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Electronics System Design of Preventive Operation for Industrial Need

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ABSTRACT

In the power generation industry, any failures may lead to blackouts which can have very severe impact on many (or actually most) aspects of our life and can cripple many services, which are crucial to our well-being. Therefore, minimizing outages and preventing plant equipment failures is becoming a critical issue for power plant operators. While condition monitoring of The most critical machines as turbines, compressors, like ID fans, FD fans ,PA fans, BFP, CWP, CEP, Mill Motors , boiler feed pumps and other big machinery, seem to be receiving the same level of attention from engineers. Failure of these machines may have catastrophic impact on the power plant operation, therefore it was decided to investigate a possibility of developing a system, which would trigger a warning in case of suspicious machine behavior. The aim of the research work was to analyze data in order to develop an alarm system which signals a warning in case of abnormal state of operation and, consequently, can be used to improve the maintenance regime through investigate condition monitoring,Data analysis ,System

Keywords : Intelligent System, Pradective Maintenance, Neuro- Fuzzy System, Vibration Monitoring,

I. INTRODUCTION

Technological progress has encouraged system complexity. Highly-automated systems need for developing intelligent maintenance strategies, that can optimize monitoring tasks' Maintenance is a very important element of machine operation.. However, maintenance means to keep something in go, to prevent a piece of machinery from breaking, on equipment which does not need repair yet. Maintenance management aims to minimize operational costs, particularly reduced man-hours and repair costs. Various technologies have been pursued to achieve the above objectives, such as total productive maintenance (TPM), root cause analysis (RCA), preventative maintenance, etc. Conventionally, maintenance has been implemented using corrective, reactive or preventative approaches. Maintenance is carried out in the reactive mode only after the obvious functional failure of a component or complete system breakdown. An alternative method is time-based maintenance where maintenance is based on accumulated operation hours. Time-based maintenance assumes that mean time between functional failures is statistically or experientially known when the equipment or machinery is running in normal usage. Obviously, time-based maintenance involves planned system shutdowns and scheduled repair activities on some still functioning equipment, meaning that system integrity may become compromised when corrective action is not necessary

II. BACKGROUND THEORY

Various maintenance approaches have been developed by the industry in order to make sure that equipment will reach or even exceed its life expectancy without problems. Further in this section following types of maintenance will be discussed: reactive, preventive and predictive.

Reactive maintenance --This is the simplest approach, which basically focuses on using a piece of machinery until it is broken. No actual maintenance actions take place in order to improve the condition of equipment.. The biggest problem with reactive maintenance is that failure of one piece of machinery may impact the operation or even lead to damage of other plant equipment.

Preventive maintenance -According to Piotrowski (2001) the second type of maintenance is called preventive maintenance. This approach focuses on performing maintenance actions in regular calendar time or machine operation time intervals in order to detect and prevent degradation of equipment condition. In practice, preventive maintenance controls and can even extend design life of a product by maintaining the degradation at an acceptable rate

Predictive maintenance -The next type of maintenance is predictive maintenance which takes into account the actual condition of the equipment based on measured degradation of the parts and indicates present and predicted future state of monitored machinery.

III. MOTIVATION TO WORK

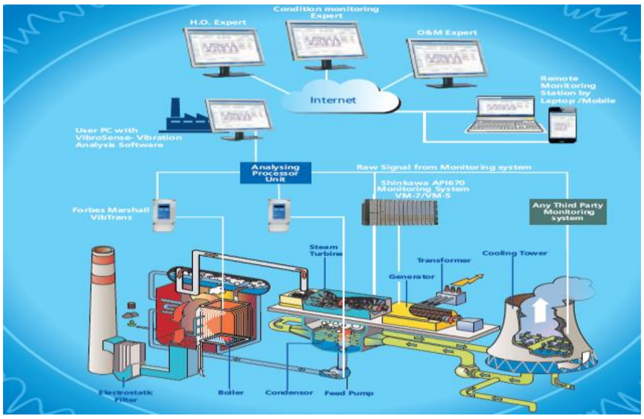
Condition monitoring is basic knowledge of machines condition and its rate of change which can be as curtained by selecting a suitable parameter form ensuring deterioration and recording its value at intervals either on a routine or continuous basis. This is done while the machines running. The data obtained may then be analyzed to give awarding on failure. This activity is called as condition monitoring. Condition monitoring essentially involves regular inspection of equipment using human sensory facilities and a mixture of simple aids and sophisticated instruments

IV. CONDITION MONITORING TECHNIQUES

There are only seven main techniques of condition monitoring. They are:

a) Visual monitoring
b) Contaminator debris monitoring
c) Performance and behavior monitoring
d) Corrosion monitoring thermograph
e) Sound monitoring.
f) Shock pulse monitoring.
g) Vibration monitoring.

VIBRATION MONITORING



An required overall view of modern intelligent system Vibration monitoring measures the frequency and amplitude of vibrations. It is Known that readings will changes machinery can be interpreted as indicators of the equipments condition, and timely maintenance actions can be scheduled accordingly .Electrical machines and mechanical reciprocating or rotating machines generate their own vibration signatures(patterns)during operation. However such raw signals contain a lot of background noise, or even impossible to extract useful, precise information by simply measuring the overall which makes it difficult signal. It is thus necessary to develop an appropriate filter to remove the operationally and environmentally contaminated components of signals(the background noise) so as to reveal the clear signals generated by the events under study. To capture useful condition monitoring data, vibration should be measured at carefully chosen points and directions.

Vibration monitoring is a well established method for determining the physical Movements of the machine or structure due to imbalance mounting an alignment this method can be obtained as simple. Easy to use and understand or sophisticated real-time analysis, vibration monitoring usually involves the attachment transducer to a machine to record its vibration level special equipments is also available for using the output from sensor to indicate nature vibration problem and even its precise cause.

Therefore vibration characteristics reveal the health condition of machine.

DEFINE THEPROBLEM

The following list s some of the reasons for performing a vibration analysis:

1. Establish "baseline data “for future analysis needs.
2. Identify t he cause of excessive vibration.
3. Identify the cause of a significant vibration increase.
4. Identify the cause of frequent component failures
5. Identify the cause of structural failures
6. Identify the source of a noise problem**.**
7.

SOURCES OF VIBRATIONINROTATING MACHINEELEMENT

1. Mis alignment of couplings,bearings and gears.
2. Unbalance of rotating components.
3. Looseness
4. Deterioration of rolling–element bearings
5. Gear wear

INTELLIGENT CONDITION MONITORING AND FAULT DIAGNOSIS SYSTEM. (Utility of vibration monitoring)

Condition monitoring traditionally means a acquiring data from various classes of plant which gives an indication of the condition of machine. Condition monitoring is an essential element of predictive maintenance. An ideal condition monitoring system would accept measured data as input and will produce the operational status, a possible mode of failure and time to failure also output

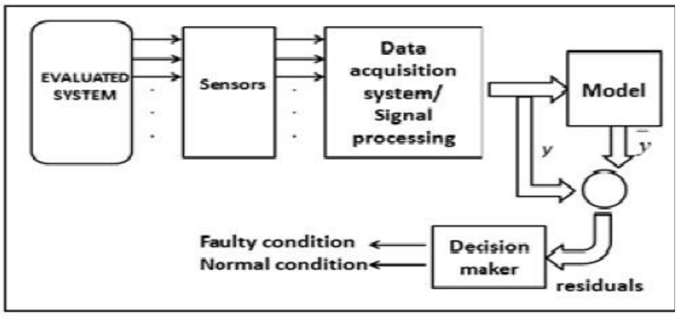


Figure1. Model-based CBM scheme

(BLOCK DIAGRAM REPRESENT OF INTELLIGENT MANITORING SYSTEM)

Many machinery fault diagnostic technique use automatic signal classification in order to increase accuracy and reduce errors caused by subjective human judgment. Detection of machine faults like massif balance, rotor rub, shaft misalignment, gear failure, and bearing defects is possible by comparing the vibration signal so far machine operating with and without faulty conditions. These signals can also be used to detect the incipient failure so the machine components through online monitoring system, reducing the possibility of catastrophic damage.

V. ANALYSIS OF DATA

The traditional way of observing signals is to view the minwhat is called the time domain. The time domain is are cord of what happened to a parameter compared to time.Typically,the signal would be displayed on an oscilloscope or a computer screen as given in Figure 2.In the analysis of time series signals ,certain restrictions are imposed by the length of the data window(T) ,being analyzed and by the sampling rate(fs), used when digitizing continuous data [21] ...

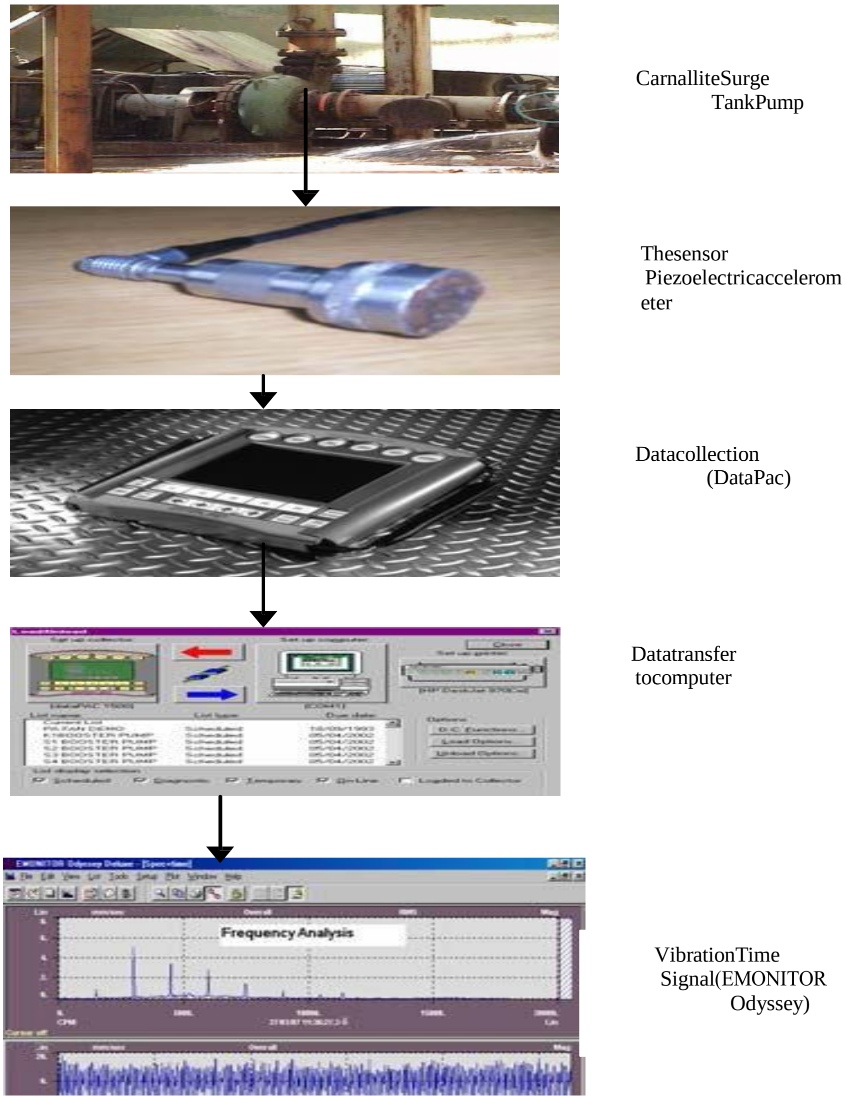
Machines faults diagnosis and prediction requires generating representative and useful information about the vibration features by means of a sensor. Our approach to predict the fault type is to mount a piezoelectric accelerometer on the machine's component under study in order to give a time-series signal which is supposed to continue information about the machine's faults, failures and health conditions. The data use d in building intelligent maintenance system has undergo several processing and analysis steps which will be described briefly in this section.

The first step is the vibration measurement by using sensor as shown in Figure3; this sensor is a piezoelectric accelerometer .Accelerometers is absolute vibration transducers which produce a signal proportional to the vibration acceleration. The piezoelectric accelerometer is most attractive in view of its rigidity, wide frequency range, flat response and dynamic range, this sensor has the ability to measure the vibration in the three dimensions (namely;axial,horizontal,andvertical).

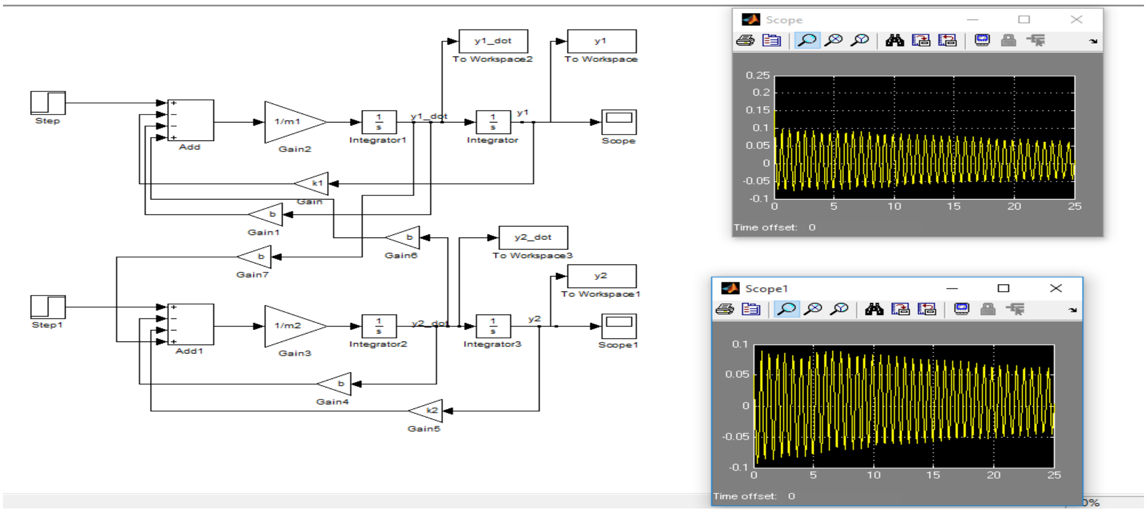
The piezoelectric accelerometer is connected with database collection device which in turn is connected with a computer that has to beanalysis,which in turn applies preliminary signal automatically on the vibration

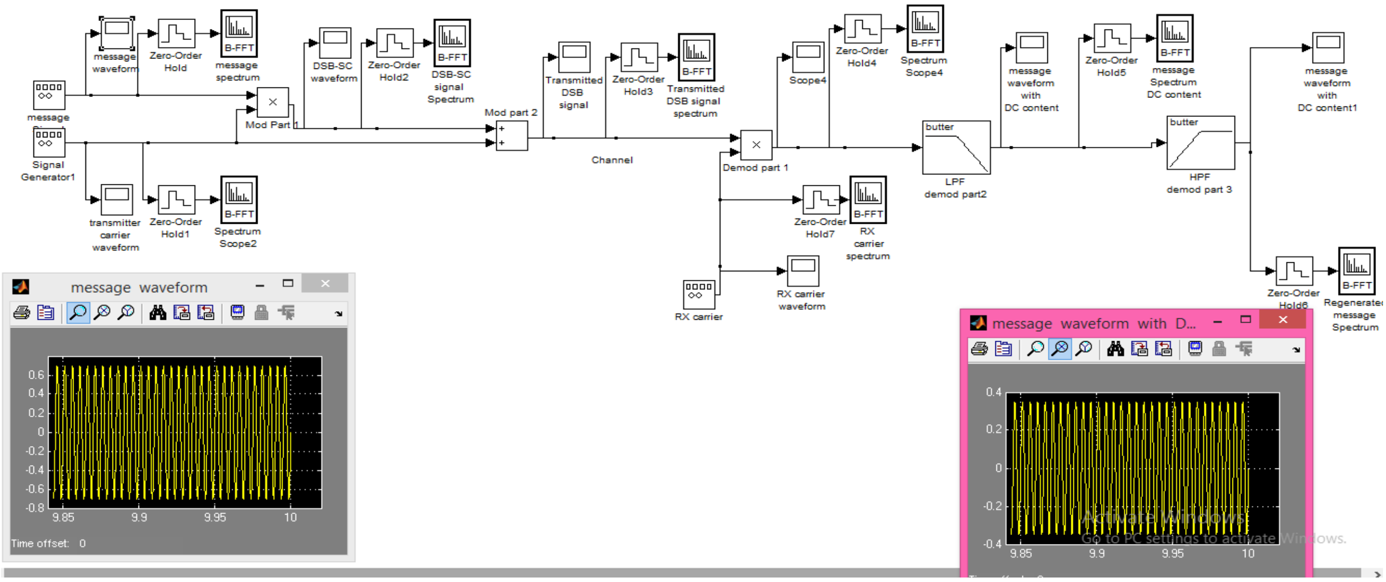
Upon the final output of signal processing steps is Generated as illustrated in Figure 3,and before analyzing data using neuro-fuzzy or neural networks, the time data of 701 observations were divided into 3 bins each, with 234 non-over lapping samples in each in .Each of these bins has been processed using MATLAB 7.0 to extract the followings features:

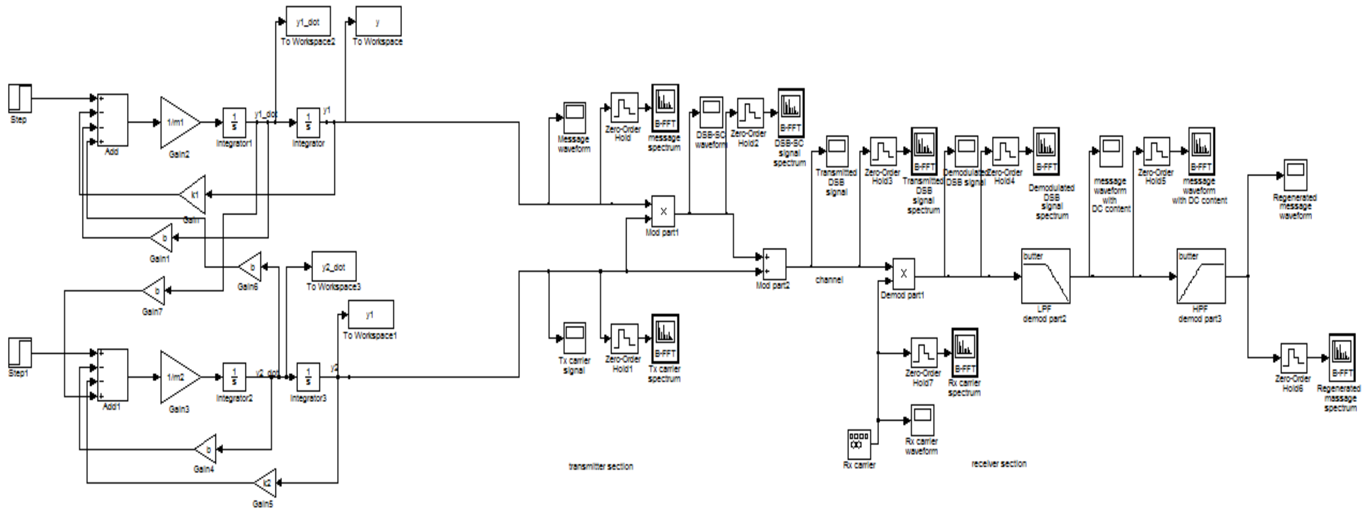
1. Root mean square (rms),
2. Variance (σ^2),
3. Skewness (normalized third central moment3),
4. Kurtosis (normalized fourth central moment4) and
5. . Normalized sixth central moment (γ6).

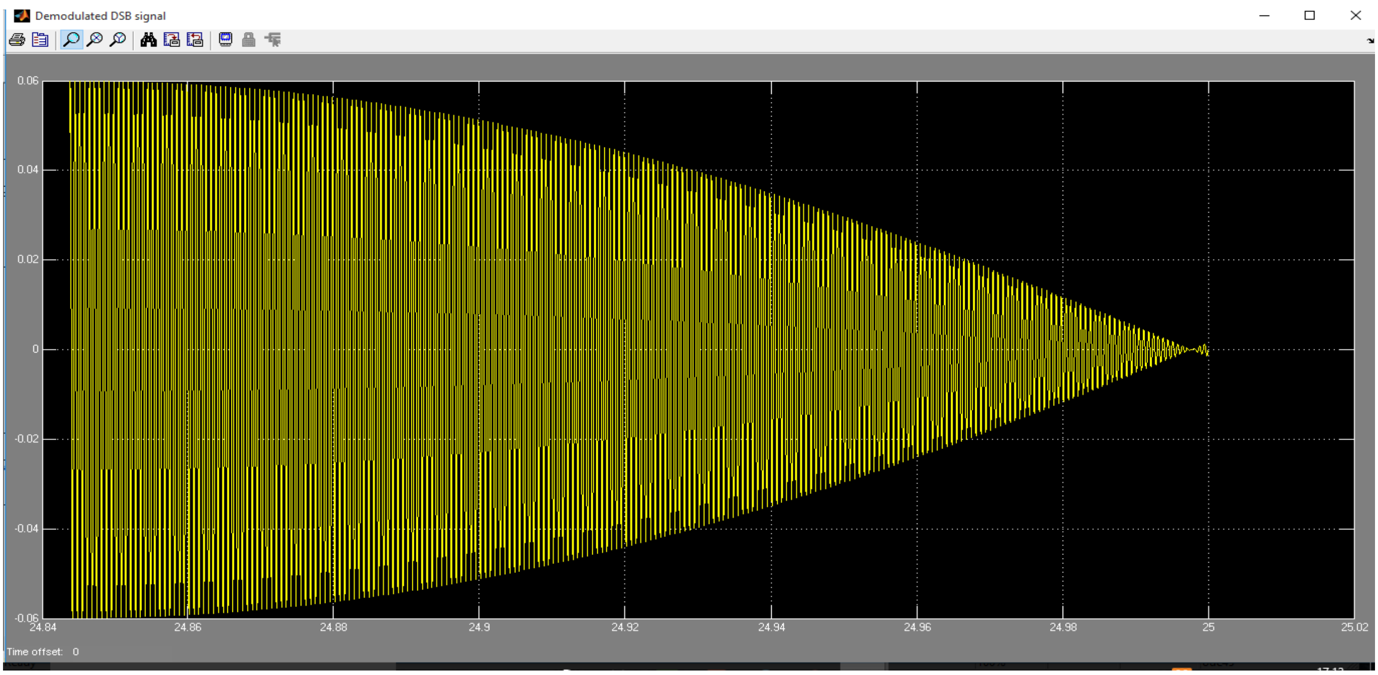


SIMULATION AND RESULT




message waveform
Zero-Order Hold
message spectrum
Mod Part 1
message
Signal Generator1
transmitter carrier waveform
Zero-Order Hold1
Spectrum Scope2
DSB-SC waveform
Zero-Order Hold2
DSB-SC signal Spectrum
Mod part 2
Transmitted DSB signal
Zero-Order Hold3
Transmitted DSB signal spectrum
Channel
Demod part 1
Scope4
Zero-Order Hold4
Spectrum Scope4
LPF demod part2
message waveform with DC content
Zero-Order Hold5
message Spectrum DC content
HPF demod part 3
message waveform with DC content1
Zero-Order Hold7
RX carrier spectrum
RX carrier waveform
RX carrier
Zero-Order Hold6
Regenerated message Spectrum
message waveform
Time offset: 0
message waveform with D...


To Workspace2
To Workspace
Step
Add
Gain2
Integrator1
Integrator
Gain1
Gain6
Gain7
To Workspace3
To Workspace1
Step1
Add1
Gain3
Integrator2
Integrator3
Gain4
Gain5
Message waveform
message spectrum
Mod part1
Mod part2
channel
Demod part1
LPF demod part2
HPF demod part3
Tx carrier signal
Tx carrier spectrum
Rx carrier
Rx carrier waveform
Rx carrier spectrum
Regenerated message waveform
Regenerated message spectrum
transmitter section
receiver section


Demodulated DSB signal
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
24.84
24.86
24.88
24.9
24.92
24.94
24.96
24.98
25
25.02
Time offset: 0

THE FOLLOWING CONCLUSIONS CAN BE DRAWN FROM THIS STUDY:

The vibration condition monitoring groups should have provide good trends of different vibration data and graphs like absolute and relative overall vibrations, FFT ,TWF and phase characteristics in different points and directions. Furthermore, vibration analysts should have good understanding and back ground about machinery characteristics of machinery. After comparing the vibration trends and data with machinery and process evidences for different main machine faults like wear, misalignment, Oilwhip/whirl, shaftcrack, loose ness and un balance, the vibration analysts could recommend optimal maintenance action on most critical equipment. Changing in load and RPM should be monitored accurately. These kinds of process abnormalities sometime cause serious mechanical problems Method for cont inuously monitoring the condition of a motor and which interprets conditionof faulty and healthy Very small defects can be detected by using FFTTechnique,Thed effects can be finding before breaking and Repairs ,maintained and replacements can be reduced

VI. REFERENCES

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