Figure 3. Multi-piece support fixture

The damaged piece is installed in a multi-piece support Fixture as in Figure 3 that has been aligned to minimize the loading eccentricities and induced specimen bending. The specimen/fixture assembly is placed between platens and end-loaded under compressive force until failure. Impacted samples were subjected to compression loading based on ASTM D 7137 specification at the rate of 1 mm/min. The speed of testing was set such that the failure is produced within 1 to 10 minutes. Preloading was applied to the specimen/fixture assembly in order to ensure all loading surfaces are in contact and to align the platens. Then the compressive force was reduced and made to re-zero to balance all instrumentation. Loading was done at specified rate until maximum force was reached and it has dropped off about 30% from the maximum.

IV. EXPERIMENTAL RESULTS

After the laminate subjected to impact force, delamination occurs which was then progressively propagated during the application of compressive force. The impacted specimen is shown in Figure 4 and the compression after impact specimen is shown in Figure 5 & Figure 6

Figure 4. Impact induced damage

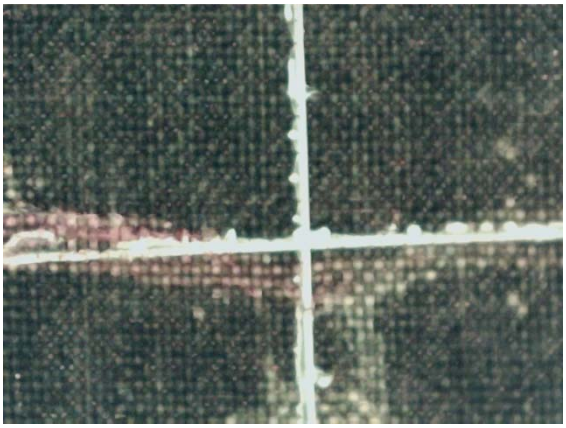

Figure 5. Damage after compression loading viewed from front face

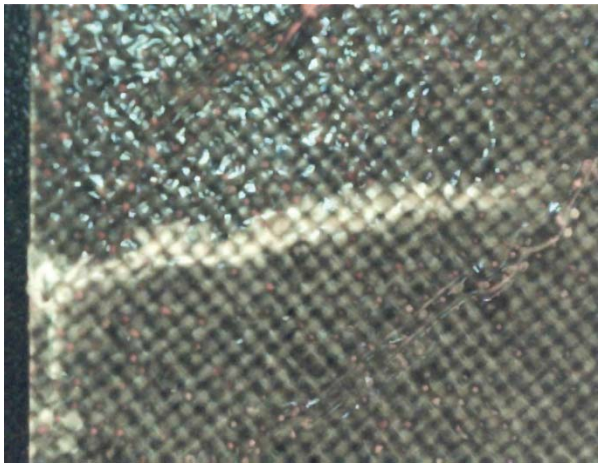

Figure 6. Damage after compression loading viewed from back face

From Figures, it is evident that after impact induced compression, the final failure was controlled by sudden extension of the horizontal crack towards the edges of the specimen. Load-displacement curve of impacted composite laminate in compression is shown in Figure 7.

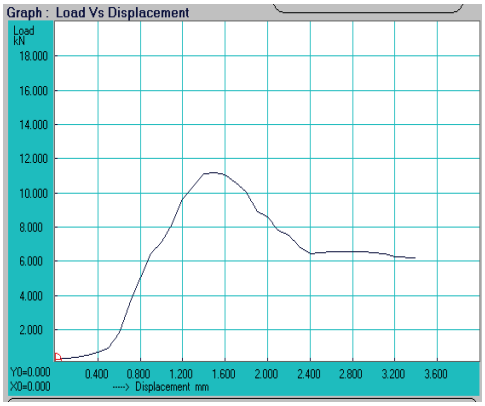

Figure 7. Load-Displacement curve of an impacted composite laminate in compression

From the plot shown in Figure 7, the ultimate compressive residual strength was calculated as below.

$$F_{CAI} = P_{max}/A = P_{max}/bd$$

where,
P_{max} = maximum force prior to failure, N
B = specimen width, mm
H = specimen thickness, mm
F_{CAI} = ultimate compressive residual strength, MPa
therefore,
F_{CAI} = 11205/(100×2.6) = 43 Mpa
Thus, the ultimate compressive residual strength was found to be 43 MPa.
Delamination occurs in the specimen after CAI test is shown in the Figure 8,

Figure 8. Delamination after CAI test

V.CONCLUSION

This paper provided a detailed investigation of compression after impact test response of woven glass/epoxy laminate with 1% graphite fillers. Resin toughness is more influencing parameter than the fibre strength and stiffness. CAI is seen as a matrix dominant failure process. Ultimate compressive residual strength for resin with graphite fillers is more than that without the inclusion of it [12]. Delamination propagation is the critical mechanism that lowers the sublaminate buckling strength of impacted specimens. Delamination propagation extends throughout the width of the specimen between middle plies, which influences the sublaminate buckling. Delamination propagation is marked by mode transition: the loading-direction shear dominated initial impact-induced delamination extends in low amplitude compression loads, which transitions to the lateral shear dominated delamination at higher amplitudes. The delamination extends laterally toward the sides of the specimen. The crack initiate at the back face of the specimen. The constituent cracks propagate laterally and along the thickness direction in shear mode to cause ultimate failure of the specimen under compressive loading.

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A Survey on Recommender Systems based on Collaborative Filtering Technique

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Abstract- **Nowadays Product advertisement and viewer's choice are two important part of marketing. These two parts generate a system that system is known as Recommender system. Recommender system plays a vital role in internet technology for data gathering and rating up a data. There are four types of filtering technique used in Recommender System-demographic, content, collaborative and hybrid. The most widely and popularly used technique is collaborative filtering. In this paper we describe a little about former three techniques but mainly focuses on collaborative filtering, their types and their major challenges such as cold start problem, data sparsity, scalability, accuracy etc.**

Keywords – Recommender System, Collaborative Filtering, Cold Start, Sparsity, Accuracy.

I. INTRODUCTION

The explosive growth of e-commerce and online environments has made the issue of information search and selection increasingly serious; users are overloaded by options to consider and they may not have the time or knowledge to personally evaluate these options. Recommender systems[5] have proven to be a valuable way for online users to cope with the information overload and have become one of the most powerful and popular tools in electronic commerce. Correspondingly, various techniques for recommendation generation have been proposed. During the last decade, many of them have also been successfully deployed in commercial environments. Recommender form or work from a specific type of information filtering system technique that attempts to recommend information items (movies, TV program/show/episode, video on demand, music, books, news, images, web pages, scientific literature such as research papers etc.) or social elements (e.g. people, events or groups) that are likely to be of interest to the user. A recommender system helps users that have no sufficient competence to evaluate the, potentially overwhelming, number of alternatives. In their simplest form recommender systems provide a personalized and ranked lists of items by predicting what the most suitable items are, based on the user's history, preferences and constraints. Typically, a recommender system compares a user profile to some reference characteristics, and seeks to predict the 'rating' or 'preference' that a user would give to an item they had not yet considered. These characteristics may be from the information item (the content-based approach) or the user's social environment (the collaborative filtering approach).
Data collections are done by two methods-explicitly and implicitly.

Explicit data collections include the following:

- Asking a user to rate an item on a sliding scale.
- Asking a user to rank a collection of items from favourite to least favourite.
- Presenting two items to a user and asking him/her to choose the better one of them.
- Asking a user to create a list of items that he/she likes.

Implicit data collection includes the following:

- Observing the items that a user views in an online store.
- Analyzing item/user viewing time.
- Keeping a record of the items that a user purchases online.

- Obtaining a list of items that a user has listened to or watched on his/her computer.
- Analyzing the user's social network and discovering similar likes and dislikes.

II. TYPES OF FILTERING

2.1 Demographic Information Filtering–

Categorize users or items based on their personal attributes and make recommendation based on demographic categorizations. In other words we can say that in the filtering based on demographic information, users are classified by their features, and recommendation is given to the class of demographic information.

2.2 Content Based Filtering –

Another filtering that is widely used in recommender systems is content-based filtering. Content based filtering methods are based on the information about the items that are going to be recommended. In other words, these algorithms try to recommend the items similar to those that a user liked in the past. In particular, various candidate items are compared with items previously rated by the user and the best-matching items are recommended. This approach has its roots in information retrieval and information filtering research. Basically those methods use an item profile i.e. a set of attributes (features) characterizing the item within the system. The system creates a content based profile of users based on a weighted vector of item features. The weights denote the importance of each feature to the user and can be computed from individually rated content vectors using a variety of techniques. Simple approaches use the average values of the rated item vector while other sophisticated methods use Bayesian Classifiers (and other machine learning techniques, including clustering, decision trees, and artificial neural networks) in order to estimate the probability that the user is going to like the item.

Content based system has features such as simplicity and effectiveness, but also some drawbacks:

- It is difficult to distinguish the quality of the filtering results from the same subject. Since the quantity of information increases rapidly, the information of the same subject increases too, making the efficiency and quality of the content-based system much reduced in a long term.

- Incapable to discover the information of user's new interests, the system could only locate the information similar to user's current interests.

2.3 Collaborative Filtering-

Another filtering technology that is widely used in recommender systems is Collaborative Filtering. Compared with the content-based filtering system, collaborative filtering system could automatically filter the information that the system could not analyze and represent, and recommend up-to-date information. Collaborative filtering methods are based on collecting and analyzing a large amount of information on users' behaviour, activity or preferences and predicting what users will like based on their similarity to other users. One of the most common types of Collaborative Filtering is item-to-item collaborative filtering (people who buy x also buy y), an algorithm popularized by Amazon.com recommender system. User-based collaborative filtering attempts to model the social process of asking a friend for a recommendation. A particular type of collaborative filtering algorithms uses matrix factorization, a low-rank matrix approximation technique. A key advantage of the collaborative filtering approach is that it does not rely on machine analyzable content and therefore it is capable of accurately recommending complex items such as movies without requiring an "understanding" of the item itself.

Many collaborative filtering techniques have been developed. They can be categorized into two types:

- <u>*Memory Based Collaborative Filtering:*</u>
  Memory-based CF uses user-to-user or item-to-item correlations based on users' rating behaviour to recommend or predict ratings for users on future items. Correlations can be measured by various distance metrics, such as Pearson correlation coefficient, cosine distance, and Euclidean distance. Memory-based collaborative filtering uses the whole training set each time it computes a prediction, which makes it easy to incorporate new data but suffers slow performance on large data sets. Speedup can be achieved by pre-calculating correlations and other needed information and incrementally updating them. For some

applications, however, the size requirement makes the approach infeasible. It can perform with high recommendation accuracy, and new data can also be easily applied into recommendation. However, it is costly in computing and with bad scalability.

- *Model Based Collaborative Filtering:*

Unlike memory-based CF, model-based approach does not use the whole data set to compute a prediction. Instead, it builds a model of the data based on a training set and uses that model to predict future ratings. For example, clustering based CF method builds a model of the data set as clusters of users, and then uses the ratings of users within the cluster to predict. A very successful model-based method is the Singular Value Decomposition (SVD) [3], which represents the data by a set of vectors, one for each item and user, such that the dot product of the user vector and the movie vector is the best approximation for the training set. Typical the model building process is computationally expensive and memory intensive. After models are constructed, predictions can be done very fast with small memory requirement. Model-based CF methods usually achieve less accurate prediction than memory-based methods on dense data sets where a large fraction of user-item values are available in the training set, but perform better on sparse data sets.

III. CHALLENGES OF COLLABORATIVE FILTERING

There are some potential problems with the Collaborative Filtering RS. One is the scalability, which is how quickly a recommender system can generate recommendation; second one is sparsity and also cold start Problem and better accuracy. We discuss all of them below[17]:

Scalability:

In many of the environment that these systems make recommendation in, there are millions of users and products. Thus a large amount of computation power is often necessary to calculate recommendation. For example, with tens of millions of customers (*M*) and millions of distinct catalog items (*N*), a *CF* algorithm with the complexity of *O*(*n*) is already too large. As well, many systems need to react immediately to online requirements and make recommendations for all users regardless of their purchases and ratings history, which demands a high scalability of a *CF* system [3].

Data Sparsity:

The number of items sold on major e commerce sites is extremely large. The most active users will only have rated a small subset of the overall database. Thus even the most popular items have very few ratings.

Cold Start Problem:

The *cold start* problem occurs when a new user or item has just entered the system, it is difficult to find similar ones because there is not enough information (in some literature, the *cold start* problem is also called the *new user problem* or *new item problem* [18, 19]). New items cannot be recommended until some users rate it, and new users are unlikely given good recommendations because of the lack of their rating or purchase history.

IV. RELATED SURVEY

We study various research paper and journal and know about recommender systems, collaborative filtering also their drawbacks. All methodology and process are not described here. But some related work in the field of filtering in Recommender System discuss by the name of authors and their respective title.

A. By Guangping Zhuo, Jingyu Sun and Xueli Yu[8] **"A Framework for Multi-Type Recommendations"** deals in the field of web minning concern on some drawbacks in collaborative filtering and also on multi type recommendation. Collaborative filtering (CF) is an effective method of recommender systems (RS) has been widely used in online stores. However, CF suffers some weaknesses: problems with new users (cold start), data sparseness, difficulty in spotting "malicious" or "unreliable" users and so on. Additionally CF can't recommend different type items at the same time. So in order to make it adaptive new Web applications, such as urban computing, visit schedule planning and so on, introduced a new recommendation framework, which combines CF and case-based reasoning (CBR) to improve performance of RS. Based on this framework, the authors have developed a semantic search demo system—MyVisit, which shows that our proposed framework is an effective recommendation model. Two key algorithms, **MIFA** and **RAA**, are used. Additionally, authors have validated them using an application instance, which is a demo system for recommending multi type recommendations combining CF and CBR.

Advantage of this method is that it involves a few of cases in the online and adjusts the rating of main items through associative other type items in order to find fit recommendations.

B. By Yechun Jiang, Jianxun Liu, Mingdong Tang and Yechun Jiang, Jianxun Liu, Mingdong Tang [9**] "An Effective Web Service Recommendation Method based on Personalized Collaborative Filtering"**. Describing an effective personalized collaborative filtering method for Web service recommendation. A key component of Web service recommendation techniques is computation of similarity measurement of Web services. Different from the Pearson Correlation Coefficient (PCC) similarity measurement, they take into account the personalized influence of services when computing similarity measurement between users and personalized influence of services. Based on the similarity measurement model of Web services, develop an effective Personalized Hybrid Collaborative Filtering (PHCF) technique by integrating personalized user-based algorithm and personalized item-based algorithm. Also conduct series of experiments based on real Web service QoS dataset WSRec [20] which contains more than 1.5 millions test results of 150 service users in different countries on 100 publicly available Web services located all over the world. Experimental results show that the method improves accuracy of recommendation of Web services significantly.

C. By Qian Wang, Xianhu Yuan, Min Sun [1**] "Collaborative Filtering Recommendation Algorithm based on Hybrid User Model".** Collaborative filtering faces challenges of scalability and also recommendation accuracy so the paper proposes a hybrid user model to remove some of its drawbacks. The recommender system based on this model not only holds the advantage of recommendation accuracy in memory-based method, but also has the scalability as good as model-based method. The user model is constructed based on item combination feature and demographic information, and it focuses on searching for set of neighbouring users shared with same interest, which helps to improve system scalability. To enhance recommendation accuracy, each feature in user model is given a different weight when computing the similarity between users. Genetic algorithm is adopted to learn the weight values of features. Methodology proposed improves recommendation accuracy and scalability to a certain extent. It constructs a concise and representative hybrid user model, and combines and integrates item ratings, item detailed description and demographic information together, which raises the density of data and improves the problem of sparse data. Besides, genetic algorithm is adopted to learn a best feature weight vector in computation of the nearest neighbor set, which helps to get a more accurate similarity. The experiment shows that algorithm proposed in the paper can get a recommendation with higher accuracy, compared to methods of TCF and CCCF.

D. By Chuangguang Huang and Jian Yin [10] **"Effective Association Clusters Filtering to Cold-Start Recommendations".** The paper focuses on how to overcome cold-start problem in the traditional research of Recommendations System (RS). The popular technique of RS is Collaborative Filtering (CF). While in real online RS, CF can't practically solve cold-start problem for the sparsity ratings dataset. The paper proposed a novel efficiently association clusters filtering (ACF) algorithm. Considering hybrid approaches, using clustering and also filtering to relieve cold-start problem. ACF algorithm establishes clusters models based on the ratings matrix. We assume the users in the same cluster; they will have the same interests. On the other hand, different users in different clusters present they will have less common interests. The more users ratings for some item in the cluster, can delegate the opinion of the cluster. So we can use the opinion of the cluster to predict the unknown ratings. Throughout the experiments, our method can enlarge the prediction scope and improve the accuracy. The advantage of our algorithm is clearer if we use the more sparsity dataset. We see our main contribution as a detailed study of a number of different clusters filter generation methods and demonstration that a very few number of simple association clusters help algorithms work better in cold-start situation, with negligible impact on non-cold-start recommendation accuracy and system efficiency.

E. By Mustansar Ali Ghazanfar and Adam Prugel-Bennett [11] **"A Scalable, Accurate Hybrid Recommender System".** The paper proposes a unique cascading hybrid recommendation approach by combining the rating, feature, and demographic information about items. They empirically show that their approach outperforms the state of the art recommender system algorithms, and eliminates recorded problems with recommender systems. Since there are three main types of recommender systems: collaborative filtering, content-based filtering, and demographic recommender systems. Collaborative filtering recommender systems recommend items by taking into account the taste (in terms of preferences of items) of users, under the assumption that users will be interested in items that users similar to them have rated highly. Content-based filtering recommender systems recommend items based on the textual information of an item, under the assumption that users will like similar items to the ones they liked before. Demographic recommender systems categorize users or items based on their personal attribute and make

recommendation based on demographic categorizations. These systems suffer from scalability, data sparsity, and cold-start problems resulting in poor quality recommendations and reduced coverage. So they combine all these filtering to form a hybrid recommender system.

F. By Liang He and Faqing Wu [12] **"A Time-context-based Collaborative Filtering Algorithm".** The paper incorporates the time-context, one of the most important contexts, into the traditional collaborative filtering algorithm and proposes a Time context-Based Collaborative Filtering (TBCF) Algorithm to improve the performance for traditional collaborative filtering algorithm. Experiments evaluating this approach are carried out on real dataset taken from movie recommendation system provided by MovieLens web site. The result shows the proposed approach can improve predication accuracy and recall ratio compared with existing methods. The time context is a very important factor in recommendation system. And the paper introduced time interval into the traditional user-based collaborative filtering algorithm. The strategies proposed improved both the prediction accuracy and recall ratio of standard user-based collaborative filtering methods.

G. By Ling Yun, Wang Xun and Gu Huamao [13**] "A Hybrid Information Filtering Algorithm Based on Distributed Web log Mining"**. For distributed large commercial mirror sites, the paper presents a hybrid information filtering algorithm based on distributed web log mining. Based on multiagent technology, the algorithm pre-processes the web logs of mirror sites, in which the web page's manual rating is replaced by user browsing preference, and then user access matrix is constructed and standardized.
The paper proposes a distributed web log mining based hybrid filtering algorithm. To solve the problem that users are reluctant to rate web pages, this paper establishes the user access matrix on the basis of web log mining to gather fundamental data for both filtering. For the sparseness of user rating data of collaborative filtering, a collaborative filtering algorithm is proposed based on web page rating prediction, which effectively overcomes the drawbacks of traditional similarity measuring methods under circumstances of data sparseness and improves the accuracy of target user's calculation of the nearest neighbor. To address the drawbacks of those two filtering models, the paper presents a hybrid filtering model. With the optimal weight, this model further improves the recommendation quality. But this algorithm is tested only in the simulation, thus lacking the test under distributed net environment, so the reliability and performance of the algorithm needs to be further proved.

H. By Ibrahim A. Almosallam and Yi Shang [8] **"A New Adaptive Framework for Collaborative Filtering Prediction".** The paper focused on memory-based collaborative filtering (CF). Existing CF techniques work well on dense data but poorly on sparse data. To address this weakness, the paper proposed to use z-scores instead of explicit ratings and introduce a mechanism that adaptively combines global statistics with item-based values based on data density level. They present a new adaptive framework that encapsulates various CF algorithms and the relationships among them. An adaptive CF predictor is developed that can self adapt from user-based to item-based to hybrid methods based on the amount of available ratings. The experimental results show that the new predictor consistently obtained more accurate predictions than existing CF methods, with the most significant improvement on sparse data sets. When applied to the Netflix Challenge data set, our method performed better than existing CF and singular value decomposition (SVD) methods and achieved 4.67% improvement over Netflix's system.

I. By Cane Wing-ki Leung, Stephen Chi-fai Chan and Fu-lai Chung [15] **"Applying Cross-Level Association Rule Mining to Cold-Start Recommendations".** The paper proposed a novel hybrid recommendation algorithm for addressing the well-known cold-start problem in Collaborative Filtering (CF). The algorithm makes use of Cross-Level Association RulEs (CLARE) to integrate content information about domain items into collaborative filters. They first introduce a preference model comprising user-item and item-item relationships, and described the CLARE algorithm for generating cold-start recommendations. When no recommendations can be generated for an item from ratings data, CLARE takes into consideration the attributes of the item for generating cold-start recommendations. Experimental results validated the ability of CLARE to recommend cold-start items and to improve significantly the number of recommendable items in a system. They experimented with only one type of attribute (cast) for mining CARs as an initial effort. They studied the behaviour of CLARE using more attribute types with varying characteristics, and obtained improved recommendation quality and coverage.

J. By Leo Iaquinta, Anna Lisa Gentile, Pasquale Lops, Marco de Gemmis and Giovanni Semeraro [7] **"A Hybrid Content-Collaborative Recommender System Integrated into an Electronic Performance Support System".** The paper proposed the adoption in an EPSS of a novel hybrid recommender that implements a neighbourhood

formation process based on the idea of grouping users by computing similarities between their semantic user profiles instead of their rating style. Our hybrid recommender overcomes some shortcomings of pure CF systems:

- ***Sparsity Problem*** - interpreted the MAE improvement as a direct consequence of the proposed neighbourhood formation strategy and this Improvement is particularly evident in case of data sparsity, when the strategy based on the Pearson's correlation coefficient is more likely to fail.
- ***Lack of Transparency Problem*** - the adoption of synset-based profiles to select the neighbourhood of users gives the possibility to understand why some users have been selected for producing recommendations. Profiles are represented by senses instead of words, thus a certain level of system transparency has been added. To the best of our knowledge, the clustering of synset-based profiles for the process of neighbourhood selection is a novel contribution in the area of CF systems. The scenario of the experimental evaluation was different from the JUMP project domain: it simply represents a proof of concept in order to verify the quality of the hybrid recommender. As future work, we expect to integrate the hybrid recommender into the JUMP EPSS and to run an experimental evaluation.

K. By Manos Papagelis, Dimitris Plexousakis, Themistoklis Kutsuras **"Alleviating the Sparsity Problem of Collaborative Filtering Using Trust Inferences"**. In this research, our main objective was to describe a method that is able to provide high-quality recommendations even when information available is insufficient. Our work employs theoretical results of research conducted in areas of social networks and trust management in order to develop a computational trust model for recommendation systems. To deal with the sparsity problem we proposed a method that is based on trust inferences. Trust inferences are transitive associations between users that participate in the underlying social network. Employment of this model provides additional information to Collaborative Filtering algorithm and remarkably relaxes the sparsity and the cold-start problems. Furthermore, our model considers the subjective notion of trust and reflects the way in which it is raised in real world social networks. Subjectiveness is defined in terms of confidence and uncertainty properties that are applied to the network associations. We have experimentally evaluated our method according to the impact that trust inferences have to sparsity and according to recommendation quality. Our experimental results indicate that our method succeeds in providing additional information to the Collaborative Filtering algorithm while it outperforms the quality performance of the classic CF method. The methodology described is general and may probably be easily adopted to alleviate the sparsity problem in other application areas, especially where underlying social networks can be identified.

V. CONCLUSION

We study various research papers including upper ones and results on this fact that Collaborative Filtering is mostly used filtering technique but then also it has some issues related to sparsity, accuracy, scalability etc. There have been many researches and also results given by many authors. They all are focuses on Scalability, Cold Start, Sparsity and Accuracy. But there is not much work was done on sparsity issue. Since today internet data is growing fastly thats why sparsity also increases as new records, items, things, music, data etc are increasing and loaded day by day. In future work we research on sparsity issue as it is also the important challenge that recommender system faces today and in future also.

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Non Adaptive and Adaptive Thresholding Approach for Removal of Noise from Digital Images

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Abstract - Image denoising is a common procedure in digital image processing aiming at the removal of noise which may corrupt an image during its acquisition or transmission while sustaining its quality. This paper presents a review of some significant work in the area of image denoising. After a brief introduction, some popular approaches are classified into different groups and an overview of various algorithms and analysis is provided.

I. INTRODUCTION

An image is corrupted by noise in its acquisition and transmission. The goal of image denoising is to produce good quality of the original image from noisy image. Wavelet denoising techniques remove the noise present in the signal while preserving the signal characteristics, regardless of its frequency content. Image denoising still remains a challenge for researchers because noise removal introduces artifacts and causes blurring of the images. This paper describes different methods for noise reduction giving an insight as to which algorithm should be used to find the most reliable estimate of the original image data.

II. CLASSIFICATION OF DENOISING TECHNIQUES

There are two basic approaches to image denoising, spatial filtering methods and transform domain filtering methods. Spatial filters employ a low pass filtering on groups of pixels with the assumption that the noise occupies the higher region of frequency spectrum. Spatial Low-pass filters will not only smooth away noise but also blur edges in signals and images while the high-pass filters can make edges even sharper and improve the spatial resolution but will also amplify the noisy background [2].
Fourier transform domain filters used in signal and image processing involve a trade-off between the signal-to-noise ratio (SNR) and the spatial resolution of the signal/image processed. The conventional Fast Fourier Transform (FFT) based image denoising method is essentially a low pass filtering technique in which edge is not as sharp in the reconstruction as it was in the original. The edge information is spread across frequencies because of the FFT basis functions, which are not being localized in time or space. Hence low pass-filtering results in the smearing of the edges. But, the localized nature of the wavelet transforms both in time and space results in denoising with edge preservation.

Wavelet Analysis, a new form of signal analysis is far more efficient than Fourier analysis wherever a signal is dominated by transient behavior or discontinuities. Several investigations have been made into additive noise suppression in signals and images using wavelet transforms. Much of the early work on wavelet noise removal based on thresholding the Discrete Wavelet Transform (DWT) coefficients of an image and then reconstructing it, was done by Donoho and Johnstone [3]. It has been found that wavelet based denoising is effective in that although noise is suppressed, edge features are retained without much damage [4].

2.1 Spatial Filtering - A traditional way to remove noise from image data is to employ spatial filters. Spatial filters can be further classified into non-linear and linear filters.

I.Non-Linear Filters - With non-linear filters, the noise is removed without any attempts to explicitly identify it. Spatial filters employ a low pass filtering on groups of pixels with the assumption that the noise occupies the higher region of frequency spectrum. Generally spatial filters remove noise to a reasonable extent but at the cost of blurring images which in turn makes the edges in pictures invisible. In this case, the value of an output pixel is determined by the median of the neighbourhood pixels, rather than the mean.

Advantage of median filter - Median is much less sensitive than the mean to extreme values (called outliers); therefore, median filtering is able to remove these outliers without reducing the sharpness of the image. In recent years, a variety of nonlinear median type filters such as weighted median [2], rank conditioned rank selection [3], and relaxed median [4] have been developed.

II. Linear Filters - A mean filter is the optimal linear filter for Gaussian noise in the sense of mean square error. Linear filters too tend to blur sharp edges, destroy lines and other fine image details, and perform poorly in the presence of signal-dependent noise. The wiener filtering [5] method requires the information about the spectra of the noise and the original signal and it works well only if the underlying signal is smooth. Wiener method implements spatial smoothing and its model complexity control correspond to choosing the window size. To overcome the weakness of the Wiener filtering, Donoho and Johnstone proposed the wavelet based denoising scheme in [6, 7].

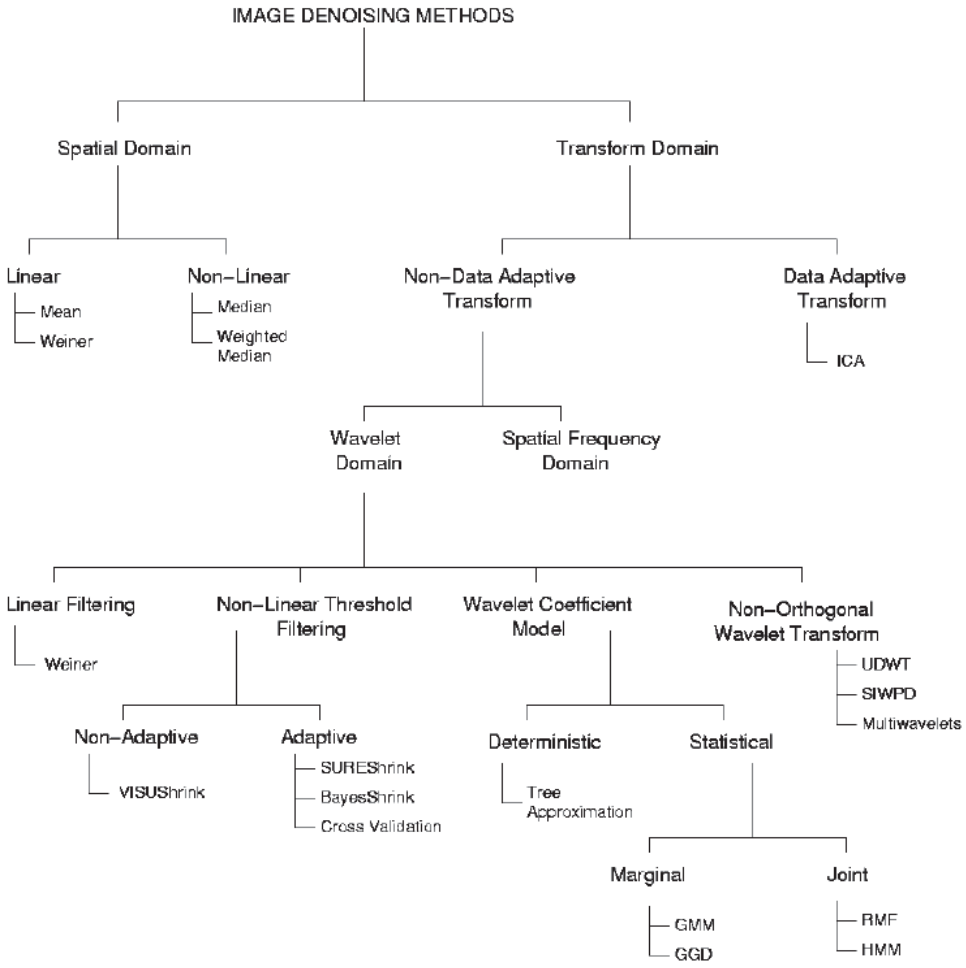

FIGURE 1 – CLASSIFICATION OF IMAGE DENOISING METHODS

2.2 Transform Domain Filtering - The transform domain filtering methods can be subdivided according to the choice of the basis functions. The basis functions can be further classified as data adaptive and non-adaptive. Non-adaptive transforms are discussed first since they are more popular. In this paper the discussion of adaptive and non-adaptive thresholding is discussed as these are the popular methods used now a days.

2.2.1 Spatial-Frequency Filtering - Spatial-frequency filtering refers use of low pass filters using Fast Fourier Transform (FFT). In frequency smoothing methods [5] the removal of the noise is achieved by designing a frequency domain filter and adapting a cut-off frequency when the noise components are decorrelated from the useful signal in the frequency domain. These methods are time consuming and depend on the cut-off frequency and the filter function behavior. Furthermore, they may produce artificial frequencies in the processed image.

2.2.2 Wavelet domain - Filtering operations in the wavelet domain can be subdivided into linear and nonlinear methods.
I. Linear Filters - Linear filters such as Wiener filter in the wavelet domain yield optimal results when the signal corruption can be modeled as a Gaussian process and the accuracy criterion is the mean square error (MSE) [8, 9]. However, designing a filter based on this assumption frequently results in a filtered image that is more visually displeasing than the original noisy signal, even though the filtering operation successfully reduces the MSE. In [10] a wavelet-domain spatiallyadaptive FIR Wiener filtering for image denoising is proposed where wiener filtering is performed only within each scale and intrascale filtering is not allowed.

II. Non-Linear Threshold Filtering - The most investigated domain in denoising using Wavelet Transform is the non-linear coefficient thresholding based methods. The procedure exploits sparsity property of the wavelet transform and the fact that the Wavelet Transform maps white noise in the signal domain to white noise in the transform domain. Thus, while signal energy becomes more concentrated into fewer coefficients in the transform domain, noise energy does not. It is this important principle that enables the separation of signal from noise. The procedure in which small coefficients are removed while others are left untouched is called Hard Thresholding [1]. But the method generates spurious blips, better known as artifacts, in the images as a result of unsuccessful attempts of removing moderately large noise coefficients. To overcome the demerits of hard thresholding, wavelet transform using soft thresholding was also introduced in [1]. In this scheme, coefficients above the threshold are shrunk by the absolute value of the threshold itself. Similar to soft thresholding, other techniques of applying thresholds are semi-soft thresholding.

a. Non-Adaptive thresholds - VISUShrink [6] is non-adaptive universal threshold, which depends only on number of data points. It has asymptotic equivalence suggesting best performance in terms of MSE when the number of pixels reaches infinity. VISUShrink is known to yield overly smoothed images because its threshold choice can be unwarrantedly large due to its dependence on the number of pixels in the image.

b. Adaptive Thresholds - SUREShrink [6] uses a hybrid of the universal threshold and the SURE [Stein's Unbiased Risk Estimator] threshold and performs better than VISUShrink. BayesShrink [11, 12] minimizes the Bayes' Risk Estimator function assuming Generalized Gaussian prior and thus yielding data adaptive threshold. BayesShrink outperforms SUREShrink most of the times. Cross Validation [13] replaces wavelet coefficient with the weighted average of neighborhood coefficients to minimize generalized cross validation (GCV) function providing optimum threshold for every coefficient.

III. Non-orthogonal Wavelet Transforms - Undecimated Wavelet Transform (UDWT) has also been used for decomposing the signal to provide visually better solution. Since UDWT is shift invariant it avoids visual artifacts such as pseudo-Gibbs phenomenon. Though the improvement in results is much higher, use of UDWT adds a large overhead of computations thus making it less feasible. In [14] normal hard/soft thresholding was extended to Shift Invariant Discrete Wavelet Transform. In [15] Shift Invariant Wavelet Packet Decomposition (SIWPD) is exploited to obtain number of basis functions.
IV. Wavelet Coefficient Model - This approach focuses on exploiting the multiresolution properties of Wavelet Transform. This technique identifies close correlation of signal at different resolutions by observing the signal

across multiple resolutions. This method produces excellent output but is computationally much more complex and expensive. The modeling of the wavelet coefficients can either be deterministic or statistical.

a. Deterministic - The Deterministic method of modeling involves creating tree structure of wavelet coefficients with every level in the tree representing each scale of transformation and nodes representing the wavelet coefficients. This approach is adopted in [16]. The optimal tree approximation displays a hierarchical interpretation of wavelet decomposition. Wavelet coefficients of singularities have large wavelet coefficients that persist along the branches of tree. Thus if a wavelet coefficient has strong presence at particular node then in case of it being signal, its presence should be more pronounced at its parent nodes.

b. Statistical Modeling of Wavelet Coefficients - This approach focuses on some more interesting and appealing properties of the Wavelet Transform such as multiscale correlation between the wavelet coefficients, local correlation between neighborhood coefficients etc. This approach has an inherent goal of perfecting the exact modeling of image data with use of Wavelet Transform. A good review of statistical properties of wavelet coefficients can be found in [17] and [18]. The following two techniques exploit the statistical properties of the wavelet coefficients based on a probabilistic model.

I. Marginal Probabilistic Model - In [19], authors proposed a methodology in which the wavelet coefficients are assumed to be conditionally independent zero-mean Gaussian random variables, with variances modeled as identically distributed, highly correlated random variables. An approximate Maximum A Posteriori (MAP) Probability rule is used to estimate marginal prior distribution of wavelet coefficient variances. All these methods mentioned above require a noise estimate, which may be difficult to obtain in practical applications. Simoncelli and Adelson [19] used a twoparameter generalized Laplacian distribution for the wavelet coefficients of the image, which is estimated from the noisy observations. Chang et al. [20] proposed the use of adaptive wavelet thresholding for image denoising, by modeling the wavelet coefficients as a generalized Gaussian random variable, whose parameters are estimated locally (i.e., within a given neighborhood).

II. Joint Probabilistic Model - The correlation between coefficients at same scale but residing in a close neighborhood are modeled by Hidden Markov Chain Model where as the correlation between coefficients across the chain is modeled by Hidden Markov Trees. Once the correlation is captured by HMM, Expectation Maximization is used to estimate the required parameters and from those, denoised signal is estimated from noisy observation using wellknown MAP estimator. A model in which each neighborhood of wavelet coefficients is described as a Gaussian scale mixture (GSM) which is a product of a Gaussian random vector, and an independent hidden random scalar multiplier.

2.2.3 Data-Adaptive Transforms - Recently a new method called Independent Component Analysis (ICA) has gained wide spread attention. The ICA method was successfully implemented in [21, 22] in denoising Non-Gaussian data. Drawbacks of ICA based methods as compared to wavelet based methods are the computational cost because it uses a sliding window and it requires sample of noise free data or at least two image frames of the same scene. In some applications, it might be difficult to obtain the noise free training data.

III. CONCLUSION

Performance of denoising algorithms is measured using quantitative performance measures such as peak signal-to-noise ratio (PSNR), signal-to-noise ratio (SNR) as well as in terms of visual quality of the images. Many of the current techniques assume the noise model to be Gaussian. In reality, this assumption may not always hold true due to the varied nature and sources of noise. An ideal denoising procedure requires *a priori* knowledge of the noise, whereas a practical procedure may not have the required information about the variance of the noise or the noise model. Thus, most of the algorithms assume known variance of the noise and the noise model to compare the performance with different algorithms.

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Generation of Electricity through Speed Breaker Mechanism

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Abstract - This paper is presenting the study of electricity generation through the speed breaker mechanism. For obtaining the electricity through the speed breaker mechanism a prototype model is developed and studied. Findings from this research work is discussed in this paper , The generator used here is permanent magnet D.C. generator. The generator voltage is 12 Volt D.C. This D.C. voltage is stored to the lead 12-volt battery. The battery is connected to the inverter. The inverter is used to convert 12 volt D.C. to the 230 volt A.C[3]. voltage is used to activate the light fan etc. By increasing the capacity of the battery and the inverter circuit the power rating is increased.

Keywords: electric power, speed breaker, inverter, lead acid battery, permanent magnet D.C. generator

I. INTRODUCTION

Energy is the primary and most universal measure of all kinds of works by human beings and nature. Every thing what happens in the world is the expression of flow of energy in one of its forms. Most people use the word energy for input to their bodies or to the machines and thus think about crude fuels and electric power.[5]

Energy in the form of electricity plays a very important role in the life of a normal man. Electricity is one of the greatest wonders of science. Next to man, it is the most important and revolutionary creation in this world of ours .It has practically revolutionized the world .The gradual but excessive use of electricity has come to bring about a stupendous changes in industry. With it our modern gigantic tools are worked. Computers as also calculators sum up totals and make other calculations with the utmost accuracy. Newspapers and books are printed in millions overnight. There is not a single phase of human life that is not indebted to electricity for its progress .The modern age has, therefore, been truly called the "age of electricity." [7]

We do many things with electricity nowadays. We warm our homes, we drive the machines in factories, we run our trains and buses. Electricity has completely revolutionized the methods of travel and transport .It has enabled us to travel in aeroplanes and fly into cold atmosphere of the sky. We also have electric trains in our country.[1]

So today our whole life style is dependent on electricity with the increasing population the use of electric power is also increasing. But we know that the resources to generate electricity are limited, and this has lead to the energy crisis. During this scenario we need to generate electricity from things used in day-to-day life[6]. In this project we have tried to generate electricity through speed breakers present on roads. As we know that vehicles on road are increasing day by day which will help us to generate electricity as these vehicles pass through the speed breakers. This electricity generated can be used for different purpose such as lighting of signals and streetlights on road etc.

This set up requires very basic mechanical components such as gear shaft bearing. There are also some electrical components such battery, inverter etc.

II. PRINCIPLE OF WORKING

The principle of the electric power generation using speed breaker mechanism is very simple. It is based on the same principle as in the case of electricity generation in case of hydroelectric power plant, thermal electric power plant, nuclear power plant, geothermal energy, wind energy, tidal energy etc. In all of the above power plant mechanical energy is converted into electrical energy[2]. In this setup also mechanical energy is converted into electrical power using a D.C. generator. Here the vertical motion of the top of the speed breaker is converted into the rotational motion, which in turn rotates the generator and generates electricity.

III. NAME OF THE COMPONENTS

componentsare used in the generation of electricity power using speed breaker are as follows.

S.No.	Name of the Component
(1)	Springs
(2)	Gears
(3)	Chain drive
(4)	Shaft
(5)	Bearing
(6)	D.C. Generator
(7)	Battery
(8)	Inverter

IV. COMPONENTS LIST WITH THEIR SPECIFICATION

S.No.	Name of the Component	Specification
1.	**Motor:**	**(i)Voltage : 12** **(ii)Type: D.C. Generator** **(iii) RPM: 1200rpm**
2.	**Gear:**	**(i)Material : Mild Steel** **(ii) No. of teeth : 56(big gear)** **(iii)No. of teeth : 48(small gear)** **(iv) Type: Spur gear** **(v)No.of gear used:2**
3.	**Spring :**	**(i) Load bearing capacity :6- 7kg** **(ii)Material: Mild Steel** **(iii)Total displacement: 2 inch**
4.	**Chain & Sprocket:**	**(i) Number of teeth on big sprocket :48** **(ii)Number of teeth on small sprocket 19** **(iii)Distance between the center 16 cms**

5.	**Bearing**	**(i) Type: Rolling contact bearing** **(ii) Bearing no. N40**
6.	**Shaft:**	**(i)Diameter : 8mm** **(ii) Material : Mild steel** **(iii) Length : 381mm**

V. CONSTRUCTION

This setup mainly consist of an arrangement which is having a shaft with a U shaped projection carrying a bearing and is connected to the top of the speed breaker. The bearing is provided in order to permit the relative motion between the shafts. In this way vertical motion is to be converted into rotational motion. The top of the speed breaker will be provided with the return spring in order to retain its position after it will be displaced by the weight of the vehicles in the downward direction. The spring is designed depending on the weight of the vehicles passing through it. The two ends of the shaft will be fixed with the help bearing. The shaft is made of mild steel. This shaft will also be provided with the sprocket, as it will rotate in direction of the shaft. This sprocket will be connected with another sprocket with the help of chain drive, which is mounted on the other shaft this action is like the bicycle arrangement. The lower shaft also consists of a gear. A gear is also mounted on the generator and is meshing with gear on the lower shaft this will help to rotate the D.C. generator and in turn will generate electrical power, which will be stored in the battery and can be used accordingly.

The generator used here is permanent magnet D.C. generator. The generate voltage is 12 Volt D.C. This D.C. voltage is stored to the lead 12-volt battery. The battery is connected to the inverter. The inverter is used to convert 12 volt D.C. to the 230 volt A.C. voltage is used to activate the light fan etc. By increasing the capacity of the battery and the inverter circuit the power rating is increased. This arrangement is fitted in highways; the complete arrangement is kept inside the floor level except the speed brake arrangement.

VI. BLOCK DIAGRAM

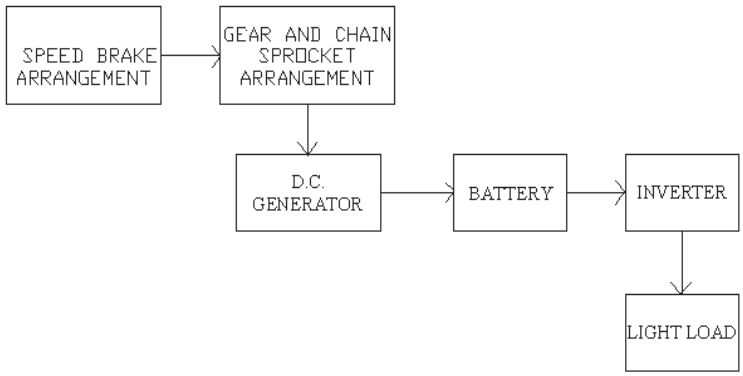

Fig.1 Arrangements of different components

VII. LINE DIAGRAM

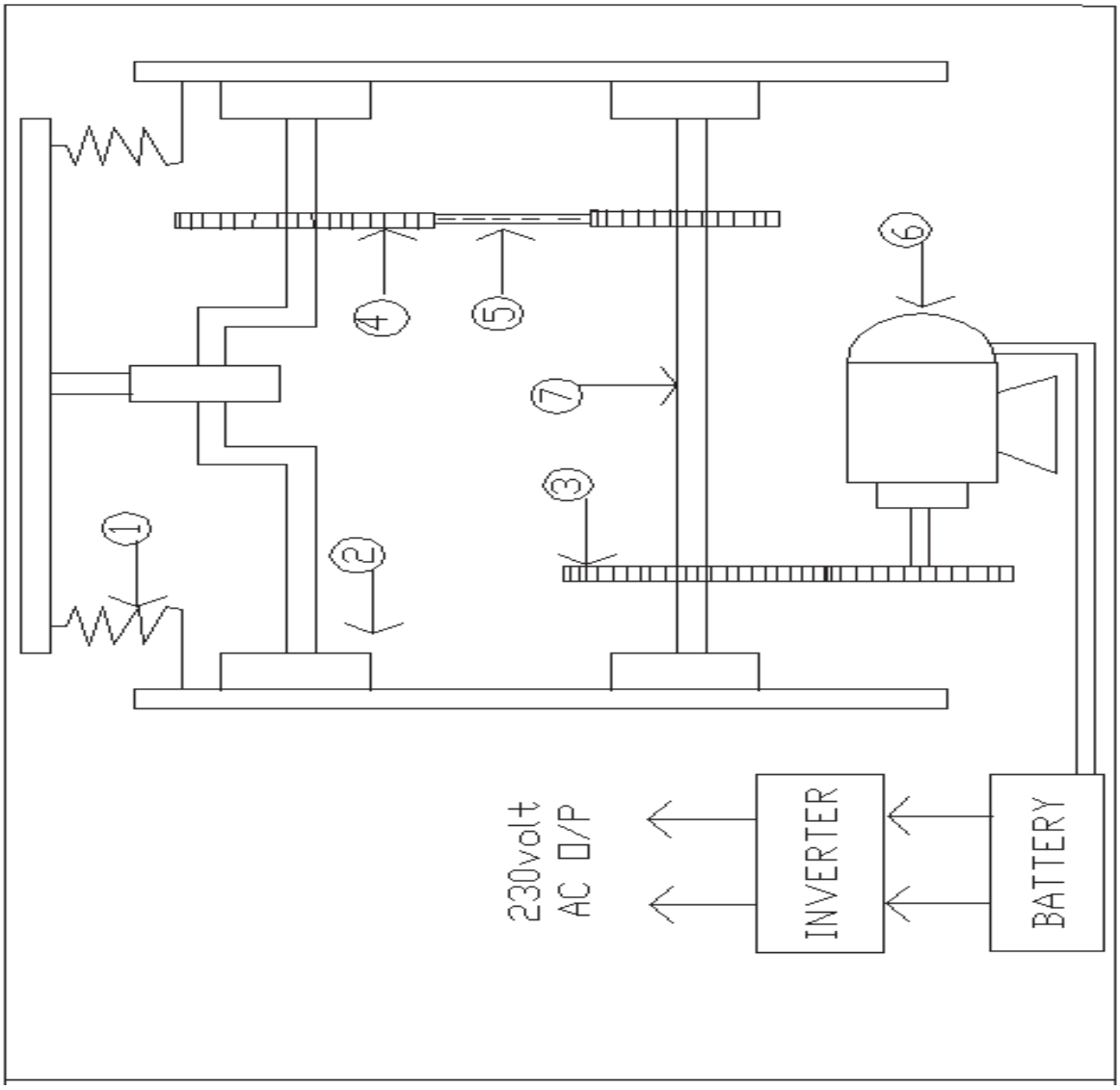

Fig.2 Mechanism of electricity generation through the speed breaker

VIII. WORKING OF THE MODEL

The working of this speed breaker arrangement for producing electricity is very simple. There are a large number of automobiles running on the road. These automobiles go over a number of speed breakers present on the road. The vehicle is having a variety of weight like trucks, buses, cars, and two wheelers therefore whenever they are passing

over a speed breaker a lot of energy is wasted. So when the vehicle will come on the speed breaker because of its weight the top portion of the speed breaker moves down wards and the shaft consisting of the U portion rotated in a particular direction. Due to this rotation of the shaft the sprocket will rotate and the rotational energy from one shaft is transferred to the other shaft with the help of chain drive mechanism. This rotates the gear on the bottom shaft, which in turn will help to rotate the gear placed on motor. This rotation of the gear starts the generator and generates electricity which can be stored in the battery and can be converted in a.c. current using inverter and used for lighting of the lamps, signals sign boards on the road.

On the other hand when the vehicles have passed over the bump the top will retain its position with the help of the spring provide and the chain drive will rotate in the reverse direction without rotating the gears as in case of the bicycle where the bicycle moves ahead when force is applied on the pedal. But when the pedal is rotated in the reversed direction the bicycle moves in the reverse direction. Thus power is generated only during the downward motion and not in the reversed motion of the top portion of the breaker.

This principle can also be used in the steps of the staircase to produce electricity. In which whenever a person puts his foot on the step due to his weight the step gets displaced in the down ward direction and will rotate the rotor of the generator in same manner as in case of speed breaker arrangement. And thus electric power can be generated which can be used in lightning of the buildings.

IX. APPLICATIONS

Power generation using speed breaker system can be used in most of the places such as:

- This technique can be used in all highways.
- This technique can be used in all roadways Speed brake.

This mechanism of generating of electricity can be placed on the actual speed breaker of the roads. The power is generated when the vehicles pass through it. Which in can be stored in the battery. This power can be used in many places after using the inverter, which enhances in the voltage from 12 volts to 230 volts. This power can be used in the following:

- Street Lights.
- Road Signals.
- Sign boards on the roads.
- Lighting Of the bus stops.
- Lighting of the check post on the highways etc.

X. CONCLUSION

This methods have many advantages such as Power generation does not require any fuel input, Running cost is very less, This is a non-conventional form of energy and therefore very useful in the present scenario of energy crisis. As coin has two faces in the same way there are also some disadvantages such as Mechanical moving parts is high and therefore there are very large frictional losses and therefore require more maintenance, Initial cost of this arrangement is very high.The overall efficiency is quite low as compared to other techniques.

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Potential of Energy Conservation of Femtocells in WCDMA Networks

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Abstract- In the strive for lessening of the environmental impact of the information and communication industry, energy consumption of communication networks has recently received increased attention in this regard, the deployment of small, low power base stations called femtocells, alongside conventional sites is often believed to greatly lower the energy consumption of mobile access networks. In this paper we focus on the impact of femtocell deployment on WCDMA network energy consumption. We introduce the model of area power consumption as a system performance metric based on WCDMA downlink load equations. The model is used to investigate the impact of load sharing between femtocells and macrocells on the overall energy consumption of the network. Based on the model we present two examples where two different deployment scenarios have been compared.

Keywords – WCDMA network, femtocell, energy efficiency, WCDMA downlink load equations, comparisons.

I. INTRODUCTION

Deployment of increasingly powerful mobile network technologies has taken place within the last decade. In roll-outs of new networks, focus has been shifting from the second generation mobile network technology to 30, and currently first commercial Long Term Evolution (LTE) networks are rolled out. Each new generation has brought increased data rates and more services. Although network efficiency has been growing, the higher access rates inevitably have led to increased energy consumption in base stations (BSs) and network densities have been constantly growing [1].

One of the main energy saving approaches is to switch base stations off whenever traffic load is small. This approach was used in [5] where focus was in WCDMA energy savings through cell breathing. Similar approach was used in [6] while in [4] daily variation in traffic load was also modeled. In this paper we consider the impact of uncoordinated femtocell deployment to the power consumption in WCDMA network. Similar problem was previously investigated in [4] from well-planned microcell deployment perspective. While most of the recent papers rely on simulations, we use WCDMA downlink load equations so that all parameters can be easily tracked from deduced formulae. In particular, when Femtocells are introduced to the network, they will offload traffic from macrocells. In WCDMA the decreased macrocell load can be utilized through cell breathing so that inter-site-distance (ISD) between active macrocells is increasing and energy consumption by macrocells is decreasing. However, the increasing energy consumption by femtocells will be the expense for the decay in macrocell energy usage.

The rest of the paper is organized as follows. In Section 2, we first recall the WCDMA downlink load equations and their relation to the network dimensioning. Then we introduce general energy usage model and comparison scenarios. In Section 3 we show some numerical examples that throw light on the energy saving opportunities in WCDMA networks and in Section 4 we conclude the paper.

II. MODELING AND COMPARISON SCENARIOS

2.1 Load equations and dimensioning –

The cell range and ISD are defined using the layout of figure 1. Thus, the area covered by a three-sector site is given by $A_{Site} = 9/4 * R^2 = ISD^2$. In the following we simplify the load equations by assuming that dimensioning is done based on a certain service. Then we can start from a simplified form of the well-known WCDMA downlink mean load equation [9], [10].

$$\lambda = \lambda + N_{users} . \frac{(E_b / N_0) . R_d . \nu}{BW} . \left(1 - \bar{\alpha} + \bar{i}\right) \quad (1)$$

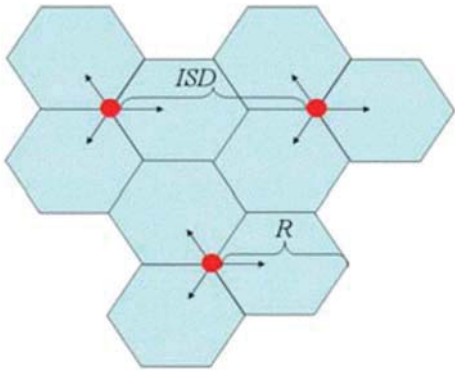


Figure 1. Macrocell layout: Cell range and ISD.

In formula (1) parameter $\boldsymbol{\lambda_o}$ refers to the minimum load due to control signaling, $\boldsymbol{N_{user}}$ is the number of users in the cell, $\boldsymbol{E_b/N_o}$ is the energy per user bit divided by the noise spectral density, $\boldsymbol{R_d}$ is the user bit rate, **v** is the connection activity factor, BW is the system chip rate, $\boldsymbol{\alpha}$ is the spreading code orthogonality factor and $\boldsymbol{i}$ is the other to own cell interference factor. We note that we have considered the mean load that is depending on the expected ($\boldsymbol{\alpha}$ and $\boldsymbol{i}$ over the whole cell.

Moreover, for the mean output power in BS transmission we have:

$$P_{Tx,out} = \frac{n_{RF}.\overline{L}.N_{users}.\left(E_b/N_0\right).R_d.\nu}{1-\lambda} \tag{2}$$

Where $\boldsymbol{n_{RF}}$ is the noise spectral density of the receiver front end. We note that part of the transmission power is used for control overhead.

After combining (1) and (2) we can express the mean signal loss as follows:

$$\overline{L} = P_{Tx,out}.\frac{1-\lambda_0 - N_{users}.\frac{\left(E_b/N_0\right)}{BW}.R_d.\nu.\left(1-\overline{\alpha}+\overline{i}\right)}{n_{RF}.N_{users}.\left(E_b/N_0\right).R_d.\nu} \tag{3}$$

$$\mathrm{R}=\left\{\frac{P_{Tx,out}(1-\lambda_0 - N_{users}.\frac{\left(E_b/N_0\right)}{BW}.R_d.\nu.(1-\overline{\alpha}+\overline{i}))}{a\cdot dL\cdot n_{RF}\cdot N_{users}\cdot(E_b/N_0)\cdot R_d\cdot\nu}\right\}^{\frac{1}{b}} \tag{4}$$

We note that mean signal loss is usually 6dB less than maximum signal loss in the cell edge [9], so that in dimensioning we need to take into account the corresponding value in (3). Furthermore, the mean signal loss should include impact of distance dependent path loss, shadow fading loss and interference margin. If single slope model $\boldsymbol{a*R^b}$ for distance dependent path loss is used, then we can express the macrocell range as:

Here $\boldsymbol{dL}$ contains the impact of signal loss averaging as well as shadow fading and indoor penetration margins.

In simplest form of network dimensioning a target load for a certain service is first selected. Then number of supported users can be calculated from (1) and corresponding macrocell range from (4). Other information besides service rate and load in (1) and (4) can be obtained from link budget. We will show concrete example in next section.

2.2. General energy usage model –

We start from a simple model that was previously applied in [5], [8] to describe the macrocell base station power sharing between load independent and load dependent operations:

$$P_{cell} = P_{Oper} + \lambda \cdot P_{Tx} \tag{5}$$

Here term $\boldsymbol{P_{Tx}}$ is the power that is needed to create required transmission power in the antenna output and $\boldsymbol{\lambda}$ is the cell load that may vary between 0.1 and 0.9 depending on the load and radio interface configuration. Term $\boldsymbol{P_{Oper}}$ contains all load independent power that is needed to operate the BS.

The equation (5) defines the cell power while sites are usually composed by three or more sectors that each forms a logical cell. Therefore, the power consumed in site is of the form

$$\mathrm{P}_{Site} = N_{Cell} + \left(P_{Oper} + \lambda \cdot P_{Tx} \right) \tag{6}$$

Where $\boldsymbol{N_{Cell}}$ refer to the number of cells in the site. Then the site energy consumption over a certain time period $\boldsymbol{T}$ is of the form

$$\mathrm{E}_{Site} = N_{Cell} + \left(P_{Oper} + \lambda \cdot P_{Tx} \right) \cdot T \tag{7}$$

Although network adaptation to temporal variations of the load is an important topic we ignore it in this paper since our focus is in the impact of femtocells. Impact of temporal load variations has been investigated in e.g. [4].

The energy usage over time $\boldsymbol{T}$ in a macrocell network is given by

$$\mathrm{E}_{Ntw} = N_{Site} \cdot E_{Site} + N_{UE} \cdot E_{UE} + E_{Other} \tag{8}$$

In (8) the first term in the right defines the energy consumption in all macrocell BSs ($\boldsymbol{N_{site}}$ and $\boldsymbol{E_{site}}$ refer to number of BS sites and energy consumed by single BS site respectively), second term defines the energy usage in all UEs ($\boldsymbol{N_{UE}}$ and $\boldsymbol{E_{UE}}$ refer to number of user equipment and energy consumed by single UE respectively) and last term contains energy consumed by other mobile network elements such as core network elements and radio network controllers in WCDMA.

We ignore the second term on the right since terminal power and energy efficiency has been under extensive investigations for a long time due to strict battery constraints. Therefore, recent energy efficiency studies have been focusing on the network side where more room for notable improvements exists. Furthermore, since we concentrate on the energy efficiency of the radio access the last term in (8) is out of our scope. We also recall that BS energy efficiency is of great importance for operators since BSs form a vast majority of mobile network nodes and thus, they also have largest contribution to the energy consumption of a modem mobile network creating a significant operational cost factor [11], [12], [13].

When femtocells are employed in the network, the energy utilized by the network is given by

$$\mathrm{E}_{Ntw} = N_{Site} \cdot N_{Cell} \cdot (E_{Cell} \cdot N_F \cdot P_F \cdot T) \tag{9}$$

Where $\boldsymbol{N_F}$ is the number of femtocells in each macrocell and $\boldsymbol{P_F}$ is the femto BS mean power usage over time $\boldsymbol{T}$. In order to simplify the analysis we do not share femto BS power between load dependent and independent parts since it is assumed that impact of load to the femto BS power usage is relatively small.

In order to make calculations more concrete we adopt from [5] the UMTS macrocell base station specific values

$$\boldsymbol{P_{Oper}} \textbf{ = 137 W, } \mathbf{P_{Tx}} \textbf{ = 57 W}$$

This will be then used in comparisons. Within three sector site the maximum energy consumption over 24 hours is round 14kWh. For femto BS input power we use two values, 2W and 5W. The former value is optimistic but reachable in future while latter value is already reality in products [14].

2.3. Comparison scenarios

We consider two comparison scenarios to estimate how the change in network configurations will effect to the energy consumption in the network. In the first scenario we fix the macrocell ISD and estimate the change in the network energy consumption when femtocell penetration rate is increasing. In the second scenario we scale the ISD

which reflects to the number of macrocell sites. Thus, when number of femtocells is increasing the load in macrocell sites is decreasing and required number of macrocell BSs is decreasing due to cell breathing. As a performance measure we will use the daily energy consumption per square kilometer in the network:

Thus, dimension for the performance is the kWh/km^2. In the above equation, number of sites in new deployment and corresponding load λ^{New} refer to the new parametric values of the modified network with respect to the old parametric

$$\left(E/A\right)_{Ntw} = \frac{N_{Site}^{New} \cdot N_{Cell} \cdot \left(P_{Oper} + \lambda^{New} \cdot P_{Tx}\right)}{N_{Site} \cdot A_{Site}} \cdot 24h + \frac{N_{Cell} \cdot N_F \cdot P_F}{A_{Site}} \cdot 24h \quad (10)$$

values of the reference network. We also note that the number of femto BSs is given per macrocell in reference deployment. Either of these changes is expected to take place in one of the two compared networks depending upon the scenario.

First scenario: Assume that macrocell ISD is fixed. Then number of macrocells is the same for both networks but load is decreasing with additional femtocells and we have

$$\left(E/A\right)_{Ntw} = \frac{N_{Cell} \cdot \left(P_{Oper} + \lambda^{New} \cdot P_{Tx} + N_F \cdot P_F\right)}{A_{Site}} \cdot 24h \quad (11)$$

Second scenario: Assume that the macrocell ISD is not fixed but instead, we fix the target load in macrocells.

$$\left(E/A\right)_{Ntw} = \frac{N_{Site}^{New} \cdot N_{Cell} \cdot \left(P_{Oper} + \lambda \cdot P_{Tx}\right)}{N_{Site} \cdot A_{Site}} \cdot 24h + \frac{N_{Cell} \cdot N_F \cdot P_F}{A_{Site}} \cdot 24h \quad (12)$$

Since femtocells offload part of the traffic, the required number of macrocell BSs is decreasing and we have
Here, the number of macrocells is decreasing due to cell breathing that is caused by data offload to femtocells.

For comparisons we first carry out dimensioning of the network without femtocells using (1) and (4). When cell range $\boldsymbol{R}$ is known we can calculate site area and daily energy consumption per square kilometer from the formula

$$\left(E/A\right)_{Ntw} = \frac{N_{Cell} \cdot \left(P_{Oper} + \lambda \cdot P_{Tx}\right)}{A_{Site}} \cdot 24h \quad (13)$$

When $\boldsymbol{N_F}$ femtocells are added to the system they take a certain portion of the users, say ($\boldsymbol{R_{femto}}$*100) % of users ($\boldsymbol{R_{femto}}$ is the ratio between femtocell and macrocell connections). Then either load in macrocells (first scenario) or ISD (second scenario) is decreasing. The latter phenomena reflect directly to the number of macrocell sites.

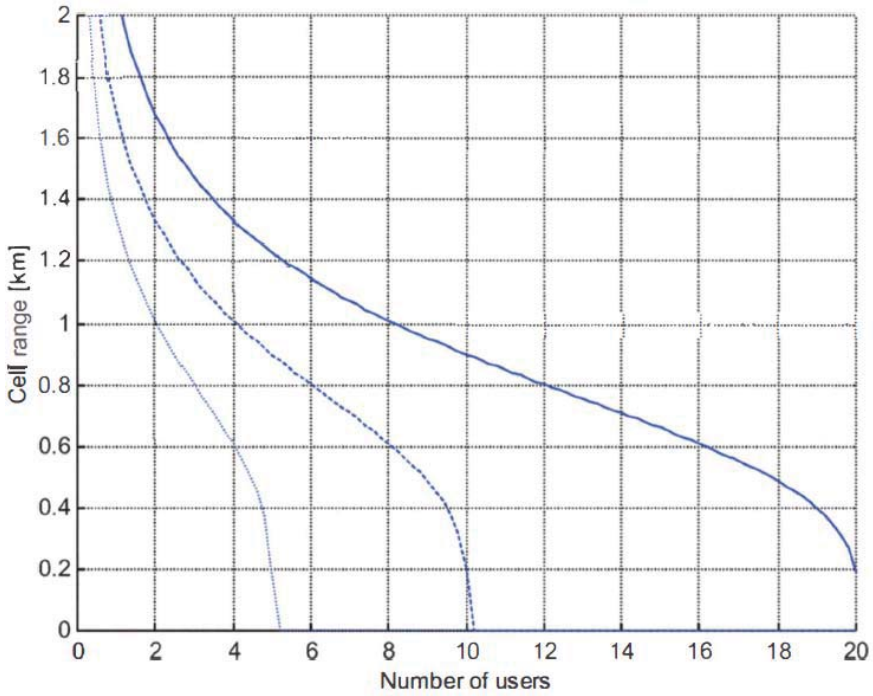
III. Numerical Examples

We consider a WCDMA related example where parameters are given in Table 1.

Table -1 Network Parameters

Reference Parameters	
Parameter	Value
Operating frequency	2000MHz
BS Antenna height	30m
MS antenna height	1.5m
Propagation model	Okumura-Hata (Urban Model)
Indoor penetration loss	10dB

BS antenna gain (incl. losses)	16dBi
User data rate	64kbps, 128kbps, 256kbps
$\mathbf{E_b/N_0}$	5dB
Macro BS transmission power	20W
Femto BS input power	5W, 2W
Control overhead	15%
System chip rate	3.84Mcps
Shadow fading margin	7dB
Mean $\boldsymbol{\alpha}$	0.80



Mean $\boldsymbol{i}$	0.65
Activity factor $\boldsymbol{v}$	1.00
Minimum load	0.10

In Figure 2 we have cell ranges as a function of number of users when user data rates are 256kbps, 128kbps and 64kbps. If dimensioning is done e.g. based on 64kbps user rate and assuming load 0.8, then cell range is round 600m.

Figure 2. Cell range as a function of number of users when user data rates are 256kbps (dotted curve), 128kbps (dashed curve) and 64kbps(solid curve).

3.1 Numerical comparisons

Consider 64kbps service and assume that initial system load is 0.9. We can then solve number of users from (1) and cell range from (4). Furthermore, if femtocells offload data of $\boldsymbol{R_{femto} \cdot N_{users} = N_F}$ macrocell users, then we can calculate new load $\boldsymbol{\lambda^{new}}$ from (1) and daily energy consumption per square kilometer from (11). Resulting numerical values are given in Table 2.

Table -1 Daily Energy Consumption in the Network First Scenario.

100%*Rfemto	0%	25%	50%	75%
(E/A)M [KWh/Km^2]	24.35	22.88	21.40	19.93
$(E/A)_{Total}$ [KWh/Km^2], PF=5W	24.35	25.77	27.18	28.59

$(E/A)_{Total}$ [KWh/Km^2], PF=2W	24.35	24.03	23.72	23.39

From second row of Table 2 we find that energy consumption per square kilometer is clearly decreasing in macrocells when ratio of femto connections is increasing. If femto BS input power is 5W, then the total energy consumption in the network is growing since the load decay in macrocell load cannot compensate the additional consumption due to femtocells. On the other hand, if femto BS input power is only 2W, then the total energy consumption is slightly decreasing with additional femtocells. Finally, we note that:

- In above calculations it was assumed that femto BSs are turned on only when there is traffic. If a number of femtocells are also active when traffic is nonexistent, then network energy consumption Increases accordingly.
- From network operating costs perspective the values on the second row of Table 2 are important since they contribute directly to the energy bill paid by the operator.

Results regarding to the second scenario has been plotted in Figure 3.

It is found that energy consumption by macro cells is rapidly decreasing since lower load allows less dense macrocell grid. The decrease in macro BS density is limited by the non-femtocell users and in practice it is not possible to shut down all the existing macrocell sites due to coverage reasons. Yet, if network is to be built from scratch then second scenario would be beneficial from energy efficiency perspective. From figure 3 we see that in case of 50% femtocell (2W) penetration, around 63% of energy would be saved and it keeps on increasing as the femtocell penetration increases. Whereas in case of 50% femtocell penetration (5W), the maximum energy saving would be around 49% and it will not further increase with the increase in femtocell penetration. In order to fully exploit this gain, a green field network should be built. However, part of the energy savings can be achieved also in existing networks if macrocell BSs can be switched off during low load periods.

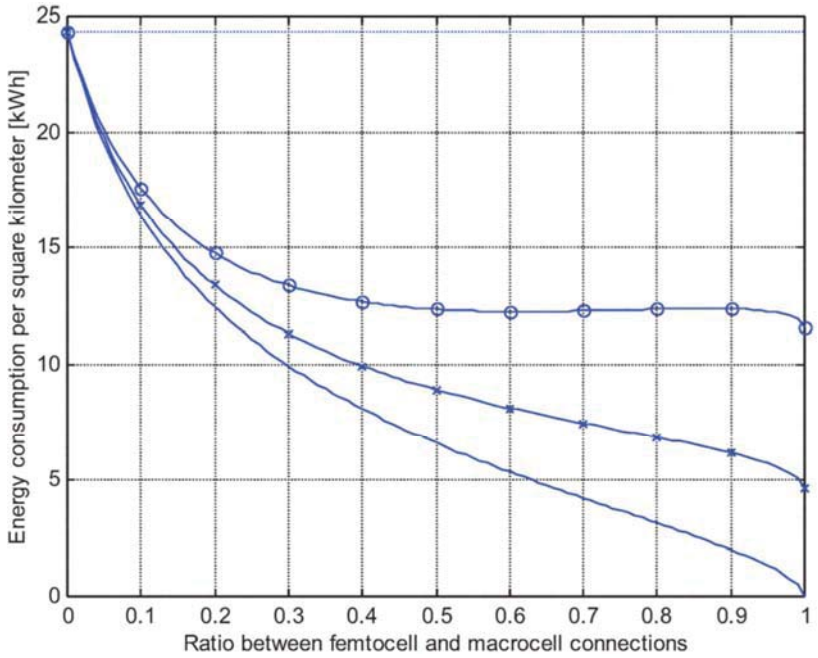


Figure 3. Daily energy consumption per square kilometer in the network when assuming second scenario. No ticks: Energy consumption by macro cells only. Total energy consumption when 5W femto BS power (O), and 2W femto BS power (x).

IV. CONCLUSION

In this paper we investigated the potential energy savings when deploying femtocells along with macro base stations in WCDMA network. To find the energy consumption per unit area we used WCDMA downlink load equations. We determined how the load sharing between femtocells and macrocells will contribute to the overall energy consumption of the network.

We introduced two comparison scenarios to make visible the impact of femtocells on the energy consumption per unit area. To elaborate these scenarios, two simple examples were presented. In first scenario we fixed the macrocell inter site distance and assumed different femto base station penetration ratios. Results show that total energy consumption in network per unit area was increasing when employing femto base stations that apply 5W input power. On the other hand, energy consumption was found to decrease slightly when employing femto base stations that apply 2W input power.

In second considered scenario the macrocell inter site distance was not fixed and the addition of femtocells to the macro cellular system decreased the macrocell base station density. In this case there was a significant amount of energy savings. Achieved gain can be fully exploited only in green field deployments but part of the energy saving potential can be utilized also in existing networks through macrocell breathing: decreased macrocell load due to femtocells results in larger macrocell coverage and in dense macrocell deployments part of the base stations can be switched off.

Finally, we note that number of active femto base stations strongly affect to the network energy efficiency. If femto BSs are on all the time then femto base station energy consumption easily overtake the achieved savings on the macrocell side. Therefore it is an important task to design efficient sleep mode procedures for femto base stations. Another topic for future work is to take into account the impact of daily traffic variations. For that purpose a new performance metrics will be needed.

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An Analysis on Security Concerns in Cloud Computing

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Abstract -Cloud computing is the emerging technology that is used worldwide for storage as well as distributed data processing. In the cloud technology, client's data is stored on the Cloud service provider's domain. The concept of this new technology i.e. cloud computing is adopted by many clients, but is receiving criticism from many people, who observe that; in this cloud technology, client loses control on computing processes. This paper mainly aims to the fundamental security issues that existing in present cloud computing environments. The fundamental issues that affect the trust between client and service provider are Security, Privacy, Accountability, Auditability and Fault recovery. These issues are the major restriction factor in the development and adoption of cloud computing. In this proposed Trusted Framework for Cloud Computing, we consider the above mentioned trust issues (Security, Privacy, Auditability, Accountability, and Fault Recovery) as the trust component. This framework introduced System Controls Mechanism that are used for establish the trust into system.

Keywords: - Cloud Computing, Distributed, data processing, Trusted Framework, System Controls Mechanism.

I. INTRODUCTION

Internet is the interconnected network of computers all over the world.. People profoundly depend on Internet because they used internet for resource sharing, mailing and information searching etc.. In the beginning of the Internet, very limited services were offered but as soon as time passing, the services of internet is growing and the research is focus to provide everything on Internet as service. Another important part is our desktops having very limited storage capacity, memory power, computing capacity and software etc. If any user wants to store documents, images, videos in his limited storage and let you wants to install heavy software but if computer haslimited resources like storage disk and memory capacity, then system cannot support such type of tasks.

Data mining applications is one of good example because various data mining applications or task process vast data to find out meaningful and useful pattern of information. So it is required more resources to process vast data as fast as possible. In such type of case users are required to increase their storage capacity, computing power and also the size of memory This new technology that is known as Cloud computing is capable to break all these barriers. The NIST (National Institute of Standards and Technology) definition of Cloud computing is as follows:

"Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." [1]
Fundamental characteristics of Cloud Computing are resource-pooling, metered service, on-demand self-service, rapid-elasticity and broad network assess [1]
The NIST definition [1] further classified cloud in three categories according to the deployment of application into the cloud. The cloud service provider's deployment model specifies that who can gain access to the particular service of cloud. There are three types of clouds:

1.1 Public Cloud
In these model providers offers cloud infrastructure and resources to the general public.The user's data isadded to the cloud into shared infrastructure. This type of cloud runs by third party and applications and data from different user or client resides together on same cloud server storage and network.

1.2 Private Cloud
Private cloud is known as internal cloud. These types of clouds are intended for specially use by a single client or organization. Private clouds may be managed and built by the external providers or by the organization. The private clouds offer the maximum level of control over consistency, security and performance.

1.3 Hybrid Cloud
In the hybrid cloud environment multiple private and public cloud models are combined together. Hybrid clouds initiate the complexity of determining that how to allocate and distribute various applications across both a private and public cloud.
Cloud Service Model can be further categorized into three service models, these models are also mentioned in the NIST document [1]. These three models are Software as a Service (SaaS), Infrastructure as a Service (IaaS),and Platform as a Service (PaaS). Each service model of cloud virtualizes aspects of storage, computation and networking[1].

II. A SURVEY ON SECURITY ISSUES IN CLOUD COMPUTING

In the cloud computing infrastructure, the whole data of client resides on a set of network resources, which enables the data, which is reside in data centres to be accessed by client through the virtual machines. These data centres can lie in anywhere in the world and the user will not be able to reach and control the data, So that there are a lot of multifarious security concerns and privacy challenges are there that should be well understood and must be taken care of.
According to a survey which is conduct by "The National Institute of Standards and Technology" (NIST) [5] the main challenges which anticipated the adoption of cloud computing environment is security and it rated with a 74.6% , as shown in given figure below, security is higher than all other issues :

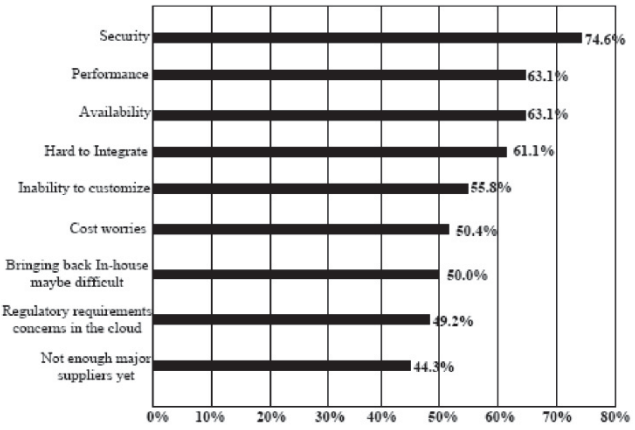


Fig 1: Challenges that expected from adoption to cloud computing (NIST, 2009)

The above figure clearly describes that almost all organizations are worried about the implementation of security mechanism in cloud computing infrastructure.

The following list have some major security issues consider by the Gartner[8] that should be consider as a prerequisite by organizations and all key decision makers whenever deal with Cloud computing vendor [8]:
2.1. Privileged access - This security issue always considers about specialization or privilege for accessing the client's data and "Who will decide about the hiring as well as management of administrator?"
2.2. Regulatory compliance - In this issue organization should consider that "Is the Cloud Service Provider (CSP) eager to go through by an external audits or security certifications?"
2.3 Data location - In this issue client should consider about the control or any decision on location of data because the data centres are operated by the cloud service provider.
2.4 Data segregation - This means, "Is encryption techniques available for data at all stages, andwere those encryption techniques had designed as well as tested by any experienced professionals?"
2.5 Investigative Support - It issues means "Does the service provider have the effective ability for investigation of any illegal or inappropriate activity?"
2.6 Data availability - In this issue the client of CSP should be aware about "Can the cloud provider move all their users data into a different environment should the present environment turns into unavailable and compromised?"

III THREATS TO SECURITY IN CLOUD COMPUTING

The fundamental concern in cloud computing environments is to establish and provide security around isolation and multi-tenancy, giving clients and organizations more relieve besides the "trust us" proposal of clouds . There is a survey report that classifies security issues and threats in cloud computing based on the character of the service delivery infrastructure or environment of the cloud computing system Service delivery model is the basic aspects that should be considered for any comprehensive survey on the cloud computing security model. Security at many different levels like Application level, Network level, as well as Host level is compulsory to keep the cloud efficient up as well as running continuously. Various types of security threats may occur in accordance with different levels.
3.1. Basic Security Attacks - Web 2.0, a basic technology in the direction of enabling the utilization of Software-as-a-Service (SaaS) relieves the client or users of cloud from tasks like installation and maintenance.Web 2.0 has been used worldwide from its beginning. And as the client community that are using Web 2.0 technology is increasing, the security of cloud data has become further important than ever for such an environment.

SQL injection attack is the one of attack in which the malicious code is include into thestandard SQL code and using this the attackers finally gain the unauthorized access to the users database and also he becomes able to retrieve sensitive data and information of user. In some cases the input data of attacker is misunderstood by web-sites they treated it as the user data and allows attacker to access by SQL server and this situation lets the hacker to have know-how of functioning of the web-site and how to make changes into it.

Cross Site Scripting (XSS) attacks, this attack injects malicious scripts or code into Web. The website can be known as dynamic or static based on the types of services provided. Static websites generally don't experience the security threats while the dynamic website does because dynamism property in providing user multi-fold services.

*Man in the Middle attacks (MITM).*MITMis the class of attack that is much popular inthe software-as-a-service (SaaS) environment. In these types of attack, an attacker tries to intrude in ongoing communication between the sender and the client to inject false or fake information and to get knowledge of important data or information communicated between them. There are various types of tools that implementing strong encryption technique such as Dsniff, Wsniff, Cain, Airjack, Ettercap, etc have been implemented and developed for provide safeguard against these threats.

3.2. Network Level Security - Networks can be classified into several types such as shared network, non-shared networks; private or public network, small area network or large area network and every one of them have a verity of security issues and threat. In order to ensure network security given points like integrity and confidentiality in the network, proper access mechanism as well as maintaining the security against any external third-party issue or threats must be considered when providing network-level security.

DNS Attacks - The Domain-Name-Server (DNS) server basically performs the task of translation of any domain name to corresponding IP address. Even though using a DNS security measure such as Domain-Name-System-Security-

Extensions(DNSSEC)always reduces the overall effects of DNS security threats and issues but still there are many cases when these security solutions and measures are proved to be not enough when the connection between a the sender and the receiver is getting rerouted by an evil connection .

Sniffer Attacks - There are such types of application that launch attack by capturing the packets when they flowing in the network and if the information that is transferred by these packets is not using encryption, then it can be read as well as there is a chance that the information that flowing through the network can be captured or traced. A sniffer program, through the (NIC) ensures that data or traffic correlated to other systems which also exist on the network is also gets recorded. This can achieve by placing the Network Interface Card (NIC) in promiscuous mode then in promiscuous mode it will track all information, transmitted on the same network. A malicious-sniffing-detection platform that is based on Address Resolution Protocol (ARP) and Round Trip Time (RTT) , that is basically used to detect a sniffing-system that is running on a network [2].

Issue of reused IP addresses - Every node of the network is has an IP address hence an IP address is definitely a finite quantity. There are a large number of cases that are related to reuse of IP address issue have been observed. When a client or user moves out to the network then IP address that is associated with him earlier is assigned to new users. This sometimes may be risks to security of the new user because there is a always certain time-lag between the change of the previous IP-address in the DNS server and the clearing of that particular address from DNS caches. Hence, we can observe that though the previous IP-address is assigned to the new user but still there is always a chances of accessing the information by other user and it is not negligible because the address still exists in the DNS server cache and the data belonging to that particular user can become accessible to other user and that is violating the privacy of original user.

3.3. Application Level Security -

In the application level security we can use the software as well hardware resources in order to provide the security to the applications in such a way that the attackers should not be able to obtain control on the applications as well as make any desirable changes into their format.In the virtual environment, many companies that work with virtualization technique such as VMware are also using Intel-Virtualization-technology for the security base and the better performance. The threats and security issues that break down application-level-security are:

Security concerns with the hypervisor

Cloud Computing depends basically on the virtualization concepts. In the virtualization technology, the hypervisor is basically defined as the controller and it is known as the virtual machine manager (VMM) and that allows multiple operating-systems to be run on a single system at a time, it provides the resources to every operating-system in such a way that they can't interfere with each.As the operating systems that are running on the hardware unit increased, the security issue that are concerned with those that of the new operating-systems also needs to be considered. There are multiple OS is running on the single hardware infrastructure, so it is never possible that keep track all the OS and thus maintaining all these operating systems securely is very difficult. It is always possible that a guest or visitor system tries to run a malicious script or code on the provider host system and that can bring the overall system down or can take full control of the system and can block the access to other guest-operating-systems (GOS) [3].If any attacker is being able to get control to hypervisor, he can get control on all the data and information that is passing through that hypervisor.

Denial of service attacks - A denial of service attacks (DoS) is an attempt to make unable the services that is assigned to an authorized user to be used by them. In this type of attack, the server providing the service to the users is extremely flooded by a huge number of requests so that the services become unavailable to any authorized client or user. The occurrence of the denial of service attacks (DoS) increases tremendous bandwidth consumption that causing congestion, and making some parts of the cloud system inaccessible to the authorized users [6].

Cookie poisoning - It this type of attack the change and modification in the contents of cookies is made in order to gain unauthorized access to any particular application or to a webpage by an attacker. The identity related credentials of the user basically contained by these cookies and once these cookies have accessible by attacker; the identity related content of these cookies can be used to impersonate any authorized user. This problem can be avoided by either performing regular cookie-clean-up or by implementing the encryption scheme for the cookies data [2].

Hidden field manipulation - While accessing the web page of any cloud website or application, there are several fields that may be hidden and that contains the web page related information that is basically used by the developers of application or web page. Although, such types of fields in web pages are highly prone to the attacker, hacker can attack because they can be modified easily and then that can be posted on the web-page or underlying application. This may be result in the violation of severe security [3].

Backdoor and debug options - A common practice of the developers of any cloud application or any web site is to enable the option of debug while he publishing an application or the web-site. This option enables the developer to make any developmental changes in the code when needed and then implemented them in the web-sites. Because these options of debugging is facilitate backend entry for the developers, sometimes these option for debug are left enabled unnoticed, and this type of error can provide an simple entry to a attacker into the application or web-site and he can make changes into the web-site or application level [7].

Distributed denial of service attacks - DDoS is the advanced version of Denial of service (DoS) attacks. In the distributed denial of service attacks (DDoS) the attack is spread from many different dynamic networks which is already being compromised unlike DOS.

The DDoS attack is basically run by three fundamental units: first one is a Master, second one is a Slave and finally a Victim. Mater is the attack launcher that play the major role in all these attacks that are causing DDoS, Slave is act like launch pad in the network for the Master. It basically provides the main platform for the Master to launch the DDoS attack on the Victim cloud. Hence it is also known as the co-ordinated attack.

Method that is commonly used against DDoS attach is to contain IDS on all physical machines which holds the user's virtual-machines [35]. This method performs reasonably well in the Eucalyptus cloud.

Security requirement for a secure Cloud computing - International Standards Organization (ISO) defined a standard ISO 7498-2 that states that prevention, detection and elimination all are needed to control and minimize threat in Information Security. Same concept is followed in Cloud computing, but prevention and detection processes are difficult to implement due to complex nature of Cloud. Security requirement for a secure Cloud computing are:

A. Identification and authentication - Users are provided rights to access information in Cloud, but the access can be limited by some constraints. Information Assurance (IA) Technology Professionals defined that Cloud provider controls the access privileges of Cloud user. Users or enterprises are provided a unique ID and corresponding password for their identification and level of services are provided to that authenticated entity after successful verification.

B. Authorization - Authorization ensures that integrity of the Cloud is maintained, thus it plays an important role in security of Cloud. Information Assurance team stated that any organizations will be immune from damage from insiders if authorized access is maintained to protected information assets.

C. Confidentiality - In Clouds, Data or information is stored across multiple distributed databases and any attacker can access data if confidentiality is not kept under notice during development of Cloud. Confidentiality ensures that only authorized data can only be accessed by authorized users not by any unauthorized user. Safety of

D. Integrity - The integrity ensures that Cloud data is not modified or tampered. So Cloud should be in same state if no authorized operation is performed on Cloud. Unauthorized alteration or modification of Cloud data may lead to low trust rating of Cloud.

E. Non-repudiation - Non-repudiation is a major problem in Cloud as it cannot be proved that whether that action was performed or not. Jun Feng showed that applying token provisioning in Cloud applications for data transmission using digital signature and confirmation receipts (i.e. digital receipt of message sent or received confirmation) may ensure non-repudiation.

F. Availability - Availability is major requirement for information security in Clouds .The NIST [1] defined Availability as whether resources of any Cloud are accessible or available to Cloud user or not. It can be affected permanently or temporarily. It can be attacked by blocking some resources so that Cloud user cannot access them anymore, such attacks are equipment outages, Denial of service attacks, and natural disasters etc

Threat	Property
Spoofing	Authentication
Tampering	Integrity
Repudiation	Non repudiation
Information Disclosure	Confidentiality
Denial of service	Availability
Elevation of privilege	Authorisation

Fig 2: Threat to property mapping

Microsoft used STRIDE approach to classify threats, in which threats are classified as Information Disclosure, spoofing, Tampering, Repudiation, DoS and Elevation of privilege. Mapping is performed on the basis that spoofing is faking someone's ID.

Tampering is alteration or modification (unauthorized) of data in Cloud, repudiation is denying a performed action, Information disclosure is access to authorized data by unauthorized user, denial of service is to prevent any genuine user to access Clouds resources and elevation of privileges is getting access without proper authorization.

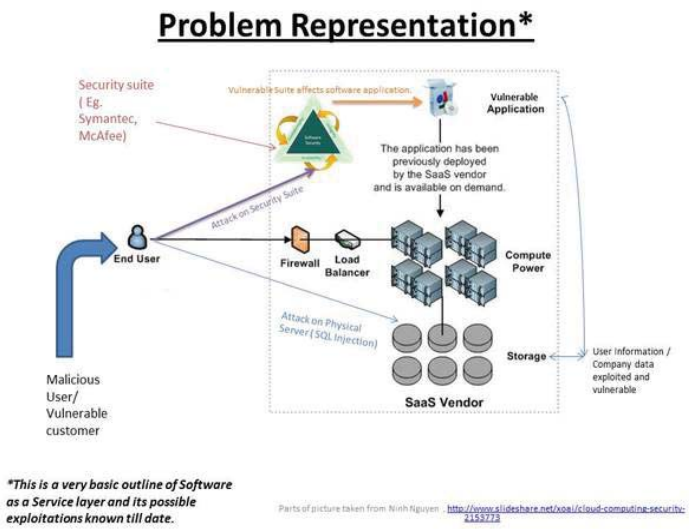
IV. PROBLEM STATEMENT

In cloud computing paradigm, client's data and information is stored at the Cloud Service Provider's data centre. In such type of scenario many issues arises between the client and the cloud service provider. The fundamental issues that affect the trust between client and service provider are Security, Privacy, Accountability, Audit ability and Fault recovery. These issues are the major restriction factor in the development and adoption of cloud computing.

For a trusted cloud computing environment the cloud service provider must ensure the client that the underling cloud infrastructure will provide security, privacy, accountability, auditability and fault recovery. And this can be possible only if the service provider has a trusted cloud infrastructurethat concern and deal with all above mentioned issues.

V. PROPOSED FRAMEWORK FOR BUILDING A TRUSTED CLOUD COMPUTING ARCHITECTURE

As stated in the Problem Statement of this thesis the clients of cloud always expect Security, Privacy, Auditability, Accountability, and Fault Recovery from the Cloud Service Provider (CSP). These are the fundamental trust issues that a client always concern before adopt the cloud computing environment.

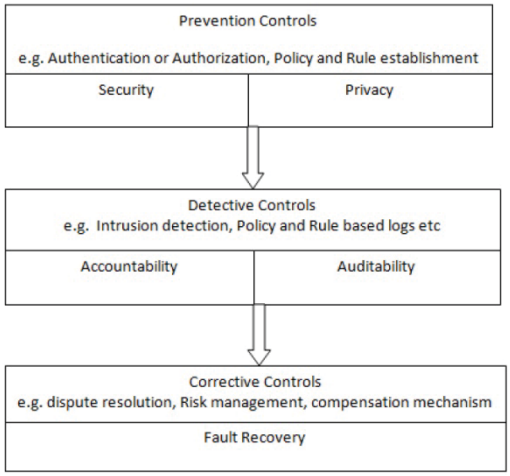


In this proposed Trusted Framework for cloud computing we consider the above mentioned trust issues (Security, Privacy, Auditability, Accountability, and Fault Recovery) as the trust component, Hence without concerning about these issues before providing service to the client a cloud computing environment cannot be a trusted. We considering these five issues as primary trust component and providing a solution for these issues by proposing a framework called Trusted Framework for Cloud Computing. This framework introduced System Controls Mechanism that are used for establish the trust into system. These System ControlsComponents handle all above mentioned trust issues in order to achieve trust in cloud computing environment. There is also a trust management system in this framework that is used for evaluation of trusted components with help three type of evaluators. Finally the step by step activities of system execution is described in order to achieve trust is this framework.

A System Architecture

The proposed Trusted Framework for cloud computing consists of following entities:

1. Client of underling cloud computing architecture
2. Primary Trust Components
3. System Controls Component
4. Needed Logs
5. Security Control Module
6. Security Level surveyor
7. Feedback surveyor
8. Reputation Trust surveyor



VI. CONCLUSION AND FUTURE WORK

The proposed Trusted Framework for Cloud Computing considers the five basic trust issues i.e. Security, Privacy, Audit ability, Accountability, and Fault Recovery. In this proposed framework the trust is achieved in the cloud computing environment through the technical as well as policy based approach.This framework gives a novel design approach that can achieve trustworthy service oriented architecture in the cloud environment using enforcement of strong audit ability. This architecture achieves strong audit ability as well accountability using logged information of the end client.

We focused on one design possibility that can improve load balancing in the cloud by carefully distributing the servicerequests among data centers in a clouding computing system.We took a systematic approach and formulated the serviceRegarding to security in cloud computing jointly with thepower flow analysis. In the future a separate Firewall system for cloud system can be implemented using the details of logs which are used in this proposed architecture in order to prevent intrusion based on behavior analysis of client and all other entities that want to access into cloud. Also the implementation with current technologies can be done to implement this framework to achieve trust by existing cloud infrastructure.

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Pressure Relief Valve Selection

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Abstract- Pressure relief valve is one of the most important devices used on the security of pipelines, since it is responsible to guarantee the integrity of the installations. Generally, the response and behavior of a relief valve during its transient is unknown by users, who employ simplified and static analysis to design the pipeline, further, the information provided by manufactures is limited. The flow-pressure, displacement -time and pressure –time relationships are an important external characteristic of the pressure relief valve and the hydraulic circuit. So, many engineers have been put an effort on this topic for its significant impact on the overall hydraulic system. Most of them are focused on the influences of the pressure relief valves, their selections and applications. It is very important to select, size, locate properly and maintain the pressure relief systems to prevent or minimize the losses from major incidents. Detail of selection and sizing of pressure relief valve is shown the following sections of this study. In order to help the circuit operators, a few flow charts are also included. Pressure relief system is used to protect piping and equipment against excessive overpressure for equipment and personnel safety.

Keywords: Relief Vale, Pressure Sensitive Valve, Valve Selection.

I.INTRODUCTION

The pressure relief valve is used in almost every hydraulic system. The function of the relief valve is to limit the maximum pressure that can exist in a system. Relief valves are fundamental equipments for oil and gas pipelines and load/unload terminals. The installation integrity and workers safety depend on the appropriate design and performance of these equipments. Under ideal conditions, the relief valve should provide alternative flow path to tank for the fluid while keeping the system pressure constant [1]. Pressure relief valves are spring-loaded valves designed to open and relieve the excess pressure, then immediately close, preventing any loss of fluid flow after normal conditions have been reinstated. Pressure relief valves are designed to act as a safety measure in hydraulic system. It is a device designed for the automatic release of a substance from hydraulic system when the pressure preset limits to protect system [2]. In spite of the high development status of the conventional pressure relief valves, there is an important research demand on the investigation of them, since they are the most used devices for protections of human life, environment and equipment. Several types of pressure-control valves are encountered in hydraulic systems. Some keep the whole system from excess pressure while other equipments only protect a portion of the system. They allow fluid flow to a circuit after reaching a preset pressure. Bypass fluid at low or no pressure when activated. All fixed-volume pumps in hydraulic systems require a relief valve to protect the system from excess pressure. Fixed-volume pumps must move fluid when they run.

In spite of the importance of relief valves, there is lack of information about the dynamic behavior of these equipments. Thus, users are forced to work using valve characteristics supplied only by manufactures. Further, the information supplied by manufactures is generally restricted to situations of maximum pressure relief flow. The full dynamic behavior of the relief valves during their opening stage, which is fundamental for analysis of transients during their actuation, is usually not available. In spite of the importance of relief valves, only a few works about its dynamic behavior has been published. Catalani (1984) performed a dynamic stability analysis of a relief valve and identified the effects of its components on its stability. The undesired phenomenon named chatter (abrupt oscillations of the disc) was studied by MacLeod (1985) who modeled, using differential equations, the dynamic of a relief valve and identified the conditions to avoid it. In either case, a relief valve is similar to a fuse in an electrical system. When circuit amperage stays below the fuse amperage, all is well. When circuit amperage tries to exceed

fuse amperage, the fuse blows and disables the circuit. Both devices protect the system from excess value by keeping it below a preset level. The difference is that when an electrical fuse blows it must be reset or replaced by maintenance personnel before the machine can cycle again. This requirement alerts the electricians to a possible problem and usually causes them to look for the reason before restarting the machine. Without the protection of a fuse, the electrical circuit would finally overheat and starts a fire.

II. DESCRIPTION OF RELIEF VALVE DESIGN

In a hydraulic circuit, a relief valve opens and bypasses fluid when pressure exceeds its set value. The valve then closes again when pressure falls down. This means a relief valve can bypass fluid anytime or all the time without intervention by operator. Many fixed-volume pump circuits depend on this bypassing capability during the cycle, and some even by-pass fluid during idle time. A well-designed circuit never bypasses fluid unless there is a malfunction, such as a limit switch not closing or an operator overriding the controls. This eliminates most overheating problems and saves energy too. Ray [3] formulated a non-linear dynamic model of a relief valve in the stage form. It is developed from fundamental principles of rigid-body motion and fluid dynamics in 1978. According to the results, opening time of the valve is linearly related to the dimensionless parameter given by the ratio of orifice length to radius. Sethi and Lai [3] developed dynamic models of a spring- loaded pressure relief valve with computational fluid dynamics and valve dynamic modelling. In 2002, Dasgupta and Karmakar [4] studied the dynamics of a pilot operated pressure relief valve through Bondgraph simulation technique. The governing equations of the system were derived from the model. Prescott and Ulanicki [5] developed a relatively simple and accurate model to solve the dynamical behavior of a pressure reducing valve. In 2005, Suzuki and Urata [6] investigated the dynamic characteristics of a direct-pressure sensing water hydraulic relief valve with Matlab–Simulink. Sizing is the most important component in selecting the right pressure relief valve for the circuit assuring reliable safety of the system. Nowadays, sizing is achieved entirely with software some available in the market and some provided by manufacturers. It is very important to know what is behind the software and to look into the formulae on which these calculations are based. It is also important that, relief valves be selected by the operators who do have a detailed knowledge of all the pressure-relieving requirements of the system to be protected [7]. Circuit designer must be aware of what is available on the market in order to select the right valve for the correct application, assuring a safe hydraulic system.

2.1. Operation of Relief Valves in Hydraulic Systems-

Some manufacturers generally assist the end user in sizing the valve based on his input of the relevant technical data. But, it is responsibility of the end user to select the right valve based not only on the system data but also on all other effective factors. Many manufacturers hand over offer dependable programs for valve sizing. Since, most are based exclusively on their own specific products; it will be difficult to compare valve brands [8]. There are two different designs of relief valves in common use such as, direct acting and pilot operated. Both types have advantages and work better in certain applications in the hydraulic circuits. Some terms relating to relief valves and their functions are explained in (a), (b), (c), (d) and (e) such as overshoot, hysteresis, stability, reset pressure and pressure overrides respectively.

(a) The actual pressure reading when a relief valve first opens to bypass fluid. (It can be up to twice the actual pressure setting.)

(b) The difference in pressure between when a relief valve starts letting fluid flow and when fluid flow is passing.

(c) The fluctuation of pressure as a relief valve is bypassing at set pressure.

(d) The pressure at which valve closes after it has been bypassing.

(e) The difference in the pressure reading, a relief valve first opens (cracking pressure) until pump flow pass to tank.

2.2. The Fundamentals of Sizing Rules in Selection of Relief Valves-

In general, pressure relief valve sizes are decided by only coordinating the size of an existing nozzle or the pipeline. This method is very dangerous and does not comply with the codes. Correct and extensive sizing and selection is

complex. That's why multistep process should be followed by step-by-step method. Therefore, following items in four separate sections must be taken in account for right sizing [9].

1. Each piece of equipment in the system must be calculated for present overpressure master plan.

2. Establish a suitable design foundation must be prepared for each item of the system which needs protection based on overpressure cases.

3. The size of the relief valve based on the design necessity must be determined.

4. By the establishment of the system, the ideal size for the relief valve, selection of the type are to be achieved. Then, design can be controlled by analysis with piping engineering basic standards. In sizing the relief valve the other requirement is to determine the correct orifice of a valve type for relieving capacity. That's why the following methodology is advised. A set pressure at which the relief valve is to operate based upon the operational limits of the system must be determined. Relieving capacity of the valve has to be assigned. For particular application size and the type of the valve with suitable capacity within the limits can be selected. Sizing of relief valves is calculated but, selection is from a capacity chart in a manufacturer's operation manual. This method is also preferable by the end users [10]. If the reliability of that chart can be demonstrated by the manufacturer then, the last method is used. In selection and properly sizing the relief valves following list of servicing conditions can be considered.

The advised parameters of selection and properly sizing the relief valves in servicing conditions

Fluid properties:

- ✓ Fluid and state
- ✓ Molecular weight
- ✓ Viscosity
- ✓ Specific gravity
- ✓ Liquid
- ✓ Compressibility factor

Opening conditions:

- ✓ Operating pressure
- ✓ Operating temperature
- ✓ Maximum allowable working pressure

Relieving conditions:

- ✓ Required relieving capacity
- ✓ Set pressure
- ✓ Allowable overpressure
- ✓ Superimposed backpressure
- ✓ Built-up backpressure
- ✓ Relieving temperature
- ✓ Liquid discharge

In the pressure relief systems, the first step is to decide the location where the pressure relief can be mounted. So it will be easy to name the type for each location in the second step. After the selection of the type of device, the specific type of safety valve and/or bursting disc should be chosen [11]. In selection of the pressure relief valve, there are few subjects which must be taken in account. These subjects are such as, seat tightness, blow down, operation temperature, orifice and sizing, liquid and materials [12- 14] respectively.

2.3. The Characteristics of Relief Valves in Hydraulic System-

a. Seat Tightness-

Operating pressures between 90% and 95% of set pressure, pilot-operated safety relief valves and spring-operated are used. Since metal-seated spring valves will get damaged in a short time so, they don't stay tight for long durations. The soft-seated valves are limited in temperature and often in pressure. If operation pressure above 95%, soft-seated valves are preferable.

b.. Blown down

Some soft-seated, spring-operated valves have large alterable blow down ranges. Present blow down can usually be set shorter than 5 % on conventional spring valves. Long blow down required due to inlet pressure losses above 3 %: In case of losses, pilot-operated valves with a remote sensor must be used.

c. Operation Temperature

At 197°C and below temperatures, it is recommended to use soft-seated and for high-performance soft-seated snap action spring valves are used at 200oC and below temperatures [12]. Valves with following specifications such as bubble tightness close to set pressure, opening faster than 10% overpressure and short adjustable blow down are preferred. For operation at 70°C and below values and backpressures needing a balanced valve pilot-operated, soft seated valves are preferable.

d. Orifice and Sizing

Some of the spring valves can be equipped with customized nozzles. One may have the option of installing multiple spring valves or using a pilot-operated valve with full bore orifice. Pressure/size limits are generally higher for pilot-operated valves than for spring-loaded valves [13]. The valve should modulate from 0 up to full lift and then will not chatter, even if oversized.

e. Liquid

Spring-operated valves can be used but need to be equipped with a trim suitable for liquid service so, they can obtain nominal flow at 10 % overpressure. When quick opening or closing is necessary, the operation will be unstable and possibly causes water hammer. Alternatively, a modulating pilot valve can be used, preferably equipped with a filter. The volume of the filter slows the pilot, which reacts too fast, creating instability and water hammer.

f. Materials

An important factor in selecting the correct relief valve is choosing the correct materials for the application. Since it is quite difficult to show all the materials for relief valve body in this study, we can give some more important ones. These are named [12, 14] as:

- ✓ ASTM A890 CE3MN UNS J93404
- ✓ ASME SA 351 CD3MWCuN UNS J93380
- ✓ ASME SA 351 CE8MN UNS J93380
- ✓ Z 6 CNDU 28.08 M, NF A 320-355 at 17 HRC MAX
- ✓ ASTM A351 CK3MCUN (6Mo)

For high temperature operations we can prefer following ones:

- ✓ ASME SA 351 CF8 SAME (with same chemical restrictions as CF8M)
- ✓ ASME SA 217 WC6 (up to maximum 593°C)
- ✓ ASME SA 217 WC9 (up to maximum 593°C)

For high temperature operations up to 815oC, we can prefer following ones:

- ✓ ASME SA 479 Grade 304H (same chemical restrictions as 316H)

- ✓ ASME SA 479 Grade 347H (same chemical restrictions as 316H)

2.4. Selection Parameters of Pressure Relief Valve-

a. The Selection on Location of Pressure Relief Valves

If the systems have two or more separate branches, the engineer has to decide whether a pressure relief device is required for every branch or not. For this decision tree (see Fig. 1) can be used in deciding the valve. In this tree, there are six questions for every chamber.

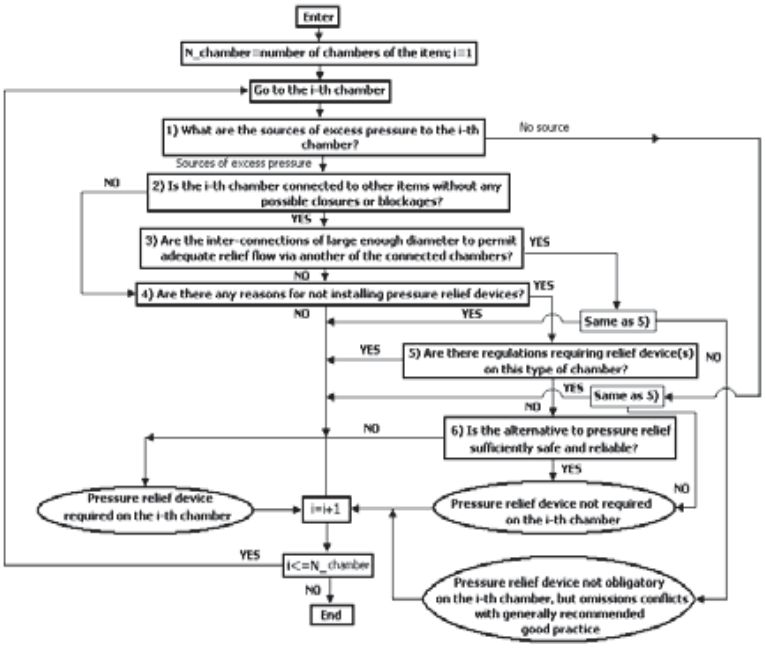

Figure 1.Decision tree for pressure relief device [15]

Besides these, uncompromising are following as;

(1) What are the sources of over pressure to the compartment?

(2) Are the connections of large enough diameters to allow required relief flow via another of the compartment?

(3) Do you really have any reasons for not installing pressure relief connected?

(4) Is one other device alternate to valve sufficiently safe?

b. The Selection of Type of Pressure Relief Devices-

After establishing the pressure relief valve for advised point, the engineer has to select a suitable type of valve. The decision tree (see Fig. 2) for selecting between safety valves and bursting discs are shown.

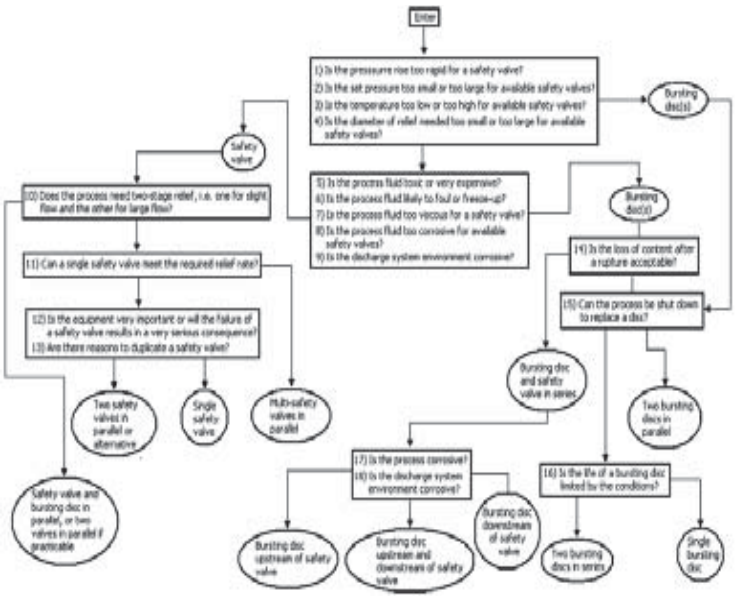

Figure 2. Decision tree for selection of relief valve [15]

Besides these one can also discuss the following questions;

(1) What is the pressure rise for a safety valve is it rapid or slow?

(2) What is the value of the set pressure? Is it small or large for the selected valve?

(3) What is the value of the temperature? Is it low or too high for the selected valve?

(4) What is the value of the diameter of relief valve? Is it too small or too large for safety valve?

The answer might be yes or no, if it is yes, this means any leakage will not be accepted in this unit.

(5) Is hydraulic fluid toxic or expensive?

(6) Is hydraulic fluid probably to freeze-up?

(7) Is the fluid too viscous for a valve?

8) Is the fluid too corrosive for a selected valve?

(9) Does the process need two-stage relief, one for small and the other for large flows?

Once more the answer might be yes or no, If it is yes, valve and a bursting disc must be used in parallel.

(10) Can a single safety valve meet the required relief rate?

If the answer is no, multi-safety valves in parallel must be used.

(11) Are there reasons to copy a safety valve?

(12) Is the process corrosive?

III.CONCLUSION

In the design of pressure relief systems regulations, codes and standards must be taken into account seriously. Otherwise, design assignment might be complex and time consuming. In order to execute the design efficiently, decision trees are used. Figure 1 is for the selection of the location of pressure relief valves. After the identification of the valves, Figure 2 is used for the selection of the type of pressure relief valves.

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