Predictive Maintenance of DC Motor

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Abstract – *Now days the maintenance of AC or DC motor is most common requirement in industries. Routine maintenance is essential to reduce plant downtime which is costly in any manufacturing facility. The goal of our device which is connected to motor is to calculate the run time values and continuously compare these values with standard values of motor. Using vibration and temperature sensor, we can predict the values. If the values are exceeds the limit which already mentioned in program of Arduino Uno then GSM send message on given number. This can determine a time for an overhaul or replacement of motor. We can easily connect this wireless device to AC or DC motor. The relay used in circuit performance a main role that is when value again exceeds the highest limit the power supply get turn off. This maintenance programs is to reduce maintenance cost by detecting problems early which allows for better planning and less expected failure.*

***Key Words*: Vibration Sensor, Temperature Sensor, Arduino Uno, GSM SIM900A.**

1. INTRODUCTION

Until now there are two types of maintenance schemes in industries, first one is preventive maintenance and another one is breakdown maintenance. These maintenance practices cause unplanned downtime of processes in industries. This also lead to excessive maintenance which is not requires which leads to wastage of man hours and resources. We are calculating and monitoring vibration and temperature values through Microcontroller (Arduino). To avoid the drawbacks of above mentioned maintenance, predictive maintenance can be a great solution. Predictive maintenance helps to determine the condition of motors in order to predict when maintenance should be performed. It is cost saving over runtime maintenance and prevent unexpected motor failures.

2. Objective

1. This system removes the need of manual handling.
2. This device monitors the sensor values wirelessly and analysis can be done as early as possible.
3. Results are sent through message on mobile phone so required action can be taken.
4. The circuit provides safety against failure of motor and predicts the requirement of maintenance of motor.
5. It saves man hours when the motor is broken.

3. Literature Survey

1. The five characteristics of Cloud Manufacturing Things *paper presented by M.Spinola. This paper is about the essential things on cloud computing we need to be aware of before using cloud computing. From the above paper we learnt that using cloud would be better than the using local server as the storage space in could is vast and data could be fetched from cloud whenever necessary. From the above paper we learnt that the sensor and physical elements like water could be combined with internet for its testing.

2. Paper presented by Harsha Khandel, Suchitra pandey and D. Raynolds. This paper is all about power consumption and data monitoring. From the above paper we learnt about how to create a database and how to process it to increase cost efficiency and productivity of time.

3. Motor maintenance: A survey of Techniques and Results by Timothy J. Barnish, Dr. Michael and Aerospace Engineering. This paper is about preventive maintenance. This takes steps to improve motor performance and to extend it's life common preventive tasks.

4. What is the Internet of Things: An economics perspective, Auto ID Labs White paper presented by Practitioners and researchers who can interested in understanding and contributing to the ongoing merge of the physical world.

4. METHODOLOGY

4.1 Block Diagram

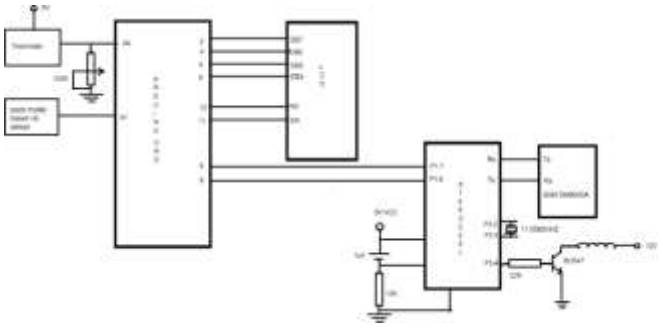

Fig. 1: Block diagram of setup

The circuit diagram contains all the components used in the project. Basic function is carried out by controller who is the brain of the system. For safety of DC motor the predicted values of temperature and vibration are given to the arduino uno for implementation and emulation. When the DC motor exceeds the predicted values in either or both temperature and vibration then the arduino will send command to the GSM module and the GSM will slert us via SMS on our cell phone on which the number has been given in arduino code.

5. TOOLS

[1] GSM SIM900A

Fig. 2: GSM SIM900A module

GSM Modem-RS232 is built with Dual-Band GSM engine SIM900A works on frequencies 900/1800 MHz. The Modem comes with RS232 interface, which allows us to connect PC as well as microcontroller with RS232 chip(MAX232). The baud rate is configurable from 9600-115200 through AT command. It's suitable for SMS, vice as well as data transfer application in M2M interface. The onboard regulated power supply allows us to connect wide range unregulated power supply. We can make audio calls, SMS, attend incoming calls and internet etc through simple AT commands.

[2] ARDUINO UNO

The Arduino Uno is a microcontroller board based on ATmega328 (datasheet).It has 14 digital input/output pins (of which 6 can be used PWM outputs),6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, simply connect it toa computer with USB cable or power it with an AC-TO-DC adapter in battery to get started.

Fig.3: ARDUINO UNO

The adapter can be connected by plugging a 2.1 mm center-positive plug into the board's power jack.

The board can operate on external power supply of 6 to 20 volts. If we supply it with less than 7 volts however the 5v pin may supply less than 5v and the board may get unstable. If we use more than 12v, the voltage regulator may overheat and damage the board.The power pins are as follows.

Vin, 5V regulated power supply, Ground , Serial 0 and 1 , External interrupts(2 and 3),PWM , SPI

[3] VIBRATION SENSOR(PIEZOCRYSTAL BASED VIBRATION SENSOR)

Single-roller type induction trigger switch. When no vibration or tilt, the product is ON conduction state, and in the steady state, when a vibration or tilt, the switch will be rendered instantly disconnect the conductive resistance increase, generating a current