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IDENTIFICATION OF A FAULT AND REALTIME MONITORING SYSTEM FOR AN AC MOTOR USING IoT

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Abstract

Now a days, most of the industries are using AC motors. If there is any occurrence of fault and it is not identified correctly, the life time and the efficiency of motor will be reduced. Even it also causes severe damages to a motor. So, monitoring of a motor is important. To avoid these problems, we have to check the conditions of a motor frequently. This paper presents monitoring of an AC motor by using IoT (Internet of Things) to check the motor conditions frequently and to increase the life time of the motor. Then, to increase the sales and productivity in an industries. The purpose of using IoT is to allow objects to be sensed or controlled remotely across existing network. Addition to this we are also identify a faults in a motor by using sensors.

Key words: Fault detection, Monitoring, Motor, Internet of Things (IoT), Sensors.

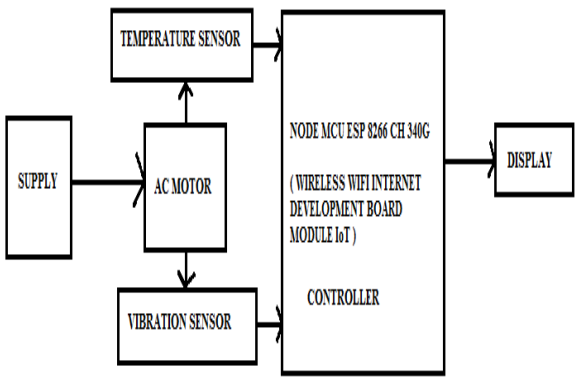
I. INTRODUCTION

DC motors are widely used for industrial applications before the invention of AC motors. With the invention of AC motors due to their higher performance attributes over DC motor, industrial automation is being frequently done with it. But in AC motor, monitoring is more important. If there is any fault occurred in an AC motor, the life time and efficiency of the motor will be reduced. To avoid this, we have to check the conditions of motor frequently. In an AC motor, real time monitoring is done using IoT (Internet of Things). IoT has got a lot of attention and is expected to bring benefits to many applications. The concept of Internet of Things is providing a best way for industrial automation through remote access. In IoT each device or devices constituting a system will be able to communicate with the other devices. The performance of an AC motor depends on an electrical, mechanical, environmental parameters of the motor. As a result of recent development in communication technologies, systems are no longer monitored and controlled by manually using classical methods. For our work we prefer a single phase Induction motor. The primary advantage of induction motors are its straight forward rotor construction leading to its low cost, ruggedness, less maintenance but it is much more difficult to control. A fault such as rotor fault and bearing fault are considered and it will be identified by using sensors. Temperature sensor is used to sense a temperature and vibration sensor is used to sense the

vibration in the motor. The sensors data are used for identification of fault. These faults are occurred due to unbalance supply voltage or current, broken rotor bars and bearing damage. Hence in this proposed work the IoT is used for real time monitoring and fault identification of an AC motors (Induction motor).

II. PROPOSED TECHNIQUES

A. BLOCK DIAGRAM



B.EXPLANATION

The above block diagram shows our proposed work. In this, a supply is given to a motor. Two sensors namely temperature and vibration sensors are connected with the motor . This is to sense the temperature and vibrations from the motor frequently. Then, a data from a sensors are fed to the controller for monitoring. If there is any deviation in the data, occurrence of a fault is identified and display in a monitor.

C. COMPONENTS

1. TEMPERATURE SENSOR

Temperature sensors are most frequently used device to measure in the motor and it is used to identify the temperature rise in the motor. Whenever the temperature rise in the motor cross the limit of the motor standard temperature level the motor will intimate or send a notification to the user or manual controller.

In this paper LM35 is used as a temperature sensor. It is a precision IC temperature sensor which output is proportional to the temperature (in ^{o}C). With LM35, temperature can be measured more accurately than with a thermistor. It also posses low self-heating and does not cause more than 0.1 ^{o}C temperature rise in still air. Its operating temperature range is from -55 ^{o}C to 150 ^{o}C. The output voltage Varies by 10 mV in response to every ^{o}C rise/fall in ambient temperature, i.e., its scale factor is 0.01V/ ^{o}C. The sensibility of the temperature sensor is 10 mV/ ^{o}C, a value addressable by the microcontroller, which is capable of capturing voltage levels below 5 mV.

2. VIBRATION SENSOR

Mostly, the motors will be affected by friction and vibrations. This vibration causes the breakage in the motor. This will be avoided by implementing the piezoelectric sensor. This sensor will monitor the motor vibrations for every second. When there is an existing vibration produced in motor means it will sense the value and pass to the controller. The controller will intimate this error to the user. Then that error will be cured and the motor attains its

stable position.

This sensor will also define as the sound maker which will make sound when the error occurred while motor at running condition.

3. A. NODE MCU ESP 8266

Node MCU is an open source IoT platform. It includes firmware which runs on the ESP 8266 Wi-Fi SoC from Espressif Systems. ESP 8266 called as a WIFI module, but it is actually a microcontroller. ESP 8266 is the name of the microcontroller developed by Espressif Systems which is a company based out of shanghai. This microcontroller has the ability to perform WIFI related activities hence it is widely used as a WIFI module.

B. TYPES OF PROGRAMMING WITH ESP 8266:

There are two of ways to work with ESP 8266 module. One way is by using the AT commands. The other way is by using the Arduino IDE.

All ESP 8266 modules shipped from the factory will have a default firmware (SDK + API) loaded into it. This firmware will help you to program the ESP 8266 module through AT commands.

The other way is by directly programming the ESP module using the Arduino IDE (board not needed) and it libraries. All the projects can be done in both the methods.

C. PINS OF NODE MCU :

Node MCU provides access to the GPIO (General Purpose Input/output) and for developing purposes below pinmapping table should be referenced.

IO Index	ESP 8266 pin	IO Index	ESP 8266 pin
0	GPIO 16	7	GPIO 13
1	GPIO 5	8	GPIO 15
2	GPIO 4	9	GPIO 3
3	GPIO 0	10	GPIO 1
4	GPIO 2	11	GPIO 9
5	GPIO 14	12	GPIO 10
6	GPIO 12		

D. DESCRIPTION :

Voltage	3.3 V
Current Consumption	10 uA – 170 mA
Max Current consumption during flashing	800 mA
Flash Memory	16 MB (512K normal)
Processor	Tensilica L106 32 bit
Processor Speed	80 – 160 MHz
RAM	32K + 80K
GPIO	17(but most are multiplexed)
Analog to Digital Converter	1 (10-bit)
Max TCP Connections	5

4. INDUCTION MOTOR

One of the most commonly used electrical motors is an **induction motor**. It always runs at speed less than synchronous speed. Because the rotating magnetic field produced in the stator will create flux in the rotor and hence will make the rotor to rotate. Due to the lagging of flux current in the rotor with flux current in the stator, the rotor will never reach it's rotating magnetic field speed, i.e. the synchronous speed.

There are basically two **types of induction motors**. The **types of induction motors** depend upon the input supply. The single phase induction motor and three phase induction motor. Single phase induction motor is not a self-starting motor, and three phase induction motor is a self-starting motor.

For our work we consider single phase capacitor run type Induction motor..

III. RESULT

In order to develop a new convenient online monitoring system for Internet of Things, an online monitoring system based on cloud computing is designed. Through the modern online monitoring system, the IoT intelligent gateway, cloud based research and construction of large data analysis and ddata mining projects are verified. The experimental results show that the relevant parameters of the model re obtained by training about 70% of the original data after adopting the cloud computing. Based on the above finding, it is concluded that the open IoT platform needs to be supported by the powerful computing resources. Thus, the customer can monitor the motor operating condition and find the fault in the motor instantaneously.

IV. CONCLUSION

IoT based automatic motor testing is the key reduction to reduce the Man power and to reduce the errors occurs in a motor while testing. Also with this the major topic topic that we covered and done by using cloud controller. This help to reduce the time of calculation and also reduce the error occurrence while calculating the motor efficiency. This help to improve the efficiency of the motor. The sensed valued are transferred wirelessly

to the local and cloud server for the analysis. On the other hand the data is also stored to the SD memory. And the reading is monitored to the manufacturing company. If there is any fault can be identified to the person of the company it will be automatically intimated to the customer. This process will help to reduce the fault in the motor and it increases the life time of the motor.

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