IOT Based Machine Health Monitoring System

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Abstract - *Machine health monitoring in today's complex plant systems has gained more prominence than ever before because of steep increase in machinery costs, plant investments and maintenance expenses. A breakdown in any one machine or a component in a plant could mean huge losses coupled with safety and environmental threats as in the case industrial and commercial plants. The advances in manufacturing technology and the competition in the market necessitate the continuous availability of machinery for production. This has created a need for integrating maintenance with other manufacturing activities for better plant availability and efficiency. The objective of present research work is to present one such Machine health monitoring (MHM) system developed using knowledge-based systems. The proposed model can be a useful maintenance tool in majority of small and medium scale manufacturing plants. A comprehensive knowledge-based system (KBS) could be developed over a period of time for industrial machinery which can monitor the major machinery faults and provide expert maintenance solutions through measurement and analysis of machine parameters such as power, vibration, noise, temperature, wear debris, lubricant condition, etc. A fault diagnosis system with KBS is based on computer programs interlinking fault symptoms, faults and remedies.*

Key Words: Industrial 3 phase load, Speed, Wear debris, Lubrication, Temperature, Vibration etc.

1. INTRODUCTION

The machine health monitoring system is used to measure various parameters of 3 phase machines like 1) over voltage and under voltage 2) over current and under current 3) over temperature 4) over speed by using Arduino and IOT technology. The proposed system uses sensors like temperature sensor and inductive type proximity sensor. These sensors mainly involve monitoring of temperature and speed. We divide project in 3 units like indicating unit, sensing unit and controlling unit.in indicating unit we show the electrical parameters like voltage and current per phase. In sensing unit, the standard rating of various devices is set and when the electrical quantity is increased or decreased according to that Parameter this relay will turn off the system in abnormal condition. In Controlling unit when the electrical parameters are same as set value then machine turns on automatically. We use IOT based GSM for the

sending message to the operator for knowing the condition of machine.

1.1 Problem Statement and Remedies

The machine health monitoring system is based on a real time morning application therefore, we have visited a small-scale industry named as 'Kambale Textiles'. There are 40 motors installed in industry for 40 loom machines. If anyone motor gets affected by a minor fault, then whole system depending on that motor will stop operating.

Loss due to one machine shut down can cause loss of Rs 70/- then approximated loss of 40 loom machines for 1Hr will be cause loss of Rs 2800 Rs. This loss happens because of the minor faults in motor like voltage spick and also during operation mechanical faults in machines produce unique vibrations which depend upon the geometry of the machine elements such as shaft, spindle etc., and shaft rotation speed which is main cause to damages the motor. Minor faults which will if not corrected at that instant then they will cause a big damage to machine.

Hence, we worked on project and get the solutions: -

 1)For bearing problem we are using proximity sensor that will sense minor change in distance of bearing which will if ignored then it leads to blocking of shaft hence it avoids using this sensor

2)If single phasing occurs then the motor will get shut down to avoid further damage.

3)By balancing voltage and current starting torque will not get affected.

1.2 Objective and Scope of Project

The objective of present research work is to present one such machine health monitoring (MHM) system developed using knowledge-based systems. The proposed model can be a useful maintenance tool in majority of small and medium scale manufacturing plant.

Machine health data takes the guesswork out of which machines in our line we need to optimize, and predictive insights allow us to implement changes in production to

maintain high-quality output standards in weeks or even days instead of the typical year-long implementation process. With machine health data, we can also see the true indicators of productivity and efficiency. A machine health platform can give us real-time insights into how machine performance correlates to the quality of our outputs and the potential to maintain that quality down the line.

2. WORKING

Working of the Project is mainly classified by following sections:

- Display Unit
- Control Unit.

Display Unit: - The display Unit is the information status about all devices. In display unit all the Electrical Parameters like Voltage, Current, Frequency, Speed, Temperature, power factor, phase reversal, phase asymmetry is displayed.

Control Unit: - In the control Unit is the control of various Electrical parameters are controlled. In control unit we control the following parameters: -

Voltage Controller:
- Under Voltage
- Over voltage
- Voltage Asymmetry
- Power factor
- Phase reversal

Current Controller:
- Under Current
- Over current

Frequency Controller:
- Under frequency

Temperature Controller:
- Over temperature

Speed Controller:
- Under speed
- Over speed

Machine health monitoring is the ability to access the electrical parameters of a machine over a period of time. Firstly, we enter the rated value of the three-phase load in the controller unit as per Indian standard. When the faults occur the electrical parameters like voltage, current, PF, frequency, speed are changes. These values are compared with the rated value and the according to which parameter are abnormal (above or under) these relay unit sense this and send signal to the microcontroller to turn off the respected unit of the machine. Then IOT based GSM unit send text message of all real time value of the machine to the Operator. In this way project provides an automated and Real-Timed monitored solution for the traditional water

supply system through smart features of the project '**MACHINE HEALTH MONITORING SYSTEM**'
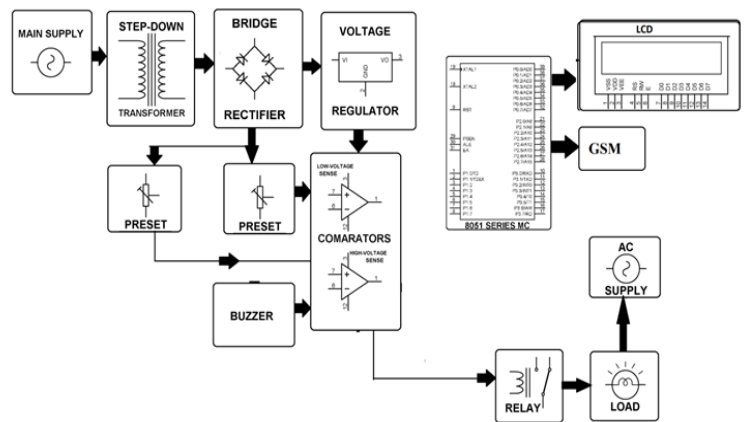
Block diagram

Table-1: Main Sensors used

Sr. No	Sensors	Specification	Quantity
1)	Voltage Sensor	0 –500-volt, ADC type	01
2)	Current Sensor	0 – 500 amp, CT operated sensor	01
3)	Temperature Sensor	PT – 100 Pencil type analog sensor	01
4)	Distance Sensor	Ultrasonic digital 5 volts DC operated distance sensor	01
5)	Speed Sensor	Tachometer	01

FUTURE SCOPE

In proposed system, there is a flexibility of adding new technologies and advanced equipment's like advanced sensors for example, waterproof sensors can be employed for application like Jack well or Submerged motors, etc.

4. CONCLUSION

This project holds the concept of modifying the traditional machine health monitoring system into a IOT based machine health monitoring system. It encompasses the programmed way of monitoring and auto correcting the industrial or commercial users and making a reliable solution for those users. This project contributes for reliable and efficient solution by providing the scheduled way of minimizing the faults and also at the same time all the electrical parameters of the system can be monitored in real time using IOT. The

Real-Time operating condition of the system is monitored and during both the condition's that is normal and abnormal it gives signal through text message to the operator.

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