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IOT BASED INDUCTION MOTOR CONDITION MONITORING AND CONTROLLING

Rajesh L V[1], Harish K L[2], Lakshmi M V[3], Vinutha L[4],Yashaswini M[5]

[1] Assistant Professor,[2] Students VIII sem
[1,2,3,4,5] Department of Electrical and Electronics Engineering
[1, 2,3,4,5] Dr. Ambedkar Institute of Technology, Bangalore, India

A B S T R A C T

In today's industrial world, induction motors are one of the most often used machines. The simple construction and rugged design of an induction motor are its key characteristics. With a few or no adjustments, induction motors can work in any environment.They also run at a nearly constant speed and have a high torque-to-speed ratio.Hence in a few applications the motor also needs to be located at remote locations. In this project we are aiming to monitor and control the induction motor using IOTtechnology in such a scenario. Various parameters are measured using sensors and the values are fed to the Arduino. The Arduino is the core of project. It reads the measurements, monitors the motor & also interfaces with the Wi-Fi module thereby allowing us to access the various parameter values of the motor remotely.

Keyword:IOT, induction motor, arduino, sensors.

1 INTRODUCTION

Before induction motors, DC motors were being used. When induction motor was introduced, it revolutionized the industrial and domestic application. This was because of its simple and rugged construction. They need less maintenance and can be operated for long time.Although induction motors are robust, they are subjected to some unpleasant stresses, causing errors and induction motor failure.

The induction motor's performance is determined by the electrical and mechanical factors. As a result, continuous induction motor monitoring is essential to ensure that induction motors operate safely and reliably. The motor's performance is influenced by electrical and environmental factors such as voltage, current, temperature, and humidity. Mechanical factors like as vibration and fluctuating speed also play a role.

Therefore, several monitoring & controlling methods have been suggested for having better control of induction motor.In this proposed system we aim to monitor & control the induction motor using IOT. Here we monitor the parameters voltage, current, speed, temperature, humidity & vibration of the motor. Also, we aim to read these parameters remotely. By monitoring these parameters control of the induction motor is made possible & supply is cut off from the motor when a fault occurs.

2OBJECTIVE

The main objective is to increase the reliability of the motor.This work ensures the continuous monitoring of motor and acquires real time condition of induction motor parameters remotely using IOT.Here we are going to monitor induction motor parameters which are voltage, current, speed, humidity, temperature and vibration.This are sent over internet from were we will able to read data from any location.Here the induction motor fault is depending on the different parameters and environmental conditions.Thus by ensuring the motor performance abnormal condition are easily identified and rectified.

3 .LITERATURE SURVEY

In paper [1] Sudharani Potturi; Rajashekar P. Mandi, Critical survey on iot based monitoring and control of induction motor

This paper describes the use of the Internet of Things (IoT) to monitor and operate induction motors in a variety of applications, including electric vehicles, industries, and agriculture. Temperature, speed, current, voltage, and other parameters of an induction motor are monitored here.

In paper [2] KEERTHANA P, VINOTH G, SENTHIL KUMAR R, RAJESH S. proposed a idea of Implementation of motor testing for single phase induction motor using iot . The induction is automatically tested in this study to determine the performance characteristics defined by ISO standards. For this reason, latest technology such as IoT programming is included. The computations are performed automatically by the system, and the results are transferred to the server using IoT (Apache web service) and MySQL.

In paper[3] JAIKARAN SINGH, ADITYA NARAYAN SHARMA Induction motor monitoring and protection .In this study, a unique concept of industrial automation is presented, as well as fault monitoring. The Arduino-based parameter monitoring system for induction motor proposes an Arduino-based control and monitoring system for induction motors.

In paper [4] P.M.AKOTKAR, V.S.KARALE, Dr.A.U.JAWADEKAR explains the idea of Condition Monitoring of Three Phase Induction Motor Based on IOT that monitioring of parameters using arduino uno.

In paper[5] ANURAG TIWARI,BHARATI VIDYAPEETH. Proposed a idea of Prototype Health Monitoring of Induction Motor .

4. BLOCK DIAGRAM

The sensors are used to sense different parameters like voltage, current, speed, temperature, humidity and vibrations. Various parameters are measured using different sensors & sent to arduino.Arduino (Microcontroller) is the core of system. The Arduino also process the data and compares the measured parameters with pre specified .The data is sent to remote locations .Since arduino operates in low voltage, a relay is used to control the supply to the induction motor. When any parameter value is abnormal the supply is cut off from the motor by relay.There is a simple alarm system that uses a buzzer to sound an alarm when there are any abnormalities or change in parameters.. The processed data is displayed in the LCD display and the same made available to the user via the wi-fi module.

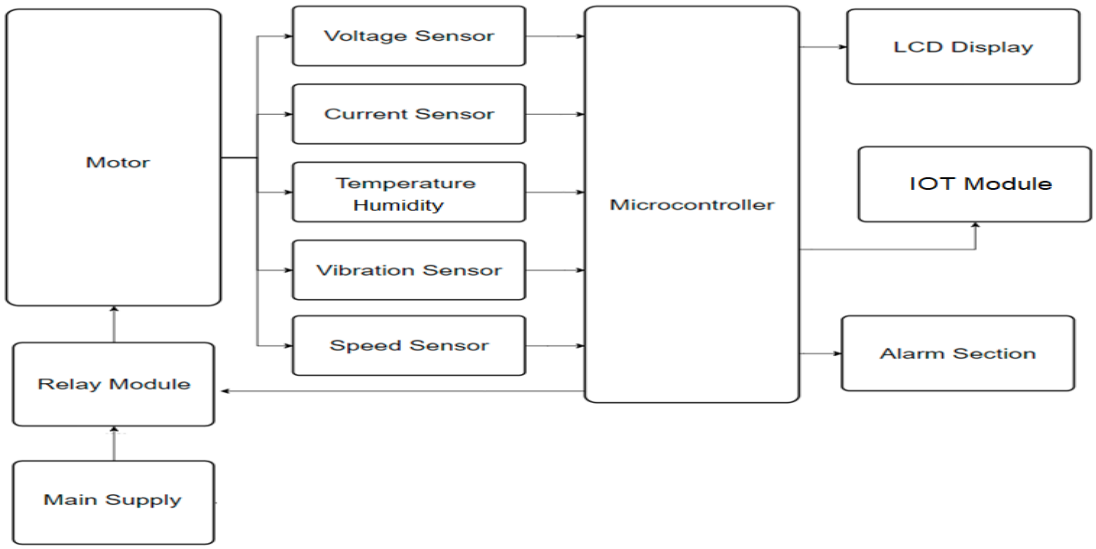

Fig 1-block diagram

5 METHODOLOGY

In this paper we are proposing a system which control and monitor the induction motor using IOT.When the power supply is switched on, the Arduino and all the interfaced components get the required power supply. Various sensors sense the corresponding motor parameters and feed the data to Arduino. Arduino reads the data from various sensors and analyses according to given instructions. Then sends the sensor information to LCD display and server through Wi-Fi. At the same time, Arduino controls relay which will control the supply to the induction motor. The sensor information's are displayed visually in the server and LCD display.

6 SYSTEM IMPLEMENTATION

For the implementation we have used a voltage sensor, current sensor, speed sensor and DHT11 temperature and humidity sensor for measuring voltage, current, temperature humidity, speed respectively and a vibration sensor for sensing vibrations or noise. The voltage sensor is connected to A0, current sensor toA1 and vibration sensor to A3.These three analog values are taken in analog pin of programmable microcontroller arduino. These analog values are given to A to D converter for converting this analog values into digital one.the IR sensor is connected to pin 2 and DHT11 is connected to 16. s. TheMicrocontroller will read all sensor value one by one and then it will process the sensor data. Then the values are then sent directly through a Wi-Fi module that displays the data in any internet connected IOT device for monitoring. All value will compare with threshold value, if any fault detected the microcontroller will send alert message. The relay will sense the fault and disconnects the motor from supply.

The hardware components used in implementation are:

1. ARDUINO UNO (ATMEGA328): Arduino is a microcontrollor board using atmega328.The board has voltage regulator, crystall oscillator, microcontroller, digital pins, analog pins and serial communication pins.It has 14 input and output digital pins. With the help of a USB cable, it may be readily connected to a computer.

2. ZMCT103C CURRENT SENSOR:ZMCT103C current sensor is used to sense current. For more precise sampling and proper signal compensation, the module is built with the ZMCT series of tiny size high-precision micro-CT and high-precision operational amplifier circuits. It is the finest method for acquiring AC current signals in the 5A range.The potentiometer can be used to alter the Analog AC signal's output voltage. The amplification ratio can be changed.

3. VOLTAGESENSOR:A voltage sensor is a device that determines and monitors the amount of voltage present in a given object. Voltage sensors can tell whether the voltage is AC or DC.The voltage divider circuit is the essential component of this sensor. The circuit's resistor serves as a sensing element. To make a voltage divider circuit, voltage is split between two resistors; a reference voltage and a variable resistor. With the help of a pair of resistors, it converts a larger voltage to a lower one.

4. TEMPERATURE AND HUMIDITY SENSOR: The DHT11 is used as humidity and temperature sensor in the system .Temperature and humidity are measured with this device.It is of low cost.In this sensor, temperature and humidity are measured using a thermister and a capacitive humidity sensing component.

5. VIBRATION SENSOR: To detect vibrations, sensor module based on the vibration sensor SW-420 and the comparator LM393 is employed. This module is a non-directional vibration sensor with great sensitivity. When no vibration, the sensor provides Low Logic as output and when the vibration occurs, it will quickly detect, and the sensor gives High Logic.

6. SPEED MEASURE: An IR Sensor is used as speed sensor.An IR Led emits rays and other IR Led detects signal that reflected from the object in front. An IR LED is used as the emitter, while an IR photodiode is used as the detector.

7. LCD: LCD (liquid crystal display) is used for displaying output the LCD which is used is of 16*2 that is 16 columns and 2 rows and it displays total 32 characters.The alphanumeric LCD display is implemented.

8. RELAY: A relay is electrical switch. It makes a circuit close or open when receives input signal. An electrical signal is used as an input to control the relay. The circuit is closed as long as the signal is applied, and when the signal is removed, the circuit is opened.

9. IOT MODULE: ESP8266 is a used as iot module and it is development kit, it helps to connect IOT devices and let data to transfer data using wi-fi.it is Arduino compatible, has a Wi-Fi on board and has enough kick to power our IOT devices by connecting to cloud server.

7 FLOW CHART AND ALGORITHM

The fig-2 shows the flow chart of the proposed system

1. Start
2. All sensors, current sensor, temperature and humidity sensor, voltage sensor, vibration sensor and speed sensor, sense the parameters and take the reading.
3. All parameter values are passed to microcontroller atmega328 and stored in microcontroller.
4. Read and convert the analog values into digital
5. Microcontroller displays these values on LCD.
6. Sends these values on IOT Cloud server for remote operation using ESP8266.
7. If any faults observed the supply is cut off with the help of relay

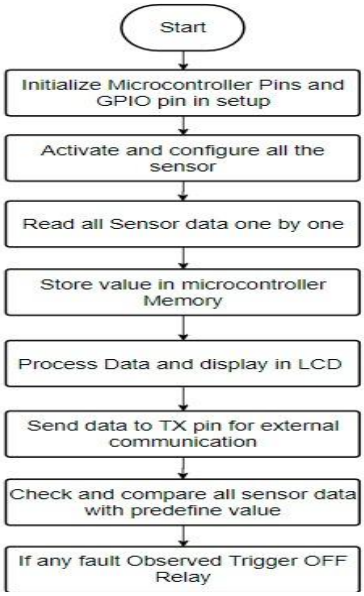

Fig-9- Flow chart

8 RESULT

In this work AC motor was used for experimental purpose.Sensors (Temperature and humidity, vibration, speed, current and voltage sensors) are attached to the motor. Sensor data is collected and processed using Atmega328 microcontroller. Relay is able to control the motor during any type of implemented fault.The various measured parameters can be accessed remotely by using esp8266 and are also displayed locally in the LCD display.

9 CONCLUSION

This project introduces the Internet of Things concept for motor monitoring both remotely and locally. The system is created with the goal of combining parameter readings in real-time namely Vibrations, temperature, speed, humidity, voltage, and current are all measured by means of the motor system monitoring. Inthis system the motor is monitored and controlled remotely via the Internet of Things (IoT). The information received is saved and shown in real time through iot cloud server. The system offers a high level of autonomy, is simple to implement, and requires less maintenance. If a failure occurs, we use a relay to control it and monitor it with an LCD.

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REFERENCES

[1]. Sudharani Potturi; Rajashekar P. Mandi, "IOT based monitoring and control of Induction Motor**" (**2018) IEEE Student Conference on Research and Development (scored).

[2]. Keerthana p, vinoth g, senthil kumar r, rajesh s "Implementation of motor testing for single phase induction motor using IOT" (IJCESR) ISSN (PRINT): 2393-8374, (ONLINE): 2394-0697, volume-5, issue-2, 2018.

[3]. Aditya Narayan Sharma, Jaikaran Singh "Protection of induction motor and monitioring"Journal of Advances in Electrical Devices Volume 2 Issue 1, MAT Journals 2017.

[4]. The research done by P.M.AKOTKAR, V.S.KARAL, Dr.A.U.JAWADEKAR on "Condition Monitoring Of Three Phase Induction Motor Based on IOT" IJEEE Volume 3 Issue 4, August 2020.

[5]. Anurag Tiwari, Bharati Vidyapeeth "Prototype Health Monitoring of Induction Motor Using IOT" JEDR 2019 Volume 7, Issue 2

[6]. Ayushi Gajbiye, Prajakta Zodpe, Zamin Abbas, Hatim Patanwala, Christopher Paul, Prof. Pramod Gadge "Iot Based Condition Monitoring Of An Induction Motor "International Conference on Innovation & Research in Engineering, Science & Technology (ICIREST-19)

[7]. M. Ashmitha, D.J. Dhanusha, M.S.Vijitlin & G. Biju George " Real Time Monitoring IoT Based Methodology for Fault Detection in Induction Motor"Irish Interdisciplinary Journal of Science & Research (IIJSR) Vol.5, Iss.2, April-June 2021

[8]. Kalpesh J Parekh , Ravi M Joshi "Analysis of the Induction Motor used in Temperature Controller Machine by Condition Based Monitoring System"IJSTE - International Journal of Science Technology & Engineering Volume 3 Issue 10 April 2017 ISSN (online)