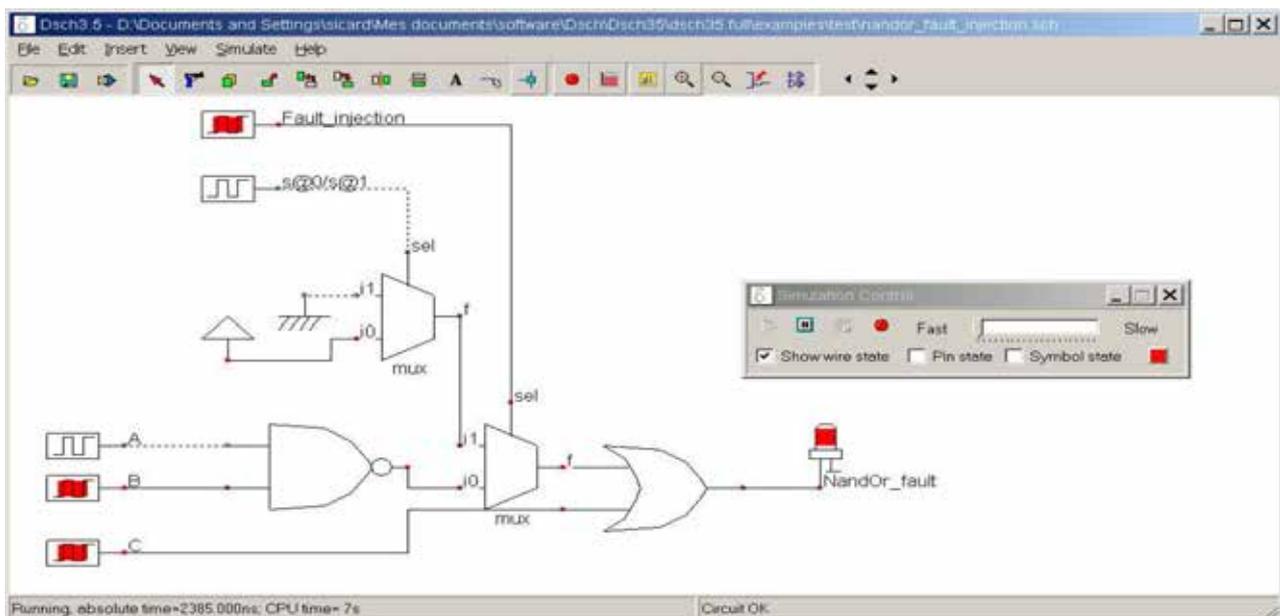


Fig. 1 View of Cricuit simulator model in DSCH



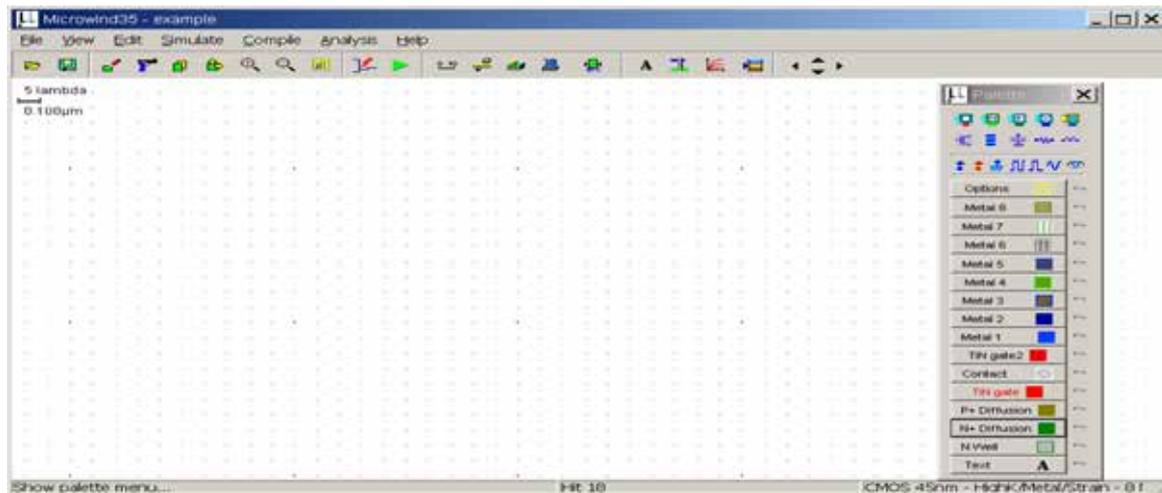


Figure 3- The Microwind window as it appears at the initialization stage

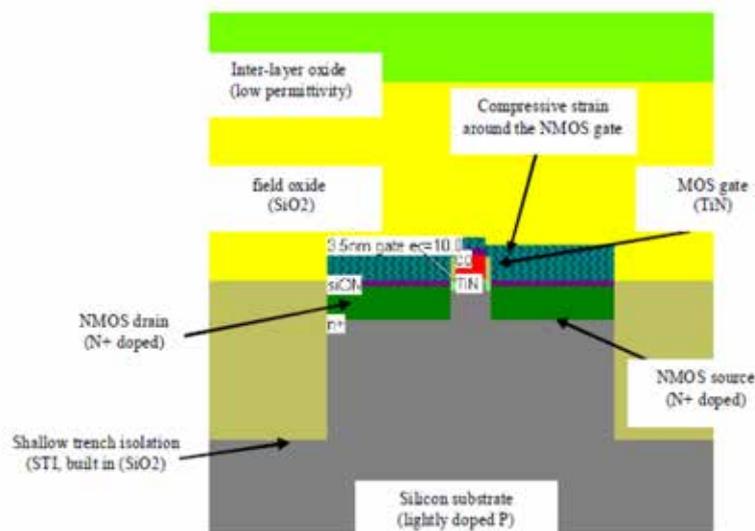
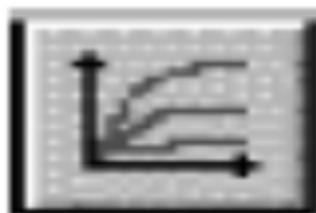


Figure 4-The cross-section of the nMOS devices.

## 2.1 Vertical aspect of the MOS

Click on this icon to access process simulation (Command Simulate  4D  4D  4D  4D  4D). The cross-section is given by a click of the mouse at the first point and the release of the mouse at the second point. In the example of Figure 4, three nodes appear in the cross-section of the n-channel MOS device: the gate (red), the left diffusion called source (green) and the right diffusion called drain (green), over a substrate (gray). A thin oxide called the gate oxide isolates the gate. Various steps of oxidation have lead to stacked oxides on the top of the gate.



## 2.2 Static Mos Characteristics

Click on the MOS characteristics icon. The screen shown in Figure 2-5 appears. It represents the  $I_d/V_d$  static characteristics of the nMOS device. The MOS size (width and length of the channel situated at the intersection of the polysilicon gate and the diffusion) has a strong influence on the value of the current. In Figure 2-5, the MOS width is 580 nm and the length is 40 nm. A high gate voltage ( $V_g = 1.0V$ ) corresponds to the highest  $I_d/V_d$  curve. For  $V_g=0$ , almost no current flows,  $I_{ds}$  is close to 0. You may change the voltage values of  $V_d$ ,  $V_g$ ,  $V_s$  by using the voltage cursors situated on the right side of the window.

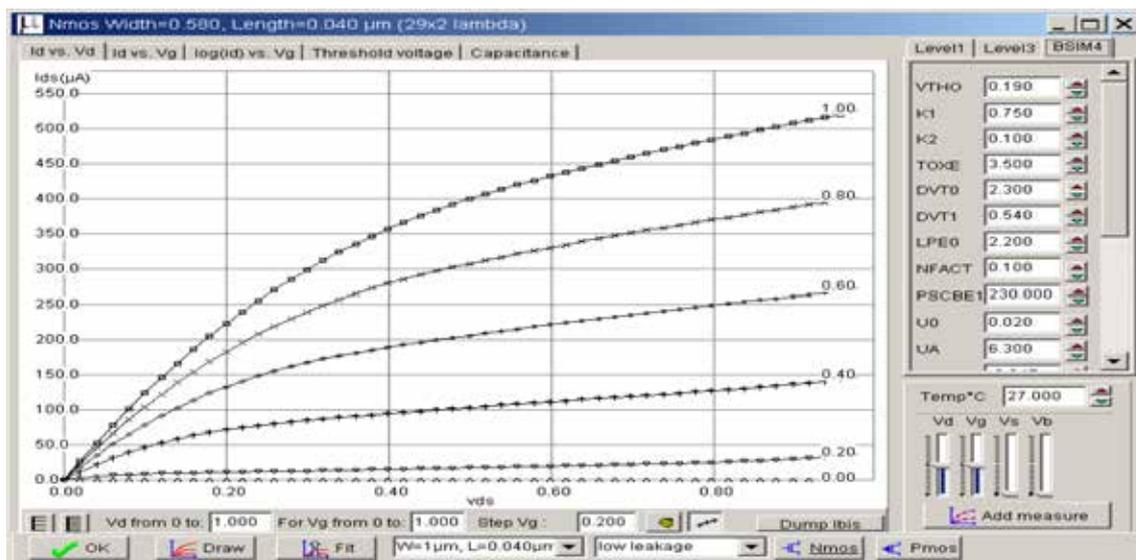
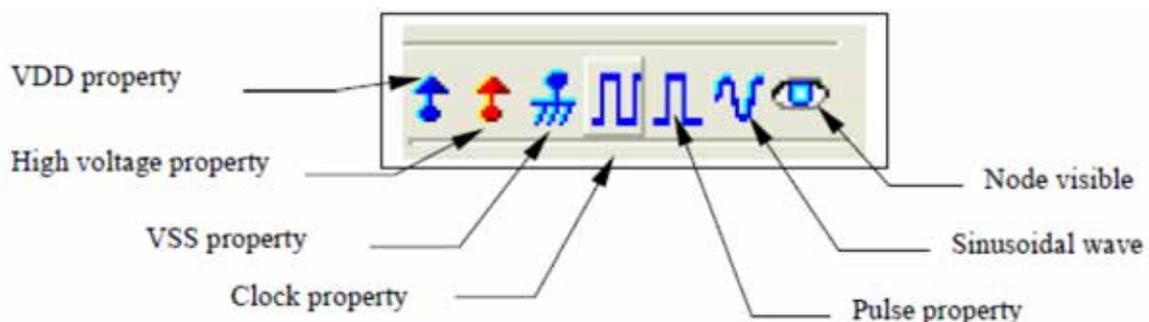


Figure 5 : N-Channel Mos Characteristics

## 2.3 Dynamic MOS behavior

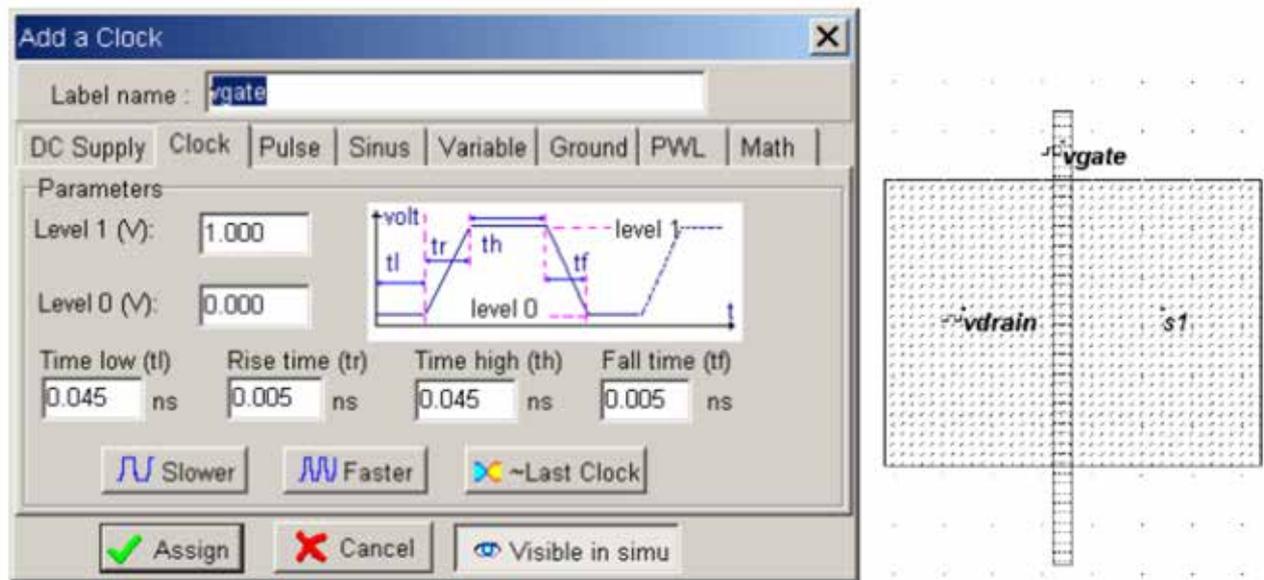
The most convenient way to operate the MOS is to apply a clock to the gate, another to the source and to observe the drain. The summary of available properties that can be added to the layout is reported below.

**2.3.1** Apply a clock to the gate. Click on the Clock icon and then, click on the polysilicon gate. The clock menu appears again. Change the name into  $V_{gate}$  and click on OK to apply a clock with 0.1 ns period (45 ps at “0”, 5 ps rise, 45 ps at “1”, 5 ps fall).



**2.3.2** Apply a clock to the drain. Click on the Clock icon, click on the left diffusion. The Clock menu appears. Change the name into  $V_{drain}$  and click on OK. A default clock with 0.2 ns period is generated. The Clock property is sent to the node and appears at the right hand side of the desired location with the name  $V_{drain}$ .

2.3.3 Watch the output: Click on the Visible icon and then, click on the right diffusion. Click OK. The Visible property is then sent to the node. The associated text s1 is in italic, meaning that the waveform of this node will appear at the next simulation



**Figure 6: The Clock Menu And The Clock Property Insertion Directly On The Mos Layout**

Always save BEFORE any simulation. The analog simulation algorithm may cause run-time errors leading to a loss of layout information. Click on File > Save as. A new window appears, into which you enter the design name. Type for example Mosn.MSK. Then click on Save. The design is saved under that filename

### 2.3.4 Analog Simulation

Click on Simulate > start Simulation. The timing diagrams of the nMOS device appear, as shown in Figure 7. Select the appropriate time scale (500 ps) to see the chronograms of the simulation. Click "Reset" to restart simulation at any time.

When vgate is at zero, no channel exists so the node vsource is disconnected from the drain. When the gate is on (vgate=1.0 V), the source copies the drain. It can be observed that the nMOS device drives well at zero but poorly at the high voltage. The highest value of vsource is around 0.6 V, that is VDD minus the threshold voltage.



**Figure 7: Analog simulation of the MOS device**

### III. THE CMOS INVERTER

First we can create CMOS Inverter circuit in DSCH software double clicking it located in the installed directory of dsch2 The following Screen will be appeared

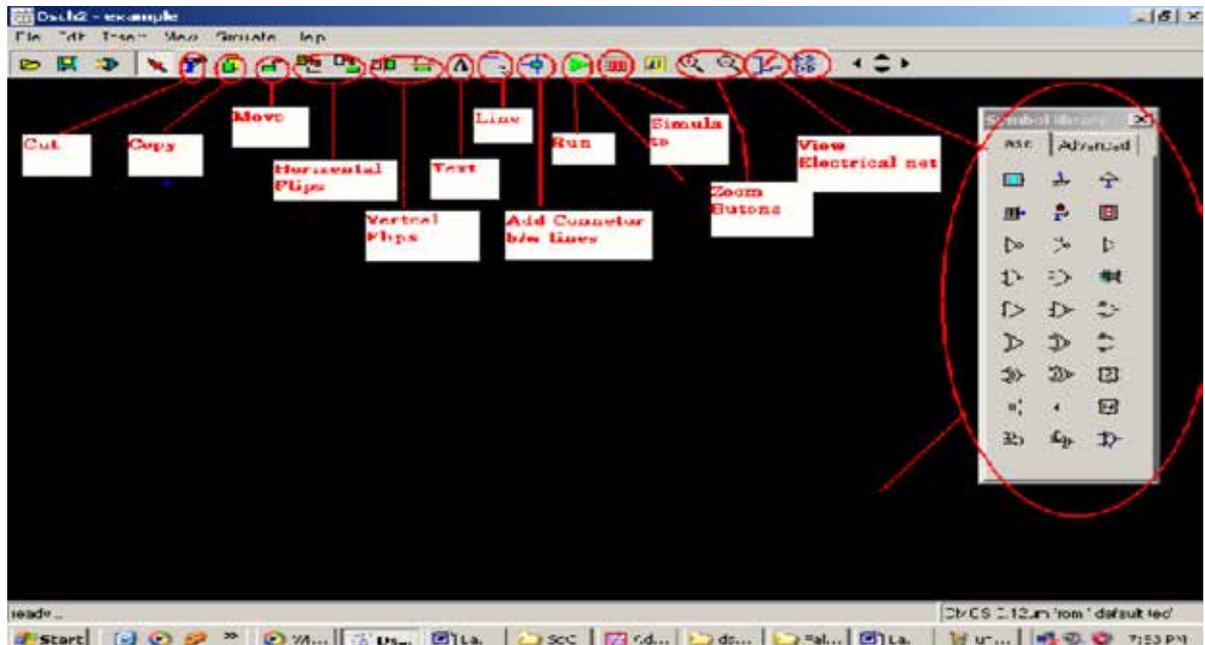


Figure 8: Main Window DSCH

3.1 Click on the pMOS and nMOS symbol button in the Symbol Library and drag it the schematic design areas as indicated in the figure.

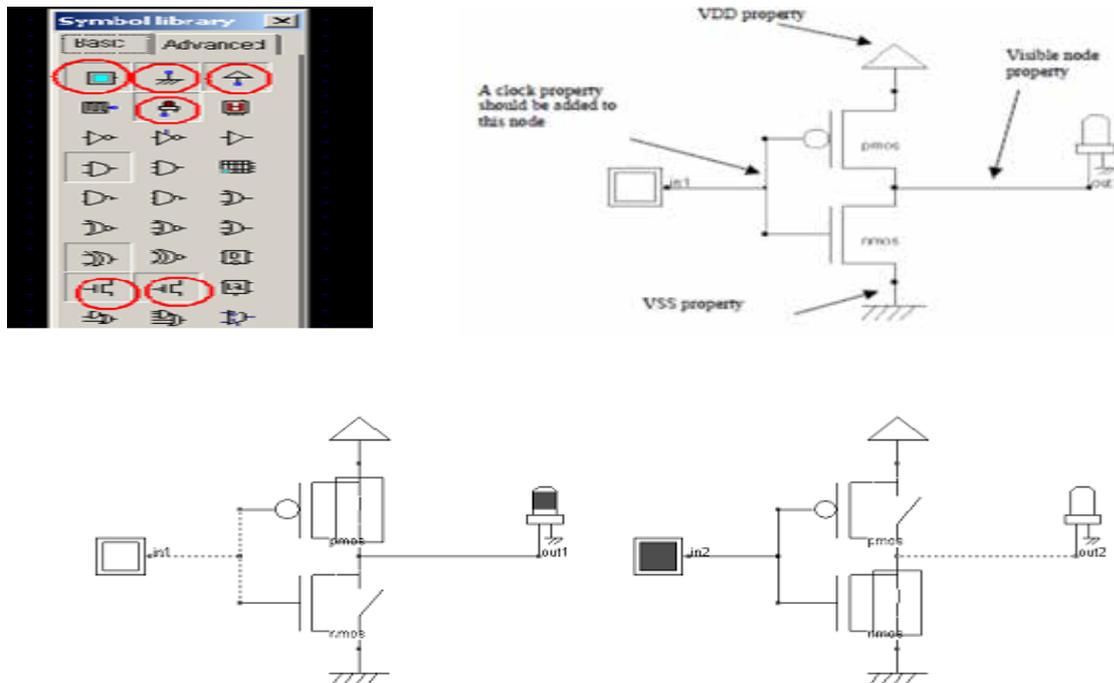


Figure 9: Simulating Schematic of CMOS Inverter in DSCH

3.2 The CMOS inverter design is detailed in the figure below. Here the p-channel MOS and the n-channel MOS transistors function as switches. When the input signal is logic 0 (Figure 10-a), the nMOS is switched off while PMOS passes VDD through the output. When the input signal is logic 1 (Figure 10-b right), the pMOS is switched off while the nMOS passes VSS to the output.

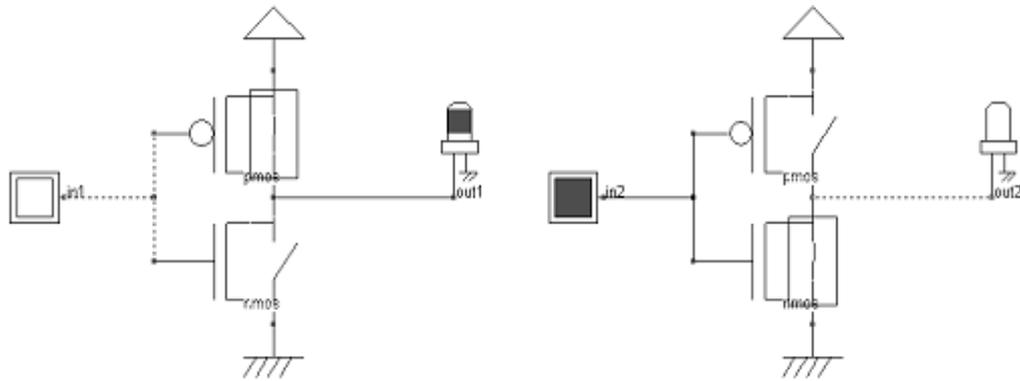


Figure 10-a Figure 10-b : The MOS Inverter (File CmosInv.sch)

### 3.3 Manual Layout of the Inverter

Click the icon MOS generator on the palette. The following window appears. By default the proposed length is the minimum length available in the technology (2 lambda), and the width is 10 lambda. In 45-nm technology, where lambda is 20 nm (0.02 μm), the corresponding size is 0.02 μm for the length and 0.04 μm for the width. Simply click Generate Device, and click on the middle of the screen to fix the MOS device.

Click again the icon MOS generator on the palette. Change the type of device by a tick on p-channel, and click Generate Device. Click on the top of the nMOS to fix the pMOS device.

The MOS generator is the safest way to create a MOS device compliant to design rules. The programmable parameters are the MOS width, length, the number of gates in parallel and the type of device (n-channel or p-channel). By default metal interconnects and contacts are added to the drain and source of the MOS. We can add a supplementary metal 2 interconnect on the top of metal 1 for drain and source.

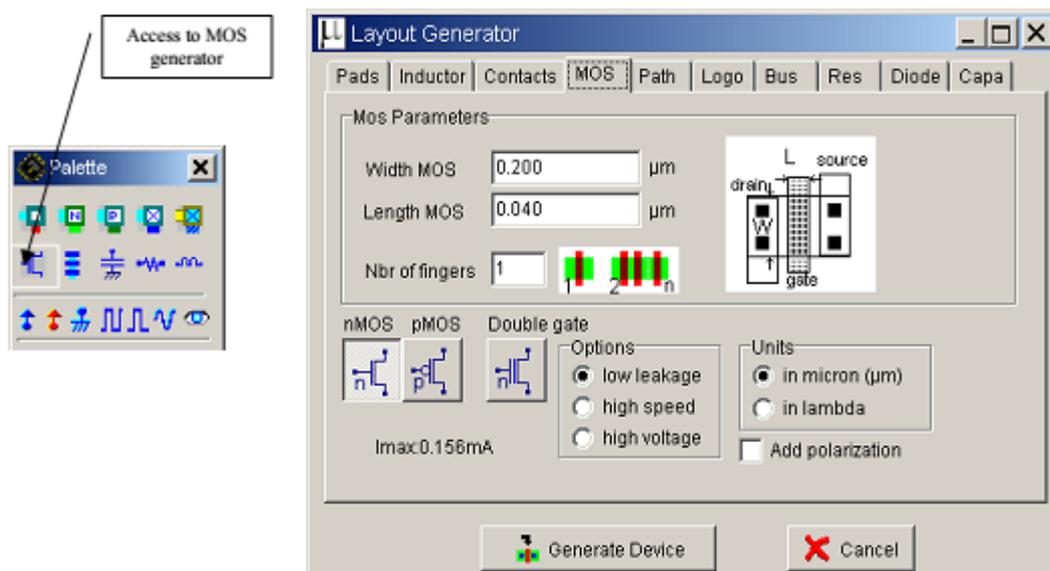


Figure 11 : Generating a nMOS device

### 3.4 Connection between Devices

Within CMOS cells, metal and polysilicon are used as interconnects for signals. Metal is a much better conductor than polysilicon. Consequently, polysilicon is only used to interconnect gates, such as the bridge between pMOS and nMOS gates, as described in the schematic diagram of figure 13. Polysilicon is rarely used for long interconnects, except if a huge resistance value is expected.

In the layout shown in figure 13, the polysilicon

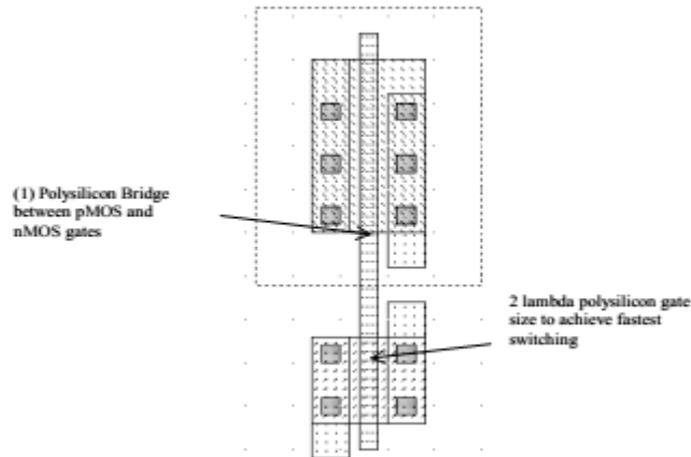


Figure 13 : Polysilicon bridge between nMOS and pMOS devices

bridge links the gate of the n-channel MOS with the gate of the p-channel MOS device. The polysilicon serves as the gate control and the bridge between MOS gates.

3.5 Save respective file and make verilog file with same destination and Open Microwind software go to Compile with same row width limit and compile it.

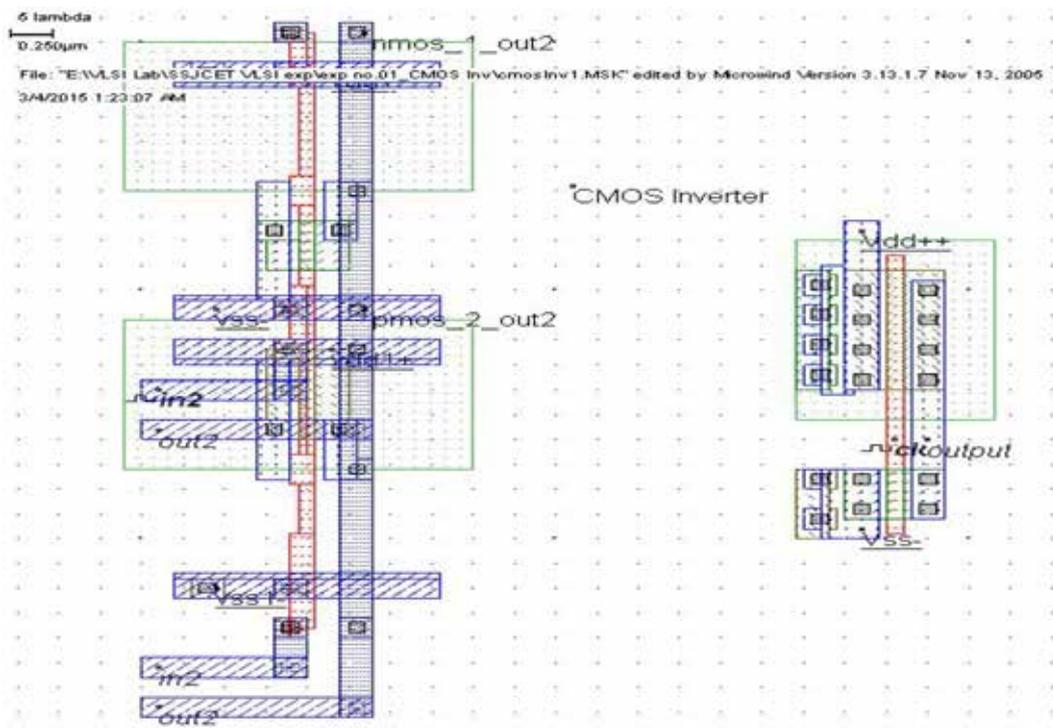


Figure 14: Layout of CMOS Inverter in Microwind

### 3.6 Useful Editing Tools

The following commands may help you in the layout design and verification processes.

Command	Icon/Short cut	Menu	Description
UNDO	CTRL+U	Edit menu	Cancels the last editing operation
DELETE	 CTRL+X	Edit menu	Erases some layout included in the given area or pointed by the mouse.
STRETCH		Edit menu	Changes the size of one box, or moves the layout included in the given area.
COPY	 CTRL+C	Edit Menu	Copies the layout included in the given area.
VIEW ELECTRICAL NODE	 CTRL+N	View Menu	Verifies the electrical net connections.
2D CROSS-SECTION		Simulate Menu	Shows the aspect of the circuit in vertical cross-section.

Figure 15 : A set of useful editing tools

### 3.7 Process steps to build the Inverter

At that point, it might be interesting to illustrate the steps of fabrication as they would sequence in a foundry. MICROWIND includes a 3D process viewer for that purpose. Click Simulate →Process steps in 3D. The simulation of the CMOS fabrication process is performed, step by step by a click on Next Step. On figure 3-13, the picture on the left represents the nMOS device, pMOS device, common polysilicon gate and contacts. The picture on the right represents the same portion of layout with the metal layers stacked on top of the active devices.

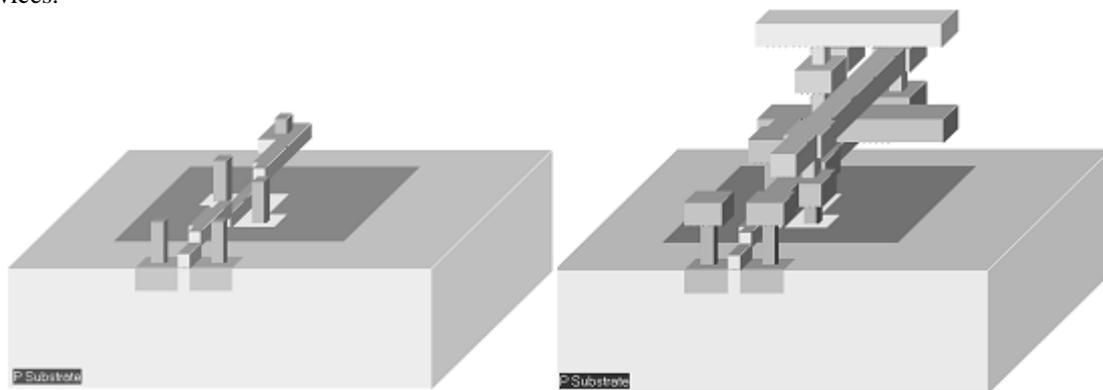
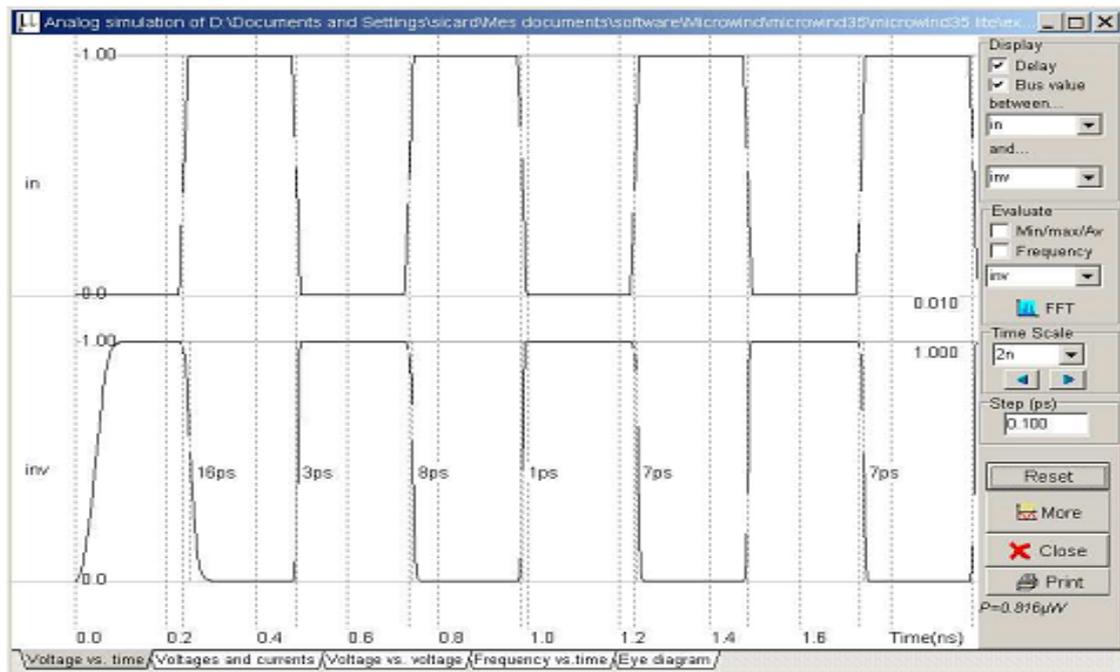


Figure 16 : The step-by-step fabrication of the Inverter circuit

3.6 The command Simulate →Run Simulation gives access to the analog simulation. Select the simulation mode Voltage vs. Time. The analog simulation of the circuit is performed. The time domain waveform, proposed by default, details the evolution of the voltages in1 and out1 versus time. This mode is also called transient simulation, as shown in figure 17 The truth-table is verified as follows. A logic “0” corresponds to 0 V a logic “1” to a 1.0 V. When the input rises to “1”, the output falls to “0”, with a 7 pico-second delay (7.10-12 second). The reason why the delay is larger before time 1.0 ns is that the circuit is “warming up” as the voltage supply suddenly rises from 0 to VDD at time= 0.0ns. The steady-state is reached at time=1.0 ns.



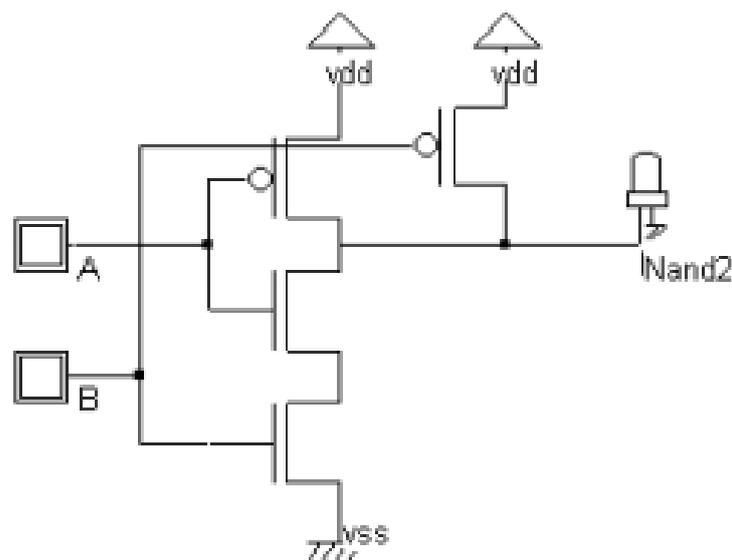
i

**Figure 17 : Transient simulation of the CMOS inverter**

#### IV. BASIC GATES

Here are some basic gates circuit diagram in dsch software and its layout in Microwind. The procedure all are same as explain above steps in CMOS inverter

**4.1 The Nand Gate:** The truth-table and logic symbol of the NAND gate with 2 inputs are shown below. In DSCH , select the NAND symbol in the palette, add two buttons and one lamp as shown above. Add interconnects if necessary to link the button and lamps to the cell pins. Verify the logic behaviour of the cell.



**Figure 18: Schematic Diagram of the CMOS NAND Gate Design**

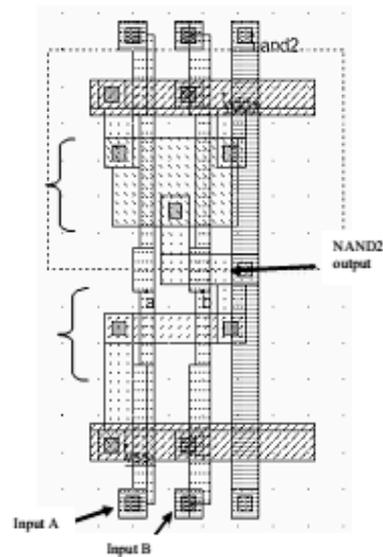


Figure 19 : A NAND cell created by the CMOS compiler.

#### 4.2 The XOR Gate

There exist many possibilities for implementing the XOR function into CMOS. The least efficient design, but the most forward, consists in building the XOR logic circuit from its Boolean equation.

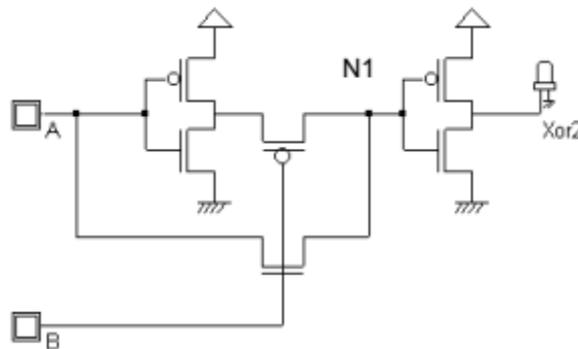


Figure 20 : The schematic diagram of the XOR gate

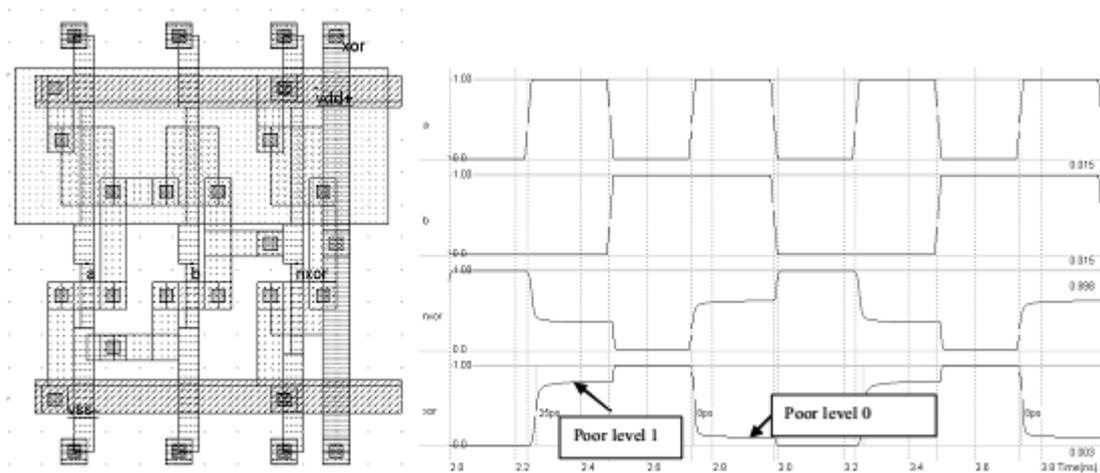


Figure 21 : Layout and simulation of the XOR gate

### 4.3 Silicon Menu

The software “silicon” is able to give a user’s controlled 3D view of silicon atoms such as SiO<sub>2</sub> (figure 22). The 3D view of the lattice shown in figure 12-2 shows the regular aspect of Si atoms and the very specific properties of the material. One boron atom acts as a dopant in the structure.

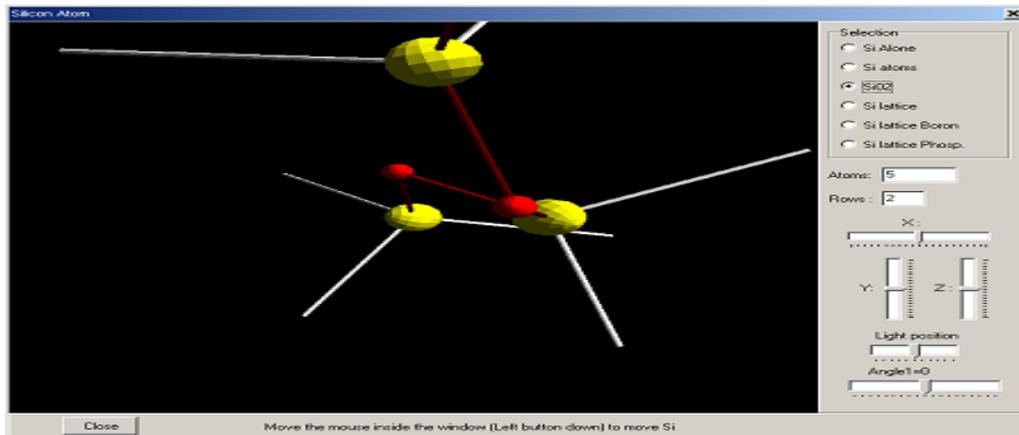


Figure 22 : The « silicon » main menu

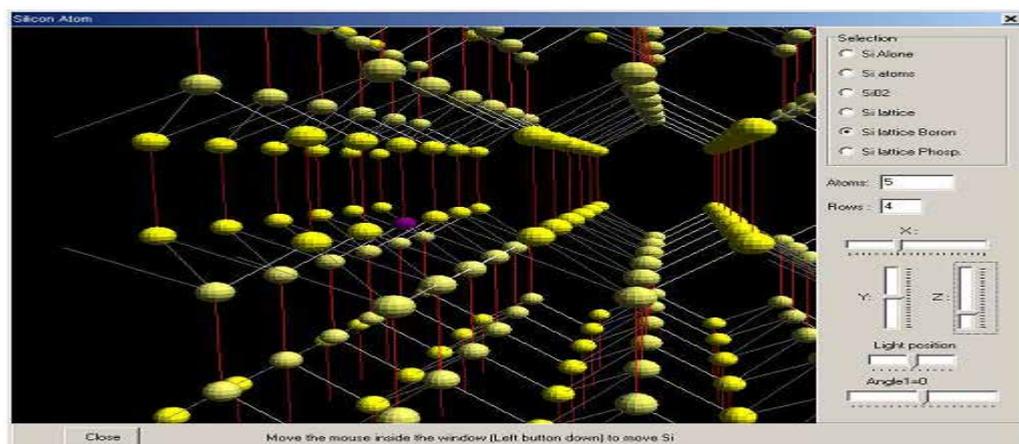


Figure 23 : The silicon lattice and a boron dopant

## V. CONCLUSIONS

Since it is a practical approach of CMOS integrated circuit but its not limited for cmos gate or its respective circuit. We can use dsch and Microwind pc tools for microcontroller simulation and with using verilog file which is compile in microwind software.

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[4] Microwind & Dsch Version 3.5 User's Manual Lite Version September 2009 by Etienne Sicard

## WEB INFORMATION

[1] [www.microwind.org](http://www.microwind.org) for general information about MICROWIND

[2] [www.microwind.net](http://www.microwind.net) to download the lite version and order the professional version

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# THE STATUS OF INDIAN WORKING WOMEN IN PRESENT ERA

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## ABSTRACT

*SHE: STOP HER EXPLOITATION. This paper has been designed considering the status of Indian working women in the present era and what are the changes that have been evolved during the course of time as the worth of civilization can be judged by the position given to women in the society. According to Swami Vivekananda, "It is impossible to think about the welfare of the world unless the condition of women is improved. It is impossible for a bird to fly on only one wing."*

*It is a descriptive study with information drawn from various secondary sources. The study also reveals the importance of women in economic development of a country. We are proceeding towards a future of shortage of skilled labor and the country in which educational and economic empowerment of women will become increasingly significant. The analysis is likely to reveal the degraded status of Indian working women and the gender inequality which she faces in every sphere of her career in spite that a working woman can perform her managerial and domestic duty together efficiently and delivering the best to both worlds.*

**Key words:** *Women Exploitation, women Empowerment, Feminist, Patriarchal society*

## I. INTRODUCTION

"She wakes up at early four Hurries to complete her daily chores For its home or job, both she lively adores Her ocean of struggle continues, without coming to any shores."

Women constitute an earthshaking segment of workforce in our country since time immemorial. Whether its organized or unorganized sector, they have played a momentous role in the economic development of the country. The percentage of working women in India has been increasing constantly during the years.

The status of working women in India has changed a lot amidst the years but their vulnerability remains the same. The world is in twenty first century still the women struggles from the same hardships which they used to face decades ago. The clout of religion, society, family hinders their growth and affects their personal and professional life. India is still a patriarchal society where there is a domination of men over women, be it rural or urban areas women are still struggling to search their identity. Whether they are engaged in agricultural activities or are recruited in top managerial position they have to accomplish their household as well as professional duties at par. Therefore the pace of growth is very sluggish as they have to contribute their energies equally towards family and work.

## II. STUDY OBJECTIVE

The study has been conducted to take stock of the situation of working women in India in present era. It includes the following objectives or purposes:

1. To study the most quotidian problem faced by the working women.
2. To analyze the changing status of women in present era.

The present study is descriptive in nature with information, analysis and conclusion drawn from various secondary sources. It's an exploratory study for knowing the insights of the topic. It is referred paper

### III. THE STATUS OF INDIAN WORKING WOMEN

#### SHE (Stop Her Exploitation)

Working women in India continues to face stiff challenges and social resistance even in twenty first century. The blackjack of family thwarts them from giving their optimum faculty. The women are permitted to work only out of necessity and not out of their choice. When husband's work was not adequate to support their family, the wife also was compelled to work. (D'Souza, 1975). Thereupon, they are allowed to work out of financial crises. They are faced with domestic violence sometimes by their fathers, husbands or in-laws. The working women in urban areas are more vulnerable than in rural areas as they contribute a large portion in the family income which is sometimes clashed by male ego. **The National Family Health Survey II (1998)** shows that working women in urban areas face more violence as compared to the rural counterparts, which may be because of their being economically active and relatively better informed about their rights which on one hand, threaten male dominance and on the other, may result in better reporting of incidences of domestic violence although it is extremely difficult to sift the independent contribution of these outcomes. **International Clinical Epidemiologists Network 2000**; observed that more educated and better employed women faces more violence.

Violence is dominated by power. As our country is a patriarchal society, so men plays an independent role while women are dependent on them, resultantly the power also prevails on men only. The concept of patriarchy, which implicates unequal power as well, has been vastly critiqued on the ground that women have multiple locations across axes of age, religion, social class and local culture. These multiple locations may intercept the neat formulation of men's domination over women that patriarchy seems to suggest; in other words, women are not always, and/or only, dominated by men (Dietrich 1992; Datar 1993; Sen 1999; Sangtin writers and Nagar 2006). However, we argue that even as multiple axes enter to destabilize patriarchy as such, changing and newly created structures continue to carry patriarchal overtones, which, by and large, do follow the pattern of domination and submission - a hallmark of patriarchy (Kandiyoti 1997). Having said this, it is also to be noted that patriarchal structures are not monolithic and interactions with localized specificities fracture them to bring in contextualized nuances (Raju 2001, 2006).

The working women find dual challenge of handling family and work pressure. They are expected to fulfill their dual roles efficiently. After crossing domestic impediments they are not able to give their optimum ability in the workplace and hence lag in the organization. The stress generated in the home affects the personal and organizational performance drastically. Earlier women were only responsible for performing their domestic roles, but as the time changed and they became a part of the workforce of the country they are now held responsible for performing both roles as a householder and as a professional worker. While managing work/life balance they are overburdened with the work, if they give their optimum capacity in fulfilling their professional duties, they fail to perform their traditional roles; this creates guilt in them as they think they are ignoring their foremost responsibility. This guilt ultimately distracts them in performing either of their roles. The husbands

feel beneath their esteem to help the wives in sharing the household responsibility and believe it to be the only responsibility of the women in our country. As compared to the foreign countries, wives are treated as domestic engineer and they feel no shame in helping their partner in household works. Studies on educated working women and role-conflict (Joshi, 1973; Kapur, 1970; Kaul, 1973; Mahajan, 1966; Srivastava, 1972) found that educated working women, even while holding very responsible posts, continue to be over conscious of their duties and obligations at home—duties towards their husband, children and home. The inner conflict and tension was experienced particularly if they are very keen to play both their roles very efficiently and are desirous of paying equal attention to their home and work. Time apportionment of a working woman was related to the type of responsibilities at home and at work place. Studies conducted by Nye and Hoffman (1963) and Kapur (1974) indicated that women who choose to combine marriage with career had to face problems in allocating time and resources between the two major responsibilities.

Our society is in a transition stage, on the one hand there is an urge for working women in the houses, the husbands think that to match their status they need an educated working wife, therefore they only search for the bride who is highly educated and is already engaged in some economic activity, on the other hand they want their wife's to accomplish their household responsibilities efficiently without sharing their responsibility. To quote Kapur (1970): 'In a society in transition then in which tradition is undergoing continuous change but the modern has not been accepted fully, a great deal of confusion in social, moral norms and cultural standards is to be expected.'

Though the women are working, they are financially independent and earning income at par with their counterparts then also they have no right in their own income. Before marriage, all their financial decisions are taken by their fathers and after marriage by their husbands. Ergo women stay poor not only in rural but also in urban areas too. Major investments are done by their male counterparts as women are considered to be emotional and cannot take the financial decisions. The reality is entirely different. Women are better decision makers because if they can take dexterous decisions in their house, then why can't outside. They are commonsensical and better managers. The whole set of responsibility of managing home and office lie on their shoulders, and they manage so beautifully yet they are considered as poor decision makers and are not allowed to take financial decisions.

In the professional world too, women are facing lot of hardships. Women's representation in management is very low. Globally, women comprise only around 10 per cent of senior management positions in Fortune 500 companies (Chadha, 2002). While liberalization of the Indian economy has created considerable employment opportunities for many, including women, who possess marketable skills and talent, women are seen mainly in HR and Information Technology (IT) departments and servicing activities. Their presence in hardcore production or marketing is less than men's and still lower at strategic policy-influencing levels. This is despite claims that women in India have played significant roles in social organizations, politics and administration (Gupta, Koshal and Koshal, 1998). Women are not preferred in production or shop floor departments as they are considered to be physically weak and are not suitable in these areas female managers are observed to be working predominantly in HR, Public Relations (PR) and administration at subordinate or junior levels, and are often found in 'soft' fields like fashion, clothing and beauty products. A large number of women also work in newspaper organizations, the electronic media, the IT industry and service organizations. Nevertheless, over the last three decades, women have been entering a variety of occupations and are diversifying into different

professions formerly the exclusive domain of males. These include banking, marketing, advertising, the civil services, the police and armed forces. Through these avenues women can aspire to the acquisition of money, knowledge and power. Yet, social stereotypes held by their male colleagues and bosses about women's role in society have influenced the position and treatment of women managers. Women are playing a significant role in the expansion of the Indian software industry and they constitute 45 per cent of the high-tech workforce. A high concentration of men exists in export software firms, whereas women are present in higher proportions in domestic low-end and IT-enabled services (Suriya and Craig, 2003). All the same, entry into IT and related service sectors are helping women in India to move out of their traditional household roles and develop a career in business organizations.

#### **IV. SOME OF THE KEY STRENGTHS IDENTIFIED IN WOMEN AS MANAGERS INCLUDE**

1. Greater sensitivity in relationships (being more understanding, compassionate, sympathetic and empathetic);
2. Ability to 'network' better amongst their colleagues;
3. Ability to better understand and perceive situations;
4. Stronger sense of dedication, commitment and loyalty to their organizations (women managers are perceived to be less likely to 'job-hop' than men);
5. Ability to perform multiple tasks;
6. Better management of crisis situations;
7. Greater readiness to share information and power (which highlights their interactive leadership style);
8. Ability to behave in a more gender-neutral manner; and
9. Ability to solicit input from others which leads to an atmosphere of greater degree of trust, self-worth and respect for ideas (Gupta et al., 1998; Kulkarni, 2002; Mehra, 2002).

In the era of globalization, the number of call centers in the country is increasing and consequently the numbers of women recruiting in this area are also increasing. Employment in call centers is considered a stepping stone in the career advancement of women. It opens avenues for further employment in other sectors of the BPO industry (Clark & Sekher, 2007). In the earlier phase of globalization, manufacturing jobs moved from the industrialized economy to low-cost locations in the developing world, and now service jobs are moving in the same direction. These changes have brought forth a global economy with the capacity to work in real time, facilitated by ICT infrastructure and liberalization policies implemented by governments and international institutions (Castells, 2000). The growth of the ICT sector worldwide and the availability of a large, low-cost, English-speaking labor pool have resulted in India emerging as one of the most desirable destinations for Business Process Outsourcing (BPO) (Ramesh, 2004). Due to the different time zones between India and these developed countries, most call center jobs in India are performed during night hours. Before the advent of call centers, other sectors such as nursing and hotel industry also utilized night shift work, but the major work in these sectors is performed during daytime. In call centers, work during daytime is rare and typically starts in late evening hours. Participation of women is constantly increasing from 25 percent of the total workforce in 2006 and is expected to touch 45 percent in 2010 (NASSCOM Foundation, 2008). The women who are engaged in these call centers find very difficult in managing their work life balance. It leads to difficulties in structuring

their family and social interactions. Working during the night brings an experience of being cut off from interaction with the family members and the services to household (Poster, 2007). Due to the flexibility of labor, risk becomes the key organizing principle for work. Workers are responsible for their own job security by continually upgrading/changing their skills to suit the job market. Such a work culture has promoted the process of individualization, through its emphasis on autonomy, self-motivation, and achievement orientation (Upadhyay & Vasavi, 2006). With the increase in the number of working women in these call centers; the security of women is a matter of concern. The cases of sexual harassment are increasing with the increase number of call centers in the country. Lack of cab facility in the organizations lead to these type of incidences.

In the organization too, women are not safe. They are sometimes physically and sometimes mentally harassed by their bosses and male colleagues. They are sexually exploited by their bosses with the lure of job enhancement. The saddest part is that our society ignores such incidences. If the woman raises any voice against their bosses either the society would question on her character or else she would have to lose her job. The social shame prevents her from complaining.

In managing the work/life balance, the working women suffer from mental and physical diseases. As per World Health Organization (WHO) estimates, depression is expected to be the second largest contributor to disease burden by 2020, and with one in every three women worldwide being afflicted by common mental disorders including depression, the mental health of women is a serious issue indeed. Since women in India, face gender-based discrimination at every stage of their lives, their psychological well-being becomes a cause for great concern. Though the government is trying its level best by bringing in women-friendly legislations like the Domestic Violence Act or pushing for the Women's Reservation Bill, the ground realities remain vastly unchanged, social apathy being the main reason behind Indian women's current predicament. Dealing with prevailing dichotomies in social norms while trying to carve out a niche for themselves can be quite a daunting task. This can often lead to emotionally explosive situations wherein women start experiencing mental health problems. (Sarah Basu, Mental Health Concerns for Indian Women; Indian Journal of Gender Studies; Sage Publication).

Even in 21st century India, physical abuse of women, especially by husbands, is condoned by society (Dutt and Noble, 1982; Kumar, Gupta and Abraham, 2002; Rao, 1997) causing further erosion of the already fragile self-esteem of women and creating conditions of psychological distress. Factors such as insecurity, hopelessness, violence, low income, limited education, abuse, physical ill health, distress, addiction, stressful work conditions and human rights violations have been found to increase vulnerability to mental ill health (Costello, Compton, Keeler and Angold, 2003; Desjarlais et al., 1995; Parker, Fernandes and Weiss, 2003; Patel and Kleinman, 2003; Rutter, 2003). With women experiencing social disadvantages in much higher proportions, their mental health problems multiply (Astbury and Cabral, 2000; Kessler, 2003; Patel et al., 1999).

The survey titled 'Multi-tasking seriously affecting corporate women's health' was conducted by the Associated Chamber of Commerce and Industry to mark International Women's Day on March 8, 2014. A survey now finds that this daily "multi-tasking" is taking a toll on their health. The worst part is most of the affected women are in the 32 to 58 age group.

The survey found that 75% of the total sample size of 2,800 corporate women employees from 120 companies across 11 broad sectors had one or the other health problems. The survey covered all levels of hierarchy and the problem was found to be prevailing across all levels of seniority and grades. It was conducted in Ahmadabad,

Bangalore, Chennai, Hyderabad, Delhi, Jaipur, Kolkata, Lucknow, Mumbai and Pune. According to press release, the study found that 78% of the sample size suffered from lifestyle, chronic and acute ailments.

These include obesity, depression, chronic backache, diabetes, hypertension, high cholesterol, and heart and kidney disease.

About 42% of the sample size was found to be suffering from lifestyle diseases such as backache, obesity, depression, diabetes, hypertension, high cholesterol and heart ailments. While 22 per cent were reported to be suffering from chronic diseases, 14 per cent had acute ailments.

## **V. CONCLUSION**

### **Emerging Role of Women In Indian Society: From Kitchen To Cosmos**

The status of working woman in India has revamp over the years. Her traditional roles have remained the same; apart from that she has stepped into the workforce of the country. Earlier the women were only allocated in agriculture, teaching and nursing activities but now at present era she is representing the banking, marketing, armed forces, IT and communication services. There is no field where women of our country have not set their foot, they have utilized their full capacity and proved their best in performing these roles. Despite facing infinite challenges, she has been successful in crossing these hurdles and has proved her metal in each and every field. They are the best managers as the sole responsibility of managing the family lies on her shoulder and hand in hand she has the ability to manage the organizations too. Be it Indira Nooyi, Chanda Kochar, Arundhati Bhattacharya they have been triumphant in managing their dual roles.

Beside these success stories working women in our country still suffers from social stigmas and other resistances. The family pressure, harassment in and outside the home, gender inequality hinders her growth and discourages her to give her best in managing work/life balance. In performing her dual role as a homemaker and professional worker, she undergoes with mental and physical infirmity. Odd hour working makes her more fragile. Night shifts hits women's fertility. It makes 80% harder to become pregnant. Shift work can cause sleep deprivation and disruption to the body clock, both of which are associated with ill health.

There are numerous challenges which are faced by working women in India. But the fact is despite these challenges they are growing and proving their metal in all spheres of life.

## **VI. SUGGESTION**

1. Women are considered as the Ardhangani of their husband which means half body, but in reality they are treated as beneath their husbands in status. If they treat their counterparts equally the cases of domestic violence would reduce. Secondly, if the man is desirous of a working wife then he should share the household responsibility equally with their wives.
2. Organizations can play a greater role in reducing gender inequality in the workplace. They should treat women at par with men at the time of promotion or at the time of reward. There should be stringent laws inside the workplace against harassment, molestations and eve teasing.
3. There are numerous steps taken by government with regard to safety of women, but the implications of these laws are not made properly. Proper mechanism should be developed by the government to see whether the laws are properly implemented everywhere.

4. Lastly, woman should themselves be empowered. Unless she makes cast-iron decisions against the wrong things, no one can protect her from the evils of the society. She has to raise her voice against the pernicious activity prevailing in the society.

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# CORPORATE TRANSGRESSION: STATE OF CORPORATION CRIMES IN INDIA

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## ABSTRACT

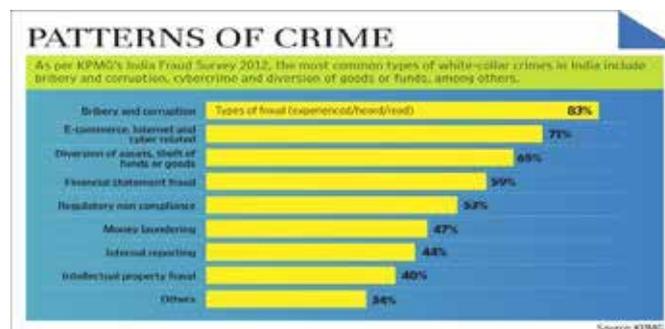
India, a country which follows the ideology of “Sarve Bhavantu Sukhina” (i.e. may all be prosperous & happy), but having criminal involvement then how it can be possible to acclaim its ideology, if people are victims of corporations criminal behaviour. As it's always, common & innocent people who suffers from unethical activities of corporations. So, how it (corporations) can bestow itself socially responsible and philanthropic if corporations are in a race of making profit and cheating pure souls? It's a descriptive study with information drawn from secondary sources. This paper will take a stock of various crimes performed by different Indian organisations & individuals. The paper is of a particularly large and intricate iceberg explaining present Indian Corporations Criminality. This paper will be helpful in expansion of knowledge about infringement of laws and human trustworthiness. The study shall also provide strong ground for further studies on the subjects like Indian Corporate laws & violations; Indian Corporate Governance & Compliance Mechanism; Corporate Non-Observance Trespass; imperativeness of CSR to obviate crimes.

**Keywords:** Corporate Crime, White Collar Crime, Corporation's Transgression/ Infractions of Laws

## I. INTRODUCTION

Corporation Crimes (white collar crime & unethical behaviour) and scandals are not just like thing, these frauds don't happen overnight and randomly but it is backed up by a continuous hidden unethical practice by individuals. This is not only result of individual criminal tendency but also result of organisations irresponsibility, which is just like a green signal for them to pursue their wrong deeds.

Crimes are not result of an overnight work but in fact it's the result of gingerly approach of human resource of an organization. They (Humans) initially like 'Phytovorous' and moderately become dangerous 'Cannibalistic'.



The figure is showing most common white collar and corporate crimes performed by Indian corporations by KPMG assessments. And, showing that bribery and corruption are most common kind of crimes performed in India.

White-collar crime or corporate transgression refers to financially motivated nonviolent crime committed by business and government professionals. Within criminology, it was first defined by sociologist Edwin Sutherland in 1939 as "a crime committed by a person of respectability and high social status in the course of his occupation"<sup>1</sup>. The importance of understanding the cultural roots and perceptions of criminal behaviour motives, bribery, fraud, and corruption is paramount in today's corporative world. In criminology, unethical involvement or white-collar crime refers to crime committed either by a corporation (i.e., a business entity having a separate legal personality from the natural persons that manage its activities), or by individuals acting on behalf of a corporation or particular employee for his own benefit. Scandals are results of many daily unethical practices like bribery, corruption, dishonesty, false report/statement, misappropriation, confidence game, mail/wire frauds, embezzlement, etc. But all these practices never get our attention and this small step-by-step approach of un-ethicality leads to big fat crime. Some perverted and greedy people like Ramalingam Raju (behind biggest corporate crime-Satyam scandal), Khetan Parekh, Harshad Mehta( or popularly known as 'big bull' who is behind the Bombay stock exchange security scam of 1992, Sudipto Sen (the latest Saradha Group Financial Scam of 2013, which was caused by the collapse of a Ponzi Scheme) etc.

### 1.1 Objectives

The Paper has been designed to provide a base for different kinds of white collar crimes and corporate transgression results because of trespassing of rules; the paper is trying to develop an understanding of different crimes performed by white collar individuals & corporation in India with various examples.

## II. CRIME: COMMONLY PERFORMED BY CORPORATIONS AND INDIVIDUALS

**Antitrust Violations:** (Investopedia defines) the antitrust laws apply virtually all industries and to every level of business, including manufacturing, transportation, distribution, and marketing. They prohibit a variety of practices that restrain trade. Examples of illegal practices are price fixing conspiracies, corporate mergers likely to reduce the competitive vigour of particular markets, and predatory acts designed to achieve or maintain monopoly power.

A classic example is the case of real estate major, DLF Ltd. in Belaire owners' association V DLF Ltd. (the DLF case). The CCI defined the relevant market extremely narrowly to be the market for "high-end residential apartment in the city of Gurgaon". By restricting the product scope and the geography of the relevant market to a particular suburb, the CCI's decision that DLF was dominant in the relevant market.<sup>3</sup>

**Adulteration:** mixing of substances in other substance (e.g. in food, beverages, fuel, drugs, cosmetic etc.), although not allowed for legal or other reasons. Adulterants like potatoes & vanaspati oil in desi ghee, water in milk, high fructose corn syrup or cane sugar in honey etc these are some example of those adulterants which are not harmful. But in India there is huge market of adulteration in dairy product, food product, beverages etc.

Like recently in august 2014, official has discovered that many dairy owner in M.P. are using hydrogen peroxide (a common paper & hair bleaching agent), potassium hydroxide (used in soap preparation) & hypo (a bleaching agent) in milk. Which can cause- gastroenteritis & damage liver & kidney.

**Bank Fraud:** Fraud against a banking institution, including check fraud, commercial loan fraud, check kiting, and mortgage fraud. To engage in an act or pattern of activity where the purpose is to defraud a bank. Dena bank and oriental bank of commerce was recently in news because of bank fraud.

**Blackmail / Extortion:** A demand for money or other consideration under threat to do bodily harm, to injure property, to accuse of a crime, or to expose secrets. Occurs when one person illegally obtains property from another by actual or threatened force, fear, or violence, or under cover of official right.

**Bankruptcy Fraud:** Individuals or corporations who lie to creditors or bankruptcy officials about assets or debts. This is also called strategic bankruptcy. As the name suggests this is art of making creditors fool as their strategy for deferring their burden of payment.

**Bribery:** Offering money or property with the intention of influencing the behaviour of others. When money, goods, services, information or anything else of value is offered, with intent to influence the actions, opinions, or decisions of the taker. You may be charged with bribery whether you offer the bribe or accept it.

Bribe in India works like key for every door. From the very first level to the higher level all need only a token for any work proceeding, they charge this token for those work for which they are paid by the organisation. Bribe is among the most common crime which is performed by most of the white collar individuals in India. Some common examples are 2G-spectrum, CRP- Scam; commonwealth game and Suresh Kalmadi; etc.

**Cellular phone frauds:** The unauthorized use, tampering, or manipulation of a cellular phone, or service. This can be accomplished by either use of a stolen phone, or where an actor signs up for service under false identification or where the actor clones a valid electronic serial number (ESN) by using an ESN reader and reprograms another cellular phone with a valid ESN number. This is very common kind of crime now days in India; people are using technology for their criminal activities accomplishment.

**Computer/Internet Fraud:** Using the Internet or computers to defraud others. Where computer hackers steal information sources contained on computers such as: bank information, credit cards, and proprietary information & causing unauthorized payments

**Currency Schemes:** The practice of speculating on the future value of currencies.

**Counterfeiting:** Copying goods (such as designer merchandise) or money, and passing off the copies as genuine. Occurs when someone copies or imitates an item without having been authorized to do so and passes the copy off the genuine or original item. Counterfeiting is most often associated with money however can also be associated with designer clothing, handbags and watches. Piracies of DVDs; Godrej – gordej, Samsung-samsung, etc. are good examples of counterfeiting.

**Confidence game:** Any elaborate swindling operation in which advantage is taken of the confidence the victim responses in the swindler. An “insider Man” induces the victim, or “Mark” into a dishonest gambling establishment. There the mark sees decoys, or “Shills”, who appear to be making big winnings. The insider man advances the mark’s fund, & he is allowed to win with uncanny the point at which he is convicted that additional investment will bring him a substantial win, or a “killing”, the mark is persuaded to leave the game in order to obtain money or document conveying title to properly, when he returns & places his bet, his luck suddenly change & his fortune disappears in a matter of minutes. (Britannica Encyclopaedia).

**Economic Espionage:** Stealing or misusing trade secrets for personal benefits. The most common kind of crime for getting the unfulfilled desires achievement is selling or leaking confidential facts & figures of an organisation to its competitors for the sake of money or equivalent.

**Embezzlement:** Using money or goods entrusted to you for your own benefit. When a person who has been entrusted with money or property appropriates it for his or her own use and benefit. Like in case of-“The Satyam fraud in India, It has often been called the “Enron of India” (Christy, 2009) because of its large scope and

worldwide consequence. Satyam was one of the world's leading technology and software consulting companies, with offices in nearly 75 countries and 40,000 employees (even this number was inflated by 30 percent). A large number of the *Fortune* 500 firms used Satyam for various software implementation projects. In early 2009 it was revealed that Satyam had overstated revenues by 76 percent and income by 97 percent (*Times of India*, 2009). Nearly all of the reported income of this very successful, worldwide consulting firm – despite being audited by a reputable accounting firm – was fraudulent. The fraud case caused significant waves in the industry as clients like the World Bank blacklisted the company. (Ribeiro, 2009) (Albrechtisan).”

**Environmental schemes:** The overbilling and fraudulent practices exercised by corporations which purport to clean up the environment. Now it's just like fashion for organisation to show how green favour they are, how better they are using their sources with being environment friendly, etc. but fact is that they are only showing their being green and go green image and just hyperbolize their investment & figures.

**Ecology /environmental law violations:** Now a day when we are facing enormous environmental & ecological problems. There are many rules, laws & regulations for the protection of environment, ecology & sustainable future of the world. But continuous industrialisation and greediness of corporate and humans directly affect it (environment). Debris, waste, dust & effluents are disposed in rivers, streets, and common places which are against rules & laws. Violation of environmental law is such a common thing that corporations don't think a bit before it's trespassing.

*Bhopal gas tragedy* is the biggest example of deadliest air pollution claiming 5,000 human lives and rendering many thousands sick and handicapped caused by sudden leakage of the poisonous gas methyl isocyanide (MIC) from the Union Carbide Factory at Bhopal which was stored to manufacture pesticides.

**Educational Institutions:** Yet another field where collar criminals operate with impunity are the privately run educational institutional in this country. The governing bodies of those institutions manage to secure large sums by way of government grants of financial aid by submitting fictitious and fake details about their institutions. The teachers and other staff working in these institutions receive a meagre salary far less than what they actually sign for, thus allowing a big margin for the management to grab huge amount in this illegal manner.

**Engineering:** In the engineering profession underhand dealing with contractors and suppliers, passing of sub-standard works and materials and maintenance of bogus records of work-charged labour are some of the common examples of white collar crime. Scandals of this kind are reported in newspapers and magazines almost every day in our country.

**Fake Employment Placement Rackets:** A number of cheating cases are reported in various parts of the country by the so called manpower consultancies and employment placement agencies which deceive the youth with false promises of providing them white collar jobs on payment of huge amount ranging from 50 thousands to two lacks of rupees.

**Forgery:** Manipulating or changing a written document for monetary gain. When a person passes a false or worthless instrument such as a check or counterfeit security with the intent to defraud or injure the recipient.

**False advertising & misrepresentation of products:** showing intentionally those features and quality of acclamation which that particular product doesn't consist. Like, the claim that “BOOST” provides 3 times more stamina than sadharan(normal) chocolate drink is misleading and violate section 24 of FSS Act, 2006. The producer has not submitted any specific study on this product to substantiate their claims.

**False Pretences:** is the obtaining of property by intentionally misrepresenting a past or existing fact. Like Disney should be charged with false pretences for making little boys & girls believe that life always has a happy ending; for making little girls believe that there is a prince charming waiting out there. Cosmetic products like fair & lovely; etc are also doing the same job.

**False report & statements:** most common kind of white collar and corporate crime is making of false report for bribe or some other greed satisfaction purpose. Manipulation in statement and reports can give huge benefits and financial strengths to the corporation. And, they can save their funds for their own benefits and hide it from general public or commonly called from stake holder. But false reports and statement somehow is hiding of real facts from those who are affected by it.

**Health Care Fraud:** Where an unlicensed health care provider provides services under the guise of being licensed and obtains monetary benefit for the service. The white collar crimes which are common to Indian trade and business world are hoardings, profiteering and black marketing. Violation of foreign exchange regulations and import and export laws are frequently resorted to for the sake of huge profits. That apart, adulteration of foodstuffs, edibles and drugs which causes irreparable danger to public health is yet another white collar crime common in India.

**Influence Peddling:** Use of position or political influence on someone's behalf in exchange for money or favours.

**Insider Trading:** When a person uses inside, confidential, or advance information to trade in shares of publicly held corporations. Recently Wipro executive, Rajat Mathur fined rs. 5 lakh in insider trading case.

**Insurance Fraud:** Defrauding insurance companies by exaggerating or fabricating claims. To engage in an act or pattern of activity wherein one obtains proceeds from an insurance company through deception.

**Investment Schemes:** Where an unsuspecting victim is contacted by the actor who promises to provide a large return on a small investment. As Indian consumer are basically belongs to village and faces a big problem of unawareness. According to one report 70% of Indian consumers are not at all knowledgeable about the protection and right they hold as a consumer. So a country which has this kind of population making fool and playing with their emotion is very easy and just like thing for a clever perverted people. People invest in investments schemes and get cheated by the cons. We frequently hear in newspapers about these frauds. Racketeering influence & corrupt organisation (RICO) are involve in all these kind of activities.

**Legal Profession:** The instances of fabricating false evidence, engaging professional witness, violating ethical standards of legal profession and dilatory tactics in collusion with the ministerial staff of the courts are some of the common practices which are, truly speaking, the white collar crimes quite often practiced by the legal practitioners.

**Larceny/Theft:** When a person wrongfully takes another person's money or property with the intent to appropriate, convert or steal it. Like: employee petty larceny and expense account frauds etc.

**Medical profession:** White collar crimes which are commonly committed by persons belonging to medical profession include issuance of false medical certificates, helping illegal abortions, secret service to dacoits by giving expert opinion leading to their acquittal and selling sample-drug and medicines to patients or chemists in India. Collusion between physicians and pharmacists to cause the writing of unnecessary prescriptions;

Dispensing by pharmacists in violation of law, excluding narcotics trafficking.etc. are very common in our country.

**Money Laundering:** Running money obtained illegally through a legitimate business. The investment or transfer of money from racketeering, drug transactions or other embezzlement schemes so that it appears that its original source either cannot be traced or is legitimate. It is 'the process by which one conceals the existence, illegal source, or illegal application of income and then disguises that income to make it appear legitimate.'<sup>2</sup>

Money laundering is the process whereby proceeds, reasonably believed to have been derived from criminal activity, are transported, transferred, transformed, converted, or intermingled with legitimate funds, for the purpose of concealing or disguising the true nature, source, disposition, movement or ownership of those proceeds. The goal of the money-laundering process is to make funds derived from, or associated with, illicit activity appear legitimate." Richards, p 44. Money laundering, we come across with this word even every day in newspapers or news. Recently 21 Indian banks are found indulged in money laundering activities (including SBI, AXIS; ICICI etc). In India hawala is very common and works as international black money mobilizing instruments

**Ponzi Schemes:** A Ponzi scheme is essentially a fraudulent investment scheme where money brought in by the newer investors is used to pay off older investors. This creates an impression of a successful investment scheme. Of course, as long as money entering the scheme is greater than the money leaving it, all is well. The recent Saradha Group Chit Fund scam of 2013 is the live and apparent example which results after the collapse of Ponzi schemes.

**Stock /Securities Fraud:** Can include insider trading and theft through market manipulation. The act of artificially inflating the price of stocks by brokers so that buyers can purchase a stock on the rise. i.e., sale of non-registered securities to obtain operating capital, false proxy statements, manipulation of market to support corporate credit or access to capital markets, etc. . Harshad Mehta (commonly known as big bull of stock market) having been charged with numerous financial crimes that took place in 1992. It was alleged that Mehta engaged in a massive stock manipulation scheme financed by worthless bank receipts; the scandal valued at rs.49.99 billion, which took place on the BSE.

**Tax Evasion:** Filing inaccurate IRS returns, not reporting income on tax returns, not filing tax returns. When a person commits fraud in filing or paying taxes by hiding some information or simply say by hiding his/her taxable income.

**Telemarketing Fraud:** Actors operate out of boiler rooms and place telephone calls to residences and corporations where the actor requests a donation to an alleged charitable organization or where the actor requests money up front or a credit card number up front, and does not use the donation for the stated purpose.

**Welfare Fraud:** To engage in an act or acts where the purpose is to obtain benefits (i.e. Public Assistance, Food Stamps, or Medicaid) from the State or Federal Government. Like in November 2014 the Anti-Corruption Bureau (ACB) conducted a raids at the social welfare commissioner's office in Pune & seized heaps of documents related to a case involving misuse of funds.<sup>3</sup> executives from private & govt. servants from the social welfare department

**Weights and Measures:** The act of placing an item for sale at one price yet charges a higher price at the time of sale or short weighing an item when the label reflects a higher weight. Tags like 80% discount on everything but really only applies on the certain things.

Some other kinds of crimes can be- Housing code violations by landlords; false claims; false statements- Statements made to induce contracts; Aiding fraud; Housing fraud; Small Business Administration fraud, such as bootstrapping, self-dealing, cross-dealing, etc., or obtaining direct loans by use of false financial statement.

### III.CONCLUSION

“There are wheels within wheels, layers upon layers. It’s not easy to tell who’s fronting from whom” said by a CBI officer. So white collar crime is very important and has wide area coverage. A simple violent crime will damage one or two but people who become convict of corporate transgression and law trespass are generally huge. Most important a big scandal can ravage lives of hundreds or thousands of people. Their emotions are get hunted and their money (which they invests after their sacrifices and suffering) is snatched. This paper is trying to sort list the kinds of white collar and corporate transgression with some examples and trying to provide a base and develop understanding of the reader about what are the white collar and corporate crimes there. As Narayan of Lok Satta Said- “all this is not just undermining the quality of goods & fleecing the exchequer – it is eliminating integrity from the system”.

The paper is trying to provide a base only, for many future studies like Indian Corporate laws & violations: the crime is always result of loopholes of law and this paper is providing list of most of crime which results because of loopholes of laws of due to violation of rules and legal frameworks. Future study can also be done on Indian Corporate Governance & Compliance Mechanism; Corporate Non-Observance Trespass; etc. But there is need of focus for a good study on understanding imperativeness of CSR to obviate crimes and development of ethical culture within organisation.

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# A SSS SCHEME TO INCREASE THE RELIABILITY IN SOFTWARE SYSTEMS

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## **ABSTRACT**

*A failure free operation is necessary for the software systems. Due to the increasing data and the real time constraints, the task failed to achieve the successful completion and for to produce the outcome of the problem. Many methods were proposed where the good outcome is reached but it is tedious in the sense of time and measurements taken throughout the process. To overcome all those things, the propose SSS scheme reduce the manipulation and it thoroughly go through the entire process and by that process it tends the information to the new process. This process produces good results for the taken inputs. In this method, the three components acts as a procedure to increase the reliability. The Start-up analyse the incoming process and the strength-up evaluates the new errors and the stater resolves all the errors while the process enters to the execution phase. SSS increase the reliability and the risk of failures and errors are reduced in the SSS scheme.*

***Keywords: SSS, Start-up, Strength-up, Stater, System Remodelling***

## **I. INTRODUCTION**

Software Reliability is defined as the probability of failure-gratuitous software operation for a designated period of time in a designated environment. Software reliability is different from hardware reliability because time is not a major constraint. It will not modify over time unless transmuted or upgraded transpired frequently. There are many software quality features such as usability, maintainability etc.... Reliability is one of them and it is very hard to procure it because it leads to a high degree of involution when the software application size is sizably voluminous. The involution of an application is inversely cognate to reliability and directly cognate to quality. Good projects are emerging from good management such as time, cost and development. Software reliability consist three components: modeling, quantification and enhancement. Reliability modeling refers the optimized model which is ascertained by a system testing. There are sundry estimation techniques to quantify the reliability, enhancing the reliability is the process of incrementing capability of software during testing and implementation.

There are sundry reasons behind software failures such as errors, interpretation faults, incompetence, testing and other quandaries. Design faults withal affect the reliability of software. The quantification of software reliability thoroughly depends on manipulation and calculation and so physical presage is not possible. There are some worst situations where the error appears without any caveat. For example, the inputs of a program additionally affect the software in the situations like redundancy, interference and overlapping. By analyzing the above

issues the standard testing and immensely colossal testing is examined to amend software reliability. But there are no standard methods other than some logic structures and calculations.

There is not a simple method to quantify software reliability. If the programmer or utilizer doesn't understand the software system or application then it becomes very rigorous to quantify it. Most of the software metrics not have a prevalent definition or methods. There are many metrics taken into consideration such as product, process, fault and failure metrics. These metrics avail the designer to quantify reliability indirectly. There is no standard way of counting the application other than LOC (Lines Of Code) or LOC in thousands (KLOC). Software operating environments are different for every application and so it withal affects the reliability. There are two issues which infringe the software reliability. They are Control dependence and data independence.

The hardware reliability is jaded but the software reliability is conceptual and document. To enhance software reliability first the quantification and amelioration of the metrics are initialized. At the next step the cost, effort, time and other set of involution metrics must be low. There are many authentic time examples of software failure such as fortuitous change of function when fault input to the system, encountered, misinterpretation of requisites etc., All the above discussed issues as certain that the reliability of a software is an capricious one. So there is a desideratum for a good presage method of software reliability. To enhance reliability the following steps to be done (i) standardizing data amassing methods (ii) documenting again and again (iii) inter-rater reliability.

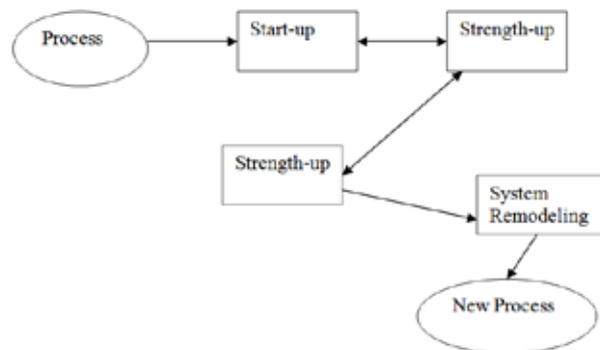
## **II. RELATED WORK**

To perform the reliability operations the existing algorithms are very tedious to manipulate. Upon various approaches the easy and efficient means of increasing the performance is not easily available. The simple approach is not use for complicate operations. In the literature, there are some works for procuring reliability models. The main disadvantage of this approach is that no distinction is made between different tests, and the fact that these different tests cover different possible faults. The main postulation utilized by these models in treating the fault rectification process is that the rate of fault rectification is proportional to the number of faults to be redressed, betokening that the expected cumulative number of redressed faults is proportional to the expected cumulative number of detected faults with constant delay. All the methods have some posits and calculations. Ingunn Myrvtveit, Erik Stensrud [5] (2005) develops a research procedure with the study of software prediction models. Kapil Sharma et al. [4] (2010) derived a deterministic model which is evaluated by distance. Ahmed et al. [1] (2010) software application method is verified by several codes and programs. Yousif A. Bastaki [9] (2012) develop a method to increase the reliability which is very user interactive. Mohd. Anjum, Md. Asraful Haque, Nesar Ahmad [7] (2005) proposed a set of twelve comparison criteria and assigned a weight to rank the software reliability growth models. Eduardo Oliveria Costa et al. [3] (2010) obtained a good curve for reliability by time and cost which is implemented by genetic programming. Costa et al. [2] (2010) developed a reliability model for the same approach. Onishi et al. [6] (2007) analysis a failure and Mean Time to improve the reliability. Manfred Broy [8] (2007) discusses the automotive software engineering with the root and issues of automotive industries as processes, methods, tools, models, product structures.

## **III. SYSTEM MODEL**

For the above discussed problems, the SSS (Starter, Strength-up, and Stater) method is introduced. In the SSS scheme there are several checkpoints to recognize and modify the corrupted and mistaken data. This method

performs minute scanning and so the errors and performance degradation existing work is considerably decreased. We will discuss the operation of this powerful SSS tool. The below description of SSS scheme is given below in fig 1.1.



**Fig.1: Overview of SSS**

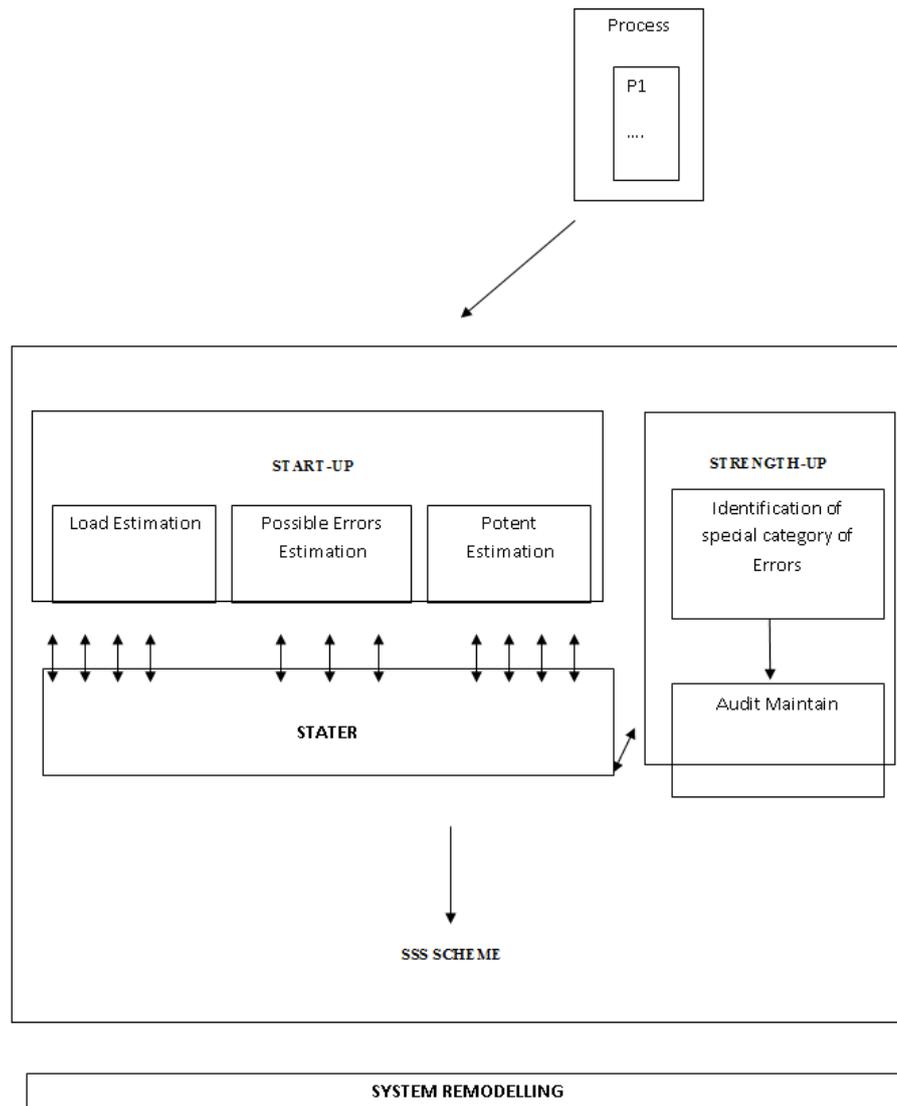
The SSS scheme performs the process as the program but actually it is a system. This system is very compatible with all environments. It suits all processor including the 2-way superscalar and 4-way superscalar. The processor contains numerous processes which are directly embedded to the SSS scheme. The below figure 2 depicts the schematic view of the SSS scheme.

The imported process initially enters into a startup stage where the starting work will process. The several checkpoints presents inside a start-up are (i) Load Estimation (ii) Possible Error Estimation (iii) Potent Estimation. The load estimation measures the load (i.e) the content, the running time, LOC etc.... The load estimation measures the process by integrating all the process. After the Load estimation the processor the possible error detection mechanism is the powerful method technology which is implemented by any high level language. This possible error method finds out all the possible errors in the processes. After this method the processor will enters to a potent estimation block. In this block the withstanding capability of all processor are measured for the purpose of error tolerance. After, the start up the process enters into a stater section.

Stater is a flexible one which composed of some mathematical terms and solutions. It acts as a interactive dictionary of our system. The outcome of the stater itself increases the reliability of the process in most of the cases. But the real time scenario changes system by system, case by case and even data by data. We cannot predict accurate outcome of a process in some cases. In order to overcome this we need in depth analysis of a system also a evaluation of individual components. The startup and stater are interconnected and so the operation is fast and quick. After the method of stater the processes enters into a strength-up section.

The strength up is a two way block and it is a special method to find out the uncoverable errors in the tasks. The possible error detection method in a startup complete the process as it is possible. But to enhance the reliability in a task we are including the block strength-up. The add on functionality in a strength up process is Audit maintain. It keep track of all records for the future process also. The major advantage and the powerful functionality in strength up block is a connection between the stater (i.e) the new errors are also stored in the stater and hence the future processor updated errors will detect easily. When the processor will not enter into strength up means then it will run quickly.

After the completion of the SSS scheme the processes are remodeled which is increased functionality and increased reliability one. The future section will discuss the increased reliability with the proven data.



**Fig.2: SSS System Model**

**IV. EXPERIMENTS AND RESULTS**

To evaluate the performance initially we are taken several programs. The below table 1,2,3 explains the various phases of SSS in the considered process P1 to P7 and give the summarization of the entire method.. All the processes are simple programs which are executed as projects.

The table 1 shows the possibility of reliability but before the strength up process in which the load, Error and potent are estimated. To enhance the reliability here the new errors are estimated and mentioned in table 2. The table 3 shows the system remodeling which is the final outcome of the SSS scheme an the graph is drawn comparing with SSS and without SSS.

Load Estimation	Error Estimation	Potent Estimation
120	10	<5
140	22.5	<10
162	32	<16
125	15	<5
138	22	<10

142	25	<10
125	15	<5

**Table 1: Start-up**

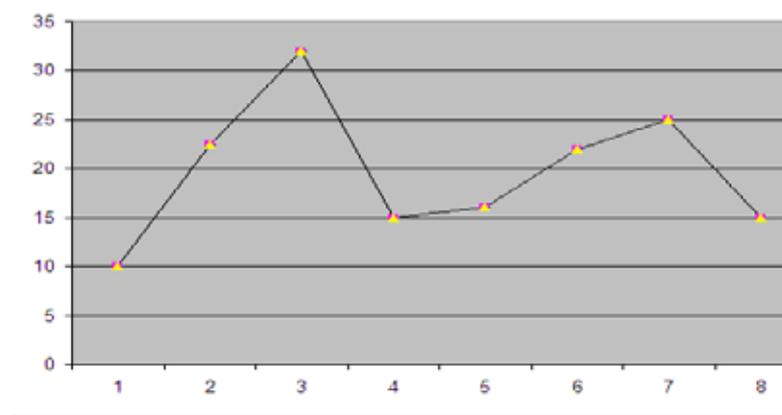
Process	Error Estimation	Special Errors(LOC)
P1	10	15
P2	22.5	215,216
P3	32	138
P4	15	20,81
P5	22	15
P6	25	10
P7	15	11,35,72

**Table 2:Strength-up**

Process	Error Estimation(Without SSS)	Error Estimation(with SSS)
P1	10	0.001
P2	22.5	0.1
P3	32	0.2
P4	15	0.001
P5	22	1.001
P6	25	0.12
P7	15	0.12

**Table 3:System Remodelling**

All the data are chosen randomly from various source codes and the reliability is measured inherently without any enhancer process. For the table 1 the corresponding graph is drawn which is given in Fig 3. The graph shows the reliability modeling with the fault profile.



**Fig.3: Reliability without SSS**

The above graph is a model with reliability enhancer. By performing the necessary enhancer i.e (SSS) the below graph Fig 4 is drawn where the reliability is enhance and it is proved.

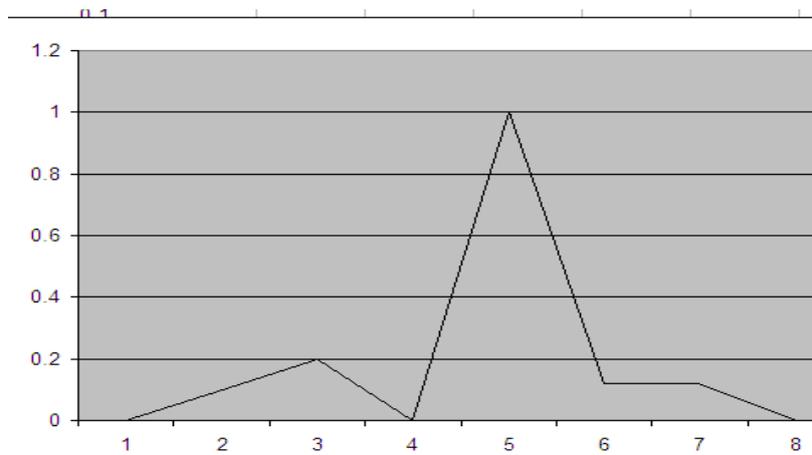


Fig.4: Reliability with SSS

## V. CONCLUSION

The SSS Scheme is an optimized model to increase the reliability. SSS model automatically estimates the load, errors and potent. The audit maintain phase of this model regularly update the start-up phase which is increase the reliability to the new models. Increasing the reliability is very tedious and it requires complicate mathematical functions. But in this model, by considering the enormous projects itself detects the errors and repair the process. This method gives a good results and it is proven in the above tables. All the above experiments induce through all the phases of the SSS scheme and the reliability is increased. This method is not affect the output and reacts with the sensitive failure optimistically. There is a possibility to improve this model which will produce no error and achieves a full optimal reliability model. Therefore, SSS is a good reliability model to increase the reliability with respect to cost, time and effort.

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# PERFORMANCE ASSESMENT AND COMPARISON OF DIFFERENT SOLAR PHOTOVOLTAIC TECHNOLOGY

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## ABSTRACT

*This paper represents the technical performance evaluation and comparison of different solar PV technology in real time conditions for the selected location in New Delhi. By examining the SPV technology, the performance of modules of different technology at the same time and same environment conditions, i.e. how the module of different type of technologies behaves in different climatic conditions and parameter such as average energy generated, solar operational efficiency, maximum generated power, efficiency of modules are calculated. The number of experiments has been performed to examine the performance of different types of modules CdTe (80Wp) and polycrystalline (75Wp) in real time conditions of New Delhi (Latitude 28°37N, Longitude 77°04E). One indoor experiment has been also performed with sun simulator to compare the average energy generated in indoor as well as outdoor conditions.*

**Keywords:** *Energy, Modules, Sun simulator, SPV technology.*

## I. INTRODUCTION

India depends heavily on fossil fuels and nuclear power to generate its electricity. The environment pollution and depleting nature of these resources has raised lot of challenges-for keeping them as source of energy. Renewable energy is clean and safer to meet present increasing demand of electrical power. From the aspect of global warming and shortage of natural gaseous, scientists and engineers are looking for clean, renewable energy solutions. Only the sun is source of solar energy. Using sun's energy is very useful because it is an everlasting, clean, renewable ener [1].

Hence solar energy is the one of the best option to replace a part of fossil fuel energy because earth receives 3.8 YJ of energy which is 6000 times greater than the world's total energy consumption [2]. Sun's energy is clean energy so for environment there is no bad effect. Sun's energy is free it do not cause pollution and mostly available at all location. India has 300-310 sunny days per year. The government of India comprising a national solar policy called as Jawaharlal Nehru National Solar Mission (JNNSM) was launched on the 11<sup>th</sup> January,

2010 by the Prime Minister. Its vision is based to develop solar power in India. The objective of the JNNSM is to establish India as a global leader in solar energy [3]. JNNSM has set target for different phases. The JNNSM mission set target of adding 20 GW of grid connected and 2 GW of off-grid capacity by 2022 in three phases. In phase 1(2010-2013) the target of 1100 MW grid connected and 200 MW for off grid. In phase 2 (2013-2017) the target of 10,000 MW grid connected and 1000 MW for off grid. In phase 3(2017-2022) the target of 20,000 MW grid connected and 2000 MW for off grid [4]. Phase one is completed and achievement for phase 1 is 252.5 MW. Currently the phase 2 is going on. The first cost-effective applications for photovoltaics were stand-alone systems. Wherever it was not possible to install electricity supply from the mains utility grid, or where this was not cost-effective or desirable, stand-alone photovoltaic systems could be installed. The applications of stand-alone system is constantly increased. Stand- alone PV systems are using greatly in developing countries, where large areas are frequently not connected to an electrical grid [5]. Elhodeiby et.al. [6], conducted performance analysis of 3.6 kW Rooftop Thin Film Photovoltaic system in Egypt. The performance of the PV system are evaluated which include: average generated kWh per day, average system efficiency, average inverter efficiency , average array efficiency, average power output, solar irradiation around the year.

This paper presents a comparison between two solar PV technologies i.e. CdTe (thin film) polycrystalline silicon. The outdoor hourly performance parameters of the stand alone solar PV system components are measured in real time conditions and in the climatic conditions of New Delhi. By examining the solar PV technology, we can get the performance of modules of different technology at the same time and same environment conditions, i.e. how the module of different type of technologies behaves in real time conditions. The daily readings from 9 AM to 5 PM are taken on hourly basis to calculate the parameters like total energy generated throughout day, efficiency, maximum power generated ,etc are determined and details are given in this paper.

The primary objective of this study is the technological description of the photovoltaic system and measure the operation of solar modules in different surroundings and also to measure the function of electronic circuitry in PV system. The place of work is Solar Lighting Laboratory, TERI (The Energy and Resources Institute), New Delhi (Latitude 28°37N, Longitude 77°04E).

## II. MATERIALS AND METHODS

The location chosen for study area is TERI University in New Delhi. The typical stand alone solar photovoltaic modules were installed at rooftop of solar lighting laboratory TERI (The Energy and Resources Institute), New Delhi (Latitude 28°37N, Longitude 77°04E). There are two kinds of PV modules; one is CdTe (thin film) and polycrystalline silicon. These PV modules are kept at inclination equal to latitude of place as per to gain maximum solar insolation radiation. Two PV modules CdTe and Polycrystalline silicon is of 80 Wp and 75 Wp respectively. The experimental study of PV modules has been done at climatic conditions of New Delhi. The measured parameter includes the solar radiation, open circuit voltage, short circuit current, ambient temperature, back panel temperature.

After having data of each day of different modules at the same time different calculations have been made by using the above measured parameters. The setup of the solar PV modules is shown in fig 1. And block diagram of experimental setup is shown in fig.2.

### III. EXPERIMENTAL PERFORMANCE EVALUATION

The Performance analysis of different modules is evaluated by different experiments. An experimental photovoltaic outdoor test facility with two different photovoltaic technology module arrays: p-Si and CdTe (Thin Film) have been set up at Solar Lighting Lab, TERI (The Energy and Research Centre), New Delhi (Latitude 28°37N, Longitude 77°04E). The CdTe module of 80 Wp and Poly Crystalline of 74 Wp are taken for analysis.



Fig.1 Solar PV System at Solar Lighting Laboratory Teri

#### 3.1 Experiment Number 1

The main objective of this experiment is to compare and analysis two different solar module technologies i.e. Polycrystalline and CdTe. for compare the Energy yield of both modules. The test is done at 28° tilt and at same environment conditions. This test is done to calculate the performance parameters for both Crystalline and CdTe modules.

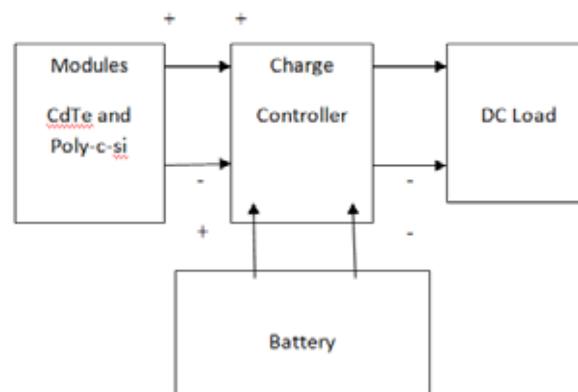


Fig.2 Block Diagram of Experiment

#### 3.1.1 Methodology or Procedure for Evaluation

The three cycles of charging and discharging can be done in evaluating the energy generated by modules of different technology. The charging and discharging is performed with the MPPT charge controller at same climatic conditions and at the same interval of time (From 9 AM to 5 PM) in outdoor conditions of New Delhi. Two identical (12 V 100 Ah) Lead Acid Batteries were charged with both modules and discharged with a Street

Light and Home lighting Load of 10 W for 8 hours (from 9 AM to 5 PM) the help of a MPPT based charge controller and its performance parameters such as Average of Total Energy Generated throughout the day. The energy generated by both the modules is calculated and then both the modules of different technologies are compared to find out that which module is performing better.

While charging the battery from the different modules, observations such as the insolation, back temperature of modules, ambient temperature and electrical specifications are noted down at every half an hour for analysis purpose.

### 3.1.2 Performance Parameters Evaluated

a) Total Energy Generated: is the total Wh generated by the module in a day while charging and is represented by

$$E = \sum E_T \quad (1)$$

Where,  $E_t$  is energy generated in each hour.

$t$  = time (1 to 8) hours.

b) Solar operational efficiency: It is the ratio of total output power, to the rated power.

$$\text{Solar operational efficiency} = \frac{\text{Output power (Wh)}}{\text{Rated power}} * 100 \quad (2)$$

Losses or electronics efficiency: It is the ratio of total power used by load, to the total power generated by the module.

$$\text{Losses or electronics efficiency} = \frac{\text{Total power used by load}}{\text{Total power generated by the module.}} * 100 \quad (3)$$

## 3.2 Experiment Number 2

The experimental setup for this is same as experiment no 1. I-V Curve Testing of different solar PV modules. The main objective is to Calculate and compare the efficiency and Fill factor of two different solar module technologies i.e. Polycrystalline and CdTe. This test is done to calculate the performance parameters for both Crystalline and CdTe modules.

### 3.2.1 Methodology or Procedure for Evaluation

In this case, the modules of CdTe and polycrystalline technologies are taken. The test is done to draw I-V curve of both the modules in the same interval of time (9 AM to 5 PM) and at same outdoor conditions. The Five cycles of I-V curve testing can be done using rheostat in evaluating the efficiency and Fill factor of modules of CdTe and Polycrystalline technology. While drawing the I-V curve then observations such as the insolation, back temperature of modules, ambient temperature and electrical specifications are noted down at every half an hour for analysis purpose.

### 3.2.2 Performance Parameters

a) Maximum power: is the product of maximum voltage and maximum current of module.

$$P_{\max} = V_{\text{mp}} * I_{\text{mp}} \quad (4)$$

b) Efficiency: It is the ratio of output energy to the input power.

$$\text{Efficiency (\%)} = \frac{\text{Output Energy (Wh)}}{\text{Input Energy (Wh)}} * 100$$

Radiation\* Area

(5)

c) Fill Factor: It is the ratio of maximum power generated by the module to the product of open circuit voltage and short circuit current of module.

$$\text{Fill Factor} = \frac{\text{maximum power}}{\text{Voc*Isc}}$$

Voc\*Isc

(6)

### 3.3 Experiment Number 3

The main objective of this experiment is to compare and analysis of two 40Wps Polycrystalline solar module technologies one having spot and another is clear surface respectively at outdoor condition.

a) To compare and analysis of two 40Wps Polycrystalline solar module technologies one having spot and another is clear surface respectively in indoor condition.

b) To compare and analysis of two 40Wps Polycrystalline solar module technologies one having spot and another is clear surface respectively in indoor condition.

An experimental photovoltaic outdoor test facility with photovoltaic technology ,two Polycrystalline module have been set up at Solar Lighting Lab, TERI (The Energy and Research Centre), New Delhi (Latitude 28°37N, Longitude 77°04E).Both module of 40 Wp are taken for compare the Energy yield of both modules. The difference in modules is that one module is having spot in single cell and another module is clear. The test is done at 28<sup>0</sup> tilt and at same environment conditions. This test is done to calculate the performance parameters for both Polycrystalline modules.

#### 3.3.1 Methodology or Procedure for Evaluation

The one cycles of charging and discharging can be done in evaluating the energy generated by modules of same one having spot and another is clear.

##### CASE 1

The charging and discharging is performed with the MPPT charge controller at same climatic conditions and at the same interval of time (From 9 AM to 5 PM) in outdoor conditions of New Delhi. Two identical (12 V 100 Ah) Lead Acid Batteries were charged with both modules and discharged with a Street Light and Home lighting Load of 14.4 W for 8 hours (from 9 AM to 5 PM) the help of a MPPT based charge controller and its performance parameters such as Average of Total Energy Generated throughout the day. The energy generated by both the modules is calculated and then both the modules are compared to find out that which module is performing better .While charging the battery from the different modules, observations such as the insolation, back temperature of modules, ambient temperature and electrical specifications are noted down at every half an hour for analysis purpose.

##### CASE 2

The experiment is performed with the SUN SIMULATOR at same climatic conditions and at the same time in indoor conditions in New Delhi. The experiment is performed at two levels of insulations i.e. 600 W/m<sup>2</sup> and 800 W/m<sup>2</sup>.

#### 3.3.2 Performance Parameter

a)Total Energy Generated: is the total Wh generated by the module in a day while charging and is represented by:

$$E = \sum E_t$$

Where,  $E_t$  is energy generated in each hour.

## IV. RESULTS AND DISCUSSION

### 4.1 Experiment Number 1

This experiment evaluate the comparison of the average produced energy on the performance between two different module technologies using MPPT charge controllers.

#### 4.1.1

In the First cycle the average energy output of the CdTe was 222.40 Wh .In the second cycle the average energy output of the CdTe was 284.03 Wh. In the third cycle the average energy output of the CdTe was 185.06 Wh as shown in fig3.In first cycle the energy generated by polycrystalline module was 181.24. In second cycle energy generated was and 234.61 Wh. In third cycle energy generated was and 153.73Wh as shown in fig 4.

The result shows that CdTe module performed better as compared to Polycrystalline module with MPPT charge controller.

#### 4.1.2

The electronics efficiency is also compared for two modules; it can be observed in fig.5 that in the first cycle the total losses of CdTe and poly-c-si module was 16.06 % and 16.80 % respectively. In second cycle the total losses of CdTe and poly-c-si module was 8.71 % and 11.72 % respectively. In third cycle the total losses of CdTe and poly-c-si module was 12.29% and 14.68 % respectively. So it can be seen that the losses of Cdte were less than the polycrystalline module in all the three cycles. So CdTe module performed better than the polycrystalline module.

### 4.2 Experiment Number 2

This experiment investigates comparison of the efficiency, Fill factor of two different module technologies using MPPT charge controllers.

#### 4.2.1

In the First cycle the Operational efficiency of the CdTe and p-Si module 9-12 % was and 8-12 % Wh respectively as shown in fig.6. In the Second cycle the Operational efficiency of the CdTe and p-Si module 9-12 % was and 9-12 % Wh respectively as shown in fig 7.. In the Third cycle the Operational efficiency of the CdTe and p-Si module 10-13 % was and 9-12 % Wh respectively as shown in fig 8.. In the Fourth cycle the Operational efficiency of the CdTe and p-Si module 5-13 % was and 10-12 % Wh respectively as shown in fig.9. In the Fifth cycle the Operational efficiency of the CdTe and p-Si module 10-12 % was and 9-12 % Wh respectively as shown in fig10. so it can be Observed that the operational efficiency of CdTe was better than polycrystalline.

### 4.3 Experiment Number 3

This experiment evaluates the comparison of the average produced energy on the performance between two same module technologies using MPPT charge controllers and SUN SIMULATOR

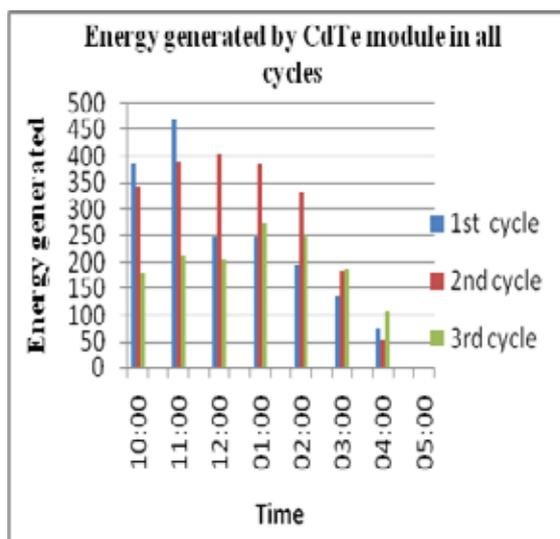
#### 4.3.1 CASE 1

In this result shows that module having spot is performed slightly better as compared to the clear module with MPPT charge controller. In this cycle the average energy output of module with spot and clear module was 13.182 and 13.104 Wh respectively as .The sun hour in whole day is 4.21 hours as represented in fig.11.

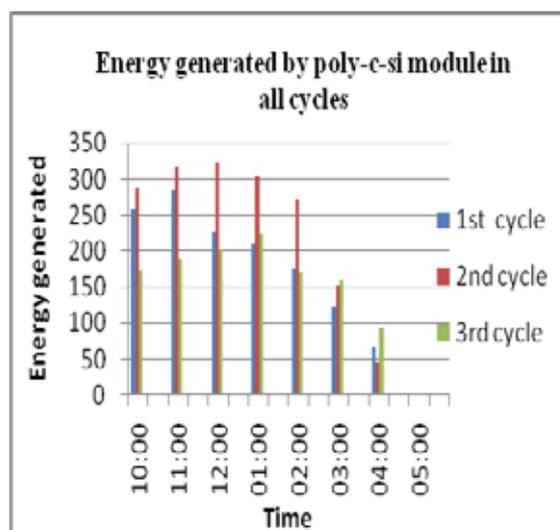
#### 4.3.2 CASE 2

In this result shows that clear module is performed slightly better as compared to the module having spot with SUN SIMULATOR. In this the average energy output of module with spot and clear module at insolation  $600 \text{ W/m}^2$  was 39.51 and 40 W respectively and at insolation  $800 \text{ W/m}^2$  was 29.91 and 30.33 respectively as represented in fig.12.

In complete experiment also the comparison with in same module at indoor and outdoor conditions is carried out and . In indoor conditions at radiation  $600 \text{ W/m}^2$  the power output was 29.91 W and at  $800 \text{ W/m}^2$  the output power was 39.51 W as shown in fig 13. In outdoor conditions at radiation  $600 \text{ W/m}^2$  the power output was 25.55 W and at  $800 \text{ W/m}^2$  the output power was 28.35 W. Power output generated by the module good module/without spot at outdoor and indoor conditions. In indoor conditions at radiation  $600 \text{ W/m}^2$  the power output was 30.33 W and at  $800 \text{ W/m}^2$  the output power was 40 W. In outdoor conditions at radiation  $600 \text{ W/m}^2$  the power output was 24.87 W and at  $800 \text{ W/m}^2$  the output power was 27.03 W as shown in fig 14.



**Fig.3 Energy Generated Cdte Throughout All Cycles**



**Fig.4. Energy Generated Poly-Crystalline In All Cycles**

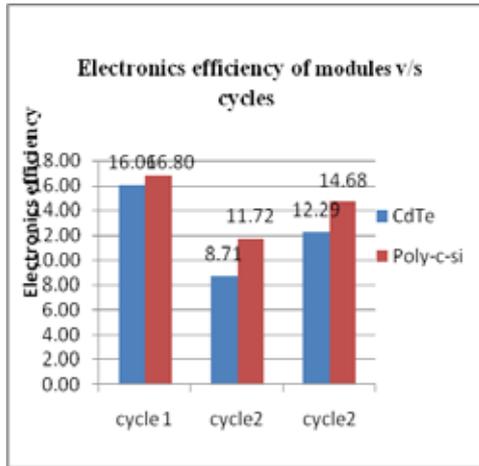


Fig.5. Electronics Efficiency of Modules.

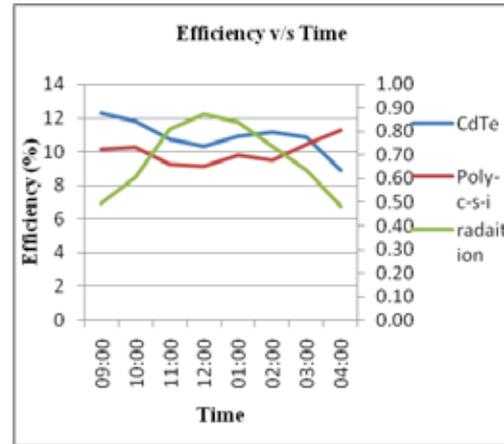


Fig.6 Efficiency of Modules Throughout Day 1

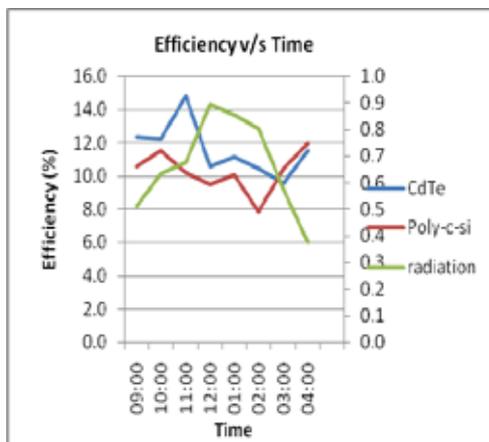


Fig.7 Efficiency of Modules Throughout Day 2

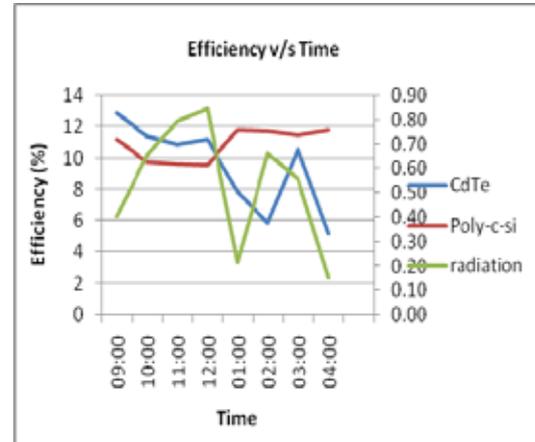


Fig.8. Efficiency of Modules Throughout Day 3

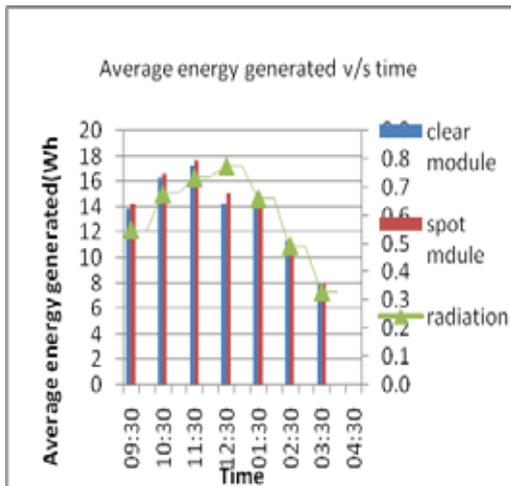


Fig 11. Energy Generated by Modules

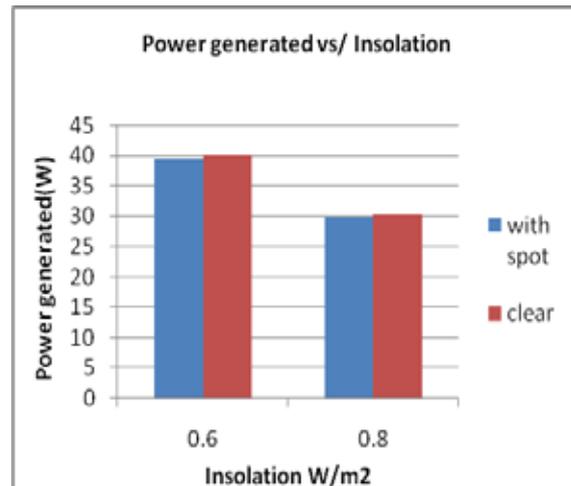
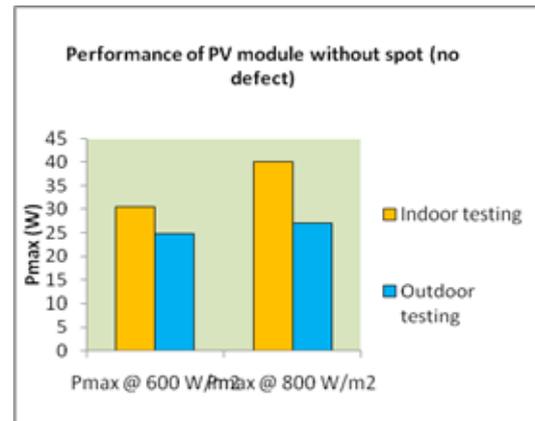
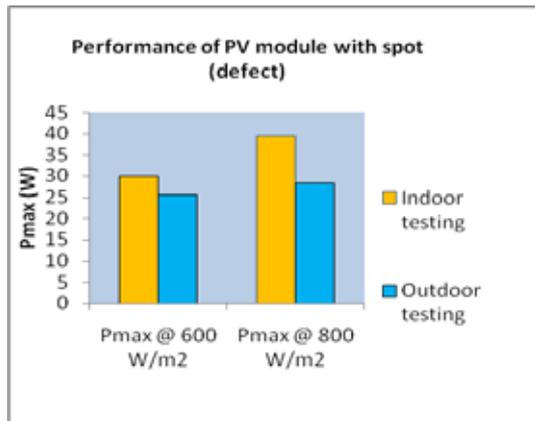


Fig.12. Power Generated With Sun Simulator



**Fig.13 Performance Of Pv Module With Spot**    **Fig.14 Performance Of Pv Module Without Spot**

## V. CONCLUSIONS

Three tests were conducted for the performance of modules.

### 5.1 First Test

- I. The performance of two modules polycrystalline and CdTe (Thin film) is examined and compared at the same climatic condition with MPPT charge controller.
- II. The conclusion is CdTe module performed better than P-Si with MPPT charge controller because of its high open circuit voltage.
- III. Average Energy generated throughout the day is more for CdTe module compared to polycrystalline.

### 5.2 Second Test

- I. The performance of Efficiency of two modules CdTe (Thin film) and Polycrystalline is examined and compared at the same climatic condition with same Rheostat.
- II. The conclusion is CdTe module have better efficiency than P-Si. But ideally the efficiency of polycrystalline modules (12 - 14 %) is better than the CdTe modules (10- 12 %).
- III. In this case the module of polycrystalline is of bad quality, the cells in module are not made up of good material that's why efficiency of polycrystalline module is poor than the CdTe module.

### 5.3 Third Test

- I. The performance of both modules polycrystalline is examined and compared at the same climatic condition with MPPT charge controller and with SUN SIMULATOR. The conclusion is when observed in outdoor conditions then the module with spot generated slightly more energy than the clear module.
- II. In Real time conditions module with spot is performing better than solar module. But in case of the SUN SIMULATOR solar module generated more energy than the spot module.
- III. It shows that the spot in module is at its initial stage that's why it does not affect the energy generated. SUN SIMULATOR is efficient, so that both the modules are tested with SUN SIMULATOR to know the better results.

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