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A REVIEW OF EEG SENSOR WITH THEIR APPLICATION AND METHODS

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ABSTRACT *: Brain activity is an essential key to understanding the psycho physiological states of humans. Using non-invasive electroencephalograms (EEG) with a dry electrode, brain states can be measured and analyzed without complex medical procedures. In the present study, different dry-contact sensors for measuring electro-encephalography (EEG) signals without any skin preparation are studied. Conventional wet electrodes are commonly used to measure EEG signals; they provide excellent EEG signals subject to proper skin preparation and conductive gel application. However, a series of skin preparation procedures for applying the wet electrodes is always required and usually creates trouble for users. To overcome these drawbacks, dry-contact EEG sensors were proposed for potential operation in the presence or absence of hair and without any skin preparation or conductive gel usage. This paper concludes with highlighting some of novel system that dry electrodes system has enabled for neural monitoring.*

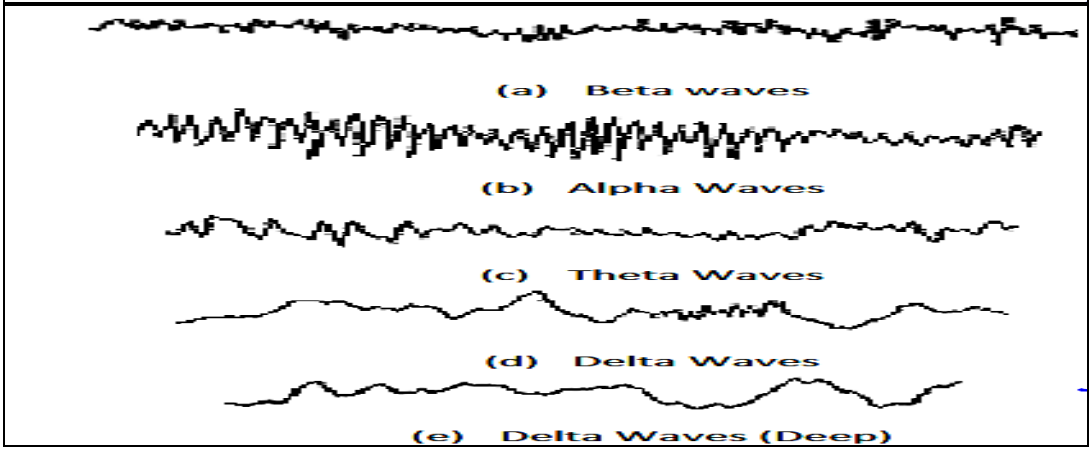
KEY WORDS *:* **:** *electroencephalography (EEG); dry electrode; conductive gels;*

INTRODUCTION

Biopotential recordings in the form of ECG, EEG, EMG, are indispensable and vital tools for both medical and research use.

Electroencephalography is the process of recording electrical impulses generated from nerve cells in the brain. The many nerve cells in the human brain creates electric fields when excited. Observing the time domain signal of an EEG is rarely of interest, and as such most studies observe the information contained in the frequency domain of the signal. Most of the power of the EEG is contained in frequencies below 50 Hz. frequencies of the EEG and where the can be observed is listed in Table

Wave		Observed	Frequencies
Alpha	(α)	At the back of the head with eyes closed	8-13 Hz
Beta	(β)	At the top and front of the head	13-30 Hz
Delta	(δ)	In infants and sleeping adults	0.5-4 Hz
Theta	(θ)	In children and sleeping adults	4-8 Hz



Because EEG is a powerful and noninvasive tool that can provide high temporal resolution to directly reflect the dynamics of brain activities [3,4], it has been widely used for both medical diagnoses and neurobiological research. Conventional wet Ag/AgCl electrodes are generally and most frequently used to measure EEG signals [1]. The conventional wet electrode characteristics have been widely studied and discussed in detail, including their applications . Indeed, EEG signal quality is excellent with the proper skin preparation and conductive gel usage. However, skin preparation and the use of conductive gels are always required when using conventional wet electrodes. These processes are employed to reduce skin-sensor interface impedance. In terms of the convenience of the EEG signal measurement process, these procedures usually create trouble for users, especially in daily life applications for long-term monitoring. In particular, the use of conductive gels inevitably leaves residues on the scalp. The gel may also leak out of the wet EEG electrodes, causing a short circuit between two electrodes in close proximity when too much gel is applied or the wet electrode is pushed down too hard on the scalp . Moreover, the above-mentioned preparation procedures for wet electrodes also have some significant drawbacks, such as being time-consuming, uncomfortable, and painful for participants because the skin preparation usually involves outer skin layer abrasion.

Repeated skin preparations and gel applications may also induce allergic reactions or infections. The EEG signal quality may degrade over extensive time periods as the skin regenerates and/or the conductive gel dries. Some issues also arise when measuring a location of interest that is covered with hair. This procedure leads to insufficient skin-electrode contact area, especially for long-term studies.

This paper aims to address all development in dry electrodes and their performance relates to the signal quality in terms of noise and motion sensitivity. One chief advantage of the standard clinical wet electrode is the fact that it adheres very well to skin. This paper reviews the latest developments in dry electrodes while providing a historical context and a discussion of the challenges and future this field.

HISTROY:

During more than 100 years of its history, encephalography has undergone massive progress. The existence of electrical currents in the brain was discovered in 1875 by an English physician Richard Caton. Caton observed the EEG from the exposed brains of rabbits and monkeys. In 1924 Hans Berger, a German neurologist, used his ordinary radio equipment to amplify the brain's electrical activity measured on the human scalp. He announced that weak electric currents generated in the brain can be recorded without opening the skull, and depicted graphically on a strip of paper. The activity that he observed changed according to the functional status of the brain, such as in sleep, anesthesia, lack of oxygen and in certain neural diseases, such as in epilepsy. Berger laid the foundations for many of the present applications of electroencephalography. He also used the word electroencephalogram as the first for describing brain electric potentials in humans. He was right with his suggestion, that brain activity changes in a consistent and recognizable way when the general status of the subject changes, as from relaxation to alertness . Later in 1934 Adrian and Matthews published the paper verifying concept of “human brain waves” and identified regular oscillations around 10 to 12 Hz which they termed “alpha rhythm”.

METHODS:

In conventional scalp EEG, the recording is obtained by placing electrodes on the scalp with a conductive gel or paste, usually after preparing the scalp area by light abrasion to reduce impedance due to dead skin cells. Many systems typically use electrodes, each of which is attached to an individual wire. Some systems use caps or nets into which electrodes are embedded; this is particularly common when high-density arrays of electrodes are needed. To improve the performance of conventional wet EEG sensors, micro-electro-mechanical systems (MEMS) have been used to develop dry MEMS electrodes to measure EEG signals. Dry MEMS EEG electrodes with several micro-needles on their top surface can successfully acquire forehead EEG signals. The micro-needles are used to penetrate the outer skin surface layers to acquire the EEG signals . The characteristics of this kind of dry MEMS EEG electrode have also been discussed in detail, including comparisons to the equivalent circuits of the wet electrode-skin interface. Dry MEMS electrodes can potentially be used to acquire EEG

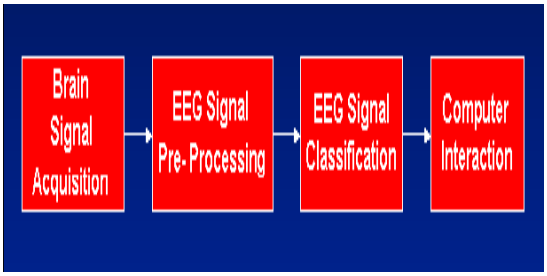
signals without skin preparation or the use of conductive gels. However, there is no convincing evidence about EEG signal quality under hairy or hairless sites using dry MEMS EEG electrodes. Moreover, some disadvantages to using dry MEMS electrodes remain, such as the lack of physical strength with which the micro-needles attach to the skin surface. Recently, Ruffini *et al.* demonstrated carbon nanotube (CNT)-based dry electrodes for applications in biopotential signal studies. These authors also measured biopotential signals in human trials for the first time. Recently, Grozea *et al.* proposed another type of dry MEMS sensor, the bristle-sensor, for EEG measurement. They indicate that the performance of the bristle-sensors compares well with wet electrodes. The success of this prototype means that it is possible to measure EEG signals on hairy sites by dry MEMS-linked electrodes.

Recently, fabric-based electrodes have been used to measure bio potential signals. Beckmann *et al.* tailored their fabric electrodes with different fabric specifications to record ECG signals in detail. Our recent study successfully utilized foam-based electrodes that were covered by conductive fabric materials to acquire forehead EEG signals for the first time. Compared with MEMS-based electrodes for measuring bio potential signals, the fabric-based electrodes are relatively comfortable and noninvasive. However, the fabric-based electrodes used to record EEG signals on hairy sites require further improvement because the hairs reduce the contact area at the skin-electrode interface.

In contrast to previous dry electrode types, Matthews *et al.* proposed a hybrid dry electrode for recording EEG measurements. These electrodes combine high-impedance resistive, capacitive characteristics and contact the scalp without any skin preparation, and depend on a high contact impedance between the scalp and the electrode. However, these electrodes possess hard substrates, which lead to discomfort or even pain on the scalp surface when force is applied. The EEG signal may be distorted easily by motion due to the hard substrate. Moreover, the fabrication cost for a high-contact impedance electrode is higher than for the other types of dry EEG electrodes.

In addition to the dry-contact electrode types, noncontact (capacitive) electrodes have also demonstrated the potential to acquire EEG signals with spacing between the electrode and body and no skin preparation. Matthews *et al.* proposed a dry capacitive electrode to noninvasively measure EEG signals without skin preparation. However, dry capacitive electrodes are easily affected by motion artifacts. As an alternative, capacitive type electrodes that do not require direct contact are attractive since they require a minimal of preparation. Early work [2] [3] have shown efficacy in resolving EEG and ECG type signals via capacitive coupling. Until recently, however, the microelectronics were not available to realize capacitive electrodes competitive with traditional gel-based designs.

PROCEDURE: The common structure is as following

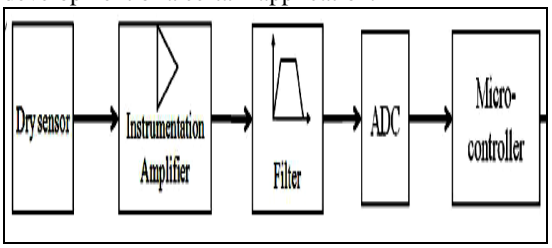


1) *Signal Acquisition*: the EEG signals are obtained from the brain through invasive or noninvasive methods (for example, electrodes). After, the signal is amplified and sampled.

2) Signal *Pre-Processing*: once the signals are acquired, it is necessary to clean them.

3) *Signal Classification*: once the signals are cleaned, they will be processed and classified to find out which kind of mental task the subject is performing.

4) *Computer Interaction*: once the signals are classified, they will be used by an appropriate algorithm for the development of a certain application.



The Design Diagram

APPLICATION :

The greatest advantage of EEG is speed. Complex patterns of neural activity can be recorded occurring within fractions of a second after a stimulus has been administered. EEG provides less spatial resolution compared to MRI and PET. Thus for better allocation within the brain, EEG images are often combined with MRI scans. EEG can determine the relative strengths and positions of electrical activity in didifferent brain regions.

According to R. Bickford research and clinical applications of the EEG in humans and animals are used to:

(1) monitor alertness, coma and brain death;
(2) locate areas of damage following head injury, stroke, tumor, etc.;
(3) test afferent pathways (by evoked potentials);
(4) monitor cognitive engagement (alpha rhythm);
(5) produce biofeedback situations, alpha, etc.;
(6) control anesthesia depth ("servo anesthesia");
(7) investigate epilepsy and locate seizure origin;
(8) test epilepsy drug effects;
(9)assist in experimental cortical excision of epileptic focus;
(10) monitor human and animal brain development;
(11) test drugs for convulsive effects;
(12) investigate sleep disorder and physiology.

As the EEG procedure is non-invasive and painless, it is being widely used to study the brain organization of cognitive processes such as perception, memory, attention, language, and emotion in normal adults and children. For this purpose, the most useful application of EEG recording is the ERP (event related potential) technique.

CONCLUSION

The brain is a complex and intricate organ serving yet leading the rest of the body. Mapping the areas of the brain is the first step in understanding how humans think and interact. Using dry sensor techniques is taking those first steps into the brain. Where there is great achievement there is also a great responsibility.

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VALUE STREAM MAPPING: SIMULATION APPROACH

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***ABSTRACT**: Value Stream Mapping (VSM) is an improvement tool used to implement lean concepts especially in manufacturing areas. Main focus is on waste reduction and inventory control. VSM sketches flow of material and information for a product or product family moving through manufacturing system (Rother, Shook 1999). Since a map is static in nature, simulation can be used as supporting tool for VSM, to consider dynamic behavior of systems. As implementation of lean may become expensive and time-consuming, researchers considered simulation to improve VSM. This paper reviews literature involving study of VSM and simulation together. Improved steps for VSM are also proposed with implementation plan for application of VSM with simulation for manufacturing industry. It will be helpful to academia and people from industry for future work.*

KEYWORDS: Inventory control, Lead time reduction, Lean, Value Stream Mapping, Simulation, Waste.

1. INTRODUCTION

Lean manufacturing is a philosophy based on waste elimination accepted worldwide across all type of industries. To sustain in current market conditions, manufacturers have understood the importance of change from traditional production systems towards the improvement tools of lean manufacturing. These tools are mostly the outcomes of Toyota Production System (TPS) at Japan, which resulted into the benefits such as reduced inventory, reduction of production lead time, manufacturing times, set up times, change over times and increased customer satisfaction (Womack and Jones 1990, 1994). Finally lean tries for customer satisfaction with continuous improvement of value. Value is voice of customer in terms of features and performance of product for which end customer is actually willing to pay (Womack et al. 2009).

Waste is anything other than the minimum amount of equipment, materials, parts, space and worker's time which is essential to add value to the product. Toyota's view was focused on the reduction of three types of waste; Muda (non value adding work), Muri (overburden) and Mura (unevenness). He used different tools to minimize waste systematically so that ideal manufacturing state could be achieved easily. General manufacturing activities was categorized as value-adding activity (processing, assembling), necessary but non-value-adding activity (sorting, storing) and waste or non-value-adding activity (scrapping, counting) (Hines and Taylor 2000). The original toyata seven wastes (muda) are transport, inventory, motion, waiting, overproduction, over processing and defect. Three wastes were added by Geoffrey Mika in 1999 which are; waste associated with not allowing worker to contribute their ideas, working with wrong metrics or no metrics and improper use of computers or not having the proper software or playing games.

Waste reduction and elimination is prime focus of lean concept. It uses tools like Value Stream Mapping (VSM), single minute exchange of dies (SMED), 5S, layout planning, visual control, Six Sigma, Cellular Manufacturing, One piece Flow Production Systems, Just in time and Kanban. It also includes efficiency improvement methods such as Just in Time (JIT), Total Quality Maintenance (TQM) and Total Preventive Maintenance (TPM). From these all tools, selection of appropriate tool for particular manufacturing environment is difficult for many companies.

VSM sketches flow of material and information for a product or product family. Flow is presented as value stream which include all value adding and non value adding activities used to fulfill the end customer demand (Womack and Jones 1996). VSM can be used to select and determine the opportunities for implementing various lean techniques for particular case. VSM is considered as initial step for lean implementation. However lean tools are difficult to implement which requires high understanding of lean philosophy Implementation of lean with VSM may become expensive and time-consuming. If lean implementation is started at shop floor without linking it to an enterprise goal, it might mislead from desired outcomes (Cutler, 2005). Also while using VSM, process improvements may be focused more, rather than use the tool to achieve overall enterprise goal. So efforts for creating initial maps may result into waste of money or time.

Simulation can be used as supporting tool for VSM to determine the outcomes before the actual implementation, reducing the possibility of waste. Simulation enables to plan for different resources and performs necessary analysis tasks to make necessary changes in manufacturing environment (Donatelli, 2001). Paper further addresses the literature in which simulation is used with VSM.

2. LITERATURE REVIEW

Taiichi Ohno (1988), Shingo (1989), Womack et al. (1990), Womack and Jones (1994, 1996, 1998, 2000 and 2005) and Rother and Shook (1999) have significantly contributed to VSM.

Rother and Shook (1999) explained how to create a map for each of value streams. Authors stated four initial value stream mapping steps as product family selection, current state drawing, future state drawing and implementation. Despite of the success of this method current state map lacks the real variability of manufacturing system. It might be hard to find wastes and their root causes only based on a map. Also the level of mapping is also restricted to avoid complications. Hence improved method for VSM at manufacturing environment need to be considered, which will incorporate simulation at each stage of VSM to increase its overall effectiveness.

A paper map is restricted in effectiveness due its static nature; hence researchers started to study simulation with VSM. Different methods were used to incorporate simulation with VSM, which can be categorized as formal modeling simulation and analytical simulation.

2.1 FORMAL MODELING SIMULATION

McDonald, Van Aken and Rentes (2002) modeled manufacturing processes for a product family. Application of VSM with simulation was described for a dedicated product line in a motion control product manufacturing plant. Researchers validated the current state map and alternatives. Models were rigid in nature and resulted into long simulation modeling times. Researchers used simulation to answer questions that could not be addressed only using the static view provided by VSM. Standridge and Rapids (2006) discussed deficiencies in lean approach. It included modeling and assessing the effects of variation, making use of all available data, validating the effects of proposed changes before implementation and identifying other possible improvements. With the help of various industrial applications, it was shown that simulation was required to successfully address the operational issues that lean approach failed to identify and could not resolve. Lian and Landeghem (2007) presented value stream mapping objects designed using simulation. Based on these objects, a modeling method was developed which could generate simulation models for current and future map scenarios. The method was applied to a real company case, in which a current state model of the manufacturing system and three scenarios of future states were generated. Method was quick and automatic.

Solding and Gullander (2009) presented a way to create dynamic value stream maps of a system using Discrete Event Simulation. In these maps, number of products could be visualized at the same time and results could be compared immediately with simulation runs. Study of dynamic environment in model, made possible to analyze complex systems than traditional VSM. Gurumurthy and Kodali (2011) suggested use of VSM and simulation was for case study organization. Model was developed using Queuing Event Simulation. It was used to demonstrate how manufacturing of doors and windows would be transformed to future state after implementing various lean manufacturing elements. It was found that the organization could achieve significant improvement in performance and could also meet the increasing demand without any additional resources.

2.2 ANALYTICAL SIMULATION

Due to the development of discrete manufacturing simulation software's, increased utilization of analytical simulation was seen in the first decade of 21st century.

Narasimhan, Parthasarathy and Narayan (2007) introduced simulation aided VSM approach which combined VSM and simulation, to ensure effectiveness of VSM. Case study illustrated successful application of simulation aided VSM approach, at a global Engine Manufacturer's Test environment. Simulation tool was used for quick and efficient data analysis and for facilitating continuous VSM updation. Abdulmalek and Rajgopal (2007) proposed a simulation model for organization under study, which again modified to future state. System Modeling Corporation's ARENA 5 software and analysis of variance ANOVA was used to study the results and to determine the significance and magnitude of all the effects. The statistical analysis was done using Minitab. Total production lead time was reduced from of 48 days to 15 days. Jeong and Phillips (2011) proposed 'concept development process' (CDP) framework to solve process layout design optimization problem. CDP was demonstrated using case study at a portable fire extinguisher manufacturing company. VSM and Simulation was used to evaluate and optimize the performance of the process layout designs. Case study finally indicated that CDP could become an effective framework when it is supported by simulation. Soroor and Header (2012) utilized VSM and ARENA software to develop simulation models. After several periods of run-time for the models, improvements were obtained. Modified future state model showed reduction in work-in-process (WIP) by 52% at both of inventory and process levels. Chukukere, Castillo and Wan (2014) presented dynamic value stream mapping model applied to an automobile collision repair shop. Model was developed and validated which would help to monitor the performance of production line, identify bottlenecks, and improve resource utilization. Future state model was proposed which would reduce cycle times and eliminate waste. Stat Fit

software was used to transform the observed data into adequate statistical distributions that mimic the behavior of the collision repair shop. Simulation model showed average lead time for repaired cars would reduce from 9.24 to 6.32 days.

2.3 LITERATURE SUMMARY

a) Simulation is useful as supporting tool for VSM in manufacturing situations.
b) Dynamic behaviors in manufacturing can be easily considered in VSM using simulation.
c) Different simulation methods are followed for creating VSM manufacturing models.
d) Formal modeling methods are now being replaced by analytical simulation software.
e) Simulation data analysis results are quick, efficient and also facilitate up gradation of VSM.

2.4 OBJECTIVE OF THE STUDY

The objective of the study is to apply simulation to improve effectiveness of VSM. Simulation is considered to improvise VSM and not to replace the traditional VSM. On the basis of literature findings, we can say that use of simulation as a tool in VSM will be effective to understand current and future state of manufacturing environment easily. It will be also helpful to find wastes and their root causes. Hence improved steps for VSM incorporating simulation are proposed further. Additional step is suggested in traditional steps followed by researchers, for making the dynamics of manufacturing system more clear and visible to all persons of organization.

3 IMPROVED STEPS FOR VSM

'Improved steps for VSM' are proposed in figure 3.1 for the use of VSM with simulation in a manufacturing industry.

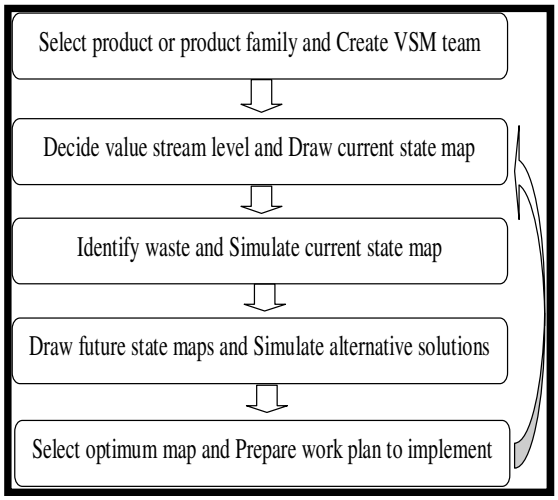

Figure 3.1: Improved Steps for VSM

3.1 Select product or product family and create VSM team

Mapping should start with single product or product family. Product family is a product range which uses same equipments or operations in manufacturing processes. Mapping for all products on one map would be complicated. One can start with a product family having highest demand, since it would result into more savings. VSM team should be formed including members from all departments with a leader which would look out activities of mapping for selected product or product family.

3.2 Decide value stream level and draw current state map.

Process may pass through number of facilities in a manufacturing plant. Levels of mapping for a product family can be considered as process level, single facility or single plant level, multiple facilities or multiple plants level and across the entire enterprise. One should start mapping with single facility or single plant level, which can be later easily amplified to other levels or product families.

Definite symbols from established principles and practices should be used to sketch flows in the map. Symbols for drawing value stream maps are shown in figure 3.2. (Ref: Jeffery K Liker, The Toyota Way).

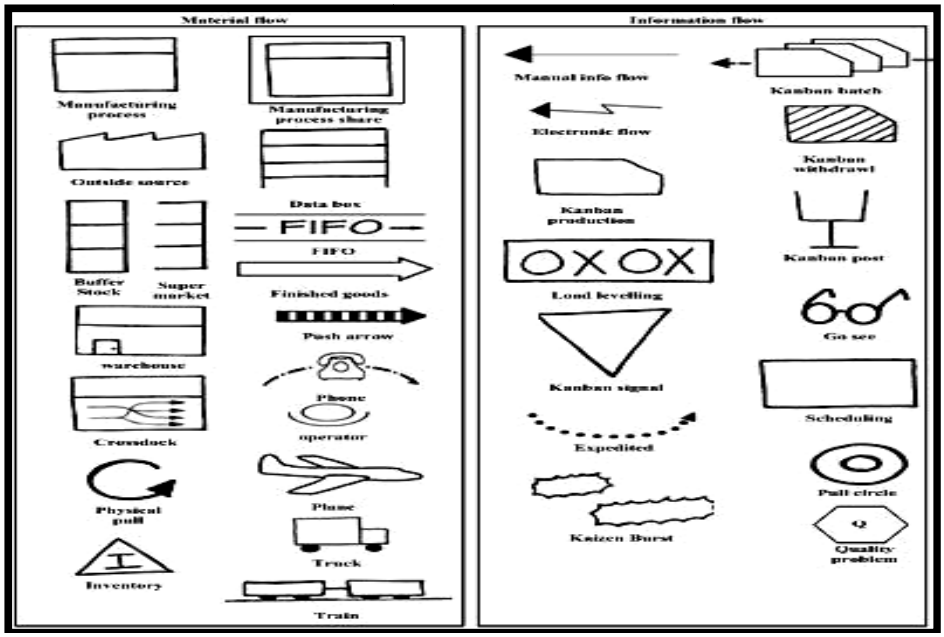

Figure 3.2: Symbols for VSM

Current state sketch should start with real time observation of manufacturing process for selected product family. Material flow should be traced in reverse manner from customer to supplier end of the process. One or two major raw materials should be followed backwards to draw the complete flow. Communication between supplier, customer and different departments should be shown as information flow. Required data should also be noted down to calculate the total value added time, total non value added time and production lead time. Current state map finally would result into the actual production lead time (time required between receiving a customer order and delivery of the product back to the customer) for current manufacturing condition.

3.3 Identify wastes and simulate current state Map

Waste (transport, inventory, motion, waiting, overproduction, over processing and defects) should be identified from complete current state map. Also root causes for wastes need to be found form the map for the product family. Push production system might result into work in process inventory and overproduction which again result into wastes as engaged capital, additional storage space, unnecessary handling and rework.

Current state model should be created and validated in selected manufacturing simulation software. Change in inventory levels and lead times with time should be studied in simulation. Current state should be simulated with different production runs to find hidden wastes and their root causes.

3.4 Draw a future state map and simulate alternative solutions.

Next step is to draw future state map. Future state map should highlight improvement areas to make current manufacturing environment more efficient. It should showcase future condition of manufacturing which would be achieved after implementation of improvements in current manufacturing state. Lean tools should be utilized to eliminate or minimize wastes identified at current state. As different lean tools could be utilized for same case; there might be multiple future state maps. Brain storming session could also be conducted to find and eliminate wastes.

Different future manufacturing states should be created and simulated in simulation software to compare their performances. Current state model could also be modified to future state. Simulation runs and their results would help to choose the best alternative. Parameters like throughput, work in process inventory, lead time and machine/men utilization could be used as key measurements.

Rother, Shook (1999) suggested following tools to eliminate wastes:

a) Follow TAKT time for production.
b) Make Continuous flow or Use FIFO lanes.
c) If flow is not possible, use Supermarket Pull.
d) Create Pace Maker Process to control manufacturing process from a single point.
e) Level the Production mix (Load leveling) and Production volume.
f) Develop production with Pitch time or ability to produce each part every day.

3.5 Select optimum map and prepare work plan to implement the future state.

Future state map with optimum results should be selected for actual implementation which could be achieved in a short period of time. Group discussion involving people from all departments could also be conducted to find

optimum solution. Short term goals of organization could also be considered to prepare initial implementation plan.

Segments should be created from entire value stream to start implementation. Segment close to customer could be chosen first for improvement including the pace maker process. It would help to achieve continuous flow back to the entire production process. Flow of material from the end consumer back to supplier should be smooth and with minimum lead time, best quality, optimum cost.

Implementation work plan should be prepared to work out the improvement activities. Action team should be created to conduct all necessary activities required to implement the plan which would be guided by VSM team. Simulation could be used as a training method to guide all employees from organization about the new manufacturing environment. Simulation model would help workers to visualize the effects like changes in layout on work environment before the implementation.

After the implementation, second step 'decide value stream level and draw current state map' should be followed again for continuous improvement of manufacturing process.

Following objectives should be considered for improved steps for VSM:

1. Decide production lead time for current condition of manufacturing system.
2. Highlight improvement areas by maximizing utilization of machine, men, space and time.
3. Identify waste and non-value added activities. Eliminate or reduce waste with lean tools.
4. Control inventory and reduce lead time, set up times and manufacturing times.
5. Establish continuous smooth flow of manufacturing and work towards ideal manufacturing state.

4 CONCLUSION

Value stream mapping is an effective way to implement lean manufacturing. It helps to eliminate waste and finds out improvement areas at industries for existing state. Simulation improves the visibility of manufacturing dynamics and analysis of the maps in VSM. Simulation tool can be used to guide all employees about effects of lean before or during the actual implementation. VSM with simulation approach can become efficient way to control the inventory and reduce lead time by proposing modifications for the existing stage. Improved steps for VSM can be helpful in work involving VSM and simulation together in future.

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STUDY ON DIFFERENT WAVELET TECHNIQUES

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ABSTRACT *: Wavelet transform is proposed to identify the power quality disturbance at its instance of occurrence. A new method for detection of power quality disturbance is proposed: first, the original signals are de-noised by the wavelet transform; second, the beginning and ending time of the disturbance can be detected in time, third, determining the cause of power quality disturbances using various approaches such as Discrete Wavelet Transforms (DWT). The wavelet transform can be accomplished three different ways. The Continuous Wavelet Transform (CWT) where one obtains the surface of the wavelet coefficients, for different values of scaling and translation factors. It maps a function of a continuous variable into a function of two continuous variables. The second transform is known as the Wavelet Series (WS) which maps a function of continuous variables into a sequence of coefficients. The third type of wavelet transform is the Discrete Wavelet (DWT), which is used to decompose a discretized signal into different resolution levels.*

KEYWORDS : Wavelet transform, Continuous Wavelet and Discrete Wavelet Technique.

1. INTRODUCTION

A wavelet transform (WT) has been introduced rather recently in mathematics, even though the essential ideas that lead to this development have been around for a longer period of time. It is linear transformations much like the Fourier transform [1]. A short time Fourier transform (STFT), the wavelet transform (WT). (WT) is a means of obtaining a representation of both time and frequency content of a signal. But in WT the window function width is dependent on the central frequency. Therefore, for a given analysis function the best trade-off between time and frequency resolution can be automatically obtained. A wavelet is a kernel function used in an integral transform [2,3].

The wavelet transform is a mathematical tool that decomposes a signal into different scales with different levels of resolution. A wavelet is a waveform of effectively limited duration that has an average value of zero. Wavelet transform leads to accurate frequency resolution and poor time resolution at low frequency. It provides accurate time location and poor frequency resolution at high frequency. This characteristic is appropriate for real signals such as voltage sags and transient over voltages [4,5].

Wavelet transforms are based on small wavelets with limited duration. A wavelet is a kernel function used in an integral transform. The general formula of the wavelet transform (WT) of a signal f (t) is given by,

$$WT(a,b) = \int_{-\infty}^{+\infty} f(t).\psi^*_{a,b}(t).dt \quad \text{.....(1)}$$

2. TYPES OF WAVELET TRANSFORM

There are three types of wavelet transforms: (i) Continuous Wavelet Transform (ii) Wavelet Series (iii) Discrete Wavelet transform.

2.1 Continuous Wavelet Transform

The Continuous Wavelet Transform (CWT) where one obtains the surface of the wavelet coefficients, for different values of scaling and translation factors. It maps a function of a continuous variable into a function of two continuous variables [4]. The Continuous Wavelet Transform (CWT) of a signal depends on two variables: scale (or frequency), designated by the parameter a, and time (or position), designated by the parameter b, and it is given as below and the parameters and be varying continually on R, the real set (with a0≠a). The wavelet transform (CWT) of a continuous signal x(t) is given by,

$$W_{a,b}(x) = \int_{-\infty}^{+\infty} x(t)\psi^*_{a,b}(t)dt \quad \text{.....(2)}$$

2.2 Wavelet Series

The second transform is known as the Wavelet Series (WS) which maps a function of continuous variables into a sequence of coefficients [6]. Wavelet series transform discrete Synthesis and continuous analysis.

2.3 Discrete Wavelet Transform

The third type of wavelet transform is the Discrete Wavelet (DWT), which is used to decompose a discretized signal into different resolution levels. It maps a sequence of numbers into a different sequence of numbers [6]. In Discrete Wavelet Transform (DWT), the parameters and don't vary continually, and this way, they can only assume values in discrete steps. The DWT is obtained modifying to the wavelet representation for:

$$\psi_{m,n}(t) = 2^{\frac{-m}{2}} \psi(2^{-m}t - n) \quad \text{.....(3)}$$

Where, $a=2^m$ and $b=n2^m$

3. Importance of Discrete Wavelet Transform

The continuous wavelet transform was developed as an alternative approach to the short time Fourier transforms to overcome the resolution problem. The important point to note here is the fact that the computation is not a true continuous wavelet. From the computation at finite number of location, it is only a discretized version of the continuous wavelet. However, Note that this is not discrete wavelet transform (DWT).

These days, computers are used to do almost all computations. It is evident that neither the FT, nor STFT, nor the CWT can be practically computed by using analytical equations, integrals, etc.

It is therefore necessary to discretize the transforms. As the discretize CWT enables the computation of the continuous wavelet transform by computers, it is not a true discrete transform. As a matter of fact, the wavelet series is simply a sampled version of the CWT, and the information it provides is highly redundant as for as the reconstruction of the signal is concerned. This redundancy, on the other hand, requires a significant amount of computation time and resources. The discrete wavelet transform DWT provides sufficient information both for analysis and the synthesis of the original signal, with a significant reduction in the computation time. The DWT is considerably easier to implement when compared to the CWT [6].

For discrete-time systems, the discretization process leads the time discrete wavelet series as DWT provides a time and frequency representation of the recorded power quality signals. This is a very attractive feature in analyzing time series because time localization of spectral components can be obtained [5,6].

4. Advantages of Wavelet Transform

The wavelet transform has been shown to be a powerful signal processing technique in many fields. The advantage of the wavelet transform is its ability to preserve the time and frequency information more efficiently than other methods such as the Fourier transform [7,8].

5. APPLICATION OF WAVELETS

Wavelets are a powerful statistical tool which can be used for a wide range of applications, namely as,

- Power System Protection
- Power Quality
- Power System Transients
- Partial Discharges
- Power System Measurement
- Identifying pure frequencies
- De-noising signals
- Detecting discontinuities and breakdown points
- Filter design

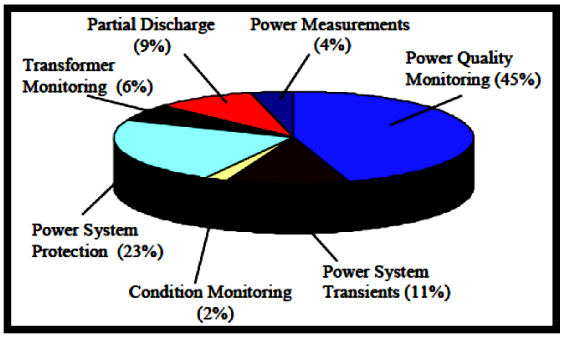

Figure 1: Application areas of the wavelet transform in power systems

6. CONCLUSION

A Wavelet transform has received great attention in power community because are better suited for the analysis of certain types of transient waveforms than the other transforms approach. WT Properties, like limited effective time duration, band pass spectrum, waveform similar to disturbances and orthogonally, allow locating information in time and frequency domains. The continuous wavelet transform analyze the continuous-time signal in a different perspective. The discrete wavelet is more useful in realization. The wavelets bring us to a new vision of signal processing. It tactically avoids the problem that Fourier analysis encounters. Its implementation is simple. Once we establish wavelets with more ideal properties, lots of difficult problems might be solved.

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SIMULATION OF THE STEP RESPONSE OF DISTRIBUTED POWER-FLOW CONTROLLER

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ABSTRACT :*In this paper, an attempt is made to present the principle and analysis of a component, to be used as a power flow controlling device, within the flexible ac transmission system (FACTS) family, called distributed power-flow controller(DPFC).The DPFC emerges from the unified power flow-controller(UPFC),a most powerful FACTS device and inherits the same control capability of simultaneous adjustment of line impedance, transmission angle and the bus voltage magnitude, which are the dynamic control parameters. The DPFC control and the functions of the shunt and series controllers of DPFC at fundamental and third harmonic frequencies are analyzed. The step response of the DPFC is simulated in MATLAB/SIMULINK environment to validate the concept of DPFC.*

Key Words: Central controller,Distributed Power Flow Controller, Series converter control and Shunt converter control

1. INTRODUCTION

To necessitate the growing demand of electric power it is desirable to control the power flow in a power-transmission system in a fast and reliable manner. Power flow is controlled by devices that attempts to vary the dynamic parameters of a system, such as voltage magnitude, line impedance and transmission angle. Any variation in voltage, current, or frequency which may lead to an equipment failure or malfunction is potentially a power quality problem [1].The flexible ac-transmission system (FACTS), utilized for power-flow control, is defined by IEEE as "a power-electronic based system and other static equipment that provide control of one or more ac-transmission parameters to enhance controllability and increase power-transfer capability" [2]. Any new power flow control device must have both acceptable cost to electric utilities and reliability for power system.The unified power flow controller was proposed for real-time control and dynamic compensation of ac transmission systems, providing the necessary functional flexibility required to solve many of the problems facing the utility industry [3].Currently,the unified power-flowcontroller(UPFC), isthemostpowerful FACTS device, which can simultaneously control all the parameters of the system: the line impedance, the transmission angle, and bus voltage [3].In a unified power flow controller, a combination of separate shunt and series converters are controlled in a coordinated manner. In the combination, current is injected into the system with the shunt controller and voltage in series in the line with the series controller.

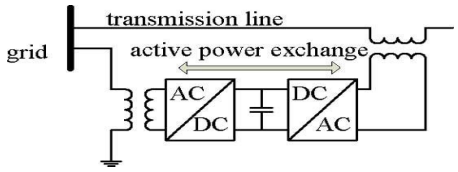

Figure 1: UPFC Configuration

When both these controllers are unified in UPFC configuration, there can be a real power exchange between the series and shunt controllers with a common dc-link interconnection indicated in Figure 1. The two approaches applied to UPFC to increase the reliability and to reduce the cost indicated in Figure 2 are the elimination of the common dc link of the UPFC and distributing the series converter. By combining these two approaches, the new FACTS device-distributed power flow controller (DPFC) is achieved [4]. The distributed power flow controller emerges from UPFC with eliminated common dc-link interconnection to enable the independent operation of theseries and shunt controllers.Series-shunt devices such asUPFC canbe used foraccomplishingbothfunctionswithmaximumflexibilityand higher cost [5]. DPFC can simultaneously adjust the

voltage magnitude, line impedance and the transmission angle, thereby independently controlling the active and reactive power flow through lines.

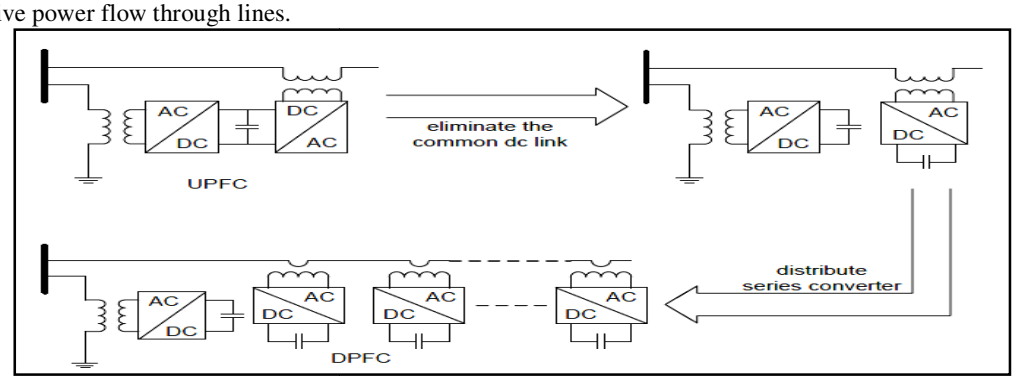

Figure 2: Combination of the two approaches applied to UPFC to achieve DPFC

2. DPFC CONFIGURATION

The DPFC consists of several series-connected converters to inject a voltage, with controllable magnitude and phase angle in series with the transmission line and one shunt converter to supply or absorb the active power demanded by the series converter. Possibly the most significant issue in terms of grid utilization is that of active power flow control [6]. The shunt converter is similar as a STATCOM, while the series converter employs the D-FACTS concept, which is to use multiple single-phase converters instead of one large rated converter [4].The D-FACTS is a distributed solution to power flow control of series converters.D-FACTS sustain the operation of the system even during contingency conditions, improving the reliability of the overall network [6]. A Static Synchronous Compensator (STATCOM) in principle is a shunt device and is a voltage source converter that is connected between a grid and the ground through a coupling inductance, represented by STATCOM configuration in figure 3.

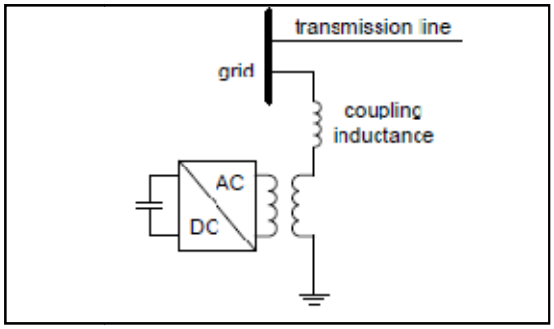

Figure 3: STATCOM Configuration

The STATCOM acts as an AC voltage source and has characteristics similar to an asynchronous condenser. An AC current is injected by STATCOM in quadrature (leading or lagging) with the grid voltage and emulates capacitive or inductive impedance at the point of connection. The shunt and series converters within the DPFC are independent and has their own individual dc capacitors to provide the required dc voltage represented by DPFC configuration in Figure 4.

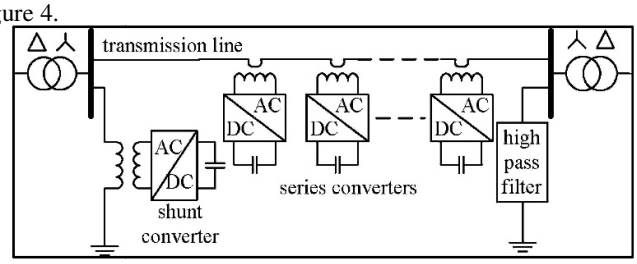

Figure 4:DPFC Configuration

2.1Elimination of the common dc linkbetween the shunt and series converters

The active power exchange in UPFC is through the common dc link between the shunt and series converters and is eliminated in a DPFC. The common connection between the ac terminals of the shunt and the series converters is the transmission line. So it is possible to exchange the real power through the ac terminals of the shunt and the series converters.

2.2 Exchange of active power in the DPFC

The active power at different frequencies is isolated from each other and the voltage or current in one frequency has no influence on the active power at other frequencies can be expressed by

$P = \sum_{i=1}^{\infty} V_i I_i \cos \Phi_i$ (1)

In equation (1) V_i , I_i and Φ_i are the voltage at the i^{th}harmonic frequency, current at the i^{th} harmonic frequency and the corresponding angle between the voltage and current respectively and it describes the independency of the active power at different frequencies. The functions performed by the DPFC shunt converter are absorption of active power from the grid at the fundamental frequency and injection of current back into the grid at a harmonic frequency and it is this harmonic current that will flow through the transmission line. The functions performed by DPFC series converter are the generation of voltage at the harmonic frequency according to the amount of required active power at the fundamental frequency and absorption of active power from the harmonic frequency. If the converter is lossless, the active power generated at fundamental frequency is equal to the power absorbed from the harmonic frequency.The fundamental frequency components are blocked and the harmonic components are allowed by the high-pass filter within DPFC as shown in DPFC configuration in Figure 4. The closed loop for the harmonic current is provided by shunt and series converters, high-pass filter and the ground. The third harmonic is selected to exchange the active power in the DPFC as it is the zero-sequence harmonic with the lowest frequency. A grounded star-delta transformer is utilized to eliminate the large-size high-pass filter and to provide the path for the zero-sequence third harmonic. Each converter generates the voltage at two different frequencies at the same time, one at the fundamental frequency and the other at the third-harmonic frequency. The link between the fundamental frequency and third-harmonic frequency circuits is the active power balance of each converter.

2.3 Control of multiple converters in DPFC:

DPFC consists of three types of controllers termed as central control, series control and shunt control to provide control for multiple converters as indicated in Figure 5.

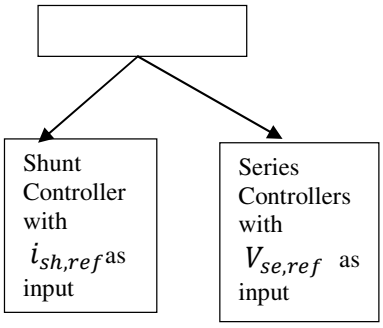

Figure 5: DPFC Control diagram

2.3.1 Central Control

The central control generates the voltage-reference signals for the series converters and reactive current signal for the shunt converter of the DPFC according to the system requirement. These generated reference signals are at the fundamental frequency. The terms $i_{sh,ref}$ and $V_{se,ref}$ are the reference signals given by the central control to the shunt control and series controllers respectively, at the fundamental frequency.

2.3.2 Series Control

The series controller maintains the capacitor dc voltage of its own converter by using the third-harmonic frequency components and generates series voltage at the fundamental frequency that is referenced by the central control.

2.3.3 Shunt Control

Shunt control injects a constant third harmonic current into the line to provide active power for the series converters.

The shunt and series controllers maintain their individual converter parameters.

3.SIMULATION PROCEDURE TO OBTAIN THE STEP RESPONSE OF DPFC

The step response of DPFC can be obtained by building Simulink modelsin MATLAB environment according to the simplified representations for DPFC control, shunt and series converter control as shown in Figures 6, 7 and 8. The entire DPFC model along with shunt and series control is placed between two buses supplied from two grids each with a nominal voltage of 220V with a line inductance of 6mH. The transmission angle between the two grids is 1°.

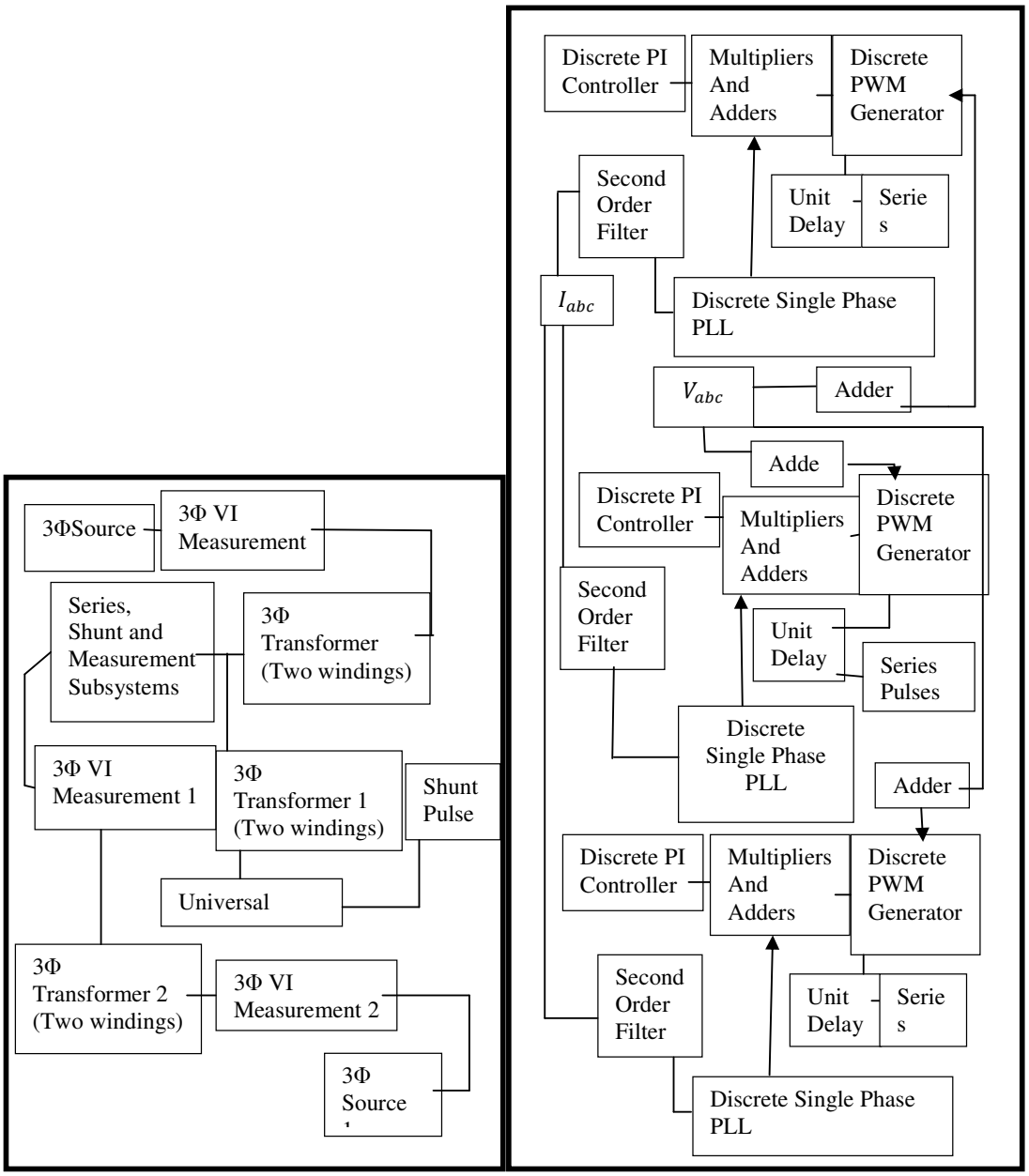

Figure 6: Simplified Representation of Figure 7: Simplified Representation of Series Controller DPFC Control

The specified maximum ac voltage and maximum ac current are 50V and 9A respectively for the shunt converter with a dc source supply of 20V. The reference third harmonic current injected by the dc shunt converter is 3A.

4. SIMULATION RESULTS

The control of power flow through the transmission lines by DPFC is obtained by varying the voltage injected by the series converter at the fundamental frequency. Figures 9 to 13 show the step response of DPFC. A step change of the fundamental reference voltage consisting both active and reactive variations $V_{d,ref}, V_{q,ref}$ of the series converter is shown in Figure 9.

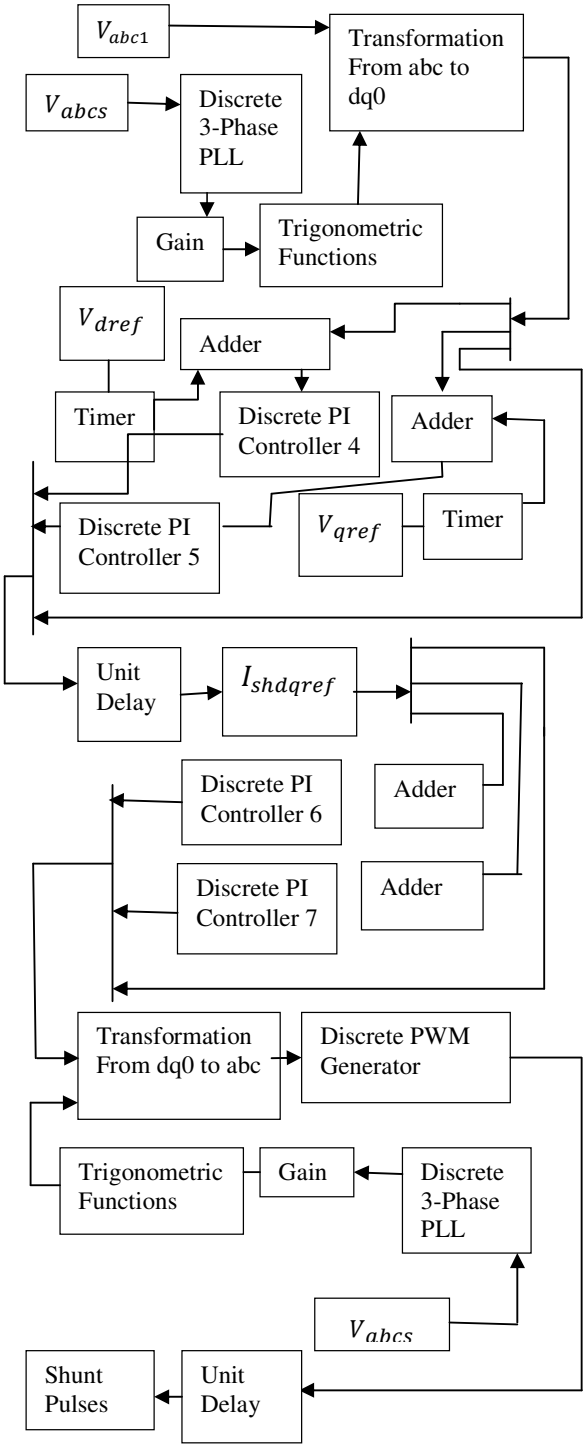

Figure 8: Simplified representation of shunt converter control

The dc voltage of the series converter is stabilized before and after the step change.The measured series converter voltage and current through the line, from which if the series converter can inject or absorb active and reactive power can be verified, are shown in Figures10 and 11.The active and reactive power injected by the series converter is shown in Figure 12. The bus voltage and current at the delta side of the star-delta transformer, used for third-harmonic filtering, are shown in Figure 13. The step response of DPFC demonstrates the concept of DPFC.

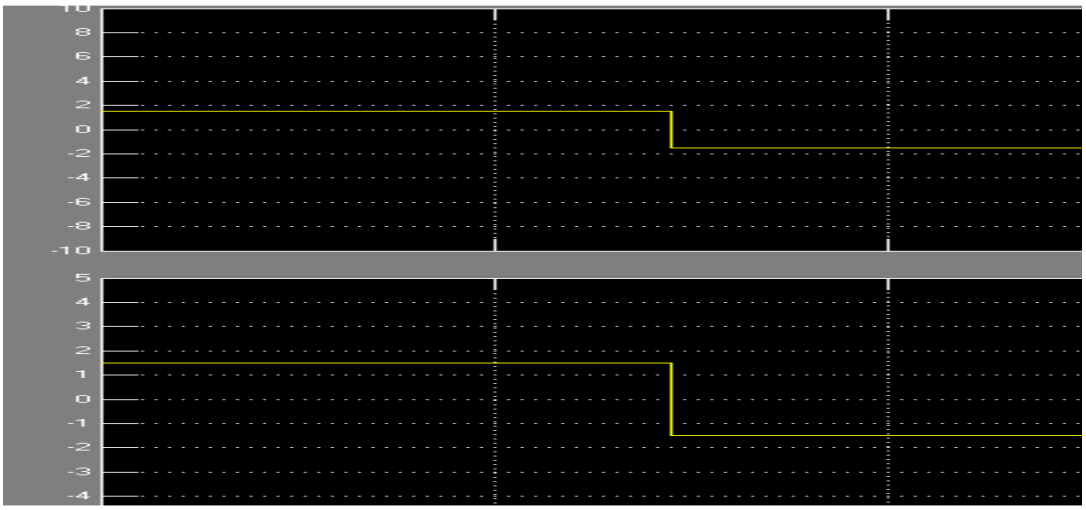

Figure 9: Reference voltage for Series Converters

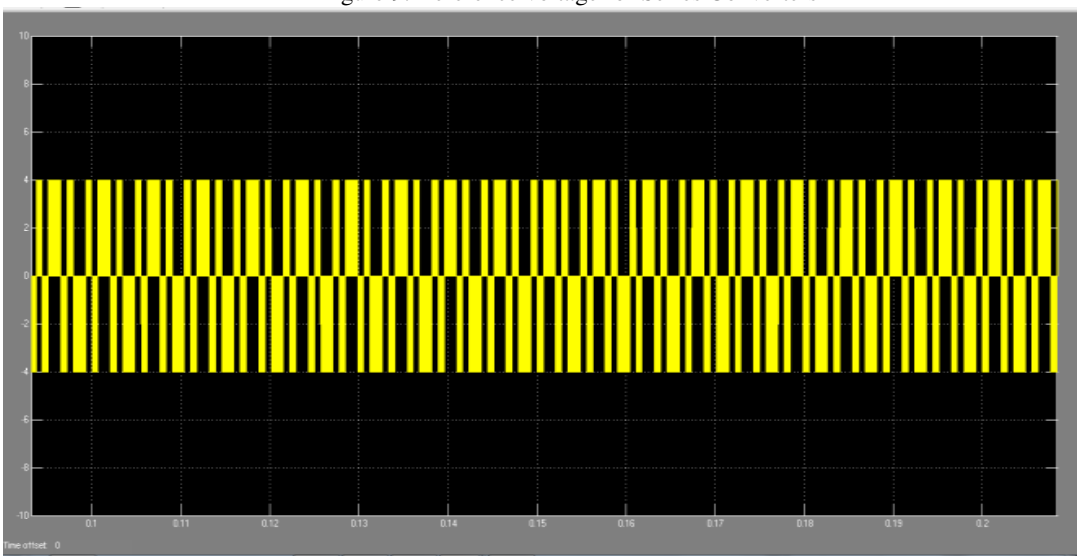

Figure 10: Step response of DPFC: Series Converter

Theseriesconverters areabletoabsorbandinject both active and reactive power to the grid at the fundamental frequency. A low pass digital filter is used to filter the harmonic distortions contained in voltage and current at the fundamental frequency. A delay is caused in the measured active and reactive power.

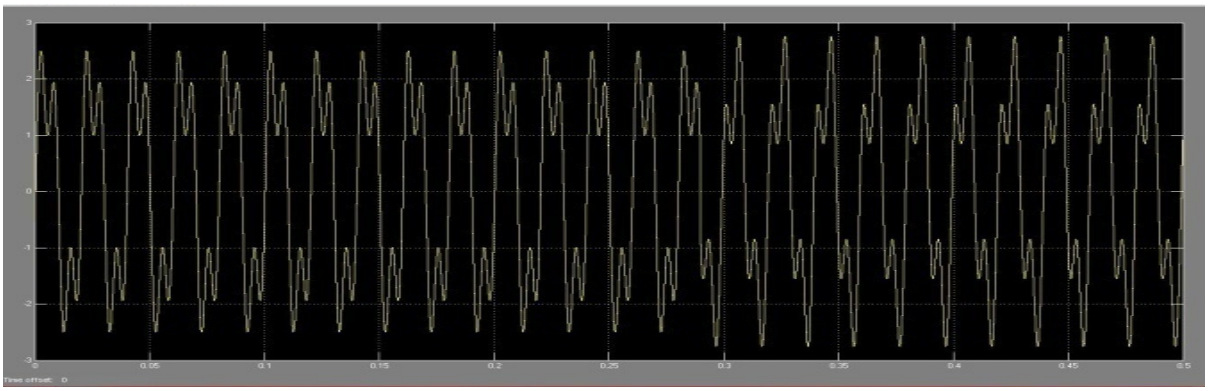

Figure 11: Step response of DPFC: Line Current

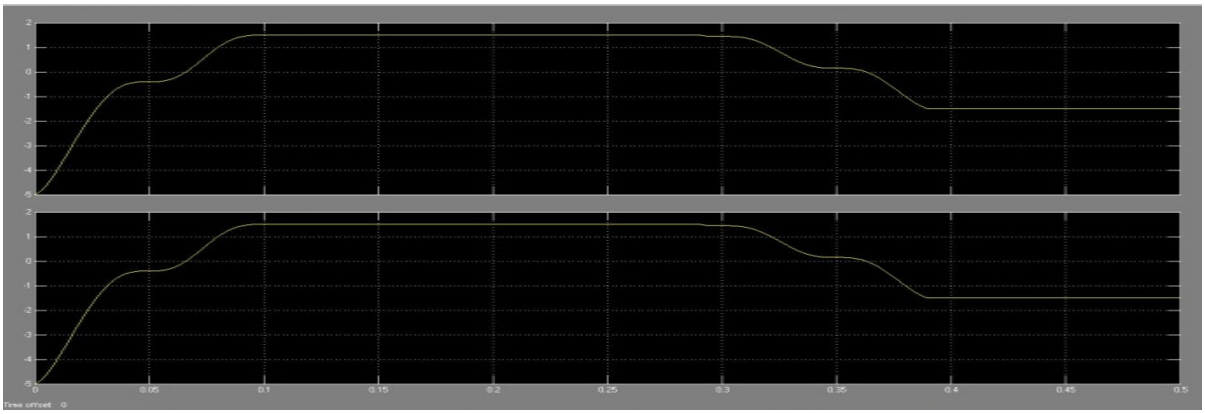

Figure 12: Step response of DPFC: Active and reactive power injected by the series converter at thefundamental frequency

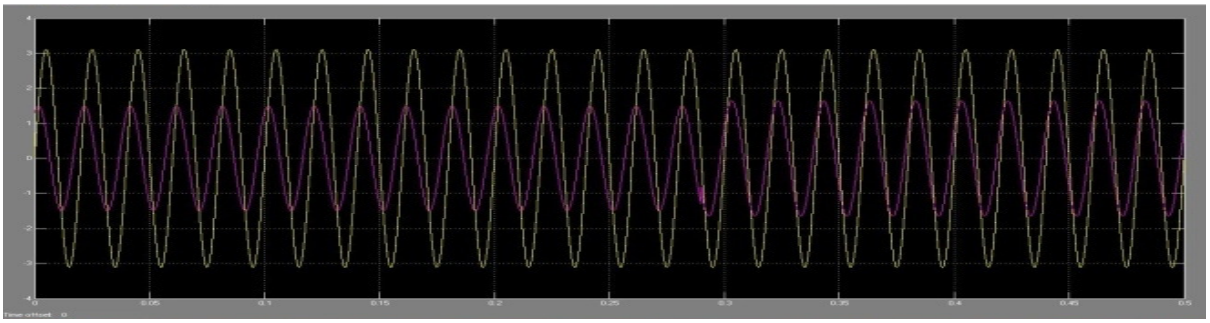

Figure 13: Step response of DPFC: Bus Voltage and current at the delta side of the transformer

5. CONCLUSION

The principle of DPFC is verified by simulation of step response of DPFC. The power transmission through the line is at the third-harmonic frequency. The shunt and series converters exchange active power at the third-harmonic frequency. Each series converter with its own series control, absorbs and injects controllable active and reactive power to the grid at the fundamental frequency. The shunt converter control injects a constant third-harmonic current into the line to provide active power for the series converters. As DPFC emerges from UPFC with eliminated common dc link between the shunt and series converters and the series converters employs the D-FACTS concept, DPFC inherits all the advantages of the UPFC and D-FACTS. DPFC has high control capability and separated installation of the shunt and series controllers provides an improved reliability.

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A REVIEW ON TECHNIQUES FOR DESIGNING LOW POWER MICROPROCESSOR

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ABSTRACT: *A microprocessor is combination of thousands of transistors on a single semiconductor integrated circuit. By combining one or more microprocessor it serves as a central processing unit (CPU). As technology is scale downand for the requirement of high performance and more functionality of the devices, power dissipation is becomes major factor for designing a microprocessor. There are basically two type of power dissipation in microprocessor- static and dynamic. Dynamic power donates more than 50% of total power dissipation. Here, we studied few techniques to reduce power dissipation of microprocessor.*

Key Words:Deterministic Clock Gating, Dual Mode Logic (DML), Low Power

1. INTRODUCTION

PRESENTDAYS, most users are requiring high performance and more functionality tasks in all hand held devices. So microprocessor becomes necessary in hand held devices. Microprocessor is brain of the devices. But as technology scale down and for the requirement of high performance, power dissipation is become a bottleneck for microprocessor. Reducing power consumption is not for more battery life period, but for improving reliability.

Microprocessor unit is consisting numbers of block. But, at an instant of time, only few blocks will be working. Clock power is main component in microprocessor because it covers most of the block in microprocessor. To reduce clock power, clock gating is well known technique. Because all the components of blocks are not use at a time, it usesindividually [4]. Clock is ANDing with a gate-control signal, so when circuit is not in used, clock-gating activated. Effective clock gating means a methodology that determines which blocks are gated, and when and for how much period of time.

Pipeline balancing (PLB) is a well-known technique, which essentially outlines a predictive clock gating method[5]. In the future technology, Deterministic Clock-gating (DCG) will be the dominant factor for reducing number of cycle for the advanced pipelined processor. DCG's key features [1]:

1) DCG is based on actual usage of circuit blocks and not on predictions. That's why DCG ignores performance loss opportunity due to mispredictions causing circuits to be gated when they are needed, and in ideal condition circuits not be gated.
2) DCG clock-gates at fine granularities of a few cycles on small circuit blocks.
3) DCG is a simple technique requiring no fine-tuning of thresholds, and is general enough to be applicable to clustered and non-clustered microarchitectures.

There are popular technology approaches to reduce technology scaling, supply voltage change, frequency scaling and leakage reduction technique by changing transistor threshold voltage Vth, etc.

Clock-gating at circuit-level focuses on clock-gating finite state machines (FSM). There is some limitation of gated-clock FSM that is power saving heavily depends on FSM characteristic. This approach is not good for general-purpose microprocessor pipelines.

For ultralow power applications, sub-threshold circuit design is very suitable. Sub-threshold region means supply voltage that is less than the threshold voltage of the transistors, which gives more reduction of both dynamic and static power. Sub-threshold digital circuits are usable only for specific application which does not require high performance, but need very low power consumptions.

Dual Mode Logic(DML) operation allows an on the fly revolutionize between two operational modes at the gate level: static mode and dynamic mode[2]. In static mode, with some performance degradation, DML gates

consume very low energy, as compared with standard CMOS gates. In place of dynamic DML gates operation gives very high performance with increased energy dissipation.

2. POWER REDUCTION TECHNIQUES

2.1 Deterministic Clock Gating(DCG)

In a microprocessor, clock network feeds clock to sequential blocks like latches and flip-flops, and to dynamic logic gates, which blocks are used in high-performance execution modules. At high level, to save the circuit's clock power, gating the clock to a logic gate or a latch by ANDing the clock with a control signal to reduce the unnecessary charging/discharging process of the capacitances when the circuit is static or idle.

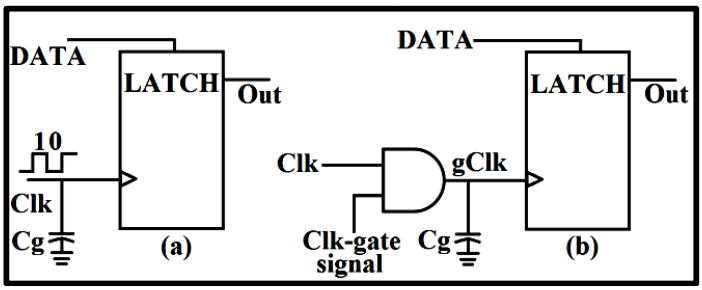

Figure 1: Latch with Clock gating

Figure 1(a) shows the schematic design of a latch element. Here latch's cumulative gate capacitance Cg connected to the clock. Just because of switching characteristic of clock, due to charging and discharging of every cycle, power consumption is increased. If there is no change in input from a clock to the next clock, the power consumption is still occurs. Figure 1(b), the clock is gated with control signal by ANDing with it, here we called as a Clk-gated signal. When the latch goes to the idle state, Clk-gate signal is goes to low and clock is not participated in charge/discharge process, reduce clock power.

2.2 Dual Mode Logic (DML)

The Dual Mode Logic (DML) means to allow dynamic switching between static and dynamic modes of operation. The basic architecture of DML gate is shown in figure 2, which quite simple. DML is the combination of conventional CMOS gate and pre Discharge transistor for dynamic operation.

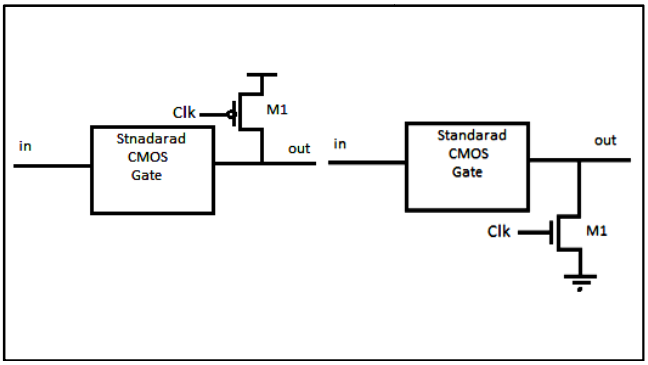

Figure 2: DML gate (a) type A topology (b) type B topology

In the static operation, clock transistor is disabled and the block of DML is operating as a standard CMOS gate. Above figure shows all the possible configurations of DML; pre-charge operation at type A and discharge operation at type B. By assigning an asymmetric clock, the gate operates in dynamic mode, which allows different phases: precharge and evaluation. In precharge phase, the output goes to high/low, as per topology of DML gate assign. In the evaluation phase, as per the values at the gate inputs, output is evaluated.

As illustrated in figure 2, Type A and Type B is topologies of DML. During the precharge phase, type A has an added PMOS transistor that pre-charges the output to a logical "1". Type B has an added NMOS that pre-charges theoutput to a logical "0".

By using footer, dynamic logic gates are also implemented, but it requires an additional transistor. In DML, footer is used to decrease precharge time by removing the ripple effect and allowing faster precharge.

2.2.1Static Logic Operation

Static logic means idle logic, where all the transistors are in steady-state condition. So, static logic operation requires very low power. Basically there is no steady state path between supply voltage and ground. The performance at this operation does not consider. Here power dissipation is very low.

2.2.2Dynamic Logic Operation

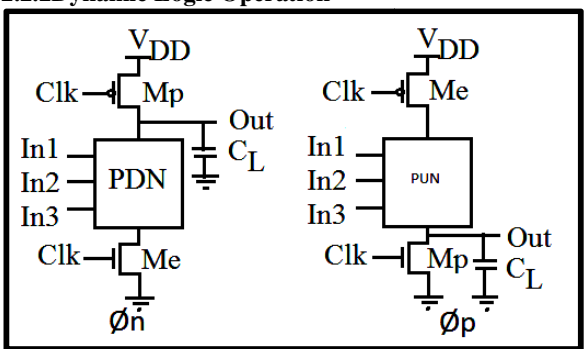

Figure 3: Dynamic CMOS

In the dynamic CMOS, PMOS transistor work as a precharge gate and NMOS transistor work as an evaluation gate.

Precharge- When clock is zero (CLK=0) output node precharge to 1 using PMOS transistor while evaluate NMOS is 0 so the pull down path is closed. NMOS transistor refuses any static power dissipation that would be covered by the precharge period.

Evolution-When clock is high (CLK=1) PMOSis off and evolution transistor is on and during this period output is discharge based on input. Output is discharged to ground if the input is such that PDN conduct. Precharge value is stored on the output capacitance if PDN is off. If output node is discharge then it cannot be charged again until the next precharge operation.

2.2.3DML operation

A DML can be sized to optimize the performance in term of speed, area or power[2][6]. In a paper, the DML gates were optimized to improve speed with high power dissipation in the dynamic mode, while maintaining a minor inflection in performance during static operation. Evolution speed can be considered for performance in the dynamic mode, the evolution is always performed through a network of parallel transistors, in the active self-restored networkand minimal sized transistors are utilized.

DML topology can be designed with or without footer and favored topology depends on the power limitations, the supply voltage and required performance [6]. By use of footed configuration following features introduces: during precharge zero short circuit power, short pre-charge phase and robustness to process variations, precharge, due to the ripple evaluation chain effect. Thereare some disadvantages of un-footed topology: a longer precharge period, lower robustness. And the main advantage of this topology is the small capacitance (gate and drain), improved gate speed because of faster evaluation time.

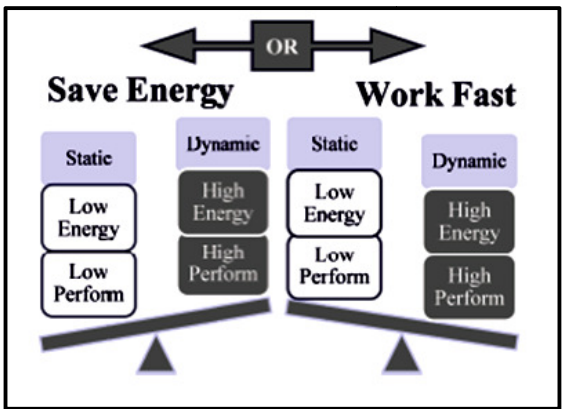

Figure 4: A DML gate working in its different operation modes [3]

3. RESULTS AND DISCUSSIONS

3.1 Deterministic Clock Gating (DCG)

For each execution periods, all the blocks which are connected with clock without clock gated, it continuously on and consume power. But if clock gated circuit connected with main circuit, power is zero. This is the ideal case. In practical, it is not possible to totally switching off the power even though clock is gated. There is some leakage loss is considered. Here, assumed that unused units consume 10% of its dynamic power[1].

By ANDing with clock to the clock control signal, power dissipation can be reduced, but sized of the overall circuit will be increase due to AND gates.

3.2 Dual Mode Logic (DML)

DML is a switching process between two operational modes, static and dynamic. DML operates in sub-threshold region. Using DML [8], in static mode, DML reduces 5X power dissipation compared with domino. And in other side, in dynamic mode, DML improve speed up to 10X compared with standard CMOS, while it dissipate 1.5X more power.

4. CONCLUSIONS

By reviewing the above result, we concluded that both the techniques, reducing power dissipation of the transistor and improve speed of the operations. In DCG, it used for reducing evaluation periods. As high performance microprocessor pipelines power becomes a critical factor, we observed that DCG's effectiveness and simplicity will continue to be important. DML gives digital switching between two operational mode, Dynamic and Static mode. In static mode, power efficient and reduced power up to 33% to 45%.

DCG technique is used at the Gate level. And DML technique is used at the Transistor level. The biggest disadvantage of these two techniques is area increased. These both techniques have been their own advantages and disadvantages. So as per application technique will be select.

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DIRECTION OF ARRIVAL ESTIMATION BY MECHANICALLY ROTATING ADAPTIVE ARRAY ANTENNA PLANE

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A***BSTRACT***— *Many DOA estimation algorithms have been already proposed. Beamformer method which scans the main beam of array antenna is the most fundamental technique. The other techniques based on eigenvalue decomposition of array input correlation matrix are the Min-Norm method, MUSIC (Multiple Signal Classification), and ESPRIT (Estimation of Signal Parameters via Rotational Invariance Techniques), are attracted attention in the mobile communication system. However, these algorithms employ eigenvalue decomposition and angle search that require very large computational cost. Moreover, in the case of correlated incident waves, they require space averaging technique which reduces the practical number of antenna elements. In this paper, we have proposed a simple DOA estimation algorithm using mechanical rotation of the array plane by small angle.*

Keywords-GPS, DOA

I. INTRODUCTION

The Global Positioning System is important for a great variety of applications, including civil or military users. It enables real-time position, time and velocity accurate estimation, and possibility to use on a variety of platforms, 24 hours a day.GPS signals are subject to several impairments, such as multipath, fading, troposphere and ionosphere delays, power fluctuations due to scintillation, doppler effects, clock and receiver errors. On the other hand, adaptive antennas may be considered as emerging techniques, which play an important role for mobile communications. In fact, these devices are based on signal processing algorithms. The application of adaptive antenna arrays for GPS is one of the ways in order to achieve a more accurate estimation of user position, as well as signal enhancement and interference cancellation. In fact, adaptive arrays provide an automatic adjustment of the radiation pattern, according to the incident signals and a given adaptation criterion, associated with an efficient signal processing algorithm. Such algorithms are generally based on space-time theory, involving DOA estimation, and impose some a priori knowledge on the number of interference as well as on desired signals. The adaptive antenna array has been shown as an interesting tool for GPS applications because the system requires increasingly quality and feasibility.

II ADAPTIVE ANTENNA ARRAY AND THE SIGNAL PROCESSING

An array of antennas consist spatially distributed antenna elements at known locations with reference to a common fixed point. By changing the phase and amplitude of the exciting currents electronically in each of the antenna elements, it is possible to steer the main lobe of radiation pattern and/or place null in any desired direction. This type of array antenna control is known as electronically steered Phased Array Antenna. A Phased array antenna which can update its radiation pattern according to the changes in its operating environment is known as Adaptive Array Antenna, and the required signal processing techniques to implement it is known as Adaptive Array Processing. Adaptive array theory has undergone extensive developments and has been used in applications linked with radar, geophysics, mobile communications and GPS. In adaptive spatial filtering, the filter process spatial samples of a wave front captured by an antenna array. For the antenna, the direction of arrival of the incoming signal plays the same role as frequency for the temporal filter. The radiation pattern, which plays for spatial domain the same role as the frequency spectrum for the temporal filter, shows the array sensibility in relation with the direction of arrival of the captured signals. The concept of spatial filtering is to modify the antenna radiation pattern according to some pre-established criterion, which optimizes reception of the desired signals. The antenna is no longer a passive subsystem acting as a transparent transducer, but an active device which controls the radiation pattern performance based on an intelligent processing. One way to

solve for this problem is to design a multiple antenna, such that elements are physically arranged into an array which can be linear, planar or circular. This array can steer nulls toward interference that provides a control for each element of the array, in a manner that it effectively creates a nearly hemispherical gain pattern when there is no external interference.

This array can detect the presence of interference and to steer a null in its hemispherical gain pattern toward each external interference. The degree of freedom here is limited by the array elements number, generally $M-1$ nulls for M array elements and the depth of the null is limited by the number of nulls that is been steered at the same time. We need to consider that if we have a desired signal and a interference signal coming from the same region, the desired signal could being null together with the interference signal but it is better than have all desired signals suppressed by an interference.

III. SIGNAL PROCESSING ALGORITHMS

The use of signal processing constrained algorithms as a solution for interference mitigation in GPS antenna array is achieved by the imposition of constraints to the antenna weights, in order to assure a constant amplitude and linear phase response in the direction of the desired signal. The constraints are imposed after the estimation of the desired signal direction of arrival (DOA), using the new proposed 2D DOA estimation algorithm.

An adaptive antenna controls its radiation pattern by mixing the received RF signals from multiple antenna elements with controlled complex weights (phase shifters and attenuators) and by summing the resulting signals. The radiation pattern of the final combined signal depends on the radiation pattern of each antenna element, on the geometry of the location of the antenna elements, and on the controlled antenna weights. Jammer suppression is accomplished by generating and using antenna weights so that the resulting radiation pattern minimizes power reception in the direction of the jammer. This system is referred to as a null steering (NS) antenna. Typically, the generation of antenna weights in adaptive NS systems is accomplished by an optimization algorithm which continuously tries to minimize the power of the interference RF signal at the output of the antenna combiner subjected to a suitable constraint (one fixed weight) to ensure signal reception.

Adaptive null steering antennas require, at a minimum, one controlled complex weight for each null in the radiation pattern in addition to one for the first antenna element. For example, we need three antenna elements to suppress two jammers radiating from different directions. These systems are very powerful, in that (I) they do not require the jammer to have distinct signal characteristics compared to the GPS satellite signal and they can provide high processing gain, i.e., improvement in the signal-to-noise ratio (SNR) at the receiver input, often exceeding 30 dB. Unfortunately, adaptive antenna systems are prone to nulling out GPS signals if the direction of arrival of the jamming signal is close to that of the GPS. Also, adaptive antenna systems are very expensive compared to the cost of alternate anti-jamming systems, or even to the cost of the receiver unit itself.

There are a broad range of interference mitigation techniques described in the literature, including antenna design changes to suppress low-elevation signals, filtering and signal processing to reduce interference power, and changes to the tracking loops including augmentation by inertial measurements. The baseline architecture may involve a multi-element antenna array to increase available signal-to-interference-plus-noise ratio (SINR); an additional component likely would be adaptive beamforming and null steering to further improve interference rejection. The sub-meter accuracy required for carrier landings necessitates limitations on navigation errors due to signal distortion, channel-to-channel timing differences, and low carrier-to-noise ratio (C/N_0).

Non-adaptive spatial-only beamforming, combined with knowledge of platform attitude and satellite constellation ephemeris, is suitable for increasing the C/N_0 of desired satellite signals. The drawbacks to this approach are high side lobes, the requirement at all times for accurate knowledge of platform orientation and satellite ephemeris, and the susceptibility to antenna and analog front-end timing and distortion errors. However, with suitable interference detection and localization processing, a null steering array can significantly reduce side lobe gain in the direction of interference sources.

Adaptive processing for noise-rejection or power-minimization allows the automatic suppression of narrowband interference and jamming, and introduces no further frequency-dependent phase distortion on the spread-spectrum GPS ranging signal. Greater interference rejection, particularly of wideband sources, may be realized by incorporating temporal filtering in the array processing – e.g., with a tapped delay line antenna array. However, adding time taps to allow space-time adaptive processing (STAP) yields a finite impulse response filter that may distort the spread-spectrum GPS ranging signal.

The topic of multi-element steered beam and adaptive antenna arrays has received attention within the GPS community, including its impacts upon the carrier and code phase observables. Errors in the calibration of antennas and front-end components can introduce additional, uncompensated phase and group delay on the incoming satellite signals. The resulting impact to steering-vector accuracy, effective signal-to-noise ratio, and code and carrier phase estimation errors has not been adequately examined within the context of adaptive antenna arrays.

To have better accuracy, lower computational burden, lower stead-state error and mitigation of interference, we need to improve in this way the antenna array performance for GPS applications. The solution is based on a constrained adaptive algorithm, based on the concept of estimation of arrival by mechanically rotating array of antenna. The assembly formed by the set DOA estimator, jointly with the constrained adaptive algorithm is used for updating the antenna array. But before that we will see the overview of some popular 1 D DOA estimation algorithms in short.

IV. OVERVIEW OF DOA ESTIMATION ALGORITHMS

Smart antenna is one of the dynamic research areas in wireless communication systems. The demand for smart antenna increases drastically when dealing with multiuser communication system, which needs to be adaptive, especially in time varying scenarios. Direction of Arrival (DOA) estimation is considered as an important task in smart antennas. It is an important signal parameter which can be used for source localization or source tracking by determining the desired signal location.

Also, it plays a key role in enhancing the performance of adaptive antenna arrays for wireless communication system and other numerous applications in the field of radar and sonar. Therefore, research has been accomplished about DOA estimation during last recent decades. Various DOA estimation methods have been proposed. These methods differ in technique, speed, computational complexity, accuracy and their dependency on the array structure. Different methods have been suggested to enhance the performance of available algorithms including the increase in the accuracy and resolution of DOA estimation algorithms.

According to the underlying methodology, the array signal processing algorithms can be categorized into two classes. The first class is called the non-parametric approach in which the source locations (or the DOA) are estimated by choosing the strongest output power of a spatial filter after sweeping over the space of interest. The advantage of this approach is that no assumption has to be made on the studied signal. The second class is called the parametric approach, in which a nominated model is assumed for the array observations. Once the model is determined, the quantities of interest in the array problem can be determined by choosing the best parameters that fit the model under some optimality criteria.

In general, the direction-of-arrival (DOA) estimation techniques can be broadly classified into conventional beamforming techniques, subspace-based techniques, and maximum likelihood techniques.

A. Classical beamforming

The conventional beamformer works described earlier on the premise that pointing the strongest beam in a particular direction yields the peak power arriving in that direction. In other words, all the degrees of freedom available to the array were used in forming a beam in the required look direction. This works well when there is only one incoming signal present. Two peaks can be seen at 10^0 and 30^0, but the 30^0 peak is not obvious and are somewhat averaged with the peak at 10^0. In other words, the spread of each peak is large, and if two impinging angles are close to each other, the two peaks may be "blurred" into one pair. In a more general term, although it is simple to implement, the width of the beam associated with a peak and the height of the side lobes, as seen in figure are relatively large; they limit the method's effectiveness when signals arriving from multiple directions and/or sources are present.

This technique has poor resolution. Although it is possible to increase the resolution by adding more array elements, it leads to the increase in the numbers of receivers and the amount of storage required for the data.

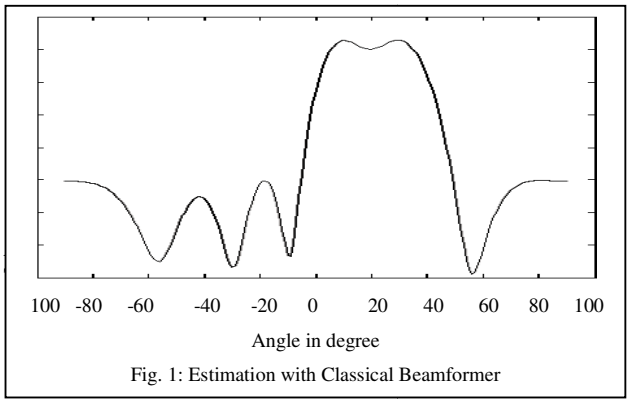

Fig. 1: Estimation with Classical Beamformer

one incoming signal present. But when there is more than one signal present, the array output power contains signal contributions from the desired angle as well as from the undesired angles. Capon's method overcomes this problem by using the degrees of freedom to form a beam in the look direction and at the same time the nulls

in other directions in order to reject other signals. In terms of the array output power, forming nulls in the directions from which other signals arrive can be accomplished by constraining a beam (or at least maintaining unity gain) in the look direction. Thus, for a particular look direction, Capon's method uses all but one of the degrees of the freedom to minimize the array output power while using the remaining degrees of freedom to constrain the gain in the look direction to be unity and at the same time the nulls in other directions in order to reject other signals. In terms of the array output power, forming nulls in the directions from which other signals arrive can be accomplished by constraining a beam (or at least maintaining unity gain) in the look direction. Thus, for a particular look direction, Capon's method uses all but one of the degrees of the freedom to minimize the array output power while using the remaining degrees of freedom to constrain the gain in the look direction to be unity. It can be seen that in comparison with figure, the peaks at 10° and 30° are much sharper and better separated compared to that of the conventional beamformer. The side peaks or lobes at other angles are also reduced, making them less likely to confuse the interpretation of the output power. The best resolution achieved was 10°. However, this increased resolution comes at the cost of increased computing time or power.

C. Maximum Likelihood Techniques

Maximum likelihood (ML) techniques were some of the first techniques investigated for DOA estimation. Since ML techniques were computationally intensive, they are less popular than other techniques. However, in terms of performance, they are superior to other estimators, especially at low SNR conditions.

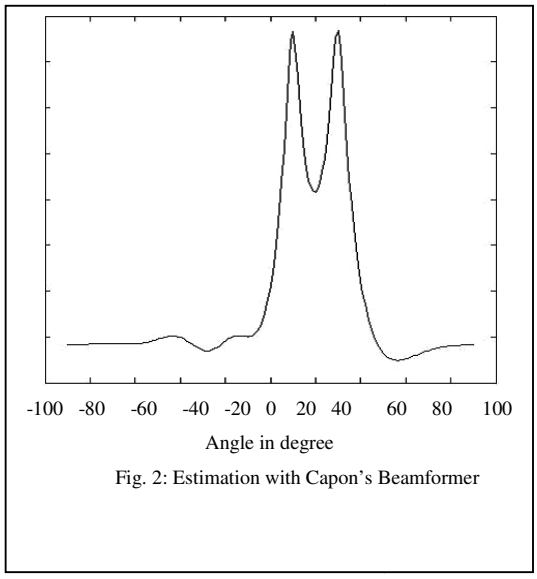

Fig. 2: Estimation with Capon's Beamformer

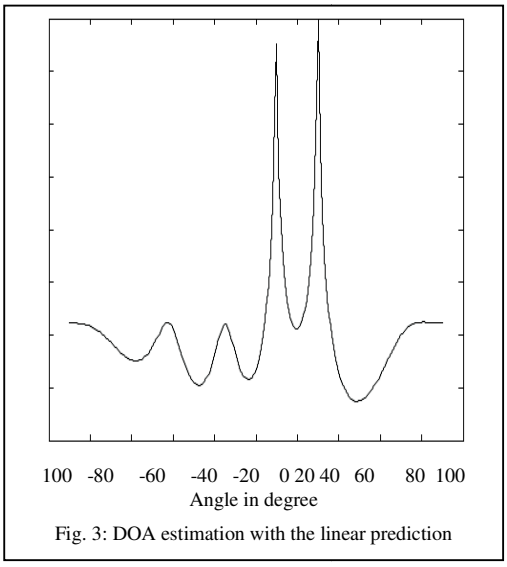

Fig. 3: DOA estimation with the linear prediction

MUSIC

MUSIC (Multiple Signal Classification) is one of the earliest proposed and a very popular method for super-resolution direction finding. The DOAs of the multiple incident signals can be estimated by locating the peaks. The *d* largest peaks in the MUSIC spectrum above correspond to the DOAs of the signals impinging on the array.

D. ESPRIT

Due to its simplicity and high resolution capability, ESPRIT has become one of the most popular signals subspace-based DOA estimating schemes. ESPRIT is applicable to array geometries that are composed of two identical sub arrays and is restricted to use with array geometries that exhibit invariances. This requirement, however, is not very prohibitive in practical applications since many of the common array geometries used in practice exhibit these invariances. There are three primary steps in any ESPRIT based DOA estimation algorithm:

1. Signal subspace estimation: Computation of a basis matrix for the estimated signal subspace.

2. Solution of the invariance equation: Solution of an (in general) over determined system of equations, the invariance equation, derived from the basis matrix.
3. DOA estimation: Computation of the eigenvalues of the solution of the invariance equation formed in step 2.

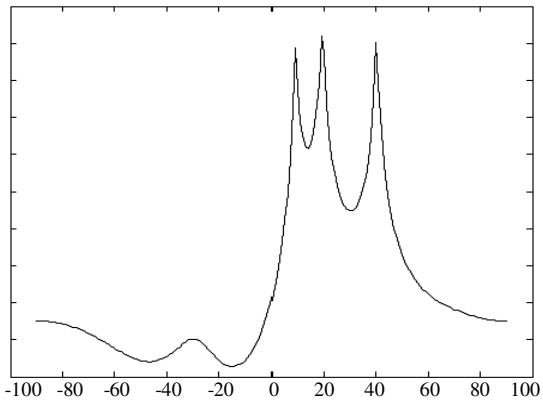

Fig 4: DOA estimation with MUSIC; the radio signals impinges at 10°, 20°, and 40°.

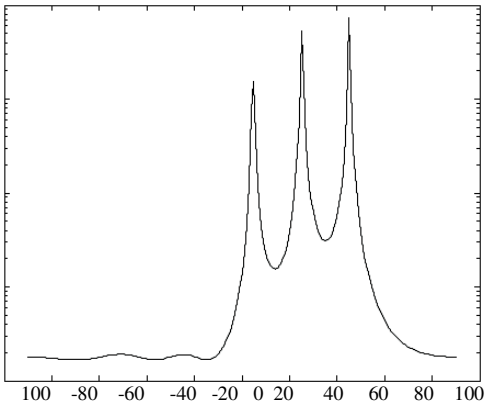

Fig 5: DOA estimation with ESPRIT; the radio signals impinges at 10°, 20°, and 40°.

V. PROPOSED METHOD

A new technique for 2 D DOA estimation of signals impinging on the array, using mechanical rotation of the array plane by small angle (Azimuth & Elevation) has been proposed for further analysis and discussion.
For an adaptive antenna system, if p users transmit signals from different locations, and each user's signal arrives at the array through multiple paths.

Let LMi denote the number of multipath components of i-th user. We have $\sum_{i=1}^{p} LM_i = p$. Let's further assume that all of the multi path components for a particular user arrive within a time window which is much less than the channel symbol period for that user, then the input data vector could be expressed as-

$$x(t) = \sum_{i=1}^{p} \sum_{k=1}^{LMi} \alpha_{i,k} a(\theta_{i,k}) s_i(t) + n(t) \qquad (1)$$

or we can write $$x(t) = \sum_{i=1}^{p} G_i s_i(t) + n(t) \qquad (2)$$

where $\theta_{i;k}$ is the DOA of the k-th multi path component for the i-th user, $a(\theta_{i;k})$ is the steering vector corresponding to $\theta_{i;k}$, $\alpha_{i;k}$ is the complex amplitude of the k-th multipath component for the i-th user, and G_i is the spatial signature for the i-th user and is given by

$$G_i = \sum_{k=1}^{LMi} \alpha_{i,k} a(\theta_{i,k}) \qquad (3)$$

The signal component arriving on *n*th antenna element at a particular instance of time is given by

$$X_n = A \exp(j 2\pi n d \sin\theta \cos\phi / \lambda) \qquad (4)$$

$$Y_n = A \exp(j 2\pi n d \sin\theta \sin\phi / \lambda) \qquad (5)$$

Where A= complex amplitude of the signal, φ = Direction of Arrival (DOA) of the signal (Azimuth Angle) (unknown), θ = Direction of Arrival (DOA) of the signal (Elevation Angle) (unknown), d= spacing between antenna elements and λ = wavelength.
Now, one can view (4) & (5) as-

$$X_n = A\exp[j2\pi f(d\sin\theta\cos\phi/c)] \quad (6)$$

$$Y_n = A\exp[j2\pi f(d\sin\theta\sin\phi/c)] \quad (7)$$

Where f= frequency of the signal and c= velocity of wave.
Now if we mechanically steer the antenna plane by $_{\delta}\varphi$ & $_{\delta}\theta$, then (6) & (7) becomes –

$$X^1{}_n = A\exp[j2\pi f(d\sin\theta\cos(\phi+\delta\phi)/c)] \quad (8)$$

$$Y^1{}_n = A\exp[j2\pi f(d\sin\theta\sin(\phi+\delta\phi)/c)] \quad (9)$$

$$X^2{}_n = A\exp[j2\pi f(d\sin(\theta+\delta\theta)\cos\phi/c)] \quad (10)$$

$$Y^2{}_n = A\exp[j2\pi f(d\sin(\theta+\delta\theta)\sin\phi/c)] \quad (11)$$

Now taking the frequencies (which can be known by seeing the spectra of the signal) of the signal from (6) and (8), and taking their ratio one could get-

$$\frac{frequency \to X_n}{frequency \to X^1{}_n} = \frac{\cos\phi}{\cos(\phi+\delta\varphi)} = \frac{1}{k} \quad \text{(k is known)}$$

Hence $$\phi = \tan^{-1}[\frac{\cos\delta\phi - k}{\sin\delta\phi}] \quad (12)$$

And from (7) & (11), we could get

$$\frac{frequency \to Y_n}{frequency \to Y^1{}_n} = \frac{\sin\theta}{\sin(\theta+\delta\theta)} = \frac{1}{k}$$

$$\theta = \cot^{-1}[\frac{k-\sin\theta}{\cos\delta\theta}] \quad (13)$$

Now using the simple relation given in (13) & (14) one can determine the unknown DOA (θ &φ) of all incoming signal impinging on the array with suitable algorithm based on (6), (7), (8), (9), (10), (11), (12) and (13).

VI. SIMULATIONS OF PROPOSED METHOD

In these simulations, $\delta\varphi = 1^0$. Estimated Frequencies and Estimated DOAs are not with the same order as signals are sensed by the array, but after estimating the entire signal space, their plots almost identical as exhibited between figures
(1) & (2).

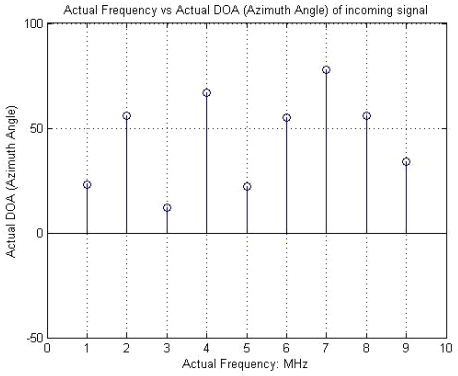

Fig. 6: Actual signals DOA (Azimuth) and frequencies

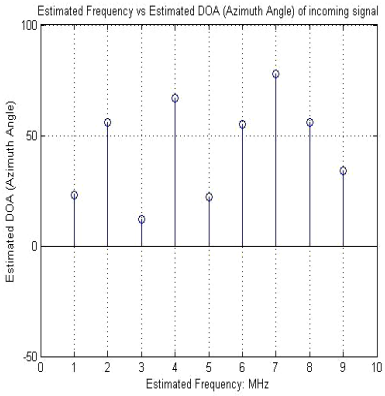

Fig. 7: Estimated signals DOA (Azimuth) and

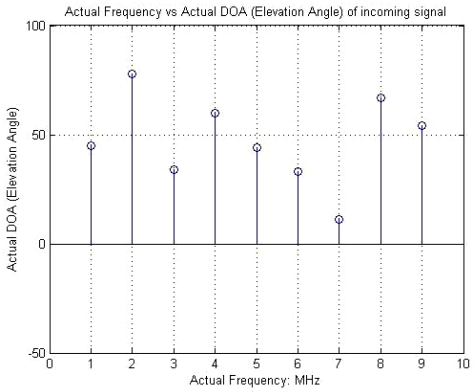

Fig.8: Actual signals DOA (Elevation) and frequencies

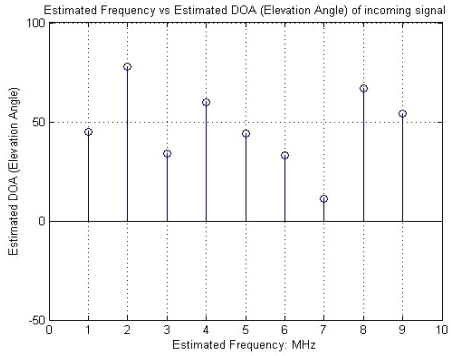

Fig.9: Estimated signals DOA (Elevation) and frequencies

VII. CONCLUSIONS

Although the proposed method needs more array elements in comparison with MUSIC method & the DOA estimation accuracy is inferior to these methods, the computational cost of the proposed method is much smaller than that by MUSIC method. Moreover, the proposed method does not require the space averaging technique.

This work points out that spatial processing techniques provide new perspectives in applications related with GPS. The use of 2 D DOA algorithm leads to good solutions where the interfering and multipath signals need to be canceled. Others scenarios, that made a better representation of GPS problem will be established in order to test the structure. Different antenna array geometric configuration will be tested, in order to compare the performance, testing less antenna elements and ambiguity resolution. Future studies will work on in the way of have DOA estimators with lower computational burden with 3 dimensional geometry. In this work, the computational burden of the algorithm is not forbidden in comparison with the reached performance on the task of cancel interfering signals, convergence speed and good results of the array radiation pattern.

ACKNOWLEDGMENT

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ANALYSIS OF CT LIVER IMAGE FOR TUMOR DIAGONOSIS

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***ABSTRACT**--The aim of project is the analysis of tumor in CT liver images using NSCT transform, classifier techniques and segmentation methods. Early detection of liver tumor is known to improve recovery rates to a great extent. In most medical centers, experienced radiologists are given the responsibility of analyzing tumors. But, there is always a possibility of human error. The sensitivity of tumor screening also varies with image quality. To offset different kinds of variability and to standardize diagnostic procedures, efforts are being made to develop automated techniques for diagnosis and grading of liver tumor images. NSCT, which is a generalization of the contourlet transform, is used to extract the features. Artificial Neural network (ANN) classifier is used for the classification of liver tumor images into normal, benign and malignant classes. The classification method produce accuracy rate of 90%, specificity of 100% and sensitivity of 85.71%. And segmentation is performed using Fuzzy C-means clustering.*

I. INTRODUCTION

A. OVERVIEW

Due to the presence of tumor there are huge lives being vanished. And there is no clear records for the detection of tumors may be in liver, lung or brain. So, I thought of making a clear of detecting the tumor using image processing tools. The objective of the project is classification of liver images to detect the stages using supervised classifier and abnormal detection through spatial Fuzzy clustering algorithm. Here Artificial neural network with radial basis function will be used for Stage classification. The detection of the liver tumor is a challenging problem, due to the structure of the tumor cells. This project presents a segmentation method, Spatial Fuzzy C-Mean clustering algorithm, for segmenting computed tomography images to detect the liver tumor in its early stages. This neural network will be used to classify the stage of liver tumor that is benign, malignant or normal. The manual analysis of the sputum samples is time consuming, inaccurate and requires intensive trained person to avoid diagnostic errors. The segmentation results will be used as a base for a Computer Aided Diagnosis (CAD) system for early detection of liver tumor which will improves the chances of survival for the patient. The process is verified using Matlab software.

B. MOTIVATION

The method is proceeded with recent advancement in the image processing tool with the use of Fuzzy c-means clustering, Artificial neural networks and NSCT transform. Here non subsampled contourlet transform is used to decompose the image for representing contour edges. The simulated result shows that the Fuzzy based segmentation results are more accurate and reliable than thresholding and clustering methods in all cases. Artificial Neural Network with image and data processing techniques was employed to implement an automated Liver Tumor classification. Decision making was performed in two stages: feature extraction using the four level wavelet decomposition followed by Haralick features and the classification using Artificial Neural Network (PNN). The performance of the ANN classifier was evaluated in terms of training performance and classification accuracies. Artificial Neural Network gives fast and accurate classification than other neural networks and it is a promising tool for classification of the tumors.

II. PROPOSED SYSTEM

The proposed system provides the idea of detecting tumor to an accurate using different image processing tools. NSCT transform is being used for extracting the features. Artificial Neural networks is been used to classify the images (being Benign, Malignant and Normal). Segmentation technique used is Fuzzy c-means clustering to segment the detected path.

A. Neural Networks

Neural networks are predictive models loosely based on the action of biological actions. The selection of the name “neural network” was one of the great PR successes of the Twentieth Century. It certainly sounds more exciting than a technical description such as “A network of weighted, additive values with non linear transfer functions”. However, despite the name, neural networks are far from “thinking machines” or “artificial brains”. A typical artifical neural network might have a hundred neurons. In comparison, the human nervous system is believed to have about $3x10^{10}$ neurons. We are still light years from “Data”.The original “Perceptron” model was developed by Frank Rosenblatt in 1958. Rosenblatt’s model consisted of three layers,(1) a “retina”

that distributed inputs to the second layer, (2) "association units" that combine the inputs with weights and trigger a threshold step function which feeds to the output layer, (3) the output layer which combines the values. Unfortunately, the use of a step function in the neurons made the perceptions difficult or impossible to train. A critical analysis of perceptrons published in 1969 by Marvin Minsky and SeymorePapert pointed out a number of critical weaknesses of perceptrons, and, for a period of time, interest in perceptrons waned.

B. NSCT DECOMPOSITION

Various image fusion techniques have been proposed to meet the requirements of different applications, such as concealed weapon detection, remote sensing, and medical imaging. Combining two or more images of the same scene usually produces a better application-wise visible image. The fusion of different images can reduce the uncertainty related to a single image. Furthermore, image fusion should include techniques that can implement the geometric alignment of several images acquired by different sensors. Such techniques are called a multi-sensor image fusion. The output fused images are usually efficiently used in many military and security applications, such as target detection, object tracking, weapon detection, night vision, etc. The Brovey Transform (BT), Intensity Hue Saturation (IHS) transforms, and Principal Component Analysis (PCA) provide the basis for many commonly used image fusion techniques. Some of these techniques improve the spatial resolution while distorting the original chromaticity of the input images, which is a major drawback. Recently, great interest has arisen on the new transform techniques that utilize the multi-resolution analysis, such as Wavelet Transform (WT). The multi-resolution decomposition schemes decompose the input image into different scales or levels of frequencies. Wavelet based image fusion techniques are implemented by replacing the detail components (high frequency coefficients) from a colored input image with the details components from another gray-scale input image. However, the Wavelet based fusion techniques are not optimal in capturing two-dimensional singularities from the input images. The two-dimensional wavelets, which are obtained by a tensor-product of one-dimensional wavelets, are good in detecting the discontinuities at edge points. However, the 2-D Wavelets exhibit limited capabilities in detecting the smoothness along the contours. Moreover, the singularity in some objects is due to the discontinuity points located at the edges. These points are located along smooth curves rendering smooth boundaries of objects. Do and Vetterli introduced the new two-dimensional Contourlet transform. This transform is more suitable for constructing a multi-resolution and multi-directional expansions using non-separable Pyramid Directional Filter Banks(PDFB) with small redundancy factor.

Image fusion is the combination of two or more different images to form a new image by using an algorithm. The combination of sensory data from multiple sensors can provide more reliable and accurate information. It forms a rapidly developing area of research in remote sensing and computer vision. Most of fusion approaches were based on combining the multiscale decompositions (MSD's) of the source images. MSD-based fusion schemes provide much better performance than the simple methods studied previously. Due to joint information representation at the spatial-spectral domain, the wavelet transform becomes the most popular approximation in image fusion. However, wavelet will not "see" the smoothness along the contours and separable wavelets can capture only limited directional information. Contourlet transform was recently pioneered by Minh N. Do and Martin Vetterli. It is a "true" two-dimensional transform that can capture the intrinsic geometrical structure, which is key in visual information. Compared with wavelet, contourlet provides different and flexible number of directions at each scale. It has been successfully employed in image enhancement, denoising and fusion. Unfortunately, due to down samplers and upsamplers presented in both the laplacian pyramid and the directional filter banks (DFB), the foremost contourlet transform is not shift-invariant, which causes pseudo-Gibbs phenomena around singularities.

NSCT decomposition is to compute the multi scale and different direction components of the discrete images. It involves the two stages such as non sub sampled pyramid(NSP) and non sub sampled directional filter bank(NSDFB) to extract the texture, contours and detailed coefficients. NSP decomposes the image into low and high frequency subbands at each decomposition level and it produces n+1 sub images if decomposition level is n. NSDFB extracts the detailed coefficients from direction decomposition of high frequency subbands obtained from NSP. It generates m power of 2 direction sub images if number of stages be m .

C. Co-occurrence Matrix

Originally proposed by R.M. Haralick, the co-occurrence matrix representation of texture features explores the grey level spatial dependence of texture. A mathematical definition of the co-occurrence matrix is as follows :

- Given a position operator *P(i,j)*,
- let *A* be an n x n matrix
- whose element *A[i][j]* is the number of times that points with grey level (intensity) *g[i]* occur, in the position specified by *P*, relative to points with grey level *g[j]*.
- Let *C* be the *n* x *n* matrix that is produced by dividing *A* with the total number of point pairs that satisfy *P*. *C[i][j]* is a measure of the joint probability that a pair of points satisfying *P* will have values *g[i]*, *g[j]*.
- *C* is called a co-occurrence matrix defined by *P*.

Examples for the operator *P* are: "*i* above *j*", or "*i* one position to the right and two below *j*", etc.

This can also be illustrated as follows… Let *t* be a translation, then a co-occurrence matrix C_t of a region is defined for every grey-level *(a, b)* by [1]:

$$C_t(a,b) = card\{(s,s+t) \in R^2 | A[s] = a, A[s+t] = b\}$$

Here, $C_t(a, b)$ is the number of site-couples, denoted by *(s, s + t)* that are separated by a translation vector *t*, with *a* being the grey-level of *s*, and *b* being the grey-level of *s + t*.

For example; with an 8 grey-level image representation and a vector *t* that considers only one neighbour, we would find '1'

1	2	1	3	4
2	3	1	2	4
3	3	2	1	1

Figure 1: Image example

	0	1	2	3	4	5	6	7
0	0	0	0	0	0	0	0	0
1	0	1	2	0	0	0	0	0
2	0	1	0	2	0	0	0	0
3	0	0	1	1	0	0	0	0
4	0	1	0	0	1	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0

Figure 2: Image Classical co=occurrence matrix

At first the co-occurrence matrix is constructed, based on the orientation and distance between image pixels. Then meaningful statistics are extracted from the matrix as the texture representation. Haralick proposed the following texture features :

1. Energy
2. Contrast
3. Correlation
4. Homogeneity
5. Entropy

Hence, for each Haralick texture feature, we obtain a co-occurrence matrix. These co-occurrence matrices represent the spatial distribution and the dependence of the grey levels within a local area.

Each ***(i,j)*** th entry in the matrices, represents the probability of going from one pixel with a grey level of '***i***' to another with a grey level of '***j***' under a predefined distance and angle. From these matrices, sets of statistical measures are computed, called feature vectors .

Energy: It is a gray-scale image texture measure of homogeneity changing, reflecting the distribution of image gray-scale uniformity of weight and texture..

$$E = \sum_x \sum_y p(x,y)^2$$

Where p(x,y) is the GLC M

Contrast: Contrast is the main diagonal near the moment of inertia, which measure the value of the matrix is distributed and images of local changes in number, reflecting the image clarity and texture of shadow depth.

$$\text{Contrast} \qquad I = \sum\sum (x-y)^2 p(x,y)$$

Entropy: It measures image texture randomness, when the space co-occurrence matrix for all values are equal, it achieved the minimum value.

$$S = -\sum_x \sum_y p(x,y) \log p(x,y)$$

Correlation Coefficient: Measures the joint probability occurrence of the specified pixel pairs.
Correlation**:** sum(sum((x- μx)(y-μy)p(x , y)/$\sigma_x\sigma_y$))
Homogeneity: Measures the closeness of the distribution of elements in the GLCM to the GLCM diagonal.

Homogenity = sum(sum(p(x , y)/(1 + [x-y])))

D. Fuzzy c-means clustering:

In fuzzy clustering, every point has a degree of belonging to clusters, as in fuzzy logic, rather than belonging completely to just one cluster. Thus, points on the edge of a cluster, may be in the cluster to a lesser degree than points in the center of cluster. An overview and comparison of different fuzzy clustering algorithms is available. Any point x has a set of coefficients giving the degree of being in the kth cluster $w_k(x)$. With fuzzy c-means, the centroid of a cluster is the mean of all points, weighted by their degree of belonging to the cluster.

$$c_k = \frac{\sum_x w_k(x)^m x}{\sum_x w_k(x)^m}.$$

The degree of belonging, $w_k(x)$, is related inversely to the distance from x to the cluster center as calculated on the previous pass. It also depends on a parameter m that controls how much weight is given to the closest center. The fuzzy c-means algorithm is very similar to the k-means algorithm.

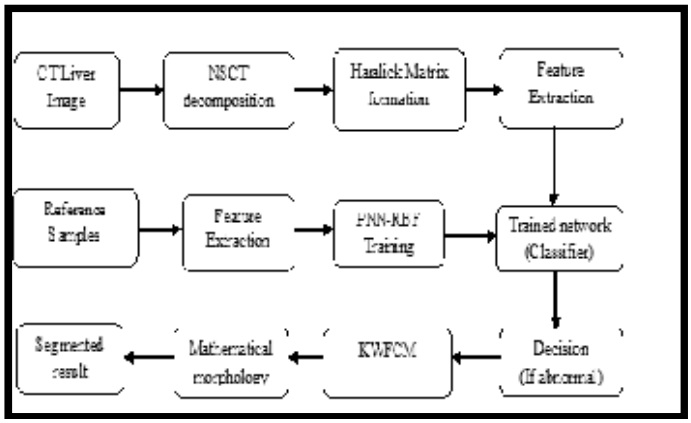
- Choose a number of clusters.
- Assign randomly to each point coefficients for being in the clusters.
- Repeat until the algorithm has converged (that is, the coefficients' change between two iterations is no more than ε, the given sensitivity threshold) :
- Compute the centroid for each cluster, using the formula above.
- For each point, compute its coefficients of being in the clusters, using the formula above.

The algorithm minimizes intra-cluster variance as well, but has the same problem as k-means; the minimum is a local minimum, and the results depend on the initial choice of weights.

Using a mixture of Gaussians along with the expectation of maximization algorithm is almost a more statistically formalized method which includes some of these ideas.

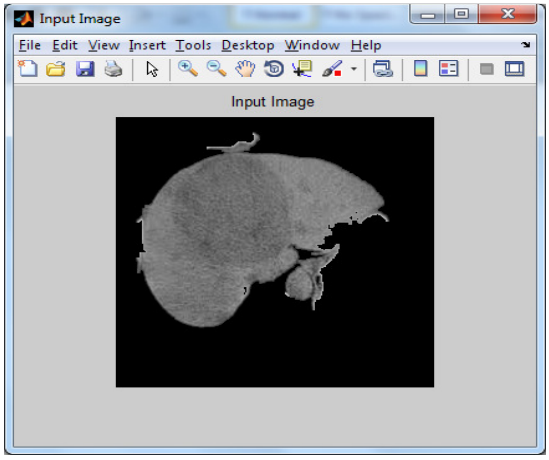
Fuzzy c-means has been a very important tool for image processing in clustering objects in an image. In the 70's, mathematicians introduced the spatial term into the FCM algorithm to improve the accuracy of clustering under noise.

E. Block diagram of Proposed system



III. RESULTS

A. Original image



The CT image to be processed is taken as the input image and transform is done to it inorder to extract its features and then classify it inorder to know about the tumors.

B. Decomposed image

Level 1 (low frequency image)

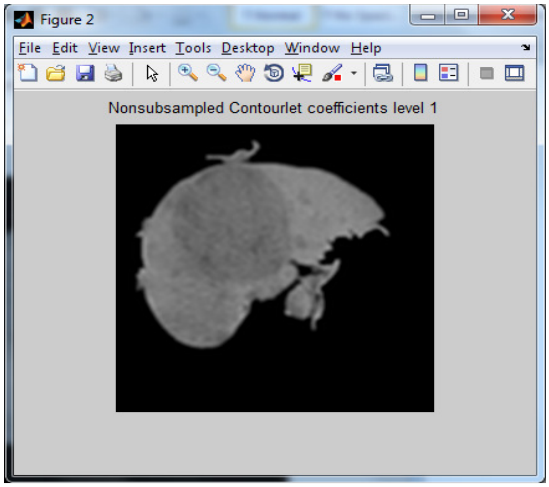
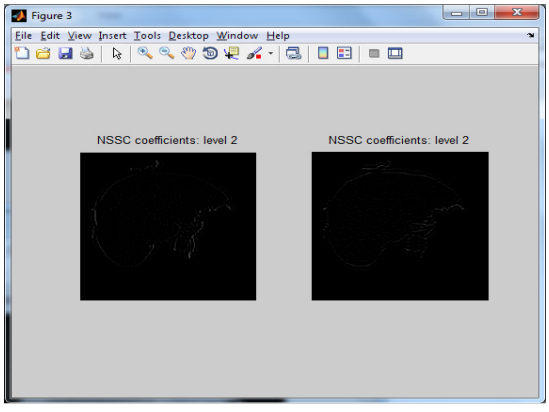


Figure 3: level 1 decomposed image

Level 2 and 3 (high and ultra high frequencies)



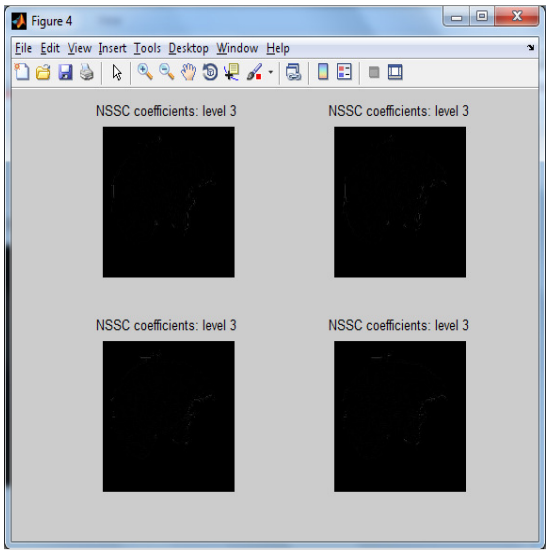


Figure 4 & 5: Level 2&3 decomposed image

The training process is done that is the decomposition of reference images is performed and feature is extracted and kept aside. Now the input CT image is decomposed and feature is extracted and classification is undergone with the trained set of images. On comparing the input image with the reference image the output will be seen (may be normal, benign or malignant). Using the method the input image is Cent percent clear about normal or abnormal. Using artificial neural network the better process is performed and obtained. The obtained results are,

Accuracy 90%
Specificity 100%
Sensitivity 85.71%

IV. Conclusion

With the rapid development of science and technology, computer, doctors may be able to diagnose almost all diseases. There has been a lot of development in the scope, technique, and ability of Liver CAD systems. In this study I have presented the existing methods for classifying liver diseases from the abdominal CT. Hence it is concluded that the neural networks and conventional image processing operations can be successfully used for liver disease diagnosis from abdominal CT. This research can further be extended in many directions. CT is of major importance in the management of liver primary cancer and liver metastasis for treatment planning, monitoring. The assessment of total and functional liver volume, lesion volume and location relative to functional liver segments and vessels can be time consuming with conventional image post processing tools. The Liver Analysis application provides a comprehensive analysis of the liver, allowing efficient patient management and treatment planning. Taking advantage of the application server capabilities of IntelliSpace Portal, Liver Analysis is an outstanding tool for extracting information from a liver C T, communicating this information to physicians and surgeons, planning the strategy for patient management, and guiding surgery.

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DESIGN, ANALYSIS AND OPTIMIZATION OF A MACHINE TOOL STRUCTURES – A REVIEW

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ABSTRACT : *This paper reviews some of current development of design, analysis and optimization of machine tool structures. Column, bad, box type housings, table, x-slide, y-slide, z-slides are known as structures of machine tool. In the new economic year and globalization phase, industries are required to manufacture good quality machine tools with optimized performance at the moderate cost. Machine tool structures are the key for quality and high productivity. Moreover, the industries are facing competition internationally due to worldwide globalization of business. One of the primary reasons for low productivity is large mass of the moving parts of machine tools which cannot afford high acceleration and deceleration encounter during operation. In this review work is made to solve the problem regards machine tool structures or machine tool industries.*

Key Words: Structure Material, Structural Bionic Design, Column Stiffeners Arrangement, Parametric Optimization.

1. INTRODUCTION

Beds, columns, box type housings, tables, x-slides, y-slides, z-slides are known as structures of machine tool. Structure of machine tool is the key for considerations and analysis of the system failures. The function of machine tool structure is to support and guide the work piece and cutting tool and to resist the cutting and feed forces encountered during the machining operations.

Thus the structure of the machine tool forms the vital link between the cutting tool and the work piece on a metal cutting machine. The degree of precision with which a component is produced is therefore dependent upon the accuracy of the slides of the machine under specified working conditions. In order to support the work piece and the position it correctly with respect to the cutter under the influence of cutting forces it is necessary for the structure to have high static and dynamic stiffness values. Thus, the general configuration of the structure is not fixed as in many other engineering structures and it is desirable to predict the important static and dynamic characteristics in all of its possible forms. Hence, the complete analysis of the machine tool structure is a particularly demanding problem. The methods adopted by researchers previously, were model analysis and mathematical modeling of structures.

Due to the limitations of above methods, presently Finite Element Analysis is adopted. It is an important technique in machine tool structural analysis. Machine tool reliability and maintainability significantly affect the three elements of competitiveness: quality, cost and production time. Well-maintained machines hold tolerances better, help reduce scrap and rework, and rise consistently and quality of the part. A machine tool is a complex system consisting of various subsystems/ components, and failure of a machine tool may occur due to failure(s) occurring in any of the subsystems/components. Therefore, Structure is very important for design considerations of any machine tool.

2. LITERATURE REVIEW

A. LITERATURE REVIEW OF STRUCTURE MATERIAL

2.1 Dail Gil Lee [1]: One of the primary reasons for low productivity is large mass of the moving parts of machine tools, which cannot afford high acceleration and deceleration encountered during operation. Moreover, the vibrations of the machine tool structure are among the other causes that restrict high speed operations.

Authors were designed, the slides of high speed CNC milling machines with fiber reinforced composite materials to overcome this limitation. The vertical and horizontal slides of a large CNC machine were manufactured by joining high-modulus carbon-fiber epoxy composite sandwiches to welded steel structures

using adhesives and bolts. These composite structures reduced the weight of the vertical and horizontal slides by 34% and 26%, respectively, and increased damping by 1.5–5.7 times without sacrificing the stiffness. Without much tuning, this machine had a positional accuracy of _5 lm per 300 mm of the slide displacement.

2.2 Sung-Kyum Cho [2]: Small machine tools have the inevitable drawback of low structural stiffness caused by a low load-carrying capacity of bearing components. Therefore, mass reduction of the components is advantageous to ensure high performance of the machine tools.

A small table-top machine tool structure was designed and fabricated by using carbon/epoxy composites and resin concrete to reduce the weight of the structure, and enhance the structural stiffness and damping capacity. To determine the specifications of the composite materials finite element analyses and vibration tests were carried out. Several machine tool components were fabricated and assembled using mechanical joining and adhesive bonding. Our results showed that the re-designed structure was 36.8% lighter, and the structural stiffness was increased by 16% with higher loss factors (2.82–3.64%).

2.3 Sung-Kyum Cho [3]:

For most production applications of machine tool structures, (gray cast iron) metal castings remain the primary choice because of cost, ease of sourcing, good damping with relatively high strength, good machinability and well-established and consistently achievable manufacturing and processing requirements. However, fabrications are normally the preferred choice for low volume production of large structures, due mainly to the high up-front molding costs and the difficulties in process control inherent in very large castings. On the other hand, with increasing emphasis on high speed machining, hard turning, and better and consistent machining accuracies, structural rigidity, thermal stability and vibration damping is becoming major design considerations making polymer composites a leading choice. For this reason, Hardinge Inc., a super precision machine tool builder has traditionally used its proprietary polymer composite (Harcrete®) in its lathe, grinder and machining center bases. Depending on the performance and cost requirements, the base can be all composite or a combination of conventional casting strategically reinforced with composite.

In this study, for proper comparison and evaluation of different materials and their effect on the performance of the machine, a set of criteria were chosen as follows:

1. Static Stiffness of the component under loading in different directions.
2. Specific Stiffness
3. Dynamic stiffness
4. Mass (Weight) of the component

The conclusions derived based on evaluations and comparisons of the results are as follows:

1. Strategically placed Harcrete (polymer composite) increased both flexural and torsional stiffnesses and significantly reduces distortion of the original thin wall cast iron structure. The Harcrete reinforced bases are 1.5 to 2 times stiffer in torsion and 1.3 to 2 times stiffer in bending when compared to the plain cast iron bases.
2. The polymer composite reinforcement in a small but strategically located cavity area increased the damping ratio by 1.5 to 2 times.

B. LITERATURE REVIEW OF STRUCTURAL BIONIC DESIGN

2.4 Ling Zhao [4]: Based on the configuration principles of biological skeletons and sandwich stems, a machine tool column with stiffening ribs inside was designed using structural bionic method.

After the lightening effect was verified by finite element simulation, scale-down models of a conventional column and a bionic column were fabricated and tested. Results indicate that the bionic

column can reduce the maximum static displacement by 45.9% with 6.13% mass reduction and its dynamic performances is also better with increases in the first two natural frequencies. The structural bionic design is effective in improving the static and dynamic structural performances of high speed machine tools.

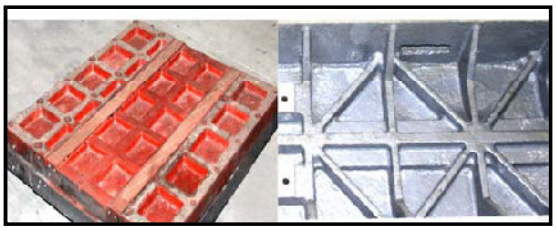

Figure 1: Conventional ribs distribution.

2.5 Shihao Liu [5]: In order to improve the machining accuracy of a gantry machining center, structural bionic design for column was conducted. Firstly, the bionic design method for stiffener plate structure was established based on distribution principles of gingko root system.

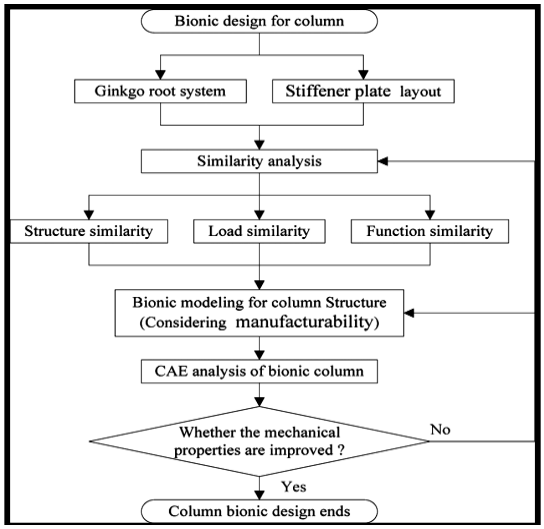

Figure 2: Column structural bionics design method.

The bionic design method was used to improve column structure of the gantry machining center, and three kinds of bionic columns were put forward. The finite element analysis on original and bionic columns indicates that the mass of the column with the best bionic stiffener plate structure is reduced by 2.74% and the first five order natural frequencies are increased by 6.62% on average. The correctness of column's bionic design method proposed in this paper was verified by the static and dynamic experiments. Finally, the bionic principles for stiffener plate of column were concluded, which provides a new idea for updating traditional design concepts and achieving lightweight structure of machine tool components.

C. LITERATURE REVIEW OF STRUCTURE ANALYSIS

2.6 Wedad I. Alazzawy [6]: Author studied the static behavior (under torsion and bending loading) of machine tool column. The effects of changing the cross sectional area of the column itself on the deformations (design parameters) was investigated. The adding of stiffeners and changing the stiffeners cross sectional area are also verified. The results show that using of stiffeners can produce a great reduction in deformation of the column structure under the static loading mentioned above. Also using stiffeners with different cross-sectional areas suggest the best stiffener cross-sectional shape can be used to give the minimum deformations of column structure. Dynamic analysis of column involves calculating natural frequencies and mode of different column structure mentioned above, these frequencies are fairly insensitive of adding stiffeners to column structures.

2.7 Migbar Assefa [7]: The performance of a machine tool is eventually assessed by its ability to produce a component of the required geometry in minimum time and at small operating cost. It is customary to base the structural design of any machine tool primarily upon the requirements of static rigidity and minimum natural frequency of vibration. The operating properties of machines like
cutting speed, feed and depth of cut as well as the size of the work piece also have to be kept in mind by a machine tool structural designer.
Author presents a novel approach to the design of
machine tool column for static and dynamic rigidity requirement. Model evaluation is done effectively through use of General Finite Element Analysis software ANSYS. Studies on machine tool column
are used to illustrate finite element based concept evaluation technique. This paper also presents results obtained from the computations of thin walled box type columns that are subjected to torsional and bending loads in case of static analysis and also results from modal analysis. The columns analyzed are square and rectangle based tapered open column, column with cover plate, horizontal partitions and with apertures. For the analysis purpose a total of 70
columns were analyzed for bending, torsional and modal analysis. In this study it is observed that the orientation and aspect ratio of apertures have no significant effect on the static and dynamic rigidity
of the machine tool structure.

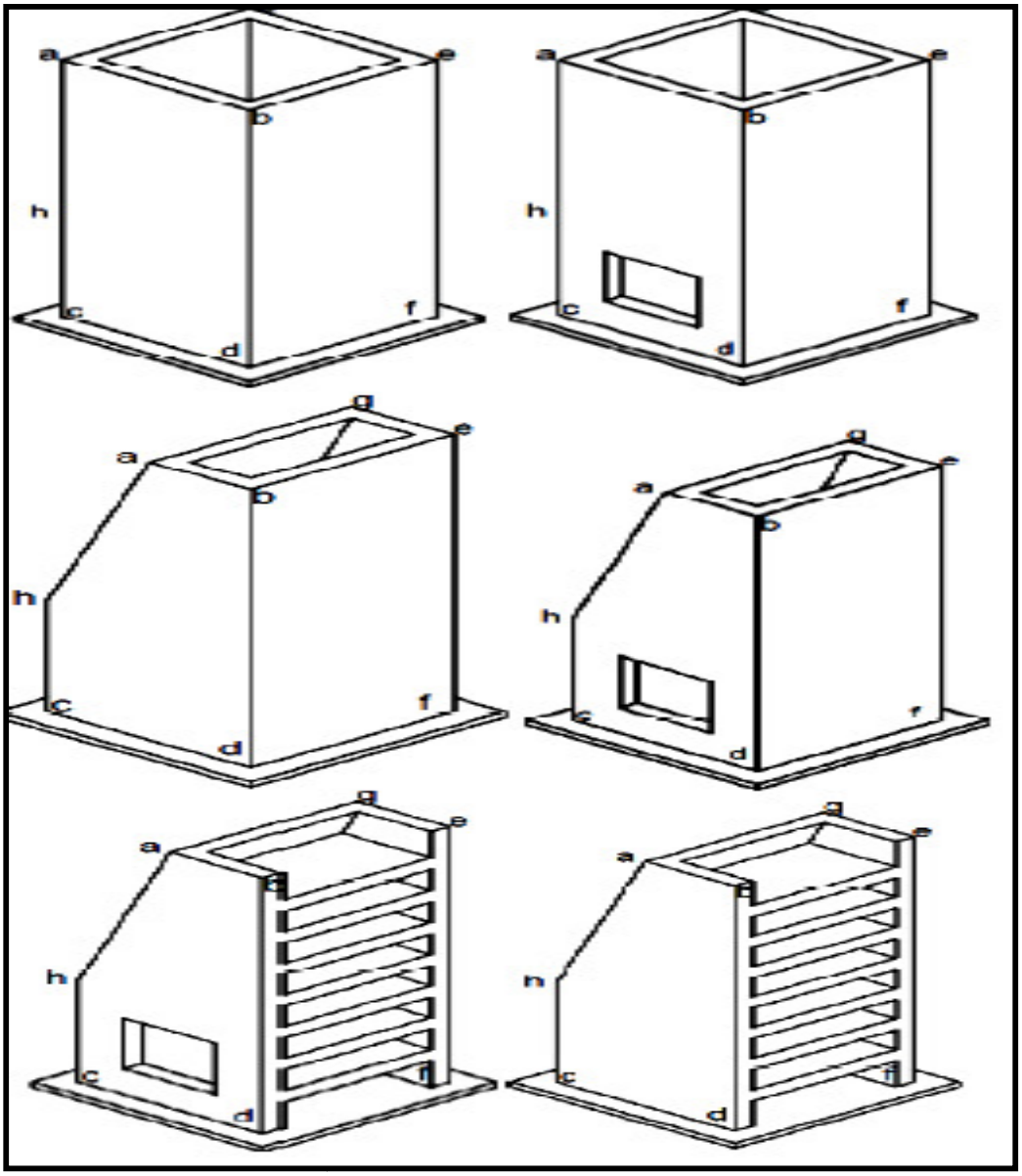

Figure 3: Different types of columns with and without apertures.

2.8 J.R.Baker [8]: It is widely accepted and well-documented that regenerative machine tool chatter is due to system instability. It is also well-known that machining system stability depends on both structural parameters and cutting process parameters. This paper focuses on the use of structural "finite element (FE) models in the stability analysis of turning operations. The method presented allows for inclusion of both cutting tool and workpiece 6exibility in the analysis. A structural model representing the machine tool system is created using the commercial FE code, ANSYS. This structural model can include practically any degree of detail desired. The structural model is then imported into a stand-alone FORTRAN program, which incorporates a cutting process model, and calculates the lobed borderline of stability.

D. LITERATURE REVIEW OF PARAMETRIC OPTIMIZATION.

2.9 D.I.Kim [9]: In this paper, sandwich structures for micro-EDM machines are optimized by using parametric study varying composite geometries and parameters like stacking sequence, thickness and rib geometry. The

structures are composed of fiber reinforced composites for skin material and resin concrete and PVC foam (Closed cell, Divinycell) for core materials. Column structure was designed by a beam with cruciform rib and performance indices such as static bending stiffness (EI) and specific bending stiffness (EI/q) for dynamic stability are
examined by controlling the thickness and stacking sequence of composites. For the machine tool bed, which usually has a plate shape, was designed to have high stiffness in two directions at the same time controlling stacking sequence and rib geometry; that is, rib thickness and number of ribs. The sensitivity of design parameters like rib thickness and composite skin thickness was examined and the optimal condition for high stiffness structure was suggested. Finite element analysis was also performed to verify the static and dynamic robustness of the machine structure. L-shaped joint for combining bed and column of the micro-EDM machine was proposed and fabricated using adhesive bonding. The dynamic performance such as damping characteristics was investigated by vibration tests. From the results optimal configuration and materials for high precision micro-EDM machines are proposed.

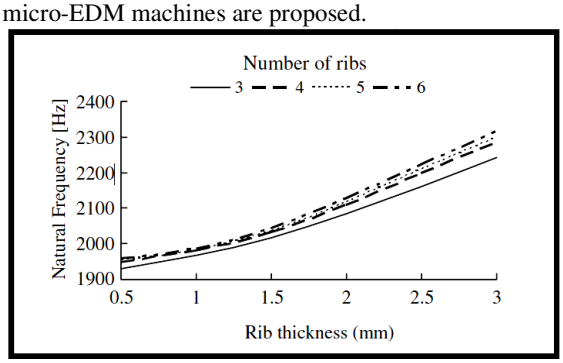

Figure 4: The first natural frequency of the sandwich bed with respect to the rib thickness and number of ribs.

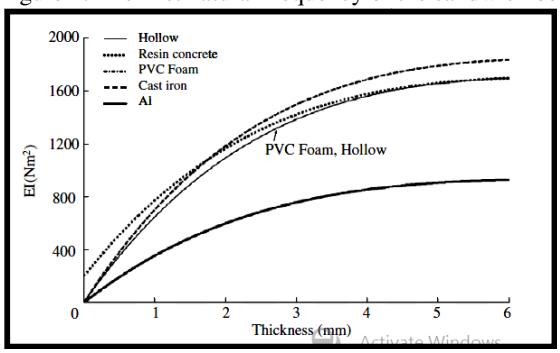

Figure 5: Bending stiffness of columns with respect to the composite thickness and various core materials.

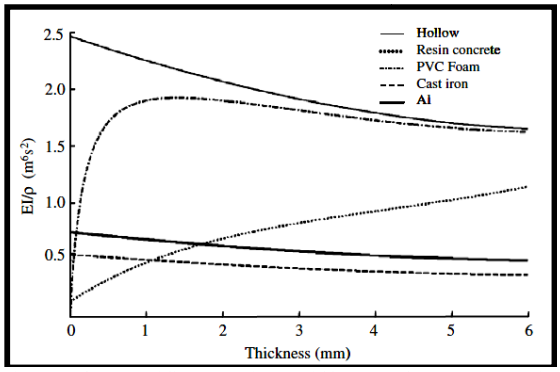

Figure 6: Specific bending stiffness of columns with respect to the composite thickness and various core materials.

3. CONCLUSIONS

In the new economic year and globalization phase, industries are required to manufacture good quality machine tools with optimized performance at the moderate cost. From this critical literature review we can conclude that the high transfer speed as well as the high cutting speed of machine tools is achieve by the structure design with fiber reinforced composite materials. The use of stiffeners can produce a great reduction in deformation of structure under the static loading. For cost reduction, mass can be reduce by use of stiffeners and apertures. Also, we can conclude that the gray cast iron metal casting remains the primary choice because of cost, ease of sourcing, good damping with relatively high strength, good machinability and processing requirements. And for very precise work requirement composite material is best choice.

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I would like to express my warm acknowledgement and my sincere thanks to my industrial guide Mr. Jitendra P. Mehta (Vice President, R&D) Macpower CNC Machine tool Pvt. Ltd. Rajkot.

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REVIEW ON CONTINGENCY ANALYSIS IN POWER SYSTEM AND IMPROVEMENT OF POWER SYSTEM SECURITY

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ABSTRACT*—The goal of this power system analysis function is to give the operator information about the static security. Contingency analysis is used to calculate violations. This paper presents the overview of contingency analysis of power system is to predict the line outage, generator outage and to keep the system secure and reliable. Whenever the maximum violation is occur in power system, that line and generator is outage element. So we find the maximum violation in the system network. For the generation, transmission, and distribution system, security can be assessed using contingency analysis. This paper describes the review of the methodologies of the power flow analysis of power system network In this paper, it is discussed the review of how contingency conditions are analyzed after that according to severity of contingency a real power flow performance index (PI) sensitivity based approach and the line outage distribution factor has been used to decide optimal location of series FACTS devices.*

Keywords—Contingency Analysis, Line Outage, Generator Outage, Location Of Series FACTS Devices.

I. INTRODUCTION

Contingency analysis gives the security status of the power system network and list of critical contingencies. Contingency analysis is achieved by running power flow cases after removing different elements of the power system network such as a transmission line, transformer, bus or generator. Most of the EMS software available in the market has the contingency analysis option. Some of the main software, such as Power World, PSS/E, and PSS/O are used by the operators at the control centers in utilities to run the contingency analysis ahead of time for system planning.

As mentioned above contingency analysis is achieved by removing different types of elements. Transmission lines, transformers, generators and buses are the key components of power system network. Different kind of contingencies that can happen based on these important components. The desired voltage level is maintained using the transformers which step up/down the voltage according to the requirements. A transformer outage is also one of the important outages in the system. During contingency analysis, transformers are generally considered as the transmission line outage with consideration of resistance and susceptance. It is very important to know the transformers and their functionalities when the load changes in the system, since they are responsible for the voltage profile in the network. Generators are the source of power for the system. Loss of generation causes many problems in the system and may lead to a blackout. Buses are the main components of the power system network, particularly because of their connections in the system. All the transmission lines, transformers and generators are connected to the rest of the system through the buses. An outage of the bus is typically an outage of all the elements connected to that bus, which becomes very huge loss if the number of elements connected to that bus is higher. A bus outage is thus considered to be critical.Thus different types of contingencies and their study will help in better planning of the system and helps the operator in preparing for them. Some events can cause outage of multiple components in the system causing more loss compared to single contingencies.

The desirable attributes in an electrical power system are economic operation, minimum damage to the environment, and security of energy supply. A power system supply is considered to be secure when the probability of power supply failure is low. A power supply failure occurs due to tripping of a transmission line or an equipment malfunction and if this trend is not arrested, it may lead to the blackout of a region due to cascading effect.

Cleary, economy of operation and security of energy management system(EMS) are conflict with each other; higher the security of power supply more costly will be its operation. Hence ,power system are operated

at minimum cost with assured levels of security of supply. The later ensure mitigation of emergency conditions. Energy management system is the process of monitoring, coordinating and controlling the generation, transmission and distribution of electrical energy. The physical plant to be managed includes generating plants that produce energy fed through transformers to the HV transmission network (grid), interconnecting generating plants, and load centers. Since transmission systems provide negligible energy storage, supply and demand must be balanced by either generation or load.

EMS security is constituted of (i) system monitoring by employing state estimation techniques and (ii) contingency analysis along with corrective action measures. In system monitoring online data, as load and generation very is gathered on real time basis at the remote terminal units (RTUs) and transmitted over microwave link to a central digital computer, which analysis the same by employing statically technique and estimates the state variables such as the system bus voltage magnitudes and voltage phase angle of the system. Additionally information in respect of frequency. Generation outputs, transformer taps, etc. is also acquired and transmitted to the central computer. Based on an analysis of the large database, the central computer directs the EMS managers or load dispatchers to take corrective action for overloads or out of limit voltage. Power system security is the ability of the power system to withstand sudden disturbances such as short circuits or non-anticipated loss of system components. Security refers to the degree of risk in its ability to survive imminent disturbances (contingencies) without interruption of customer service. Thus it relates to robustness of the system in a context of imminent disturbances and depends on the power system operating condition before the disturbance and the contingent probability of disturbances. Security is a dynamic issue and it implies both the transition to the new operating point and the state of this new operating point. Online steady-state security analysis of power systems requires evaluation of the effects of a large number of contingencies in order to assess the security of the system. Contingency analysis is an important component of the security function which is considered to be an integral part of the modern energy management System at energy control centers. Because of the high-speed of solution required for online processing of a large number of contingencies, approximate non iterative techniques are most often used. It is well known that Contingencies causing line flow problems may not necessarily cause bus voltage problems and vice versa. Hence, two separate ranking lists are required, one for line flow problems, and the other for bus voltage problems have proposed a technique that uses the DC formulation with the compensation method to compute the post outage angles.

II. LITERATURE REVIEW

In [1],Chengjun Fu and Anjan Bose have studied in this paper that the index must be a measure of stability. In this paper, several indices are proposed for contingency screening in online DSA. Usually there are three basic requirements in contingency screening of DSA:

- Accuracy: It should not miss any serious contingency, i.e., avoid the masking problem.
- Speed: It should be much faster than full-scale simulation.
- Number: It should be able to handle a large number of contingencies.

There are two processes in the screening: ranking and selecting. The purpose of ranking is to compute the index, which is a relative measure of severity in the transient condition. The indices are important for successful screening. Good indices can produce accurate and fast results. The purpose of selecting and classification is to give the cutoff point between stable and unstable contingencies in the ranking previously made. This paper is primarily concerned with the ranking problem. For every stable case, the angle of each machine will move coherently with the center of inertia (COI). For an unstable case, there are some machines whose angles will move away from the COI. This paper presents some indices for contingency screening in dynamic security analysis. These indices are based on the concepts of coherency, the transient energy conversion between kinetic and potential energy, and three dot products, after the fault is cleared. These indices can be calculated fast because they do not need to do the long time simulation to determine whether the contingency is stable or unstable. They are also simple because they do not need to calculate the controlling unstable equilibrium point to get the normalized energy margin.

In [2], Thomas L. Baldwin, Magdy S. Tawfik and Miles McQueen have discussed about US Power System. As the US power systems continue to increase in size and complexity, including the growth of smart grids, larger blackouts due to cascading outages become more likely. This paper addresses the implementation and testing of a process for N-k contingency analysis and sequential cascading outage simulation in order to identify potential cascading modes. A modeling approach described in this paper offers a unique capability to identify initiating events that may lead to cascading outages. It predicts the development of cascading events by identifying and visualizing potential cascading tiers.

Analysis of the following categories of contingencies:

- A loss of a single element (Category B)
- A loss of two or more elements (Category C)
- Extreme events resulting in two or more elements removed or cascading out of service (Category D)

This paper describes a methodology for simulating and analyzing cascading outages in a power grid. The methodology incorporates an N-k contingency analysis, where k is selectable (usually 3 or 4), and provides

input to a cascading analysis model. The cascading model checks several limits associated with generator and line operation, including generation minimum active power and line loading limits. Power flow analysis is conducted in each step of the cascade analysis to compute line flows, rebalance generation using participation factors, and solve for any load shedding.

In [3], VeenavatiJagadishprasad Mishra and Prof. Manisha D. Khardenvis have researched that Contingency Analysis of a power system is a major activity in power system planning and operation. In general an outage of one transmission line or transformer may lead to over loads in other branches and/or sudden system voltage rise or drop. Contingency analysis is used to calculate violations. This paper shows the example on 6 bus power system which gives information of violations & remedial action to remove violations. Detailed studies have been carried out to work out the contingency plans. In this paper, discussed about Line outage distribution factors and Power transfer factors, explained about Contingency analysis in the Energy Management System (EMS) and types of the violations and the remedial actions taken on the violations, then discussed 6-Bus case with the help of Power World Simulator and checked the results after taken the remedial actions.

In [4],R.Manikandan and M.Bhoopathi have researched in this paper that contingency analysis of power system is to predict the line outage, generator outage and to keep the system secure and reliable by using Load Flow method. This algorithm is more efficient for large power system and IEEE-14 bus is the test system for contingency analysis by using power world simulator. In this research the load flow problem is solved by full Newton method and algorithm, derived Generator outage and Line outage distribution factors for the system, then taken IEEE-14 Bus system and solved it by Power World Simulator and compared the results of both methods for single contingency and multiple contingencies. At last, checked voltage profile of violated and un violated lines by results

In [5],Nnonyelu, Chibuzo Joseph and Prof. Theophilus C. Madueme have studied As new sources of power are added to the Nigeria's power system, an over-riding factor in the operation of the power system is the desire to maintain security and expectable reliability level in all sectors –generation, transmission, and distribution.
They have studied also System security can be assessed using contingency analysis. In this paper, contingency analysis and reliability evaluation of Nigeria power system will be performed using the load flow method. This analysis will be used to determine the security level of power system. Contingencies are defined as potentially harmful disturbances that occur during the steady state operation of a power system. Contingencies can lead to some abnormalities such as over voltage at some buses, over loading on the lines, which if are unchecked, can lead to total system collapse. System security involves practices designed to keep the system operating in emergency state when components fail and to restore it to its preventive state.

Contingency analysis can be broken down into the following steps:

- Contingency definition
- Contingency selection
- Contingency evaluation

Three major line-loading limits are:

- The thermal limit,
- The voltage-drop limit, and
- The steady-state stability limit.

The ratio of the receiving end voltage and the sending end voltage must be greater than 0.95.Any power system should adopts the (Flexible AC Transmission), FACT devices as they can improve the lines active power capability in any contingency event as have faster switching than the traditional compensation devices.

In [6],Nirav J. Patel and Manish N. Sinha have described in this paper the power flow analysis of power system network using Power World Simulator with a view of estimating the real and reactive power flows, power losses in the entire network and phase angle. The entire system is modeled as electric networks and a solution is simulated using a digital program. Such a problem solution practice is called power flow analysis (Load Flow analysis).This analysis is used to evaluate the bus voltage, branch current, real power flow, reactive power flow for the specified generation and load conditions.

In general the power flow solutions are needed for the system under the following conditions:

- Various systems loading conditions (peak and off peak).
- With certain equipment outage.
- Addition of new generators.
- Addition of new transmission lines or cables. Interconnection with other systems.
- Load growth studies.
- Loss of line evaluation.

Power world simulator is a major tool to achieve the solution of the power flow problem. The 19 bus models for existing Navsari substation grid network was modeled in the edit mode of power world simulator.

In [7],R.H.Bhesdadiyaand C. R. Patel have studied that the recent trend is towards the deregulation in power markets around the world, transfer capability computation emerges as a key issue in running power system smoothly with multiple transactions and reactive power sources. Total Transfer Capability (TTC) is usually limited by overloaded transmission lines and voltage limits imposed at buses. This paper presents the procedure of ATC calculation and enhancement using powerful power world simulator software considering both thermal limits and voltage limits and enhancement using capacitor placement. The IEEE-6 bus test system is used in this paper to show the effect of capacitor on ATC. Power World Simulator is a power system visualization, simulation, and analysis tool. Power world has been developed to illustrate some of the basic aspects of operation of an interconnected, high voltage power system. Capacitors controlling the power flows in the network can help to reduce the flows in heavily loaded lines. The main objective function is to increase the total generation and load on specific source and sink nodes i.e. to enhance the capabilities of existing transmission lines considering thermal limits of transmission lines, voltage bounds of buses.

In [8], AtiyanaazL.Sayyed, Pramod M. Gadge,and RuhiUzma Sheikh have studied first contingency conditions are analyzed after that according to severity of contingency a real power flow performance index (PI) sensitivity based approach and the line outage distribution factor has been used to decide optimal location of series FACTS devices, Thyristor controlled series compensator(TCSC) and Thyristor controlled phase angle regulator(TCPAR) to restabilize the system. The effectiveness of the proposed controller has been tested on modified IEEE 14 bus system using Power world simulator 12.0 software. There is an interest in better utilization of available capacities by installing Flexible AC Transmission System (FACTS) devices such as thyristor controlled series compensators, thyristor controlled phase angle regulators and unified power flow controllers etc. These devices, by controlling the power flows in the network, can help to reduce the flows in heavily loaded lines, resulting in an increased loadability, low system loss, improved stability of the network and reduced cost of production. The increased interest in these devices is essentially due to increased loading of power systems and deregulation of power industry. From this paper it is concluded that the optimal locations of TCSC & TCPAR can be effectively decided based on the real power flow Performance index. Sensitivity factors which indicates the reduction of the total system real power loss and will also improve the system voltage profile. In this paper first line outage distribution factor has been calculated after that sensitivity index is being calculated and on comparing both the results we get the same ranking for TCSC and TCPAR and from that it is concluded that the best suitable Optimal location of TCSC and TCPAR.

Among all of the above study, my objective of present work is selection of power system contingencies by calculating the performance of transmission line outages using load flow analysis methods and power world simulator. Then solution of improvement of power system security by locating FACTS devices.

III. CONCLUSION

For any power system network it is necessary to carry out power flow analysis. It will be helpful to us in power system planning and design. It will be also useful to us in future expansion of network, contingency analysis and fault analysis. Contingency analysis study helps to strengthen the initial basic plan. It is also helpful to develop system operators to improve their ability to resolve problem. The contingency analysis in power world simulator is easy to run the power system and more reliable than compared with state estimation based contingency analysis. The security limits described from maximum violation of the element of test system and sensitivity analysis of both line outage distribution factor and generation shift factor. Sensitivity factors which indicates the reduction of the total system real power loss and will also improve the system voltage profile. Transmission Companies should adopts the (Flexible AC Transmission), FACT devices as they can improve the lines active power capability in any contingency event as have faster switching than the traditional compensation devices.

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AUTOMATIC LOAD FREQUENCY CONTROL OF MULTI AREA POWER SYSTEMS

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ABSTRACT *: In this paper variation in load brings about drifts in frequency and voltage which in turn leads to generation loss owing to the line tripping and also blackouts. These drifts might be reduced to the smallest possible value by automatic generation control (AGC) which constitutes of two sections viz, load frequency control (LFC) along with automatic voltage regulation (AVR). Here simulation evaluation is done to know the working of LFC by building models in SIMULINK which helps us to comprehend the principle behind LFC including the challenges. The multi area system is also being taken into consideration together with single area in addition to two area systems.*

Keywords-Load Frequency Control Space Analysis.(AGC) Automatic Generation Control

1.INTRODUCTION

The Power systems are very large and complex electrical networks consisting of generation networks, transmission networks and distribution networks along with loads which are being distributed throughout the network over a large geographical area [1]. In the power system, the system load keeps changing from time to time according to the needs of the consumers. So properly designed controllers are required for the regulation of the system variations in order to maintain the stability of the power system as well as guarantee its reliable operation. The rapid growth of the industries has further lead to the increased complexity of the power system. Frequency is greatly depends on active power and the voltage greatly depends on the reactive power. So the control difficulty in the power system may be divided into two parts. One is related to the controlof the active power along with the Frequency whereas the other is related to the reactive power along with the regulation of voltage [2]. The active power Control and the frequency control are generally known as the Automatic Load Frequency Control (ALFC).Basically the Automatic Load Frequency Control (ALFC) deals with the regulation of the real power output of the generator and its frequency (speed). The primary loop is relatively fast where changes occur in one to several seconds. The primary control loop reacts to frequency changes through the speed governor and the steam (or hydro) flow is managed accordingly to counterpart the real power generation to relatively fast load variations. Thus maintain a megawatt balance and this primary loop performs a course speed or frequency control. The secondary loop is slower compared to the primary loop. The secondary loop maintain the excellent regulation of the frequency, furthermore maintains appropriate real power exchange among the rest of the pool members. This loop being insensitive to quick changes in load a s well as frequency although it focuses on swift changes which occurs over periods of minutes. Load disturbance due to the occurrence of continuous and frequent variation of loads having smaller values always creates problem for ALFC. Because of the change in the active power demand/load in an area, tie-line power flows from the interconnected areas and the frequency of the system changes and thus the system becomes unstable. So we need Automatic Load Frequency Control to keep up the stability at the time of the load deviations. This is done by minimizing transient deviations of frequency in addition to tie-line power exchange and also making the steady state error to zero [3]. Inequality involving generation with demand causesfrequency deviations. If the frequency is not maintained within the scheduled values then it may lead on the way to tripping of the lines, system collapse as well as blackouts.

2.DYNAMICS OF THE POWER SYSTEM

The automatic load frequency control loop is mainly associated with the large size generators. The main aim of the automatic load frequency control (ALFC) can be to maintain the desired unvarying frequency, so as to divide loads among generators in addition to managing the exchange of tie line power in accordance to the scheduled values. Various components of the automatic load frequency control loop are as given away in the Fig

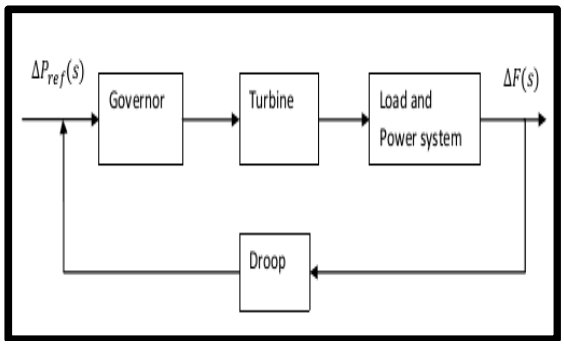

Fig 1: Block diagram of Automatic load frequency control.

3.TURBINES

Turbines are used in power systems for the conversion of the natural energy, like the energy obtained from the steam or water, into mechanical power (Pm) which can be conveniently supplied to the generator. There are three categories of turbines usually used in power systems: non-reheat, reheat in addition to hydraulic turbines, each and every one of which may be modelled and designed by transfer functions. We have non-reheat turbines which are represented as first-order units where the delay in time known as time delay (Tch) takes place between theinterval during switching of the valve and producing the torque in the turbine. Design of reheat turbines is done by using second-order units as there are different stage because of soaring and low down of the pressure of the steam. Because of the inertia of the water hydraulic turbines are treated as non-minimum phase units. The turbine model represents changes in the steam turbines power output to variation in the opening of the steam valve. Here we have considered a non-reheat turbine with a single gain factor K_T and single time constant T_T. In the model the representation of the turbine is,

$$\frac{\Delta P_T(s)}{\Delta P_v(s)} = \frac{K_T}{1 + sT_T} \qquad (1)$$

Where $\Delta P_v(s)$ = the input to the turbine
$\Delta P_T(s)$ =the output from the turbine

4.GENERATORS

Generators receive mechanical power from the turbines and then convert it to electrical power. However our interest concerns the speed of the rotor rather than the power transformation. The speed of the rotor is proportional to the frequency of the power system. We need to maintain the balance amid the power generated and the power demands of the load because the electrical power cannot be stored in bulk amounts. When there is a variation in load, the mechanical power given out by the turbine does not counterpart the electrical power generated by the generator which results in an error which is being integrated into the rotor speed deviation ($\Delta\omega$). Frequency bias $\Delta f = 2\pi\Delta\omega$ The loads of the power can be divided into resistive loads (P_L), which may be fixed when there is a change in the rotor speed due to the motor loads Which change with the speed of the load. If the mechanical power does not change then the motor loadsshall compensate. The change in the load at a rotor speed which is completely dissimilar from the planned value. Mathematically,

$$\frac{\Delta P_v(s)}{\Delta P_g(s)} = \frac{1}{1 + sT_g} \qquad (2)$$

Where,
$\Delta P_v(s)$= the output from the generator
$\Delta P_g(s)$ = the input to the generator
T_g= time constant of the generator

5.GOVERNORS

Governors are employed in power systems for sensing the bias in frequency which is the result of the modification in load and eliminate it by changing the turbine inputs such as the characteristic for speed regulation (R) and the governor time constant (Tg). If the change in load occurs without the load reference, then some part of the alteration can be compensated by adjusting the valve/gate and the remaining portion of the alteration can be depicted in the form of deviation in frequency. LFC aims to limit the deviation in frequency in the presence of changing active power load. Consequently, the load reference set point can be utilized for adjusting the valve/gate positions so as to cancel all the variations in load by controlling the generation of power rather than ensuing deviation in frequency.
Mathematically,

$$\Delta P_g(s) = \Delta P_{ref}(s) - \frac{1}{R}\Delta F(s) \qquad (3)$$

Where, $\Delta P_g(s)$ = governor output
$\Delta P_{ref}(s)$= the reference signal
R = regulation constant or droop
$\Delta F(s)$= frequency deviation due to speed.

6.LOAD

The power systems load constitutes of a diversity of electrical devices. The loads that are resistive, for example lighting and also heating loads are not dependent on frequency, but the motor loads are responsive to frequency depending on the speed-load characteristics as shown here,

$\Delta P_e = \Delta P_L + \Delta\omega$
Where, ΔP_L = non frequency responsive load change
D $\Delta\omega$= frequency responsive load change
$D = {}^{\%\text{change in load}}/_{\%\text{change in frequency}}$

7.AUTOMATIC GENERATION AND CONTROL

The schematic diagram of AGC is shown below. It consists of speed valve controller, turbine, generator and governor. Any change in load is reflected on the frequency. The change in frequency is compared with a reference speed setting. A steam valve controller is used to regulate the steam valve there by increasing the power output from the generators resulting in matching of generation and demand. As a result the frequency is restored to the original value. The generators are grouped together to form a coherent network. Based on this the network can be classified as single area or two area systems as discussed below.

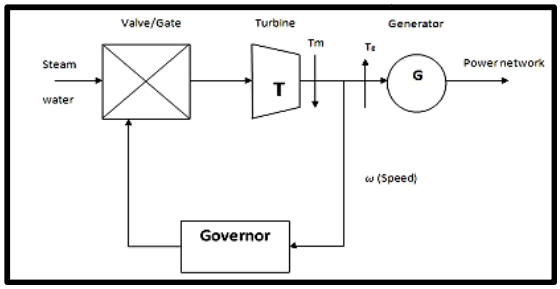

Fig 2: schematic of AGC Model of AGC of a single Area

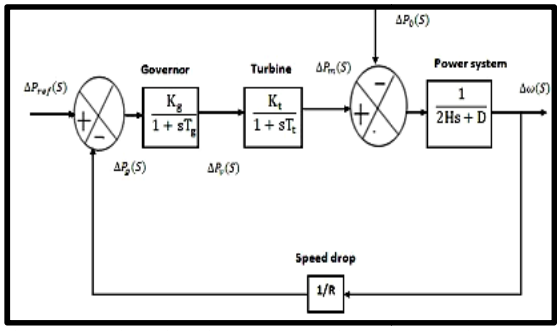

Fig. 3 : Model of a Single Area without secondary Loop [2]

Where, ΔPo is the load disturbance and ΔP_{ref} is the incremental speed reference setting.
The Automatic Load Frequency Control (ALFC) loop shown in fig. is called the primary ALFC loop. It achieves the primary goal of real power balance by adjusting the turbine output ΔPm to match the change in load demand ΔPO.
The transfer equation of the system can be given as:

$$KG_{(s)}KH_{(s)} = \frac{1}{R}\frac{1}{(2Hs+D)(1+\tau gs)(1+\tau Ts)}$$

$$\frac{\Delta\omega(s)}{-\Delta PL(s)} = \frac{(1+\tau gs)(1+\tau Ts)}{(2Hs+D)(1+\tau gs)(1+\tau Ts)+\frac{1}{R}}$$

$$\Delta\omega(s) = -\Delta Po(s)T(s)$$

For the case with no frequency-sensitive load (D=0),

$$\Delta\omega(ss) == (-\Delta Po)R$$

Where Δω is the frequency drift for the step change in load ΔPL. The above equation gives the steady state value of the Frequency drift following a load disturbance and it can be inferred that the system's new operating frequency will be less than the nominal value due to the load disturbance. However from the stability point of view, the frequency drift should be brought down to zero or to a level acceptable for stable operation and this is done with the help of a secondary loop shown below.

B. Single Area (with secondary loop)

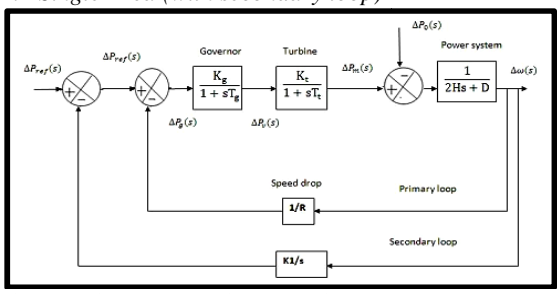

Fig. 4 : Single Area with secondary Loop[2]

The ALFC loop shown in Fig. achieves the primary goal of real power balance by adjusting the turbine output ΔPm to match the change in load demand ΔPo. But a change in load results in a steady state frequency deviationΔω. The restoration of the frequency to the nominal value requires an additional control loop called the supplementary loop. This objective is met by using an integral controller which makes the frequency deviation zero. The ALFC with the supplementary loop is generally called the AGC. The block diagram of an AGC is shown figure .The main requirement in the frequency control is to make-Δω=0. So the speed changer setting is changed in response to Δω(s) through an integrator. For this purpose the signal from Δω(s) is fed back through an integrator block (1/s) to adjust ΔPref so as to bring the frequency to the steady state value. Because of the secondary loop the steady state value of Δω(s)=0. Thus the integral action results in automatic adjustment of ΔPref so as to make Δω=0. This action is rightly called Automatic Generation Control. The transfer function with the integral group is given below [2].

$$\omega = \frac{1}{D+\frac{1}{R}}[\Delta P_{ref} - \Delta P_0] \qquad (4)$$

B. Two Area system and tie line flow

1) With primary loop

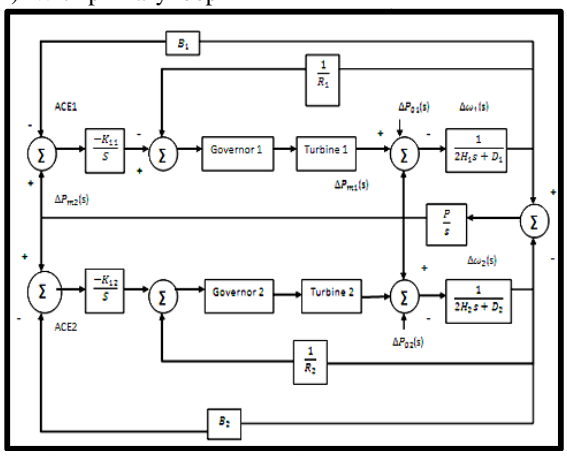

Fig. 5 : Two Area System (without secondary Loop) [2]

The model is similar to the Single Area System but with the additional input of ΔP_{12}.Suppose there is a change in load(ΔPo) in area1, the frequencies of the two area systems settle to a steady state value.

$\Delta\omega = \Delta\omega_1 = \Delta\omega_2$

A typical control area consists of number of generators coupled together and operating in unison. The combination of turbine-generators with AFC can be grouped under a system referred to as a Control Area. The two areas are connected by means of a tie line with a reactance X12.Then the power delivered out of area 1 to area 2 will be given as P12. This power is known as tie line power and is given in (6)

$$P_{12} = \frac{|E1|\,|E2|}{X12}\sin\delta 12 \qquad (5)$$

Where $X_{12}=X_1+X_{tie}+X_2$ and $\delta_{12}= \delta_1+ \delta_2$ Equation can be linearized

$$\Delta P_{12} = \left.\frac{dP_{12}}{d\delta_{12}}\right|_{\delta_{120}} \Delta\delta_{12} = P_s \Delta\delta_{12} \quad (6)$$

The tie-line power derivation

$\Delta P_{12}=Ps(\Delta\delta_1-\Delta\delta_2)$ (7)

Consider a change in load ΔP_0 in area1. The steady state frequency deviation $\Delta\omega$ is the same for both the areas. That is $\Delta\omega= \Delta\omega_1= \Delta\omega_2$ Thus,for real we have [2]

$\Delta P_{m1}- \Delta P_{12}- \Delta P_{01} =\Delta\omega D_1$ (8)

$\Delta P_{m1}- \Delta P_{m1}= \Delta P_{12} =\Delta\omega D_1$ (9)

where, ΔP_{12} is the tie line power flow from Area1to Area 2; and for Area

$\Delta P_{m1}=\frac{-\Delta\omega}{R1}$ (10)

$\Delta P_{m2}=\frac{-\Delta\omega}{R1}$ (11)

Substituting these equations, yields

$\left(\frac{1}{R}+D\right)\Delta\omega = -\Delta P_{12} - \Delta P_{D1}$ (12)

$\left(\frac{1}{R}+D\right)\Delta\omega = \Delta P_{12}$ (13)

Solving for$\Delta\omega$,we get

$$\frac{-\Delta P_{O1}}{\left(1/R_1+D_1\right)+\left(1/R_2+D_2\right)} = \frac{-\Delta P_{O1}}{\beta_1+\beta_2} \quad (14)$$

$$\Delta P_{12} = \frac{-\Delta P_{01}\beta_1}{\beta_1+\beta_2} \quad (15)$$

where, β1andβ2 are the composite frequency response characteristic of Area1 and Area 2 respectively [2]. An increase of load in area1 byΔP_{01}results in a frequency reduction in both areas and a tie-line flow ofΔP_{12}12. A positive ΔP_{12} is indicative of flow from Area1 to Area 2 while a negative ΔP_{12}means flow from Area 2 to Area1. Similarly, for a change in Area 2 load by ΔP_{02}, we have $\Delta\omega$ as

$\Delta\omega=\frac{-\Delta P12}{\beta1+\beta2}$ and

$\Delta P_{12}=- \Delta P_{21}=\frac{-\Delta P12\beta1}{\beta1+\beta2}$

2) Frequency bias tie line control

The tie line deviation reflects the contribution of regulation characteristic of one area to another. The basic objective of supplementary control is to restore balance between each area load generation. This objective is met when the control action maintains frequency at the scheduled value. The supplementary control should ideally correct only for changes in that area. In other words, if there is a load change in Area1, there should be supplementary control only in Area1 and not in Area 2. For this purpose the area control error (ACE) is used [2]. The ACE of the two areas are given by

For area 1: $ACE1 = \Delta P_{12}+ \beta1\Delta\omega$ (16)

For area 2: $ACE2 = \Delta P_{21}+ \beta2\Delta\omega$ (17)

In an interconnected (multi area) system, there will be one ALFC loop for each control area (located at the ECC of that area). They are combined as shown inFig. for the interconnected system operation. For a total change in load of ΔP_D the steady state deviation in frequency in the two areas is given by [2]

$$\Delta\omega = \frac{-\Delta P_{L1}}{\left(\frac{1}{R_1}+D_1\right)+\left(\frac{1}{R_2}+D_2\right)} = \frac{-\Delta P_{L1}}{\beta_1+\beta_2} \quad (18)$$

Where

$\beta_1 = \frac{1}{R_1}+D_1$ (15) and $\beta_2 = \frac{1}{R2}+D2$ (19)

3) Two Area system (with secondary loop)

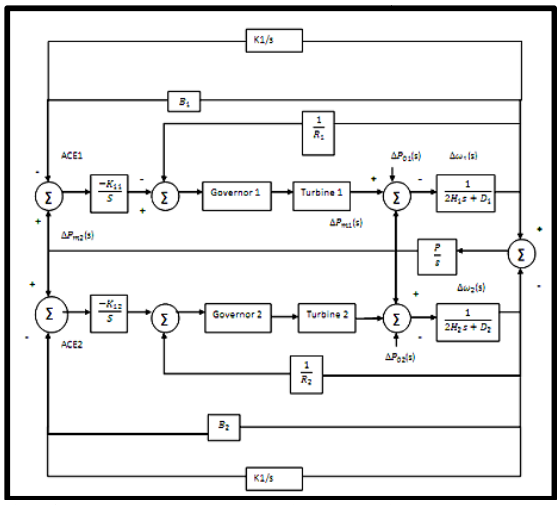

Fig. 6 : Two Area System (with secondary Loop)

[2]ACEs are used as actuating signals to activate changes in the reference power set points, and when steady-state is reached, $\Delta P_{12} and\ \Delta\omega$ will be zero. The integrator gain constant must be chosen small enough so as not to cause the area to go into a change mode. The block diagram of a simple AGC for a two-area system is shown in fig . Conventional LFC is based upon tie-line bias control, where each area tends to reduce the area control error (ACE) to zero. The control error for each area tends to consists of linear combination of frequency and tie-line error [2].

$ACEi = \sum nj = \Delta Pij + Ki\Delta\omega$ (20)

8.INTERCONNECTED AREAS IN A POWER SYSTEM

The four area power system model identified in the present study has the following configuration;
(i) It is a four area interconnected power system consisting of identical single stage reheat thermal turbines.
(ii) The four areas are interconnected via HVAC tie line in parallel with HVDC link.

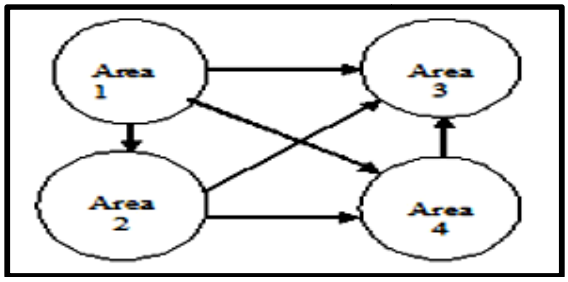

Fig 7: Tie-lines connected with four area

Let
ACE1 = Area control error of area 1
ACE2 =Area control error of area 2
ACE3 = Area control error of area 3
ACE4 = Area control error of area 4
In this control, ACE1, ACE2, ACE3 and ACE4 are made linear combination of frequency and tie line power error.

9.GA AND ITS APPLICATION IN AGC

An optimal AGC strategy based on the linear state regulatory theory requires the feedback of all state variables of the system for its implementation, and an optimal control feedback law is obtained by solving the non-linear Riccati equation using suitable computational technique. To illustrate the effectiveness of the proposed control design and the algorithm to tune the feedback gains to the controller, a two area
Restructured power system having two
GENCOs and two DISCOs in each area is
considered. The time-invariant state space
representation as feedback gains to the controller, a two area

Restructured power system having two GENCOs and two DISCOs in each area is considered. The time-invariant state space representation as:

$X = A.X + B.U$ (1)

$Y = C.X$

Where X is the state vector and, U is the control vector and Y is the output variable.

$U = [\Delta PL1\ \Delta PL2\ \Delta PL3\ \Delta PL4 \quad \Delta Pd1\ \Delta Pd2]^T$ (2)

For the system defined by the Eq.(1) and (2), the feedback control law is given as

$U = -K.Y$

Where K is the feedback gain matrix. In this paper Evolutionary Genetic algorithms is used to optimize the feedback gains of the controller. Genetic algorithm (GA) is an optimization method based on the mechanics of natural selection. In nature, weak and unfit species within their environment are faced with extinction by natural selection. The efficiency of the GA gets increased as there is no need to encode/decode the solution variables into the binary type .Steps in genetic algorithm

I) reproduction.

II) Crossover.

III) Mutation.

10.SIMUALTION DIAGARM FOR TWO AREA POWER SYSTEM USING GETICALGORITHM.

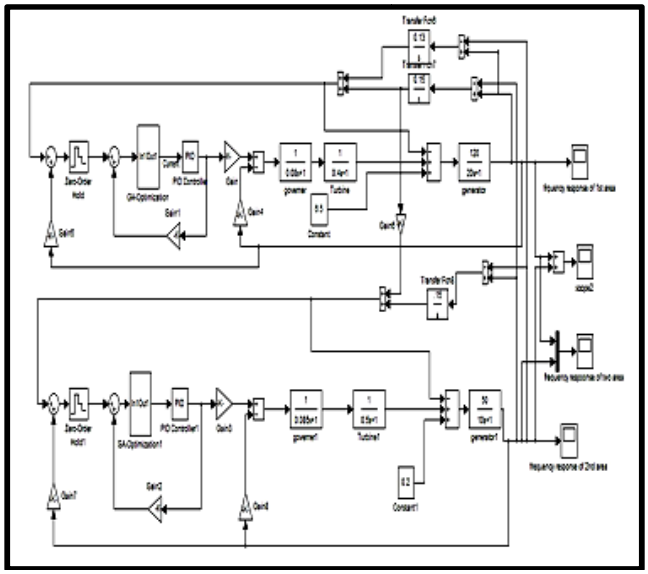

Fig 8 : **Simulation diagram of two area power system using G.A.**

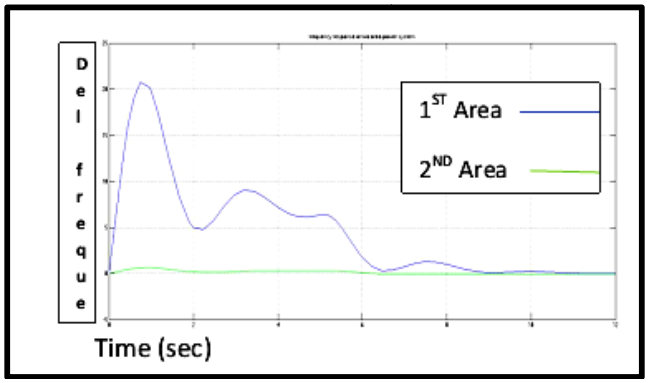

Fig-9 : **Result of two area power system using G.A**

11.CONCLUSION

In this paper we study the Load Frequency Control of automatic generation control of two area power system using genetic algorithm for different loads , the system stability and performance drastically over the pole

placement method with extensively depended on trial and error process. In fact there is a huge scope of improvement in this area where the power system study can be extended to a multi-area system that shall ensure stability in closed loop system. And we obtain the different settling time for neural approach and for genetic algorithm approach**.**

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A COMPARATIVE ANALYSIS OF THE IMPACT OF TRAINING AND DEVELOPMENT ON QUALITY OF WORK LIFE OF EMPLOYEES WORKING IN PRIVATE AND PUBLIC MANUFACTURING INDUSTRIES

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ABSTRACT *:Quality of Work Life (QWL) of employees in any organization plays a very vital role in shaping of both the employees and the organization. The objective of this research is to highlight the prominence of training and development programmes adopted in manufacturing industries encompassing the private and public sectors and the impact that it exerts on the quality of work life of employees in these sectors.*
It is assumed that employees who undergo T & D programme either in private or public sectors enjoy better QWL. Here a comparative study among the employees of private and public manufacturing industries is carried out to measure the QWL of employees in these respective sectors. Hence the research concludes that the QWL enjoyed by the employees of private industries is superior to the QWL of employees of public industries.

KEYWORDS:Quality of Work Life (QWL) and Training and Development (T & D)

1. INTRODUCTION

Quality of work life

The term ‘‘Quality of Work Life’’ (QWL) was originated from the concept of open socio-technical system designed in the 1970s that helps to ensure autonomy in work, interdependence, and self-involvement with the idea of ‘‘best fit’’ between technology and social organizations [1] The importance of QWL gained huge importance in almost every domain of work environment. Indeed many Management pioneers have contributed volumes of their work related to QWL in order to bring forth the conditions of QWL at environment to improve the same. Although there are many definitions of QWL by various scholars, management gurus, thinkers, scientists etc. one of the definition is as follows;

“QWL is the extent to which employees can enhance their personal lives through their work environment and experiences.”[2]

Quality of working life is a degree to which members of a work organization are able to satisfy their personal needs through their experience in the organization. Its focus is on the problem of creating a human work environment where employees work cooperatively and contribute to the organizational objectives. The indicators of QWL are *job involvement, job satisfaction and productivity.*

Work plays a central role in the life of the worker engaged in a productive organization. It has an important impact on:

a. Shaping his/her personality.
b. Determining his/her performance.
c. Commitment to fellow employees.
d. Commitment to organizational society.

The workers expect the following needs to be fulfilled by their organization.

i. Adequate pay:

QWL is basically built around the concept of equitable pay. The employees must be paid their due share in the progress and prosperity of the firm.

ii. Employment benefits:

Workers have raised their expectations over the years and now feel entitled to benefits that were once considered a part of the bargaining process. They want a share in profit of the organization in medical, housing and welfare facility.

iii. Job security:

Employees want stability of employment. They do not like to be the victims of whimsical personal policies of employers. The workplace should offer security of employment layoffs and retrenchments are opposed tooth and nail by all the categories of employees these days.

iv. Job satisfaction:

The workers are living beings. They want to work on jobs that will utilize their talents and thus satisfy them. The management must enrich the job and redesign the jobs in such a manner that workers feel satisfied.

.**Training and Development**

Training can be stated as the method(s) which is imparted to the employee in fulfilling the organizational goals [3]. Organizations involving in the evaluation of training effectiveness are not only responsible for what the employees learn but they need to see that the knowledge which the employee gained is being applicable in their work performance.Training and its regular evaluation would definitely make an organization to stand in the lime light in achieving the objectives.

Background

According to Hackman and Oldham (1976)[4,5,6]psychological growth needs as relevant to the consideration of Quality of working life. Such needs are identified as Skill variety, Task Identity, Task significance, and Autonomy and Feedback. Taylor (1979)[7] more pragmatically identified the essential components of quality of working life as basic extrinsic. job factors of wages, hours and working conditions, and the intrinsic job notions of the nature of the work itself. He suggested that a number of other aspects could be added, which includes Employee participation in the management, Fairness and equity, Social support, Self development, Social relevance of the work or product.

Further, Warr and colleagues (1979)[8], in an investigation of quality of working life, considered a range of apparently relevant factors, including Work involvement, Intrinsic job motivation, Job satisfaction, Life satisfaction, Personality factors and Psychological well-being. Mirvis and Lawler (1984)[9] **s**uggested that quality of working life was associated with satisfaction with wages, hours and working conditions, describing the "basic elements of a good quality of work life" are Safe work environment, Equitable wages, Equal employment opportunities and Opportunities for advancement. Baba and Jamal (1991) [10] listed what they described as typical indicators of quality of working life, including Job satisfaction, Job involvement, Work role ambiguity, Work role conflict, Work role overload, Job stress and Organizational commitment.

Karthik R. (July 2013), states that the secret to work-life balance will vary depending on field of work, family structure and financial position. Personal life and professional work are two sides of coin and it is very difficult to separate and form a source of conflict. Companies must strive to develop a special bond with its people, so that they will put in more into their jobs and contribute positively. It is important to recognize that any policies to be initiated by organizations should be carefully tailored to suit the life stages of employees.

Satyakumar. J and Raja Ram Iyer (September 2012) acknowledges that the ability to perceive the environment and adapt to the various changes and stress is crucial in a dynamic era where the quality of work life depends on various factors which cannot always complement each other. This study has shown that a person's emotional intelligence is positively correlated with the quality of work life and greater the quality of work life people perceive their environment better and adjust to stress, change etc in their own unique way. It was found there exist a positive correlation between EI and QWL. It was also found that women marginally lower in EI and QWL as compared to males. There was no considerable difference noticed between academic and non-academic teaching staffs.

Donald Kirkpatrick (1950)[11,12], there are four levels of training evaluation, viz. Level 1 —Reaction, Level 2 — Learning, Level 3 —Behavior and Level 4 —Results, by the virtue of which there are several positive outcomes.M L Monga and Ashok Maggu attempts to find out the Quality of Work Life's influence on the individual and organizational health of public sector in India, wherein QWL in the Indian public sector is poor and there exists a significant gap between what the mangers expect and what they have. This gap was significant on all the determinants of the QWL in the public sector and the socio-personal work related factor could not influence the perception of the work life.

2. MAIN THRUST OF THE PAPER

From the literature survey it is evident that, work pertaining to the impact of training and development on quality of work life of employees working in public and private manufacturing industries is seldom carried out and there lies a huge scope for research in this area. This piece of research brings out a comparison between public and private manufacturing sectors with respect to the quality of work life and training and development practices or techniques adopted in these sectors. From the literature review some key dimensions of both quality of work life and training and development techniques are adopted so as to establish a comparative study among

these two sectors. Some four dimensions pertaining to quality of work life and training and development which are recognized from the literature survey are Skill variety, Task identity, Task significance and Self-development.

The instrument used to quantify the comparison between private and public sectors was a structured questionnaire comprising of questions related to the above mentioned dimensions. The questionnaire was administered to a considerable population working in public and private manufacturing sectors that too confined to the supervisory level employees. The employees were supposed to rate on a five point Likert scale (1- Strongly agree, 2- Agree, 3- Not decided, 4- Disagree and 5- Strongly disagree).

Once the responses were obtained the reliability analysis was carried out and the value of Cronbach Alpha by test and re-test method was found to be 0.889 for the mentioned nine dimensions.

Table 1. Reliability Analysis

Cronbach's Alpha	N of Items
0.881	15

Hence the value of Cronbach Alpha was an impetus to carry out the research further. Thus a comparative study among the private and public sectors in view of the four dimensions and its attributes was done whose results are discussed below.

Table 2.Major dimensions and its attributes

Sl. No.	Dimensions	Items/Attributes
1.	Skill variety	1.Learning organization
2.	Task Identity	1. Recognition 2. Appreciation 3. Respect
3.	Task significance	1. Job security
4.	Self-development	1. Career growth 2. Organizational support 3. Promotional avenues 4. Work culture

Dimension 1- Skill variety: One of the major attribute of skill variety is "Learning organization" and the questions/features arising from this attribute is encouragement and support for continuous learning (Q1), tolerance for mistakes(Q2), encouragement for experimentation(Q3) and dissemination of knowledge(Q4). The following chart gives a comparison between private and public manufacturing sectors with respect to the above mentioned questions.

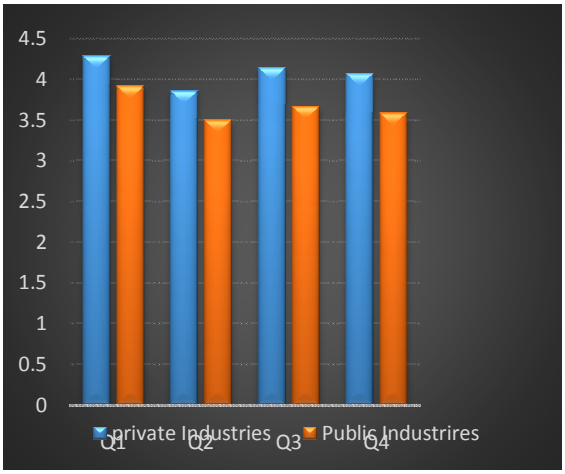

Figure 1-Features of Skill variety (Learning organization)

Inference: It is evident from the chart that private industries enjoy higher level of skill variety than the public industries.

Dimension 2-Task Identity: The attributes of Task identity are Recognition, Appreciation and Respect and the questions arising from these attributes are performance recognition (Q9), rewards for efforts (Q10), productive effort (Q11) and achievement recognition (Q12). The following chart gives a comparison between private and public manufacturing sectors with respect to the above mentioned questions.

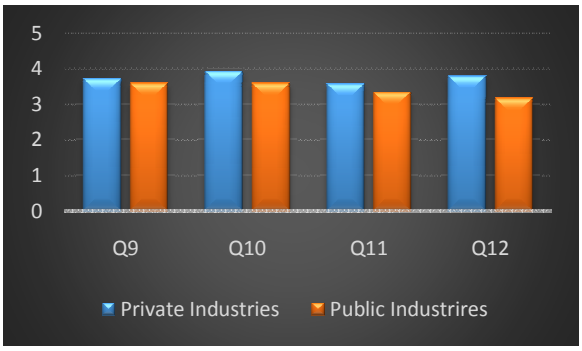

Figure 2-Features of Task Identity (performance recognition, rewards for efforts, productive effort achievement recognition)

Inference: It is evident from the chart that private industries enjoy higher level of Task identity than the public industries.

Dimension 3 –Task significance: The attributes of Task significance is Job security and the questions arising from this attribute are continuance of employment (Q17 –Reverse coring) and secure feeling about the job and leading to concentration on work (Q18). The following chart gives a comparison between private and public manufacturing sectors with respect to the above mentioned questions.

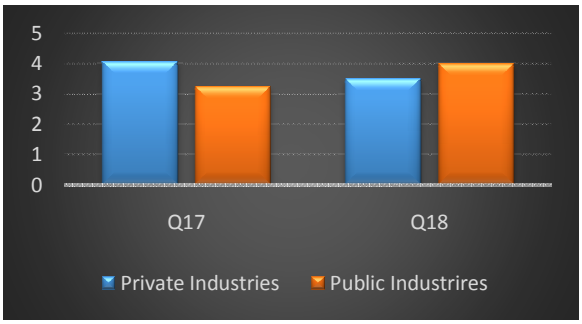

Figure 3-Features of Task significance (continuance of employment and secure feeling about the job and leading to concentration on work.)

Inference: From the chart it is observed that Continuance of employment is more promising in public industries than private ones, nevertheless when it comes to secure feeling about the job leading to concentration on one's own work, the nod again goes to the public sector.

Dimension 4 - Self-development: The attributes of Self-development are Career growth, Organizational support, Promotional avenues and Work culture and their respective questions are career path (Q24), overall support for self-development (Q25), promotional avenues (Q26-Reverse coring), harmonious work culture (Q27) and culture that enables to appreciate acceptable norms, behavior, attitudes, values, dress and so on (Q33). The following chart gives a comparison between private and public manufacturing sectors with respect to the above mentioned questions.

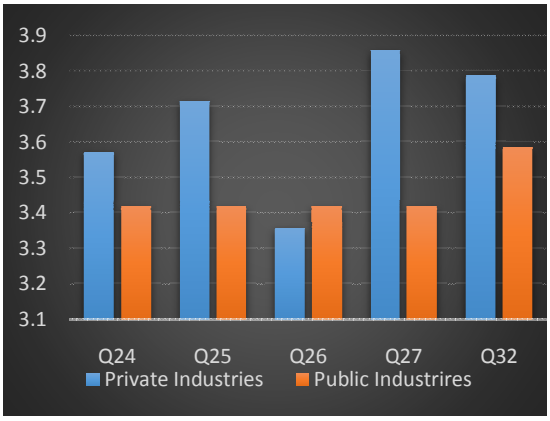

Figure 5-Features of Self-development (career path, overall support for self-development, promotional avenues, harmonious work culture, culture that enables to appreciate acceptable norms)

Inference: From the chart it is evident that career path is more promising in private industries rather than in public industries. Secondly overall support for self-development is appreciable in private industries comparatively. On the contrary promotional avenues are better in public industries when compared to private industries. Last but not the least harmonious work culture is dramatically higher in private sector rather than in public sector. Finally culture that enables to appreciate acceptable norms, etc., is pretty higher in private than in public industries.

3. FUTURE TRENDS

The research carried out is a sincere effort to project the condition of employees working in both private and public sectors in connection with the quality of work life and training and development practices, which are measured as two separate domains. But there lies a huge scope for the research pertaining to the impact of training and development on quality of work life of employees working in public and private manufacturing sectors.

4. CONCLUSION

It is evident from the above discussion and the charts describing the dimensions and its pertinent attributes that private manufacturing industries have a higher edge gas compared to the public manufacturing industries. The Dimensions such as skill variety, Task identity and Task significance fair better in private Manufacturing industries as compared to public manufacturing industries. But when it n it comes to "Self-development", all the attributes have a upper hand in private manufacturing industries except for 'promotional avenues', which fair better in public sector rather than in private ones.

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COMPARATIVE STUDY ON THERMAL ANALYSIS OF SHELL AND TUBE HEAT EXCHANGER WITH PLAIN TUBE AND CORRUGATED TUBE

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ABSTRACT : *In this work Comparative Study on Thermal Analysis of Shell And Tube Heat Exchanger with Plain Tube and Corrugated Tube by doing firstly Thermal design calculation by TEMA(Tabular Manufacturer Association) Standard .of Shell and tube heat exchanger as oil cooler type. And then this type of STHX with Plain tube compare with Corrugated tube for different characteristics parameters like heat transfer rate, overall heat transfer coefficient, efficiency, effectiveness pressure drop etc. for in order to increase heat transfer rate, efficiency, heat transfer area and reduce pressure drop. The characteristics parameters of the corrugated tube :height-to-diameter ratio (e/D) , relative pitch ratio (p/e), relative helix angle (β) and CFD Analysis of particular tube pattern like triangular tube pattern, rotated square tube pattern, corrugated tube pattern spiral type pattern are also will do. Shell and Tube Heat Exchanger is indirect contact type heat exchanger as it consist of series of tubes, through which one of fluid runs. They are widely used in petroleum refineries, chemical plants, petrochemical plants, air conditioning, refrigeration and automotive application. In CFD Analysis Software geometry can do by Gambit 2.3 software and analysis can do by fluent software. This literature review focuses on the performance and Thermal Design with validate to CFD Analysis.*

Key Words: Shell and tube Heat Exchanger, TEMA Standard, Computational Fluid Dynamics, LMTD.

1. INTRODUCTION

A shell and tube heat exchanger is a class of heat exchanger designs. It is the most common type of heat exchanger in oil refineries and other large chemical processes, and is suited for higher-pressure applications. As its name implies, this type of heat exchanger consists of a shell (a large pressure vessel) with a bundle of tubes inside it. One fluid runs through the tubes, and another fluid flows over the tubes (through the shell) to transfer heat between the two fluids. The set of tubes is called a tube bundle, and may be composed of several types of tubes: plain, longitudinally finned, etc. Shell and tube heat exchanger design is based on correlations between the Kern method and Bell-Delaware method [16], Shell and tube heat exchangers are the most common of the various types of unfired heat transfer equipment which are used in the industrial fields such as process industries, conventional and nuclear power stations, petroleum refining and steam generation. Although they are not especially compact they are robust and their rugged shapes make then well suited for high pressure operations. Moreover they are versatile and can be designed to suit for almost any application. Due to technological advancement and growth of industrial processes as well as the environmental and Energy concerns, heat exchanger systems must be improved to transfer heat more efficiently.[4] The basic principle of operation is very simple as flows of two fluids with different temperature brought into close contact but prevented from mixing by a physical barrier. Then the temperature between two fluids tends to equalize by transfer of heat through the tube wall. The fluids can be either liquids or gases on either the shell or the tube side. In order to transfer heat efficiently, a large heat transfer area should be used, leading to the use of many tubes. In this way, waste heat can be put to use. This is an efficient way to conserve energy. Counter current heat exchangers are most efficient because they allow the highest log Mean temperature difference between the hot and cold streams. Many companies however do not use single pass heat exchangers because they can break easily in addition to being more expensive to build. Often multiple heat exchangers can be used to simulate the counter current flow of a single large exchanger. Shell-and-tube exchangers are designed and fabricated according to the standards of the Tubular Exchanger Manufacturers Association (TEMA). [18]

Components of STHX [15]:
It is essential for the designer to have a good working knowledge of the mechanical features of STHEs and how they influence thermal design. The principal components of an STHE are:
• shell;
• shell cover;
• tubes;
• channel;
• channel cover;
• tubesheet;

Other components include tie-rods and spacers, pass partition plates, impingement plate, longitudinal baffle, sealing strips, supports, and foundation.

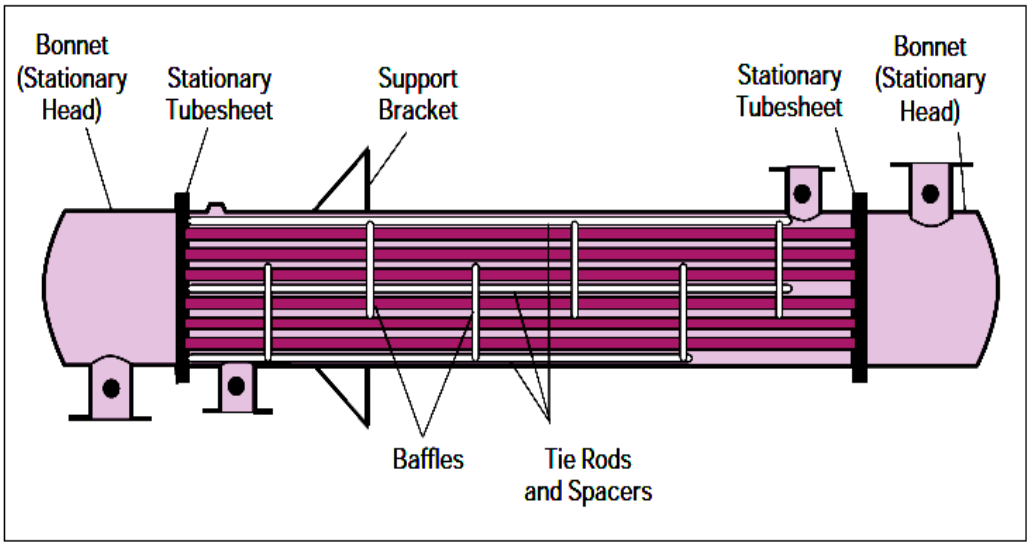

Figure 1 fixed Tube sheet Heat Exchanger [15]

A fixed-tube sheet heat exchanger (Figure 1) has straight tubes that are secured at both ends to tube sheets welded to the shell. The construction may have removable channel covers (*e.g.,* AEL), bonnet-type channel covers (*e.g.,* BEM), or integral tube sheets (*e.g.,* NEN). [15]
The principal advantage of the fixed tube sheet construction is its low cost because of its simple construction. In fact, the fixed tube sheet is the least expensive construction type, as long as no expansion joint is required. Other advantages are that the tubes can be cleaned mechanically after removal of the channel cover or bonnet, and that leakage of the shell side fluid is minimized since there are no flanged joints.[15]
A disadvantage of this design is that since the bundle is fixed to the shell and cannot be removed, the outsides of the tubes cannot be cleaned mechanically. Thus, its application is limited to clean services on the shell side.[15]
Here, Shell and Tube Heat Exchanger is Fixed Tube-sheet and Counter Flow Type Heat Exchanger. Here, Shell side fluid is crude oil and tube side fluid is ammonia gas. Crude oil is hot fluid And Ammonia Gas is Cold fluid. We are designing and Analysis of oil cooler due to the problem of Large Pressure Drop at shell side, Large Pressure Drop at tube side, Less Heat Transfer rate and Cost is very high.

2. DESIGN CONSIDERATION [2]
In designing heat exchangers, a number of factors that need to be considered are:
1. Resistance to heat transfer should be minimized
2. Contingencies should be anticipated via safety margins; for example, allowance for fouling during operation.
3. The equipment should be sturdy.
4. Cost and material requirements should be kept low.
5. Corrosion should be avoided.
6. Pumping cost should be kept low.
7. Space required should be kept low.
8. Required weight should be kept low.

Shell and tube heat exchanger design is based on correlations between the Kern method and Bell-Delaware method. [16]

In **Bell‟s method** the heat-transfer coefficient and pressure drop are estimated from correlations for flow over ideal tube-banks, and the effects of leakage, bypassing and flow in the window zone are allowed for by applying correction factors. This approach will give more satisfactory predictions of the heat-transfer coefficient and pressure drop than Kern‟s method; and, as it takes into account the effects of leakage and bypassing, can be used to investigate the effects of constructional tolerances and the use of sealing strips. Bell- Delaware method is more accurate method and can provide detailed results. [16]

In **Kern's method**-is based on experimental work on commercial exchangers with standard tolerances and will give a reasonably satisfactory prediction of the heat-transfer coefficient for standard designs. The prediction of pressure drop is less satisfactory, as pressure drop is more affected by leakage and bypassing than heat transfer. The shell-side heat transfer and friction factors are correlated in a similar manner to those for tube-side flow by using a hypothetical shell velocity and shell diameter. [16]

TEMA STANDARDS [17]

Shell and Tube Heat Exchanger are designed by TEMA Standards. TEMA means Tabular Exchanger Manufactures Association. A different class of TEMA Standards is as follow:

CLASS R Covers Exchangers for the generally severe duties of the Petroleum and related industries.

CLASS C Covers Exchangers for moderate duties in commercial and general process application.

CLASS B Covers Exchangers for use in the chemical process industries.

3. LITERATURE SURVEY

Byung-Hyun Jang, Byeong-Ha Jeon, Kwon-Hee Lee et al [1] conclude that the shell and tube heat exchanger is used throughout various industries because of its inexpensive cost and handiness when it comes to maintenance. There are several thermal design factors that are to be taken into account when designing the tubes in the shell and tube heat exchangers. They are tube diameter, tube length, number of tubes, number of baffles, etc. The characteristics of flow and heat transfer within the shell are not simple. This paper conducted numerical analysis to predict the characteristics of difference in temperature and pressure drop, which are the performances of channel heat exchanger. ANSYS CFX was used for heat transfer and fluid flow analysis and the initial and boundary conditions. For future study, the optimized value of each design variable must be decided and the credibility of such values must be evaluated through verification experiments.

Folaranmi Joshua et al. [2] concludes that the concentric tube heat exchanger was designed in order to study the process of heat transfer between two fluids through a solid partition. It was designed for a counter-flow arrangement and the logarithmic mean temperature difference (LMTD) method of analysis was adopted. Water was used as fluid for the experiment.

There are three main types of heat exchangers:

The Recuperative type in which the flowing fluids exchanging heat are on either side of a dividing wall.

(a) The Regenerative type in which the hot and cold fluids pass alternately through a space containing a matrix of material that provides alternately a sink and a source for heat flow.

(b) The Evaporative type in which a liquid is cooled evaporatively and continuously in the same space as the coolant.

This research paper is on recuperative type of heat exchanger, which can further be classified, based on the relative directions of the flow of the hot and cold fluids, into three types:

(A) Parallel flow, when both the fluids move in parallel in the same direction.

(B) Counter flow, when the fluids move in parallel but in opposite directions.

(C) Cross flow, when the directions of flow are mutually perpendicular.

KEVIN M. LUNSFORD et al. [3] has concluded that these requests may arise as a result of the need to increase process throughput, increase profitability, or accommodate capital limitations. Processes which use heat transfer equipment must frequently be improved for these reasons. This paper provides some methods for increasing shell-and-tube exchanger performance. The methods consider whether the exchanger is performing correctly to begin with, excess pressure drop capacity in existing exchangers, the re-evaluation of fouling factors and their effect on exchanger calculations, and the use of augmented surfaces and enhanced heat transfer. A plan for increasing heat exchanger performance for shell and tube exchangers should consider the following steps.

Determine that the exchanger is operating correctly as designed. Correcting flaws in construction and piping that may have a detrimental effect on heat transfer and pressure drop may be the solution.

Estimate how much pressure drop is available. For single phase heat transfer coefficients higher fluid velocity increases heat transfer coefficients and pressure drop.

Estimate fouling factors that are not overstated. Excessive fouling factors at the design state result **in** oversized exchangers with low velocities. These low velocities may exacerbate the fouling problem. More liberal fouling factors and periodic cleaning may increase the heat exchanger’s performance.

Consider using a basic shell-and-tube exchanger with enhancement or intensification such as Finning, tube inserts, modified tubes, or modified baffles.

Su That Mon Than, Khin Aung Lin et al. [4] has conclude that A characteristic of heat exchanger design is the procedure of specifying a design, heat transfer area and pressure drops and checking whether the assumed design satisfies all requirements or not. The purpose of this paper is how to design the oil cooler (heat exchanger) especially for shell and tube heat exchanger which is the majority type of liquid to liquid heat exchanger. General design considerations and design procedure are also illustrated in this paper and a flow diagram is provided as an aid of design procedure. In design calculation, the Mat LAB and AutoCAD software are used.

Liljana Markovska, Vera Mesko~Radmila Kiprijanova, Aleksandar Grizo et al. [5] has concludes that Optimization of shell-and-tube-heat exchanger is accomplished by use of the OPTIMIZER software package. The objective function is defined together with the implicit constraint. The simultaneous equation solving method is used to solve the equations that describe the process.

The advantages of the simultaneous equations solving approach are that:

(1) It is a natural way to specify a problem since the design problem is by nature and optimization problem and the engineer does not have any other criterion for specifying many arbitrary variables.

(2) It is easy to specify variables and constraints.

(3) It can handle highly integrated systems since all equations are solved simultaneously.

The Extended Complex algorithm is chosen for such optimization study. The optimal value of the objective function and appropriate design variables are obtained.

C.Sivarajan, B.Rajasekaran, Dr.N.Krishnamohan et al. [6] has conclude that As the helix changer offers process designers a high performance, it has been considered for study in this project. Helical baffles are employed increasingly in Shell-and-tube heat exchangers (Helix changer) for their significant advantages in reducing pressure drop, vibration and fouling while maintaining a higher heat transfer performance. In order to make good use of helical baffles, serial improvements have been made by many researchers. Helix changer is cost effective, having lesser shell side fouling. It has higher shell-side heat transfer and lower shell-side pressure drop. Because of homogeneous flow distribution it improves plant reliability and run length, having reduced vibration hazards.

Figure 2 Shell and tube heat exchanger with conventional baffle (STHX)

Extensive analysis results from numerical simulations indicate that these STHXHB have better flow and heat transfer performance than the STHX. Based on these new improvements, the STHXHB might be replaced by STHX in industrial applications to save energy, reduce cost, and prolong the service life and operation time.

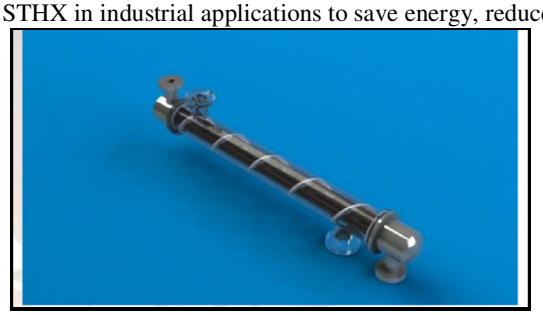

Figure 3 Shell and Tube heat exchanger with continuous helical baffle

CHANDRAKANT B. KOTHARE et al. [7] Generally shell and tube heat exchanger is widely used in much application like waste heat recovery system, refrigeration and air conditioning application and high pressure and temp. Application. In this research paper heat exchanger is design by kern method and also design by visual basic language 6.0 software. it cover all rating, sizing and vibration module and also cover graph to easily show.

The software consists of Rating and Tutorial. Basically this software consists of five forms designed in Visual Basic 0.6 at front end. User should fill the relevant information into the forms. The forms are 1) fluid property 2) Shell side property 3) Tube side property 4) form containing different graphs 5) solution .

Presently rating module has been designed shell and tube heat exchanger design means thermal design and mechanical design. Mechanical design includes three modules viz. sizing, rating, and vibration. This paper covers the rating modules. These modules can be designed and linked with this module. Thermo physical properties of fluid can also be store in the database. So that once user enter the name of the fluid all the concerning properties get entered. Curve fitting algorithm can be implemented to read the values from the graph when user provides one parameter.

Pawan P. Singh et al [8] many commercial and general applications in which shell an tube heat exchanger is used. Now the design like mechanical, structure design, thermal design can be determine. Here thermal design of heat exchanger is done my LMTD (Logerathmic Mean Temperature Difference) and NTU (Number of Transfer Unit) method. rating and sizing of this heat exchanger is find out with some suitable example with clear idea about problem solving and more information obtained by doing computational fluid dynamics tool. For perticular on parallel and counter flow.

Ventsislav ZIMPAROV, Plamen PENCHEV et al. [9] has conclude that extended performance evaluation criteria have been used to assess the benefit of replacing the smooth tubes with deeper corrugated tubes in shell-and-tube heat exchangers. The goal is to assess the influence of characteristic parameters of the corrugated tubes: height-to-diameter ratio e/Di; relative pitch p/e; and relative helix angle **β** on the thermodynamic efficiency in the case of condensers with steam condensing on the outside of the vertically or horizontally mounted tubes and water in forced convection (non-boiling) flow being pumped through the tubes. Corrugated Tube Heat Exchangers (CTHE) are shell and tube heat exchangers which use corrugated tubes instead of plain tubes.

Shiv Kumar Rathore , Ajeet Bergaley et al. [10] has conclude that the main objective of this paper is to identify advantages of finned tube and simple bare tube type shell and tube heat exchanger. and comparison of this two types of tube for to obtain greater advantage in heat transfer , efficiency, pressure drop , weight, cost etc. entire comparisons of this two type of tube explain by thermal design. they also conclude that by using the integrally fin tube give grater advantages compare to conventional bare tube. and result of analysis show that the finned tube heat exchanger is more economical than conventional bare tube heat exchanger. They also tell that if shell side diameter of finned tube heat exchanger is less than conventional bare tube heat exchanger which give result in reduce size of shell and cost is reduce.

C.Z.Patel et.al [11] has conclude that CFX simulation of STHX and also validation done for oil cooler type STHX where servo prome 46 oil is hot which is coming out at turbine casing is hot and required to cool for further lubrication purpose in power plant. with cold fluid volume fraction is water. The oil which is comes out from turbine casing after lubrication is having temperature around 55oC and it is required to cool it drawn before using it once again for further lubrication. The CFX model is validated by comparison to the experimental results within 10% error.

For the future work for checking variation in result of using nano fluid - water for performance of heat exchanger increase in all case.

Farhad Nemati Taher, Sirous Zeyninejad Movassag et al. [12] has conclude that helical baffle is use at particular helix angle in order to increase heat transfer rate, overall heat transfer coefficient and reduce pressure drop at both side. Simulation can be done by fluent software with different heat exchanger having different mass flow rate (3.54-12 kg/s). Compare experiment and modeling data. The pressure gradient decreases with increase baffle space. and obtain high heat transfer. And they also conclude that the baffle spaces have significant impact on the helical STHXs performance:

1. Pressure drop reduce with increase baffle space.
2. At same mass flow rate and same working condition, longer baffle space get low heat transfer coefficient.
3. At same pressure drop, longer baffle space have high heat transfer coefficient in different baffle space cases.

In present year a significant researches on the performance of STHXs on effect of baffle inclination angle upon heat transfer and pressure drop.

In order to optimize the analysis, various geometries of helical baffle (helix angle, pitch length, discontinuous helical baffle, and segmental helical baffle) to be analyzed.

In the present work, working fluids used is water to water, in future, the working fluid can be changed as water to high viscous fluid (Shell side). Also a model may be fabricated and the experimental results can be compared with present analytical results.

L.Godson*, K.Deepak, C.Enroch et. A; [13] has conclude that by using silver/water nano fluid on STHE it is obtained to increase Heat transfer rate, overall heat transfer coefficient and Efficiency with pressure drop. with compare experiment and correlation data for LMTD, Effectiveness and thermo physical properties. They also conclude that the result show increase in convective heat transfer coefficient and effectiveness of silver/water nano fluid as the particle volume concentration is increased. A maximum enhancement in convective heat transfer coefficient of 12.4% and effectiveness of 6.14% is recorded.

The noticeable increase in heat transfer coefficient is due to enhanced thermo physical properties of nano fluid and delay in the boundary layer development in the entrance regions with addition of nano particles. The Reynolds number is varied from 5000 to 25000.

Pethkool et al. [14] carried out experimentally augmentation of convective heat transfer in a single-phase turbulent flow by using helically corrugated tubes . Effects of pitch-to-diameter ratio (P/DH=0.18, 0.22 and 0.27) and rib-height to diameter ratio (e/DH=0.02, 0.04 and 0.06) of helically corrugated tubes on the heat transfer enhancement, isothermal friction and thermal performance factor in a concentric tube heat exchanger are examined. The experiments were conducted over a wide range of turbulent fluid flow of Reynolds number from 5500 to 60,000 by employing water as the test fluid.

Experimental results show that the heat transfer and thermal performance of the corrugated tube are considerably increased compared to those of the smooth tube. The mean increase in heat transfer rate is between 123% and 232% at the test range, depending on the rib height/pitch ratios and Reynolds number while the maximum thermal performance is found to be about 2.3 for using the corrugated tube with P/DH=0.27 and e/DH=0.06 at low Reynolds number. Also, the pressure loss result reveals that the average friction factor of the corrugated tube is in a range between 1.46 and 1.93 times over the smooth tube.

In addition, correlations of the Nusselt number, friction factor and thermal performance factor in terms of pitch ratio (P/DH), rib-height ratio (e/DH), Reynolds number (Re), and Prandtl number (Pr) for the corrugated tube are determined, based on the curve fitting of the experimental data.

4. PROBLEM DEFINITION

Here, Oil Cooler is Shell and Tube Heat Exchanger. The Problems are:

Less Heat transfer rate.

Large Pressure Drop at shell side.

Large Pressure Drop at tube side.

Cost is very high.

For this reason I will do thermal design of shell and tube heat exchanger by TEMA Edition - $9^{TH}$and then comparison and analysis will do.

5. CONCLUSIONS

From Literature review it can be conclude that, Entire STHX design by standard, LMTD method also include we get clear idea about each and every parts design and we easily compare with standard data. And another benefit for by using CFD is that CFD provides cost effective alternative, speedy solution and eliminate the need of prototype, it is limited to Plate, Shell and Tube, Vertical Mantle, Compact and Printed Circuit Board Exchangers but also flexible enough to predict the fluid flow behavior to complete heat exchanger design and optimization. We can easily comparison with theoretical calculation data and simulation result. It is observed that the CFD simulation results are in very good agreement with the Bell-Delaware method.

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THERMAL ANALYSIS AND DESIGN OF SCRAPED SURFACE HEAT EXCHANGER

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ABSTRACT *:In this paper we describes problem of shell and tube heat exchanger use for high viscous fluid and study of thermal analysis of scraped heat exchanger by using high viscous fluid which is used in food industries, chemical, or pharmaceutical industries for several thermal applications such as freezing, sterilization, cooling and gelatinization. Study of effect of different parameter like mass flow rate, blade speed, axial and rotational Reynolds number ,mixing time, with blade and without blade configuration, blade geometry,LMTD on a heat transfer performance and power consumption of a scraped surface heat exchanger.CFD analysis is used for thermal analysis. Results of analysis show that For each blade rotational speed and mass flow rate values, the heat transfer coefficient for cooling are always higher than heating in A-SSHE. value of overall heat transfer coefficient of A-SSHE is almost double than value for C-SSHE. Increasing in mixing time reduced the quantity produced by SSHE. Heat transfer coefficient with phase change is about 3 to 5 times greater than without phase change. Power consumption is increased synchronously with ice formation due to the increase in apparent viscosity or reduce in fluidity at ice slurry curved scrappers have better heat transfer performance . Increasing number of blades beyond four will not appreciable improvement in heat transfer and power consumption increased with numbers of blades. Wall Shear rate for SSHE Without blade geometry is depend on flow regime where as Wall Shear rate for SSHE Without blade geometry is depend on rotation of blades. Increasing LMTD difference decrease the heat transfer coefficient up to 1.5 times.*

KEYWORDS : Scraped Surface heat exchanger, overall heat transfer coefficient, blade geometry

1. INTRODUCTION

Efficient heating or cooling of complex fluids is an important problem for several operations in food industry. High viscosities and non-Newtonian behaviors of the processed fluids are often encountered in this field and tend to complicate their handling and to reduce the heat transfer rates in process equipment. In addition, the presence of solid food pieces causes additional problems related to the formation of solid deposits on hot surfaces. During
heating, these deposits can eventually heat up to roasting temperatures altering the aromatic properties of the treated fluid. Some of these issues can be avoided or minimized by adopting a scraped surface heat exchanger (SSHE) in place of classical shell and tubes or double-pipe exchangers.[6]

CONSTRUCTION

An SSHE is a double-pipe heat exchanger with a rotor coaxially inserted in the internal tube, known as the stator. The rotor is equipped with scraping blades to clean the inner surface of the stator. The blades play a double role in the SSHE: on the one hand, they literarily scrape the inner surface of the stator, avoiding particle deposition and cooking; on the other hand, they enhance the heat transfer rates by increasing the fluid velocity near the ex-change surface and by generating turbulence. The typical design of an SSHE presents a given number of blades arranged longitudinally on the rotor surface; the blades have the same length of the rotor In the following, we call this configuration C-SSHE, where C stands for ‘‘continuous blades’’ [6]

WORKING

Scraped surface heat exchangers (SSHEs) are widely used in the food industry for sterilizing or cooling highly viscous fluids such as mayonnaise, cream cheese, peanut butter and ice cream. Such fluids are often non-Newtonian and frequently shear–thin

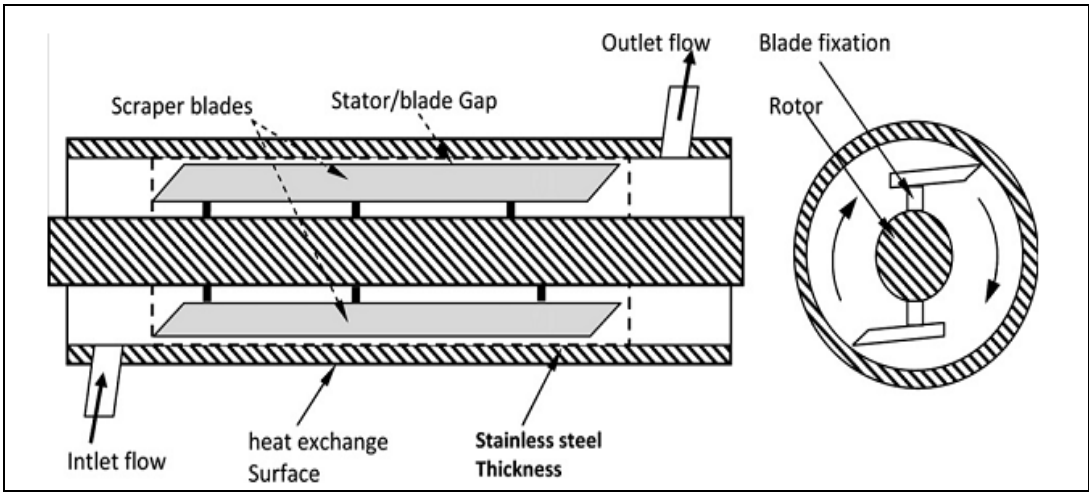

Fig .Schematic representation of a scraped surface heat exchanger ''SSHE'', longitudinal and transversal cross-section.[10]

In a typical SSHE (Fig.), fluid is slowly pumped along the annulus between a stationary heated or cooled outer cylinder and a rotating inner cylinder. Moving blades attached to the inner cylinder scrape the outer cylinder surface periodically to prevent film formation and promote mixing and heat transfer. The blades are often manufactured with holes or gaps to allow mass flow through the scrapers and to reduce the power required for rotation. In comparison with the axial flow, the rotational flow dominates the mixing process. The high shear region close to the tips of the blades and the significant thermal effects due to viscous dissipation imply that it is crucial to understand the local shear and thermal effects in order to predict heat transfer performance.[5]

APPLICATION

SSHE is widely used in the food, chemical, or pharmaceutical industries for several thermal applications such as freezing, sterilization, cooling and gelatinization. SSHE is designed to deal with the problems that arise when processing viscous products food stuffs such as margarine, ice cream, chocolate,
spreads, peanut butter, yogurt and jam. Scraped surface heat exchangers (SSHEs) are widely used in the food industry for sterilizing or cooling highly viscous fluids such as mayonnaise, cream cheese, peanut butter and ice cream.[10]

THERMAL ANALYSIS OF SSHE

The quantitative thermal analysis has been reported and validated by means of numerical simulations of the heat transfer process. The presented numerical simulations results have been performed using CFD code (Fluent ver. 6.3).

The main steps of the analysis are the following:

(1) Estimate of convective heat transfer coefficient necessary to calculate a Nusselt number in proposed correlation.

(2) Discretization of the computational domain of SSHE geometry and 3D-CFD modeling capability of coupling fluid flow and heat transfer.

(3) Establishment of the thermal correlations and validation of numerical results with the given literature correlations.

(4) Thermal analysis of the SSHE and the effect of the viscous dissipation on the heat performance.

(5) Effect of the axial flow rate on the heat performance within the SSHE

(6) Mixing time analysis on the heat performance.[10]

2.LITERATURE SURVEY

David S. Martínez, Juan P. Solano, FernandoIllán, Antonio Viedma.[1] they present experimental study of a heat transfer during ice slurry production in a SSHE by using a 7% sodium chloride brine. Effect of different parameter like scrapers velocities, Logarithmic mean temperature difference and scrapper arrangement on a heat transfer coefficient and ice layer growth.

Results Shows that:

1) Rotational speed of the scrappers have a low effect on heat transfer than sub cooling.

2) Global nucleation occurred only for high velocities and low super cooling degree.

3) Increasing LMTD difference decrease the heat transfer coefficient up to 1.5 times.
4) Due to Change in Scrapper design there will be change in heat transfer coefficient. Adaptable scrapper improve heat transfer than rigid scrapers.

Eric Dumont, Francine Fayolle, Jack Legrand, **[2].**they present an experiment investigation of SSHE was under taken by visual observation and electrochemical technique in order to understand transition between laminar and vortex Flow. Secondary evaluate the wall shear rates. They studied flow pattern for both geometric condition ,SSHE Without blade and SSHE with Blade.

Results Shows that :

1)For Both geometric condition the flow pattern are noticeably different.
2)The transition between laminar flow to vortex flow for SSHE with blade at Taylor number Tagc = 80 and for SSHE without blade at Taylor number Tagc = 45
3)Wall Shear rate for SSHE Without blade geometry is depend on flow regime where as Wall Shear rate for SSHE Without blade geometry is depend on rotation of blades.

Frank Qin , Xiao Dong Chena, Shashini Ramachandra , Kevin Free. [3] they present study for measure the heat transfer coefficient and the power consumption of a laboratory SSHE when it was used for freezing 10% sucrose solution. they were used a cylindrical vessel with cooling jacketed on the vertical side with a 2 mm layer from rubber insulation and 190 ml of 10% aqueous sucrose solution. Fig. shows experimental set up.

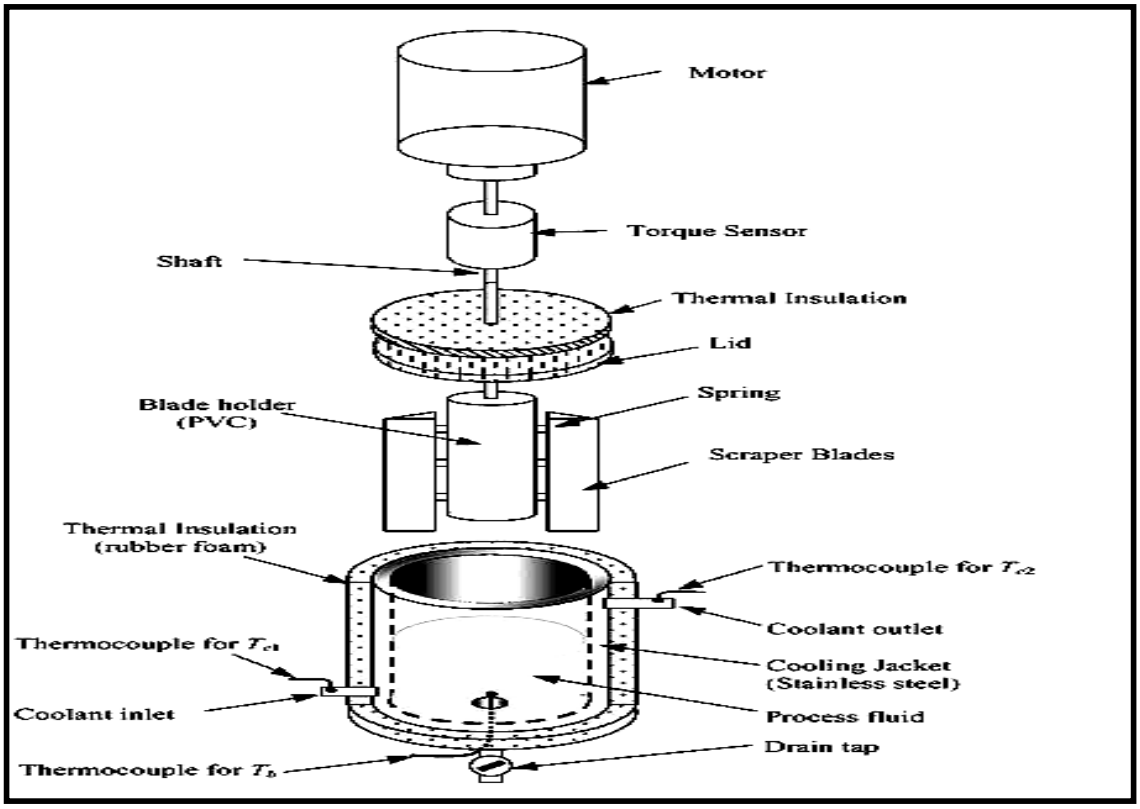

Fig.Schematic diagram of the experimental SSHE.

Results indicate that :

1)Change in heat transfer coefficient with phase change having functional jump at onset time of a phase change and it is because of direct exchange of the ice fusion heat to the scraped cooling surface .the heat transfer coefficient with phase change is about 3 to 5 times greater than without phase change.
2)Power consumption is increased synchronously with ice formation due to the increase in apparent viscosity or reduce in fluidity at ice slurry. The power consumption of SSHE is influenced by the ice content in slurry

because when the ice content increase in ice slurry, it increase torque required for driving the scrapers. So the power consumption increase as the ice content is increase in the ice slurry. The initial power consumption is independent of the cooling surface temperature.
3)As the ice content increase in the ice slurry ,the process fluid may undergo from turbulent to laminar flow regime as decrease Reynolds number from 1000 to 10.

JeromeMabit, CatherineLoisel, Francine Fayolle, Jack Legrand. [4] they developed a measured the quantity of product that is subjected to higher shear in SSHE with using a starch as a viscous fluid. They did experiment for study effect of stratch granule size for conditions like without blade SSHE and With Blade SSHE and take a same parameter like flow rate , rotational speed of rotor in both condition.
Results Shows that :
1)When the shear rate applied to the suspension, the starch granule diameter increase.
2)For SSHE without blade, analysis of Starch at outlet concludes that there is no modification on the granule size distribution even for max. Rotational speed. And granule size is not affected by rotor rotation.
3) For SSHE with blade, analysis of Starch at outlet conclude that there is modification of granule size due to the blades and modification of flow pattern .For rotational Speed below 6.5 rps, starch suspension is not affected. When the rotational speed is increase from 6.5 rps to 10 rps ,37% of starch will be modified.
4)Products are readily transformed due to rotation of blades and blades also influence the quantity and structure of product**.**

K.-H. Sun,D.L. Pyle,A.D. Fit,C.P. Please,M.J. Baines,N. Hall-Taylor[5] they present the study of 2D heat transfer in SSHE using non Newtonian fluid. They used finite element method to generate numerical results for 2D stedy state conditions. The effect of blade design, material properties and shear thinning and heat thinning on the flow and heat transfer were studied.
Results Shows that:
1)The shear thinning property of a fluid reduce the viscous dissipation near the tip of blades and as a results the local fluid temperature .for shear thinning fluids ,the gap at root of a blade act to reduce the net force on the blades and shift the location of the centre stagnation point. Small gap on tangential blade enhance heat transfer .Large gap should be avoided because it reduce in convection mixing and wall heat flux.
2)Heat thinning effect is greatest for Newtonian fluid where viscous dissipation and local temperature are highest at tip of blades.
3)The heat transfer is greatly affected by a characteristics viscosity as the Nusselt number increase with increase characteristic viscosity.
4)Heat and shear thinning make variation in the local viscosity which affect the heat transfer.

LucaD'Addio, Claudia Carotenuto, FrancescoDiNatale,RobertoNigro [6] In this paper they present study of thermal behavior different type of scraped surface heat exchanger with changing the blade arrangement than a conventional scraped surface heat exchanger by using of hazelnut paste as a fluid and heat exchanger is operated in laminar regime. They used numerical stimulations which were carried out using software Fluent 6.2 and Gambit 2.1 for finding the value of heat transfer coefficient of an A-SSHE unit operated in laminar regime during both heating and cooling of hazelnut paste. The matrix of numerical simulation is defined to investigate the effect of mass flow rates, blade rotational speeds and wall temperatures on the thermal behavior of A-SSHE.the main result of numerical simulations performed in terms of parameters like, Fluid mean velocity magnitude U, mean value of food paste viscosity and over all heat transfer coefficient h. the results shows that the mass flow rate mainly influences the axial component of fluid than the tangential .In the heating, there is only a very slight increase viscosity of fluid with M. while in cooling decrease viscosity of fluid with M up to 25%.the values of overall heat transfer coefficient increase with the mass flow rate changing up to 20% during heating and up to 25% during cooling. Result shows that for each blade rotational speed and mass flow rate values, the heat transfer coefficient for cooling are always higher than heating.

Luca D'Addio ,Claudia Carotenuto,Francesco Di Natale,Roberto Nigro. [7] they present analysis of different type of scraped surface heat exchanger with changing the blade arrangement than a conventional scraped surface heat exchanger by using of hazelnut paste as a fluid. They were compared overall heat transfer coefficient for A-SSHE and the convectional SSHE. Three dimensional axial symmetric CFD simulations of A-SSHE were performed by using software Fluent. And the result was compared with numerical stimulation result of equivalent SSHE with convectional blade design. And they also developed a equation for overall heat transfer coefficient as a function of rotational speeds and mass flow rates. Results shows that due to back mixing phenomena occurred in a A-SSHE ,it has high thermal efficiency than C-SSHE.and also value of overall heat transfer coefficient of A-SSHE is almost double than value for C-SSHE.

Marcela Arellano, Hayat Benkhelifa, Graciela Alvarez, Denis Flick [8]. They present the mathematical modeling of the ice crystallization occurring during freezing of sorbet in a SSHE. Two different model approach have been used for study of nucleation, growth and breakage phenomena of the crystal. Two model used for study are 1) population balance equation and plug flow model 2) coupling of PBE and RTD modeling. For Both Model the rate of crystal nucleation and growth were determined by sub cooling degree. Comparison of both modeling approach for ice crystal from sobat produced at T=15.5 C . It can be seen that crystal size distributing for modeling approaches are very similar .These modeling approaching can be used to identify new way to improve the performance of the process.

Mounir Baccar, MohamedSalah bid [9] they present the study of hydrodynamic and thermal behavior of SSHE under various geometric condition. Effect of number, size, shape of scrapers and ratio of rotation to the axial Reynolds numbers on the thermal and hydrodynamic nature of SSHE were studied using controlled method to solve the three dimensional Navier Stocks and Energy Equations. The rate of heat transfer is also numerically determined in order to optimize operating and geometrical condition.
Results Shows that:
1)It is seen that curved scrappers have better heat transfer performance .
2)Increasing number of blades beyond four will not appreciable improvement in heat transfer and power consumption increased with numbers of blades.
3)When the Axial Reynolds number decrease , axial dispersion increase and reduce heat transfer coefficient and when axial Reynolds number increase high axial flow low rotational speed void back mixing so improve in heat transfer coefficient. The axial dispersion effect completely disappear with ratio of rotation to the axial Reynolds numbers equal to 0.1 and there is constant heat transfer coefficient.

Mourad Yataghene, Jack Legrand [10] ,they present the numerical study of the coupled fluid flow and heat transfer within scraped. they were used fluent 6.3 and gambit 2.2.3 software to solve the energy equation, momentum equation and continuity equation and also messing of a SSHE geometry in order to consider the effect of change of geometry on the overall heat transfer coefficient . Also they were established the heat correlation. Numerical model were used to understand the heat performance of SSHE and also effect of rotational velocity on a heat performance. they also present study the effect of axial flow, viscous dissipation and mixing time on SSHE performance.
Results show that:
1) Increasing mass flow rate does not significant improvement to heat transfer within SSHE at a constant rotating velocity of a rotor.
2) For pure glycerin, in increasing the velocity significantly reduced the cooling process because of viscous heating. Viscous dissipation or viscous heating reduce significant cooling effect for Newtonian fluid. Where as in non –Newtonian fluids increasing on rotating velocity improved thermal efficiency of SSHE.
3) When time of mixing t = 6.72 min, the temperature reduced to desire cooled temp. the increasing in mixing time reduced the quantity produced by SSHE.

3.CONCLUSION

From the literature review we can conclude that For each blade rotational speed and mass flow rate values, the heat transfer coefficient for cooling are always higher than heating in A-SSHE. Due to back mixing phenomena occurred in a A-SSHE, it has high thermal efficiency than C-SSHE.and also value of overall heat transfer coefficient of A-SSHE is almost double than value for C-SSHE. Increasing mass flow rate does not significant improvement to heat transfer within SSHE at a constant rotating velocity of a rotor.
Increasing in mixing time reduced the quantity produced by SSHE. Heat transfer coefficient with phase change is about 3 to 5 times greater than without phase change. The power consumption of SSHE is influenced by the ice content in slurry because when the ice content increase in ice slurry, it increase torque required for driving the scrapers. So the power consumption increase as the ice content is increase in the ice slurry. As the ice content increase in the ice slurry ,the process fluid may undergo from turbulent to laminar flow regime as decrease Reynolds number from 1000 to 10.It is seen that curved scrappers have better heat transfer performance . Increasing number of blades beyond four will not appreciable improvement in heat transfer and power consumption increased with numbers of blades. The transition between laminar flow to vortex flow for SSHE with blade at Taylor number Tagc = 80 and for SSHE without blade at Taylor number Tagc = 45 .Wall Shear rate for SSHE Without blade geometry is depend on flow regime where as Wall Shear rate for SSHE Without blade geometry is depend on rotation of blades. Rotational speed of the scrappers have a low effect on heat transfer than sub cooling. Global nucleation occurred only for high velocities and low super cooling degree. Increasing LMTD difference decrease the heat transfer coefficient up to 1.5 times.Due to Change in Scrapper

design there will be change in heat transfer coefficient. Adaptable scrappers improve heat transfer than rigid scrapers.

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REVIEW OF TRANSMISSION PRICING METHODS OF DEREGULATED POWER SYSTEM

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ABSTRACT*—Electricity plays a vital role in achieving economic, social and environmental objectives of sustainable human development. This paper shows the review of development of other sectors is also dependent on electricity sector. It is an essential ingredient to improve quality of life. Power engineering is the oldest and most traditional field of electrical engineering. Generation, transmission and distribution are three main parts of electrical power system. Electrical power industry is undergoing a dramatic revolution in both technology and industry structure. Worldwide deregulation, privatization and restructuring have transformed the business and operating context within which electrical power industry must operate. The transmission network is a vital mechanism in competitive electricity markets. In a restructured power system, the transmission network is where generators compete to supply large users and distribution companies.*

Keywords—Power Tracing, Transmission Pricing, Electricity Tracing, Embedded Costs, MW-Mile, Counter-Flow

I. INTRODUCTION

Transmission pricing should be a reasonable economic indicator used by the market to make decisions on resource allocation, system expansion, and reinforcement. Few years back, electricity transmission pricing was more of an academic interest, rather than practical use. This is because generation, transmission and distribution were vertically integrated. The vertically integrated utilities used to sell their power inside their territory, or exchange power with the neighbouring utilities. Hence, the need for having a formal mechanism for pricing of transmission did not exist. The costs incurred by the vertically integrated utilities were recovered by embedding them in the electricity price billed to the consumers. However, in recent times, as a primary step towards deregulation, generation and transmission businesses have been separated from each other in many countries and hence, transmission prices are used to charge the transactions. One important fact about the transmission pricing issue is that it is a technical issue rather than an engineering problem. To some extent it couples operational aspect of the power system with it, so long as provision of correct economic signals is considered. Engineering analysis which deals mainly with determining the viability and the cost of providing transmission services is only one of the many considerations in the overall process of pricing transmission services.

Loss allocation is another issue, where no single solution can be ultimate solution. The loss allocation problem is different from loss supply. Loss allocation is all about allocating costs of losses amongst various participants. The problem of loss allocation is a debatable issue because of the non-linearity associated with power flows [2]. The competitive environment of electricity markets necessitates wide access to transmission and distribution networks that connect dispersed customers and suppliers. Moreover, as power flows influence transmission charges, transmission pricing may not only determine the right of entry but also encourage efficiencies in power markets. For example, transmission constraints could prevent an efficient generating unit from being utilized. A proper transmission pricing scheme that considers transmission constraints or congestion could motivate investors to build new transmission and/or generating capacity for improving the efficiency. In a competitive environment, proper transmission pricing could meet revenue expectations, promote an efficient operation of electricity markets, encourage investment in optimal locations of generation and transmission lines, and adequately compensate owners of transmission assets. Most important, the pricing scheme should implement fairness and be practical.

However, it is difficult to achieve an efficient transmission pricing scheme that could fit all market structures in different locations. The ongoing research on transmission pricing indicates that there is no generalized agreement on pricing methodology. In practice, each country or each restructuring model has chosen a method that is based on the particular characteristics of its network. Measuring whether or not a certain transmission pricing scheme is technically and economically adequate would require additional standards. During the last few years, different transmission pricing schemes have been proposed and implemented in various markets. The

most common and unsophisticated approach to transmission pricing is the postage-stamp method. In this method, regardless of the distance that the energy travels, a customer pays a rate equal to a fixed charge per unit of the energy transmitted within a particular utility system. Postage-stamp rates are based on average system costs. In addition, the rates often include separate charges for peak and off-peak periods, which are functions of season, day, and holiday usage. Under this approach, when energy is transmitted across several utility systems, it can suffer from a pan caking problem.

Another commonly used method is the contract path method, which is proposed for minimizing transmission charges and overcoming the pan caking problem. However, this pricing method does not reflect actual flows through the transmission grid that include loop and parallel path flows. As an alternative to the contract path method, the MW-mile method is introduced as a flow-based pricing scheme. In this scheme, power flow and the distance between injection and withdrawal locations reflect transmission charges. The main drawback of the aforementioned approaches is that they do not consider transmission congestion. In the new environment, it is essential to involve transmission tariffs in transmission pricing according to flow-based pricing and congestion-based pricing. Congestion pricing would allocate each limited transmission resource to customers who value it the most . A proper pricing scheme should allocate congestion charges to participants who cause congestion, and should reward participants whose schedules tend to relieve congestion. An efficient transmission pricing mechanism should recover transmission costs by allocating the costs to transmission network users in a proper way. The transmission costs may include:

- Running costs, such as costs for operation, maintenance, and ancillary services.
- Past capital investment.
- Ongoing investment for future expansion and reinforcement associated with load growth and additional transactions. Running costs are small compared with the capital investment (or embedded transmission costs). Consequently, transmission charges for embedded cost recovery would largely exceed running costs over the investment recovery period.

II. LITERATURE REVIEW

In[1], Satyavir singh has analysed that in a deregulated environment, generation, transmission and distribution are independent activities. This unbundling of the transmission services has resulted in need to trace the flow of power i.e. to assess the impact of a particular generator or the load on the power system. This paper is based on Bialek's tracing method which may be applied to both real and reactive power flows. The results corresponding to the upstream looking algorithm tabulated in table allows one to assess:

- What amount of power from a generator goes to a particular transmission line.
- What amount of power from a generator goes to a particular load

The results corresponding to the downstream looking algorithm tabulated in table allows one to assess:

- What amount of power from a generator goes to a particular load.
- The contribution of a particular transmission line flow to a particular load.

In [2], M. Vinodkumar and P.Arul have studied that the upstream-looking algorithm determines the gross power flow which shows how the power output from each of the generators would be distributed between the loads if the network was lossless. For each load, the difference between the gross and the actual power demand gives a transmission loss associated with supplying this load. A dual to that is the downstream-looking algorithm resulting in the net power flow. This shows how the actual demand of each of the loads would be distributed between individual generators if the network was lossless.

In [3], G. A. Orfanos and G.T. Tzisiou have researched eight transmission-pricing methodologies via three tracing methods have been evaluated. They are theoretically discussed and applied on Garver's 6-bus system and on IEEE 24-bus reliability test system in order to identify the advantages and drawbacks of each method. In case of Garver's 6-bus test system, a comparison between used and unused MW-mile methods is made for each tracing method where under used methods a supplementary charge was calculated in order to cover the transmission network owner's revenue. In case of the IEEE 24-bus reliability test system, the annual marginal network revenue was first calculated based on the annual load curve and the remaining network costs not covered were allocated between network users using embedded methods. A comparison between tracing methods for each pricing scheme is made. Different results were derived because each tracing method is based on different principle. Moreover, it is not always clear which pricing method suits better a transmission network; it depends mostly on the generation and load location as well as the network topology itself. However, these pricing methods are able to fulfill transmission pricing objectives: economic efficiency, non-discrimination, transparency and cost coverage and can be also applied to large power systems.

In [4], Chan S park and Jorge Valenzuela studied two methods of transmission pricing and they are flow based method and nodal pricing method. In the flow-based method, the congestion cost collected from the market is assigned only to the lines that are congested, including the flowgate. On the other hand, in the nodal pricing method a line that induces a price differential, between its sink and source nodes, is allocated a congestion cost. Therefore, the latter never assigns congestion cost to the stability constraint, whereas this constraint may be the

principal cause of the transmission congestion on the network. The issue of which allocation scheme provides a correct economic signal to the market needs further investigation in the future research.

In [5], Dharmesh gehlot and M.J. Sathvara studied and implemented the Bailek tracing method. This method, when applied to the real power flow result in two different algorithms applicable for two different purposes. The upstream-looking algorithm determines the gross power flow which shows how power output from each of the generators would be distributed between the loads if the network was lossless. . The downstream-looking algorithm shows how the actual demand of each of the loads would be distributed between individuals generators if the network was lossless. For 12-Bus test system, the cost comparison shows that overall transmission cost of the system is less in Bialek's method compared to GGDFs method but per unit MW cost is less in GGDFs method. Bialek's tracing method creates only positive contributions to the line flows, thus the same charges occur under all MW-Mile approaches for counter-flows. Bialek's method can produce zero charges for some users. Where the Distribution Factors tracing method charges all users of the system, since all users utilize all transmission lines no matter how far they are located. However, it is very sensitive to system operating conditions and can produce relative different results for different operating points.

In [6], M. Murali and M.S. Kumari have studied that line lengths are assumed to be proportional to the line reactance. For transformers line lengths are neglected and are taken as zero. Postage stamp method doesn't consider sys-tem line lengths, and hence gives a very inferior result compared to other methods. MW-Mile method uses DC power flow solution and accounts for line lengths. MVA-Mile method uses AC power flow and also accounts for the line lengths. GGDF method uses DC power flow and Power transfer Distribution factors for pricing and traces the actual power flow of each line by each participant. Bialek tracing method uses AC power flow algorithm and it also traces the actual power flow of each line by each participant. The results shows that, power flow tracing based methods present more accurate pricing compared to postage stamp method, MW-Mile method and MVA-Mile method. Flow based Bialek tracing method is the best way of transmission pricing among all embedded cost based methods which con-siders AC power flow and total line flows. It is observed that combination of incremental and embedded cost based methods could result in the recovery of true transmission system costs.

In [7], Jiuping Pan and Younael Teklu have analysed that it is necessary to develop an appropriate method that could allocate the costs of transmission services based on the actual usage by different users. The design of usage-based cost allocation methods involves two major issues: accurate and efficient algorithms for transmission usage evaluation and fair and equitable pricing rules. Cost allocation procedures should be technically easy for implementation and transparent to transmission users. As far as the MW flow is concerned, the transaction-related (or generator-related) flows and transmission charges for the recovery of fixed transmission costs determined by different algorithms are quite similar. The choice of algorithms used for the evaluation of transmission use depends mainly on the study objectives and the market structures. There is still no a general agreement on the measure of the "extent of use" of transmission network capacity, especially the value of transmission capacity margin and the charge for reactive power flows.

In [8], C.W.Yu and A.K. David have studied that Transmission services have to be provided as a separate item in a restructured electricity supply industry. This paper presents an intuitively logical split between operating and embedded cost based pricing and methodologies for implementation. Transmission operating cost recovery is based on marginal pricing. A conceptually straightforward mechanism for the equitable allocation of transmission network embedded cost recovery based on capacity-use and reliability benefit is also presented. The 80-20 split between capacity-use and reliability benefit components seems reasonable. As illustrated through case studies the methodology reflects the quality of transmission service by giving different price signals to transactions. The framework could be used to allocate operating and embedded costs regardless of the number of transactions involved. As every transaction is treated separately by considering only the generation and load associated with the transaction, the methodology is insensitive to the order in which transactions are considered, hence eliminating potential conflicts of interest. The problematic case of transmission expansion has been examined. It is inevitable that after each expansion are distribution of costs that goes beyond the principle of making the "triggering" transactions pay for the specific expansion it triggered, will occur. Good pricing should achieve equity and efficiency in the utilization of existing resources and distribute transmission expansion costs in some rational way.

In [9], Francisco D. Galiana and Antonio J. Conejo studied that although incremental transmission loss analysis has been in use for several decades, recent interest in its application to loss allocation calls for new rigorous results dictating the conditions under which the allocated losses are unique and nondiscriminatory. Thus, it is shown that incremental loss allocation among bus power injections is arbitrary and therefore cannot be used to allocate losses in a nondiscriminatory manner. Mathematical formulae are developed showing that unique incremental loss allocations are possible for equivalent incremental power exchanges between generators and loads. Unique allocations among individual bus loads or bus generators are also possible, but it is necessary to specify a priori in which proportion the losses are to be divided among the two. It is also shown that incremental loss allocation requires the specification of two vector quantities, the loss supply and the load

distribution parameters. One of these can be left unspecified and estimated, provided that a load flow solution is also known. The allocation algorithms developed and tested show that incremental methods can be applied to large changes in operating point with little loss of accuracy if use is made of loss allocation parameters expressed as a percentage of the exact system losses.

In [10], Judite Ferreira1and Zita Vale studied that the method Postage-Stamp taxes all the transactions in function of the contracted power value and the total transmission cost. What it implies for one electrical system, that all the transactions with the same value of power pay the same for the use of the transmission network, just that they do not use it. For example, a transaction between producers and consumers on the same bus, that don't need use the electrical lines for the physical concretization of the transaction, is taxed in the same way that another one, that carries through between producers and consumers who are in different bus, needing therefore to use the network. In relation to the method Base, we conclude that this method allow that the transactions receive for the use of the network, although when they are taxed positively pays very high values. We can be conclude that this method isn't advantageous to the transactions, because it provokes great difference in the values taxed to the transactions with equal power transacted. The taxes calculated for the method MW-mile classic present the same tendency that the values taxed by the method Base, however with lesser amplitude of the taxed values. For the methods, Module or Use, Zero Counterflow and the Dominant Flow, we conclude that they always tax the transactions with a positive value. Although this values are smaller and more uniform, comparing identical transactions. These taxes in certain situations give some incentives, but they do not provoke therefore a great increase of taxes for the transactions where this benefit if does not verify. The methods, MW-mile classic, Base, Module or Use, Zero Counterflow and the Dominant Flow, tax in function of the impacts in the actives powers flows or in function of the distance from the load point and the injection point. This result in a null value for the taxes in the cases where the load and the generator are in the same bus and the power injected for the generator is equal or superior to the one of loads.

In [11], S. B. Warkad and Dr. M. K. Khedkar have studied that a good transmission pricing system has to give correct incentives and improve economic efficiency of to the market participants. It should encourage an efficient use of the existing network, encourage investments in network expansion, encourage an efficient location of new generation units etc. The transparency of pricing is a key in a restructured electricity markets. The prices should be non-discriminating to identical clients buying electricity at the same location on a grid and at the same time should also pay the same price. Transmission pricing should design to fully recover the transmission owner's costs (including a profit), efficient allocation of scarce (congested) transmission capacity, efficient allocation of the costs of transmission losses etc., and it should be based on marginal cost principle.

In this paper an AC-DC OPF based transmission fixed embedded and variable nodal pricing methodology is presented. Simulated results show that Postage Stamp, MW-Mile and MVA-Mile and electricity nodal pricing is suitable for real transmission network in developing countries including India. These pricing methods can able to fulfill transmission pricing objectives i.e. economic efficiency, non-discrimination, transparency and cost coverage etc., in developing wholesale electricity market in developing countries.

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INTEGRATION OF MICRO GRID WITH RENEWABLE ENERGY SOURCES

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ABSTRACT- *The demand for high quality electricity and growing electricity consumption has-been caused by increasing electrification of daily life causes and the rising number of sensitive or critical loads. Due to the rapid increase in global energy consumption and the diminishing of fossil fuels, the customer demand for new generation capacities and efficientenergyproduction,deliveryandutilizationkeepsrising.Themicro grid concept has the potential to solve major problems arising from large penetration of distributed generation in distribution systems. This paper presents integration techniques of micro grid with renewable energy sources.*

Keywords-Micro Grid, Renewable Energy Sources ,Renewable Energy Techniques ,Distributed Energy Sources

I. INTRODUCTION

Micro grid is cluster of distributed generation sources, storage systems and controllable loads. Micro grid can provide quality and reliable supply of energy to consumer. Micro grid is one of the solutions to present energy crisis. It is basically network comprising of distributed generation sources, storage system and controllable loads, which can operate in grid connected mode or in case of fault in isolated mode. Micro grid provides various advantages to end consumers utilities and society

Various advantages include improvement in energy efficiency, minimization of overall energy consumption and improvement in service quality and reliability of power supply. The co existence of multiple energy sources which have versatile dynamic properties and electrical characteristics have impact on safety ,efficiency, control and stability of micro grid.

II. RENEWABLEENERGYSOURCES

Renewable energy sources are used as distributed generation in micro grid. Major advantages of RES are: sustainability, less maintenance cost ,low operation cost, environmental friendly, reduction of greenhouse gas emission, reduction of pollution, etc. Renewable energy penetration not only affects the local market price, but also reduces the electricity price of adjacent interconnected systems. Low percentage of RES increases the consistency of the system ,but difficulty arises due to the high penetration of renewable generation in to the grid .Several renewable energy sources are used to generate electrical power, such as wind energy, photovoltaic energy, wave energy, tidal energy, thermal energy, bio-mass energy, etc. Of them wind and solar energy is broadly used for their characteristics.

Due to availability of wind world wide, wind energy generation is increasing day by day[1],[2] which helps to develop rural electrification ,create job opportunities in technology[3]. But there are some limitations to the penetrating of wind energy into the grid. Wind speed forecasting has high uncertainty, high volatility and low predictability which reduce the system security and wind revenue [4].Another major problem of wind penetration is maintaining voltage profile. Most of the wind turbines are coupled with SCIG[5],which are not able to support reactive power within the system. High penetration of wind energy causes more stress on breaker, transmission line, bus bar at the time of fault due to low fault ride-through capability of wind generator. Therefore, the high penetration of wind Energy creates stability problem, and possible blackouts thus wind energy penetration is limited by available transfer capability of the system [6].Frequency behavior of the system also changes with wind penetration due to lower inertia of distributed wind generators. Finally, wind energy penetration reduces overall efficiency and power quality.

The huge amount of solar energy is available on the earth .Humans consume almost 15TWofsolar energy[7].Customers are interested in solar power due to low cost, environment friendly [8],flexible installation and no reactive power consumption by solar panel. But constraints of solar generation are: high installation cost of solar panels, low generation capacity, uncertainty of solar irradiance],power fluctuation due to intermittency

behavior of sunlight. Solar penetration so changes the voltage profile and frequency response of the system .Most of the PV system is designed with unity power factor and the characteristics of output power are dependent on the inverter. There is no Low voltage-ride through capability and it does not contribute at the time of fault or any transient condition of the system. Since photovoltaic system has no inertia, some extra devices are required to maintain frequency oscillation.

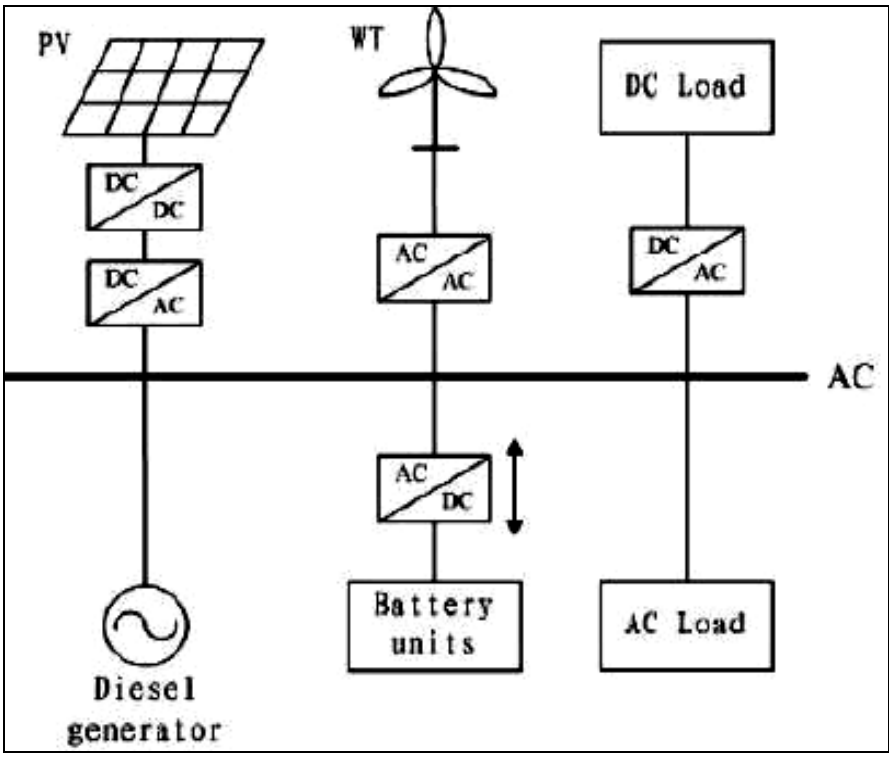

Fig.1.Typicalstructureof micro grid system

III. RENEWABLEENERGYTECHNIQUES

A. Micro turbine:
Micro turbines are composed of a generator and small gas turbine mounted on a single shaft. These units currently range in size from 30to about100kW.

B. Fuel cells:
A number of fuel cell technologies are either underdevelopment or currently being used to generate power. The attraction of fuel cells is their potential for highly efficient conversion to electrical power.

C. Photo voltaic cells:
They rely on sun light to produce DC voltage eat cell terminals. The amounts of voltage and current that PV cells can produce depend on the intensity of sun light and the design of the cell. PV systems use cell arrays that are either fixed or track the sun to capture additional energy. Storage is required for standalone systems if power requirements exceed available sunlight. PV systems operate highly reliably, quietly, and with no emissions.

D. Solar thermal:
The main technology for small- scale generation technologies In the solar thermal field is the sterling dish. This technology is being tested in the10-25kW range. In this system, light is concentrated on a small receiver by a sun- tracking array of mirrors. The heat collected by the receiver is transferred to the hot end of a sterling engine. The sterling engine uses working fluid in a closed cycle to push pistons and generate shaft rotation. In a sterling dish ,shaft rotation is used to spin an induction generator that is connected to the electric grid.

E. Wind:
Wind generation has been commercially available for many years. The main push has been in large wind farms where wind turbines from 700kWto1.5MWareavailable. These machines typically use an induction generator driven by a rotor with blades. When the turbine is operating in stand-alone mode ,any power requirement in excess of the wind energy available must be supplied by storage systems or other generators.

The power electronics are the critical distinguishing feature of the Micro Grid. Beside the energy conversion and store depending on the renewable energy and distributed generations, a mount of electrical issues for operation are introduced to micro grid, Including:

- Interconnection issues:
- Voltage regulation
- Monitoring and control
- Load balancing
- Power interactions
- Harmonic resonance

IV. CONCLUSION

Micro Grid is a prospective approach to integrating various renewable energy technologies in to electricity distribution networks, or more generally, into the current wider power system. In addition to generating technologies, Micro Grids also include storage, load control and heat recovery equipment. Micro Grids would be designed to operate independently, usually operating connected to the grid but islanding from it. Micro grids will provide improved electric service reliability and better power quality to end customers and can also benefit local utilities by providing dispatch able load for use during peak power conditions and all postponing distribution system upgrades.

ACKNOWLEDGMENT

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PERFORMANCE OF EVALUATION ON ACTIVE SOLAR STILL WITH EVACUATED SOLAR TUBE

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ABSTRACT*: Water is fundamental to human life on earth for survival and good health. Access to safe water is a major challenge in many communities in developing countries. In this paper we describes problem of conventional solar still are low daily yield, low thermal efficiency etc. to overcome those difficulties active solar still is introduce. Solar still is couple with evacuated tube collector. Experiment perform at Ahmedabad (Latitude: 23°01'32"N Longitude: 72°35'14"E Elevation above sea level: 56 m = 183 ft.) Gujarat, India. The air is circulating inside collector and under basin of solar still so it gives extra energy to rise temperature of saline water. Due to this modification in solar still rate of evaporation process and condensation process are increase. We studied different parameter were affected to output of solar still. The output daily yield is increase to 2-3 times than conventional solar still.*

KEYWORDS: Active Solar Still, Evacuated Tube Collector, Air Circulation

1. INTRODUCTION

Water is essential for all life forms on earth-plants, animals and human being, etc. For fresh water requirements humanity is dependent on rivers, ponds, lakes and underground water reservoirs. The available fresh water on earth is fixed, but the demand of fresh water is increased due to population growth and rapid industrialization In natural desalination process solar radiation is absorbed by the sea and causes water to evaporate. The evaporated water rises above the earth's surface and moved by the wind. Once this vapour cools down to its dew point temperature, condensation occurs and the fresh water comes down as rain. The basic process is responsible for the hydrological cycle. This same principle is used in all man-made distillation systems using alternate sources of heating and cooling. Solar still is a device, which is used for desalination purpose. Solar still is of two type's namely passive solar still and active solar still [11]

CONSTRUCTION

A schematic of water-in-glass evacuated tube solar still is shown in Fig. The system consists of a solar still and water in tube evacuated tube collector. The single slope solar still of an effective basin is mounted on iron stand. The still consists of an air tight basin, usually constructed out of concrete/cement, galvanized iron sheet (GI), galvanized reinforced plastic (GRP) or fiber reinforced plastic (FRP) of better insulating materials. The basin liner is painted black to increase its absorptivity to radiation. Transparent glass cover
(thermal conductivity of 0.76 W/m K) with a thickness of 0.004 m with an inclination to the horizontal is fixed to the top using iron clamps and is further sealed with window-putty to prevent vapor leakage. Glass cover allows 95% the solar radiation (short wave) to transmit inside, which are mostly being absorbed by the blackened absorber liner and water in it. [12].

WORKING

A schematic diagram of water-in-glass evacuated tube solar still is shown in Fig. the solar radiation is fall on transparent glass cover. The saline water fill in basin is absorb the radiation of solar and temperature of saline water is rise, evaporation of water start. The evaporated water goes to transparent glass then condensation process start. This condensed water is collect with collecting jar. Evacuated tube collector is used to supply addition heat to saline water. The heat transfer fluid enters through small diameter delivery glass tube and exits from the same end of the tube through annular space between delivery tube and selective coated absorber tube [5]

APPLICATION

Active solar still with Evacuated tube collector are used as commercial water purification.

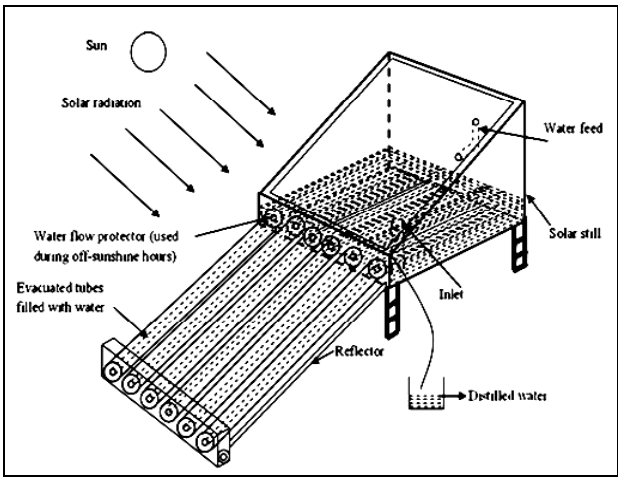

Fig 1 Schematic diagram of solar still integrated with evacuated tube system in natural mode [12]

TERM OF HEAT TRANSFER RELATION FOR ACTIE SOLAR STILL

The quantitative thermal analysis has been reported and validated by means of numerical simulations of the heat transfer process and conventional method. The presented simulation carried out by conventional method (manually calculation)

The main steps of the analysis are the following:

(1) Apply the energy balance equations in terms of various heat transfer coefficients.
(2) Calculate all types of heat transfer coefficient of the solar still.
(3) Calculate the mass transfer during evaporation and condensation process.
(4) Calculate the hourly yield and daily yield of solar still.
(5) Calculate the overall thermal efficiency and exergy efficiency of solar still.[2]

2. LITERATURE SURVEY

Rajesh Tripathi, G. N. Tiwar.[1] In this research paper authors were present on active solar still and passive solar still. Active Solar still is couple with a flat plate collector (FPC). The area of still was taken as 1 m^2 and the area of FPC was taken as 2 m^2. The water pump was used to circulate water from basin to FPC.

By the experimental data result shows for same water depth 0.15 m the difference between convective and evaporative heat transfer coefficient of passive solar still less than the difference between convective and evaporative heat transfer coefficient of active solar still. As the water depth change internal convective heat transfer coefficient changed due water temperature was change. The value of the evaporative heat transfer coefficient is greater in active mode due to higher operating temperature range for given water depth. The output decease with increases in water depth and the daily yield obtained is 5.0875 kg/m^2 for 24 hr duration.

G. N. Tiwari, Vimal Dimri1, Usha Singh, Arvind Chel1 and Bikash Sarkar, [2] authors were present on active solar still with different types collector like flat plate collector, concentrating collector, evacuated tube collector, evacuated tube with heat pipe. Authors were also studded exergy and overall efficiency of passive and active solar still.

They are conclude that The maximum values of total heat transfer coefficient for active solar stills integrated with FPC, concentrating collector, e ETC and ETC with heat pipe are 43, 86, 67 and 76W/m^2 per day, respectively. The high performance in daily total yield and overall thermal efficiency are achieving ETC with heat pipe with 4.24 kg/m^2per day in and 18.26%, respectively.

A.A. El-Sebaii, S.J. Yaghmour, F.S. Al-Hazmi, Adel S. Faidah, F.M. Al-Marzouki, A.A. Al-Ghamdi [3] they present on the transient performance of an active single basin solar still (ASS) integrated with a thin layer of a sensible storage material. Material used for storage material was sand because it is cheap and easy available. The experimental data integrated with a sensible storage material has been investigated by computer simulation under Jeddah (Saudi Arabia). Numerical calculation computer program is based on Liu and Jordan isotropic model.

After sunset, sand will act as the heat source for the basin water so the still continues to produce fresh water during night. The various temperatures of solar still components are increase with increase solar radiation. Experimental data shows that the daily productivity decreases with increasing the mass of sand m_{st}. The daily productivity P_d and efficiency η_d are found to increase with increasing the thickness of the basin liner y_p until an

optimum value of 0.003 m beyond which ;P_d and η_d decrease slightly with further increase in y_p. The P_d and η_d decrease with an increase of thermal conductivity of the basin linear material k_p. The annual average of daily productivity with 10 kg of sand is found to be higher than that without sand by 23.8%. Thus, it is recommended to integrate storage materials in active and wick-type solar stills to produce fresh water overnight

Mahmoud IM Shatat K Mahkamov. [4] authors were presents on the water desalination system integrated with four stage tray still coupled to heat pipe in evacuated tube solar collector of 20 tubes and frame consist of an array of 110 halogen floodlight. The climate condition was same as mid-summer day of Middle East region for experimental setup.

The CFD analysis is unfeasible for heat transfer and flow in four stage so FLUENT 6.2 CFD software used for simulation of condensation and evaporation processes only inside the first stage. Here the experimental result and computer simulation result was not same author develop a computer mathematical program in MATLAB.

Author concluded that evacuated tube give better result than the flat plate collector in multi stage solar still. The overall efficiency obtained is 33% and the daily yield obtained is 5 kg/m^2 per day and it can improved and reach at 11 kg/m^2 per day.

K. Sampathkumar, T.V. Arjunan, P. Pitchandi, P. Senthilkumar, [5] authors were presents studies of active solar still with different configuration. They were also present the comparative studies of different types of active solar still.

They concluded after studies of different research paper the length of solar still, depth of water in basin, inlet water temperature and solar radiation are the major parameters which affect the performance of the still. The performance of the solar distillation is depend upon the material used, latitude of the place, types of solar still, local climate condition, geometry of system. The yield was high in hybrid photovoltaic/thermal (PV/T) active solar still compared to the passive solar still. Solar still coupled with FPC with forced circulation mode gives higher yield than that of the thermosyphon mode. The multistage solar desalination system with heat recovery system produces higher yield than the simple solar still.

Rahul Dev , G.N. Tiwari [6] In this research paper authors were presents on the inverted absorber solar still which a curved reflector has been placed under the basin An experimental data taken during June, 2009 at Sultan Qaboos University, Muscat, Oman. They consider different water depth like 0.01, 0.02, 0.03 m for experiment. They were also considering of wind velocity, relative humidity, and ambient temperature because of near to the sea. The daily yield obtained is 4 kg/m^2 per day. They concluded that the values of instantaneous gain efficiency (η_i) are higher for the Solar Still in comparison to that of the inverted absorber solar still at the same water depth and climatic conditions. The values of instantaneous gain efficiency (η_i) decreases as the water depth increases whereas the values of instantaneous loss efficiency decreases due to the thermal storage effect of the water. They found that 0.01 m water depth is the most efficiently for solar stills.

Gajendra Singh a, Shiv Kumar b,G.N. Tiwari. [7] They were presents on the hybrid photovoltaic thermal double slop active solar still. The photovoltaic operated DC motor was used for circulation of saline water. And then check for connection of two flat plate collectors. The experimental data were taken during October, 2010 at KIET campus, Ghaziabad, India. The output of the solar still varies with solar radiation. The daily yield of series force mode and natural mode circulation was 6.854 kg and 6.373 kg respectively. The parallel force mode is more efficient than the series mode and natural circulation mode in case of energy efficiency, exergy efficiency. They concluded that Parallel forced mode configuration of the solar still will produce higher yield than the other configurations and obtained as 7.54 kg/day with energy efficiency of 17.4%. The hourly exergy efficiency is also found to be highest for the same configuration and reached as high as 2.3%. The comparative yield obtained is about 1.4 times higher than that obtained for hybrid (PVT) single slope solar still

Sampathkumar K. [8] author was presents on the Single Basin Solar Still Augmented with Evacuated Tubes. The evacuated tubes were directly couple with solar still and black gravel was used to increase the exposure area. The experimental data was taken during May 2008 to March 2009 at Solar Park, Tamil Nadu College of Engineering, Coimbatore, Tamil Nadu, India.

The evacuated tubes supply addition heat energy to saline water. The daily productivity was increased to 49.7%. The black gravel is act as an energy storage media. The daily productivity was increased 59.48% by coupling evacuated tube with gravel. Author concluded that that evacuated tube were another option for high temperature distillation compared to flat plated collector and it were also effectively work in winter

Shiv Kumar [9] In this research paper authors were present on the Performance of Passive and Hybrid (PVT) Active Solar Stills. The PV operated DC pump used for circulation of the saline water. The experimental data was taken during the year of 2006 to 2007 at New Delhi, India.
The average temperature of day was higher in case of hybrid active solar still. The daily yield is 3.5 time higher in summer and 5.5 times in peak winter than the passive still. The efficiency of the hybrid (PVT) active solar still is in the range of 9.1-19.1% and lowers than the passive. The heat transfer coefficient and efficiency were varies with solar radiation. Author concluded that the average water temperature obtained from the hybrid (PVT) active solar still is higher in the range of 8-10 degree C than the passive solar still. The electrical efficiency of integrated PV module is found to be in the range of 9.5 -12.4%.
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Sethi A.K., Dwivedi V.K [10] , In this research paper authors were present on of double slope active solar still under forced circulation mode distillate output and instantaneous thermal efficiency were calculated different water depths. The experimental data was taken during July 2011 to June 2012 at Galgotias College of Engineering & Technology Greater Noida, UP, India
During the experiment water depth 0.03, 0.04, 0.05 m. Author concluded that depth of basin water increase the water output decrease. The instantaneous thermal was maximum 46.96 % at 0.04 m water depth

H.N.Panchal [11] In this research paper authors were present on double basin solar still with vacuum tubes. And increase distillate output of a solar still, black granite gravel is used inside the inner and outer basins of a solar still. The experimental data was taken during March, 2012 at Gitanjali Society, Mehsana, Gujarat, India.
14 vacuum tubes were directly coupled with inner basin of solar still. Black granite gravel was used to reduce quantity of water inside inner and outer basins and also increase in area and black granite gravel is acting as an energy storage medium and during evaporation it also increases capillary action, hence the distillate output is increased by use of it. Author concluded that distillate output is increased to 56% with adding vacuum tubes and 65% of adding vacuum tubes and black granite gravel in double basin solar still. The daily yield obtained is 4.2kg/$m^2$for 8 hr duration

R.V.Singh [12] In this research paper authors were present on thermal modelling and performance evaluation of a solar still integrated with evacuated tube collector in natural mode. System has been optimized to find the best combination between the size of ETC and water depth in solar still for optimum performance.
MATLAB was used to calculation of different parameters. The hourly yield was decrease with increase water depth and increase with solar radiation. With increase in irreversibility of the system decreases the exergy efficiency. Authors concluded that the optimum value of water depth is 0.03 m with daily yield 3.8 kg/m^2. Instant overall energy efficiency of the system has been found in the range of 5.1–54.4%, while exergy efficiency in the range of 0.15–8.25%. Smaller size of ETC with 10 number of tubes is preferable than a single unit the larger size ETC integrated

T. Rajaseenivasan P. Nelson Raja, K. Srithar [13] In this research paper authors were presents on solar still with an integrated flat plate collector. The main object was to accommodate the flat plate collector system into the single basin still, to enhance the distillate of the still by supplying the preheated water. The horizontal flat plate collector is horizontal flat plate collector is integrated in the basin of a single slope single basin solar still. The experimental data was taken during the period of March–July 2013 at the Mechanical Engineering Department, Fatima Michael College of Engineering and Technology, Madurai, Tamil Nadu, India
There were two part of experimental. In first part performance of the system studied with various depth of water in basin. In second part wick and energy storing material are used in the basin to improve the heat storing and evaporation rate of the still. The hourly efficiency of the solar still with an integrated flat plate collector is always higher than the conventional solar still. Due to preheating water supply, water temperature of solar still with an integrated flat plate collector is higher than conventional solar still. Authors concluded that the effect of extended surface and preheated water supply increases the distillate of the FPCB still about 60% than that of the conventional still for the same basin condition. Stills with jute cloth enhance the productivity in sunshine hours and the black gravel has a significant effect at afternoon hours. The maximum productivity values obtained for conventional and FPCB stills are 3.62 and 5.82 kg/day respectively.

Shiv kumar, Aseem Dubey, G.N. Tiwar [14] In this research paper authors were presents on solar still with an evacuated tube collector in forced mode and to complement the studies cited earlier on ETC integrated solar still in natural mode, with modified geometry in forced mode. The experimental data was taken during May 2008 to December 2008 at New Delhi (India) climatic condition.
The variable parameters found with MATLAB computer program. The higher value of hourly yield (0.485 kg/m^2) is obtained at 13:00 h for 0.01 m water depth, which decreases further with increase in water depth as

expected. It is also observed that the hourly yield increases with increase in solar radiation. The mass flow rate is increase with the temperature of water. Authors concluded that the Optimum mass flow rate of 0.06 kg/s is obtained with water depth of 0.03 m in the basin. The combination produces daily yield of 3.9 kg/$m^2$and higher than the yield predicted for the configuration of same size operating in natural mode at 0.03 m water depth on SSHE performance.

Mohamed A. Eltawil [15] authors were presents on solar still performance using with solar photovoltaic, flat plate collector and hot air. Connecting a suction (vacuum) blower with the developed solar still (DSS) from the top back side to withdraw water vapour and pass it to the external condenser. The flat plate solar collector coupled with DSS, to increase the temperature of feed water of the solar still. The experimental data was taken during summer 2013 at Kafrelsheikh University, Egypt.

The DSS consists of single sloped solar still, PV system, water spraying units, plastic solar collector (hot air collector), AC air pump, AC water pump, perforated tubes and flat plate collector. Authors concluded that 51% production increase with use of external condenser with basin solar still. Jet hot water is more efficient than sprayed hot water passive and active circulations. The system efficiency decreases with air solar collector and the system becomes more expensive and complex. The solar still coupled with air solar collector and condenser showed better performance over conventional basin solar still by 60%. But the system efficiency decreased and reached about 21%

3. CONCLUSION

From the literature review we can conclude that the inclination of solar still is equal to latitude angle of location of experimental setup to get maximum solar radiation. Higher water temperature can be achieved by the active solar still compared to the passive solar still due to the additional thermal energy supplied by collector; increase in water temperature is more than 20°C supplied by collector; increase in water temperature is more than 20°C. Higher efficiency obtains at optimum depth of water with best combination of the collector and solar still configuration. The length of solar still, depth of water in basin, inlet water temperature and solar radiation are the major parameters which affects the performance of the still. The multistage solar desalination system with heat recovery system produces higher yield than the simple solar still. The distilled output varies with the water depth and it decreases with increase of water depth in basin. However optimum value of water depth depends on type of solar collector used and its thermal efficiency. Due to simplicity, low cost, less energy losses and high performance the evacuated tube collector is proved to be better option for higher temperature distillation.

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A STUDY OF RECRUITMENT AND SELECTION PRACTICES IN SMALL AND MEDIUM SIZED ENTERPRISES IN MYSORE AND BANGALORE REGION

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ABSTRACT: *Recruitment and selection practices involve two interrelated processes. Without right personnel, the performance may not enhance in Small and Medium sized enterprises (SMEs). SMEs have to follow structured recruitment and selection practices as they are very much labour intensive.The questionnaire was developed and was measured by using a five point Likert scales ranging from strongly disagree to strongly agree. ANOVA and Chi-square test were used to examine relationship and impact of recruitment and selection practices on organizational performance.*

Key Words: Recruitment And Selection Practices, Organizational Performance, Small And Medium Sized Enterprises (SMES)

1. INTRODUCTION

Management is a process of managing the resources of the organisation. These resources are financial, physical, information and human. Among all resources available to organisations, humans are very important as they hold or bind the other resources. This implies that, without right personnel, the performance may not enhance in Small and Medium sized enterprises (SMEs). SMEs have to follow structured recruitment and selection practices as they are very much labour intensive [1][2]. Recruitment and selection practices involve two interrelated processes. Recruitment is the process of generating a pool of capable people to apply for employment to an organisation while selection is the process by which specific instruments are employed to choose from a pool of applicants' most suitable for the job taking into consideration, management goals and legal requirements. Recruitment therefore provides the organisation with a pool of potentially qualified candidates from which selection can be made to fill job openings. Recruitment and selection are therefore a crucial part of organisational success [2]. Moreover, effective recruitment and selection are strategically important to any firm. Recruiting and selecting the wrong candidates can have extensive negative cost implications, while effective processes can contribute to a reduction in turnover and therefore increase in productivity [7].

Most businesses would like to benefit from an influx of talent, enthusiasm and fresh ideas. However it comes with an acceptable cost. Overall aim of the recruitment and selection process should be to obtain at minimum cost the number and quality of employees required to satisfy the human resource needs of the organisation. It has been emphasized that the three stages of recruitment and selection are; defining requirements (preparing job descriptions and specifications, deciding terms and conditions of employment), attracting candidates (reviewing and evaluating alternative sources of applicants, inside and outside the organisation) and selecting candidates (sifting applications, interviewing, testing, assessing candidates, assessment centres, offering employment, obtaining references; preparing contracts of employment) [12]

2. LITERATURE REVIEW

According to Perumalla [3], regarding hiring practices, word of mouth appears to be a common element and fringe benefits are considered as an important element in attracting prospective employees.

Reid and Adams [4]explored that family businesses use internal source to fill managerial positions.

Bernice Kotey& Alison Sheridan [5]explored that at early stage of the firms recruitment and selection process are informal. As firms grow structured recruitment and selection procedures are adopted. Micro firms may not require formal recruitment sources, screening of candidates.

According to Jyothi [5] sources of recruitment for small firms are network of friends and relatives.

Spencer [6] elucidates that effective recruitment and selection are important to any firm. Effective recruitment and selection process reduces employee turnover and therefore increases productivity.

Kotey and Slade [7] explored that the firms involuntarily adopt professional recruitment process, as the size in terms of employees of the firm grows up.

Kamble [8]explored that the SMEs use advertisement as a source of recruitment and found that there is no human resource planning, no promotion for employees in majority of the firms.

Islam and Siengthai [9]explored that recruitment and selection practices have positive impact on firm performance. Their observation implies that firms should invest more in HRM to enhance their performance.

Dr. Moses N. Ogindaet. al. [10] investigated the influence of recruitment and selection practices on the performance of the SMEs and found that recruitment and selection practices play a significant role in the performance of the SMEs.

3. METHODOLOGY OF THE STUDY

This was a descriptive study aimed at understanding the effect of recruitment and selection practices on financial and non-financial performance of the manufacturing small and medium sized enterprises in Mysore and Bangalore region. The samples of 384 owners/managers were selected for this study. The data collected is based on primary data source. The questionnaire was developed and was measured by using a five point Likert scales ranging from strongly disagree to strongly agree. ANOVA and Chi-square test were used to examine relationship and impact of recruitment and selection practices on organizational performance.

4. RESULTS AND DISCUSSION

4.1 The analysis has been carried out based on variable like Recruitment and Selection adopted or not adopted by the enterprises under the study and the mean agreeability scores of the respondents representing various enterprises on various aspects like Financial Performance and Non – Financial Performance of the enterprises. The table below shows overall mean agreeability score on financial performance and non-financial performance among the respondents representing the enterprises that adopt or do not adopt any formal Recruitment & Selection Practices.

Table –1: Recruitment& Selection PracticesandFinancial Performance

Recruitment& Selection Practices	**Respondents**		**Overall agreeability on financial performance**			
			Range			**S.D.**
	N	**%**	**Mean**	**Min**	**Max**	
Adopted	71	18.5	4.76	3	5	.572
Not-Adopted	313	81.5	3.06	1	5	1.479
Total	384	100	3.38	1	5	1.509
	F val.(df:1,382)= 90.186*					

Source: Primary data

With respect to formal adoption of Recruitment & Selection Practices by enterprises under study, inference can be made based on the above table. As can be seen, 81.50 % of the enterprises under study are not adopting any formal Recruitment & Selection Practices, whereas only 18.50 % of the enterprises under study adopt formal Recruitment & Selection Practices. The analysis of variance show that there is significant difference in the overall mean agreeability score on financial performance among the respondents representing the enterprises that adopt or do not adopt any formal Recruitment & Selection Practices. The mean score ranged from 3.06 to 4.76 and it is higher among the enterprises that adopt formal Recruitment & Selection Practices.

Table –2: Recruitment & Selection Practicesand Non -Financial Performance

Recruitment & Selection Practices	**Respondents**		**Overall agreeability on Non-Financial performance**			
			RANGE			**S.D.**
	N	**%**	**Mean**	**Min**	**Max**	
Adopted	71	18.5	4.55	1	5	.733
Not Adopted	313	81.5	2.96	1	5	1.452
Total	384	100	3.26	1	5	1.482
	F val.(df:1,382)= 80.164*					

Source: Primary data

With respect to formal adoption of Recruitment & Selection Practices by enterprises under study and the analysis of variance on Non - financial performance, inference can be made based on the above table that there is significant difference in the overall mean agreeability score on Non - financial performance among the respondents representing the enterprises that adopt or do not adopt any formal Recruitment & Selection Practices. The mean score ranged from 2.96 to 4.55 and it is higher among the enterprises that adopt formal Recruitment & Selection Practices.

4.2 Chi-square test was conducted to check the association between recruitment and selection practices with financial and non-financial performance of the manufacturing SMEs in Mysore and Bangalore region. Table below shows the results.

Table –3: Recruitment & Selection Practices and Financial Performance

Recruitment & Selection Practices	**Financial Performance**					**Total**
	Strongly Disagree	**Disagree**	**No Opinion**	**Agree**	**Strongly Agree**	
Adopted	0 (7.8)	0 (20.3)	5 (8.9)	7 (5.4)	59 (28.7)	71
NOT Adopted	42 (34.2)	110 (89.7)	43 (39.1)	22 (23.6)	96 (126.3)	313
Total	42	110	48	29	155	384

Source: Primary data

NULL HYPOTHESIS

There is no association between those enterprises who adopt formal Recruitment & Selection Practices and those enterprises who do not adopt formal Recruitment & Selection Practices and their financial performance.

Accordingly Chi Square test was conducted and the Expected frequencies are given in the parenthesis of the above table.

Chi-Square Value: **76.578**** D.F: 4 p = 0.004

Since the calculated χ^2 value is significant, the null hypothesis of no association between the two attributes is rejected and hence there is an association between those enterprises who adopt formal Recruitment & Selection Practices and those enterprises who do not adopt formal Recruitment & Selection Practices and their financial performance.

Table –4: Recruitment & Selection Practices and Non - Financial Performance

Recruitment & Selection Practices	**Non - Financial Performance**					**Total**
	Strongly Disagree	**Disagree**	**No Opinion**	**Agree**	**Strongly Agree**	
Adopted	1 (7.0)	0 (25.1)	4 (6.3)	20 (7.8)	46 (24.8)	71
NOT Adopted	37 (31.0)	136 (110.9)	30 (27.7)	22 (34.2)	88 (109.2)	313
Total	38	136	34	42	134	384

Source: Primary data

NULL HYPOTHESIS

There is no association between those enterprises who adopt formal Recruitment & Selection Practices and those enterprises who do not adopt formal Recruitment & Selection Practices and their Non - Financial performance.

Accordingly Chi Square test was conducted and the Expected frequencies are given in the parenthesis of the above table.

Chi-Square Value: 84.163**D.F: 4 p = 0.001

Since the calculated χ^2 value is significant, the null hypothesis of no association between the two attributes is rejected and hence there is an association between those enterprises who adopt formal Recruitment & Selection Practices and those enterprises who do not adopt formal Recruitment & Selection Practices and their Non - Financial performance.

5. CONCLUSION

Recruitment and selection practices involve two interrelated processes. Recruitment is the process of generating a pool of capable people to apply for employment to an organisation while selection is the process by which specific instruments are employed to choose from a pool of applicants' most suitable for the job taking into consideration, management goals and legal requirements[2]. The analysis of variance shows that there is significant difference in the overall mean agreeability scores on financial performance and non-financial performance of SMEs and the mean agreeability scores are high among the enterprises that adopt formal Recruitment & Selection Practices. The Chi-square test reveals that there is an association between those enterprises who adopt formal Recruitment & Selection Practices and those enterprises who do not adopt formal Recruitment & Selection Practices and their financial and non-financial performance.

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Efficient Congestion Control Using Transmission Control Protocol

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***Abstract*—TCP- Transmission Control protocol is one of the most popular protocols at transport layer. The main responsibilities of TCP are connection oriented and reliable end to end delivery. As a part of reliability, TCP offers congestion control. This paper discusses the entire process of congestion control in detail. This paper discusses how transmission rate is managed by TCP. This paper is useful for beginners who want to define research problems in computer networks.**

Keywords—TCP; Congestion; Slow Start; Congestion Avoidance; Congestion Detection;

I. INTRODUCTION

TCP- Transmission Control protocol is one of the most popular protocols at transport layer. The main responsibilities of TCP are connection oriented and reliable end to end delivery. As a part of reliability, TCP offers congestion control. TCP congestion control refers to setting transmission rate efficiently to avoid any issues like buffer overflow. TCP has a systematic algorithm to increase transmission rate slowly and later on detection of a loss, reduce. Section 2 discusses fundamentals of congestion control. Section 3 discusses various phases of congestion control. Various phases like slow start, congestion avoidance and congestion detection are used for this purpose. This paper helps in understanding the basis of congestion control in detail. This paper is useful for beginners who want to define research problems in computer networks [1][2].

II. CONGESTION CONTROL

A. *Types*

Congestion is overflow and overburden in the network which occurs when network is flooded with more packets then it can handle. It is difficult to delivery by any or few or all of the internetworking devices. Intermediate devices have limited amount of buffering facility. Congestion occurs when we flood network with more than what it can handle. If a node has to handle more number of packets than it's buffer capacity(forward), they get overflowed, too much in queues kind of situation known as network congestion. Now Router may drop some of the pending packets which degrades network's performance. When an intermediate node receives a packet, it performs these three steps[1][2].

1. packet is inserted in an input queue.
2. Router program removes a packet from the queue and finds its route.
3. packet is sent to an output queue and waits for transmission.

There are two issues. First, if the rate of packet arrival is higher than the packet processing rate, the input queues become larger. Second, if the packet departure rate is lesser than the packet processing rate, the output queues become longer and longer. At this point, because of the packet overflow in any of the buffer queues, routers may discard some packets. If senders still continue to send more and more packets, the situation may become worst. Transport layer and Network layer should work together for congestion control. Network layer witnesses the congestion while transport layer causes

congestion. Congestion control can be of two types [1][2].

Open-Loop, Congestion Avoidance, Proactive schemes based on retransmission, window, acknowledgements, discard, admission policies.

Closed-Loop, Congestion Detection & Recovery, Reactive schemes based on various techniques like back pressure, choke packet, implicit signaling, and explicit signaling.

B. *Congestion Window*

TCP uses a sliding window to keep track of number of bytes sent and acknowledged, sent but not acknowledged and going to be sent. TCP varies the size of transmission window as per current stateof network as well as of the receiver. The actual size of the sender sliding window wnd is maximum number of outstanding bytes that can be sent without expecting any acknowledgement. On receiving an acknowledgement, TCP resize the sliding window as per congestion control. A round is the completion of transmission of all the bytes presently loaded into the window[1][2].

Receiver sends the maximum rate at which it can receive by specify the window size parameter in TCP header of the acknowledgement or piggybacked data. This is known as rwnd which is a part of flow control. Sender uses various signals like packet delay, packet loss, and pattern of acknowledgements to predicate the congestion of the network. Based on such prediction, sender maintains a value of congestion window, cwnd which is a part of congestion control. Actual sender window size Wnd must be minimum of rwnd and cwnd [1][2].

C. *Congestion Policy*

TCP's congestion control is based on three phases: slow start (exponential increase), congestion avoidance (additive increase), and congestion detection (multiplicative decrease). In the slow-start phase, the sender starts with a slow rate of transmission, but increases the rate exponentially until it reaches a threshold value. At the threshold value, congestion avoidance phase starts where TCP increases the sending rate linearly. If congestion is detected at any point, the sending rate is reduced and either slow start or congestion avoidance phase is started based on how the congestion was detected [1][2].

III. PHASES

A. *Slow Start*

In slow start, size of the congestion window is increased exponentially per round completion. At the time of connection establishment, congestion window cwnd is set to very few segments, Mostly 1 to 4. (1 - Maximum segment size determined during connection establishment). The congestion control scheme is byte oriented but for simplicity we are considering segments as unit of different windows.

Receiver sends an acknowledgement for successfully received packets. Sender increments Cwnd by 1 for every acknowledgement. So eventually cwnd will be doubled for every round – per round trip time. In real time implementations, congestion window is incremented with following formula which is almost equivalent to increment by 1 [1][2].

A slow start threshold value – ssthresh is set in starting which is mostly set to 65535. Sender remains in slow start till size of congestion window cwnd reaches the ssthresh. At this point, it enters into congestion avoidance. Slowstart increments value of congestion window in exponential growth, after every another round like 1,2,4,8,…, after every ACK, 1,2,3,4,5…. until it reaches a threshold ssthresh. In most implementations the value of ssthresh is 65,535 bytes.

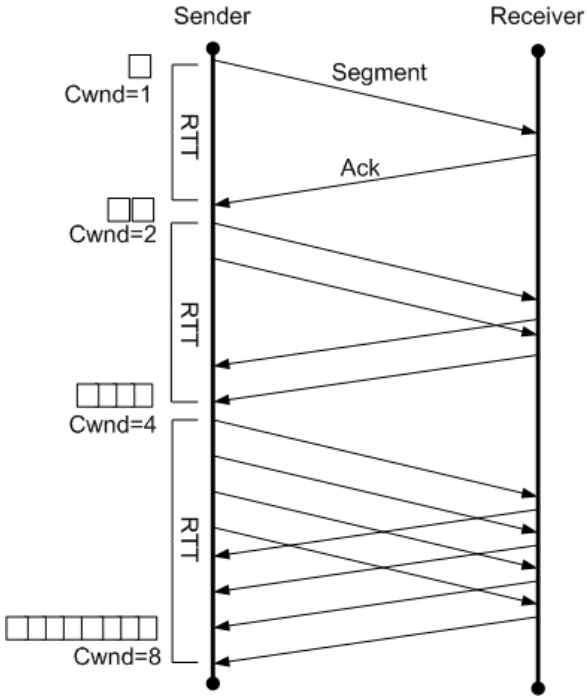

Figure 1 Slow Start

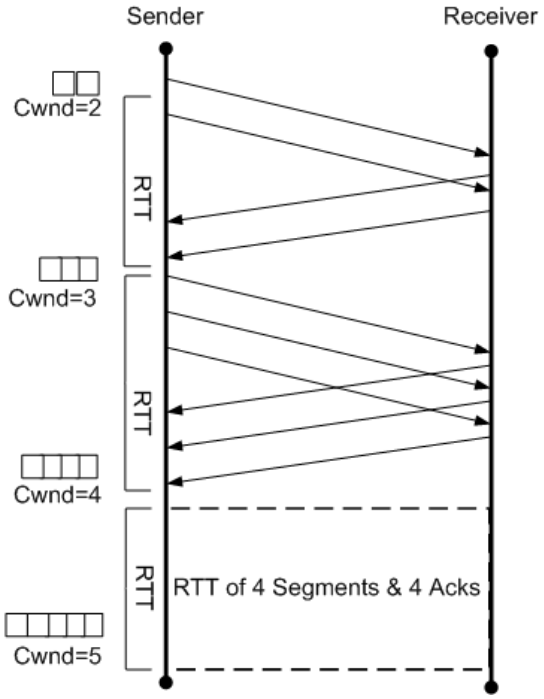

Figure 2 Congestion Avoidance

B. Congestion Avoidance

Congestion avoidance is a proactive effort towards the congestion control. To avoid congestion, we must reduce the rate before congestion happens. Slow start's exponential growth is replaced with congestion avoidance's linear growth known as additive increase. In this algorithm, cwnd is not incremented with every acknowledgement, but it is incremented with every round- when whole window of segments is acknowledged. congestion avoidance increments value of congestion window in linear growth: increment by 1at every another round 1,2,3,4,5…until congestion is noticed[1][2].

C. Congestion Detection

When congestion is detected, TCP decreases size of congestion window immediately. Retransmission is performed in either of following two situations: 1-Time out or 2-Three duplicate acknowledgements. In either of these two cases, ssthresh is set to half of current congestion window called multiplicative decrease. Most TCP implementations have two reactions[1][2]:

I. If a time-out occurs, it can be a strong possibility of congestion; a segment was most probably dropped,in this situation TCP reacts strongly[3]:

a. It sets the value of the ssthresh to one-half of the current window size.
b. It sets congestion window - cwnd to the size of a segment.
c. It starts a new slow-start phase.

II. If three duplicate ACKs are received, it can be a weak possibility of congestion; a segment might have dropped, but some segments after that may have arrived safely since three ACKs are received. This activates fast transmission and fast recovery. In this situation, TCP reacts weakly [1][2]:

a. It sets the value of the ssthresh to one-half of the current window size.
b. It sets cwnd to the value of the ssthresh (some TCP variants add three segment sizeto the ssthresh corresponding to three segments received corresponding to three duplicate acknowledgements).
c. It starts a new congestion avoidance phase.

CONCLUSION

TCP is a transport layer protocol, it ensures congestion control to prevent buffer overflow. The main reason of TCP's congestion control is to ensure that the transmission rate remains suitable for the network. The congestion control mechanism has been set and used to define how to increase or decrease transmission rate as per the rate of receiving acknowledgements.

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IMPLEMENTATION OF ISO 14001 ENVIRONMENTAL MANAGEMENT SYSTEMS IN MANUFACTURING INDUSTRIES AT MYSORE DISTRICT

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ABSTRACT : *The past two decades have seen an extraordinary increase in both interest and reactions to the idea of preserving the environment. This can be attributed to the increasing statutory and regulatory requirements of government and the pressure from consumers and the life- threatening of global ecosystem deterioration. Therefore, organizations are gradually under pressure to develop and implement Environmental Management System (EMS). While some sincere efforts have been made by the Indian organizations to implement EMS and their performance have been very good, still countrywide efforts are not adequate. Recently, the number of facilities and organizations also that have adopted certified environmental management system (EMS) has been increasing globally. As some form of the voluntary program, the certified EMS is expected to help firms identify their environmental goals and to reduce energy consumptions, waste, and the risk of future environmental liability. This article explores ISO 14001 Environmental Management System benefits, problem in implementing in manufacturing industries in Mysore District, Karnataka, India.*

Keywords: Environmental Management System, Benefits, Implementation

1. INTRODUCTION

Mysore also known as Mysuru, is the third largest city in the state of Karnataka, India, Mysore is located at 12.30°N 74.65°E and has an average altitude of 770 metres (2,526 ft).It is spread across an area of 128.42 km^2 (50 sq mi) at the base of the Chamundi Hills in the southern region of Karnataka. Mysore is the southern-most city of Karnataka, and is a neighboring city of the states of Kerala and Tamil Nadu in the south, flanked by the state cities Mercara, Chamarajanagara, and Mandya. According to the 2011 census of India, Mysore had a population of 8,87,000. According to source of industrial department, In the Mysore district nearly 25000 industries are working, including micro, small, medium and large scale industries. In the Mysore district 24 ISO 14001 certified companies are functioning according state pollution control board reports.
Till recent years, the emphasis to control industrial pollution was at the discharge points (end-of-the pipe).Pollution Control was considered as an appendage to the overall production activities and attended in an isolated way. Since this approach has not yielded desired results, the emphasis has been shifted from pollution control to Environmental Management System (EMS). Environmental Management Systems such as ISO 14001 and Eco Management and Audit Scheme (EMAS) have opened a new chapter in abatement of industrial pollution. ISO 14001 helps an industry to identify its environmental problems to reduce pollution and improve environmental performance gradually. It takes a holistic view of all the activities of an industrial unit (starting from quantity and quality of raw materials including water and energy usage, production and packaging processes to transportation of finished products) to identify the activities responsible for environmental degradation and to address these problems in a systematic manner. ISO 14001 is popularly known as EMS. Enterprises are responding positively because they get a number of direct and indirect benefits by obtaining ISO 14001 certification. An EMS also allows an organization to systematically manage its environmental and health.

2. LITERATURE REVIEW

2.1 UNDERSTANDING ISO 14001

ISO stands for International Standards Organisation which is based in Geneva, Switzerland. The short form "ISO" is not an acronym, but instead is derived from the Greek "isos", meaning "equal" (implying "standard").

ISO was founded in 1947. It promotes the international harmonisation and development of manufacturing, product and communications standards. ISO has laid down more than 8000 standards ranging from paper sizes to film speeds. More than 120 countries are full ISO voting members, while several other countries serve as observer members. India is a founder and a full voting member of ISO and is officially represented by the Bureau of Indian Standards (BIS). ISO produces internationally harmonised standards through various Technical Committees.
ISO 14001 specifies the standard for establishment and maintenance of an environmental management system (EMS). It belongs to the ISO-14000 series of standards relating to environmental management including eco-labelling and environmental audit etc.

ISO 14001 is applicable to any organisation that is defined as a "Company, Corporation, Firm, Enterprise, Authority or Institution or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration". Therefore, any organisation, small or big, manufacturing industry or business house can get ISO 14001 certification by establishing and maintaining EMS as per ISO 14001 specifications**.** Though ISO 14001 Standard does not specify the validity period of certification but normally it is valid for 3years, and the certification needs to be renewed after every three years. During the currency of certificate, internal audit and surveillance audits are conducted to ensure that EMS is maintained as per environmental management plan.
As audit consult, it is a systematic, periodic, independent and documented verification process of objectively obtaining and evaluating evidence to determine whether an organization's EMS conforms to the EMS audit criteria set by the organization, and for communication of the results of this process to management. Following are the types of audits in EMS.

1. First Party or Internal Audit is carried out within the Company so that the business can maintain control of the environmental performance and the EMS.
2. Second Party audit is one where a purchasing Company audits a supplier to be satisfied that the product is being manufactured according to specifications.
3. Third Party audit is defined as the one where an independent certification body audits an organisation in order to issue a certificate of approval that the system meets the specification of the standard (ISO 14001).

And also ISO 14001 standard allows an enterprise to self certify that it has established and it is maintaining an EMS as per ISO 14001 after carrying internal audit. Third party certification is the certification which is issued by an independent agency after satisfying that the organisation's EMS conforms to ISO 14001 standard.

2.2 The Benefits of an EMS

An environmental management system (EMS) is a structured program of continuous environmental improvement that follows procedures drawn from established business management practices. The concept is straightforward, and the principles can be easily applied, given the necessary support. There has been increasing interest in the potential value of EMS approaches, of which the recently released ISO 14000 series is the most widely known.

The first steps in the control of industrial pollution have been the creation of the necessary regulatory framework and the specification and design of control equipment to reduce emissions. These efforts have been broadly successful in improving the performance of many polluters, but in other cases, investments in pollution equipment are wasted because the equipment is not operated properly. Attention, in the World Bank and elsewhere, is turning to support of regulatory and end-of-pipe approaches through incentives, production efficiencies, and management improvements—a range of measures often grouped under the broad banner of cleaner production and eco efficiency. The potential benefits of ecoefficiency are unequivocal: good operational practices, supported by committed management, can achieve considerable improvements in environmental performance at low cost and can get the maximum benefits from investments in hardware. Without management and worker support, the best equipment can be useless. The challenge is to achieve long-lasting improvements in performance, and EMS is seen as one of the key tools in achieving this.

2.3 ISO 14000 and Other Standards

If an EMS were adopted purely as an internal management tool, the details of the system and its structure would not be important. However, the EMS is becoming more and more a matter of interest to people outside the management of the enterprise—to workers, regulators, local residents, commercial partners, bankers and insurers, and the general public. In this context, the EMS is no longer an internal system and becomes a

mechanism for communicating the enterprise's performance to outside parties, and some level of standardization and common understanding is required.
The best-known common framework for EMS is the ISO 14000 series. This series is based on the overall approach and broad success of the quality management standards prepared and issued as the ISO 9000 series. ISO 14000 consists of a series of standards covering eco labeling and life cycle assessment (LCA), as well as EMS .The documents formally adopted (by the end of 1996) as international standards are those covering EMS: ISO 14001 and ISO 14004.

The ISO 14000 series is a series of standards for different aspects of environmental management. A number of these standards relating to environmental management systems have been adopted formally by the members of the ISO, while others are in different stages of preparation. The ISO 14000 series detailed mentioned in following Table 1.

Title	**Standard**
14001	Environmental Management System-Specification with Guidance for Use
14002	Environmental Management System-Guidelines on Special Considerations Affecting Small and Medium Scale Enterprises
14004	Environmental Management System-General Guidelines on Principles, Systems and Supporting Techniques
14010	Guidelines for Environmental Auditing- General Principles of Environmental Auditing
14011	Guidelines for Environmental Auditing-Audit Procedures Part 1: Auditing of Environmental Management Systems
14012	Guidelines for Environmental Auditing-Qualification Criteria for Environmental Auditors
14013/15	Guidelines for Environmental Auditing-Audit Programmes, Reviews and Assessments
14020	Environmental Labels and Declarations-General Principles
14021	Environmental Labels and Declarations-Environmental Labelling- Self Declaration of Environmental Claims-Terms and Definitions
14022	Environmental Labels and Declarations-Environmental Claims-Self Declaration of Environmental Claims - Symbols
14023	Environmental Labelling-Self Declaration of Environmental Claims-Testing and
14024	Environmental Labels and Declarations-Environmental Labelling-Type 1-Guiding Principles and Procedures
14031	Environmental Performance Evaluation-Guidelines
14032	Technical Report Type III –Environmental Management-Environmental Performance Evaluation-Case Studies Illustrating the Use of ISO 14031
14040	Life Cycle Assessment- Principles and Framework
14041	Life Cycle Assessment-Life Cycle Inventory Analysis
14042	Life Cycle Assessment-Impact Assessment
14043	Life Cycle Assessment-Interpretation
14049	Technical Report Type III-Environmental Management- Life Cycle Assessment-Examples for the Application of ISO 14041
14050	Environmental Management Terms and Definition
14061	Technical Report III-Guidance to Assist Forestry Organizations In the Use of ISO 14001 and ISO 14004

TABLE1: SERIES OF ISO 14000

3. MATERIALS AND METHODS

The research design is one of the key factors in determining the effectiveness of the research study. If the method applied does not meet the needs of the objectives, the findings and analysis of data collected are wasted. A mixed method of Qualitative and Quantitative research design would be employed. The Review of current literature will provide a meaningful addition to the qualitative aspect of the study, while survey questionnaire will contribute to the quantitative aspect of the study. This study conducted using the cross-sectional survey

which is the most appropriate tool to be used. Information of this study was gathered from various ISO 14001 certified and non certified companies in Mysore. The best approach to gather data for this study is through a survey by distributing questionnaires to the respondents. The set of questionnaire is designed to collect the data and information needed in this study.

For questionnaire method, organizations certified to ISO 14001 and non certified were approached, which accounted for approximately 60 organizations. Out of a potential 60 participants, 25 participants returned the survey questionnaires. The lists of companies were obtained from the Karnataka Industrial authority development Board, Govt. of Karnataka. Data for the questionnaire was developed by analyzing journals, media articles, internet documents and information, and relevant publications & personal observations in organizations. The questionnaire targeted employees in organizations that are involved in the ISO14001 certified and non certified companies both. Data was collected using pre-designed and structured questionnaires. Before the actual survey were conducted, the questionnaires were pre-tested and reviewed for structure, readability, ambiguity and completeness, and the survey instrument was refined in light of comments from the respondents. The respondents were asked to rate the answer of each question on a 5-point ranging from 1 (strongly disagree) to 5 (strongly agree) to what extent the statement fits the situation in their organization.

4. RESULTS

4.1 Benefits of Implementing EMS ISO14001

Benefits gained from ISO14001 implementation were categorized into seven constructs of 24 items in total. The mean values of each item are arranged in descending order and the top ten items are listed in Table 2. Compliance with regulatory requirements has the highest mean value of 4.6. where regulatory compliance is the most important motivating factor in adopting ISO 14001. This proves that organizations have achieved the objective of compliance with legal requirements after ISO 14001 implementation.

No	Benefit	N	Mean	Std dev.
1	Comply with regulatory requirements	8	4.6	0.51
2	Improve environmental performance	8	4.6	0.51
3	Increase image and reputation	8	4.6	0.51
4	Better management of environmental aspects	8	4.5	0.54
5	Become more competitive in the market	8	4.5	0.54
6	Save the cost	8	4.5	0.54
7	Improve morale of employees	8	4.5	0.54
8	Increase sales revenue	8	4.3	0.516
9	Promote team creativity	8	4.3	0.516
10	Better relationship with authorities	8	4.3	0.516

TABLE 2: Means and Standard Deviations for Benefits from ISO 14001 implementation

The second benefit was better management of improve environmental performance (4.6), followed by Increase image and reputation (4.6), environmental aspects(4.3), Become more competitive in the market(4.3), Save the cost(4.3), Improve morale of employees(4.3), Increase sales revenue(4.3), Promote team creativity(4.3), Better relationship with authorities(4.3) indicating that the responses were close to 'agree' on the benefits of ISO 14001 implementation.. The findings reveal that ISO 14001 certified organizations acknowledged that there were improvements in employee performance, stakeholder relationship and economic aspect.

4.2 Problems with ISO14001 implementation.

Problems faced by organisations in ISO 14001 implementation were grouped into five constructs of 31 items in total. The mean value of each item is arranged in descending order and the first 10 items are shown in Table 3. Costs involved in environmental improvement has the highest mean value (3.0), followed by Lack of cooperation from suppliers(2.8) and contractors, Costs involved in getting information (2.6), Suppliers and contractors are unaware of environmental issues related to their activities(2.6), Lack of knowledge in ISO 14001 EMS standards(2.3), Understanding environmental concept/terminology Linkage between documentation and actual operations not understood(2.3), Lack of knowledge in environmental subject(2.3), Lack of knowledge in environmental regulations(2.16), Understanding the local environmental regulations(2.16), Identify environmental aspects and impacts(2.16). The overall mean for P is 2.66 which shows that the responses were close to 'neutral' on problems faced during ISO 14001 implementation.

Most of the mean values for the 31 items are below 3.50 (close to neutral) which imply that ISO 14001 certified organizations in Mysore did not have much problems in ISO 14001 implementation. The findings indicate that financial and human resources were the problems in ISO 14001 implementation in Mysore, similar to that reported in other studies, especially among the Small and medium enterprises.

No	Problem	N	Mean	Std dev.
1	Costs involved in environmental improvement	8	3	1.41
2	Lack of cooperation from suppliers and contractors	8	2.8	1.3
3	Costs involved in getting information	8	2.6	1.3
4	Suppliers and contractors are unaware of environmental issues related to their activities	8	2.6	1.3
5	Lack of knowledge in ISO 14001 EMS standards	8	2.3	1.03
6	Understanding environmental concept/terminology Linkage between documentation and actual operations not understood	8	2.3	1.03
7	Lack of knowledge in environmental subject	8	2.1	0.98
8	Lack of knowledge in environmental regulations	8	2.1	0.98
9	Understanding the local environmental regulations	8	2.1	0.98
10	Identify environmental aspects and impacts	8	2	0.63

Table 3: Means and Standard Deviations for Benefits from ISO 14001 Problems

Apart from financial and human resources, organizations faced challenges in dealing with external parties during EMS implementation. The suppliers and contractors were unaware of environmental issues of their activities, not cooperative and difficult to communicate with. These problems were common to organizations whose activities involved many suppliers and contractors. ISO 14001 requires that organizations ensure competency of their suppliers and contractors who carry out critical environmental tasks, and communicate environmental policy,
procedures and requirements to them (ISO, 2004).

5. CONCLUSION:

The implementation of EMS ISO 14001 has its benefits to organizations. At the organizational level, the implementation of EMS ISO 14001 can put companies at an international position with quality standards and procedures, which in turn can lead to increased organizational productivity and success. At the employee level, the implementation of EMS ISO 14001 can be very challenging with increased workload and changes in the way tasks are performed, particularly with additional documentation and procedures to follow which can be very bureaucratic and unnecessary at times. Hence, it is suggested that employers conduct sufficient awareness training on the objective and benefits of EMS and get employees from all levels to participate in the implementation of EMS ISO 14001.

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