Parameters Monitoring of Induction Motors Using IoT Platform

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Abstract:

The induction motor condition monitoring is a growing technology to detect the fault of an induction motor i.e. under voltage fault and block rotor of IM due to less voltage. It detects the unexpected faults of a critical system. As well as determine various parameter of induction motor i.e. Speed, temperature, voltage, etc. which will analyze and display the parameters, here the processing unit communicates with Gateway module to send information to cloud database for remote monitoring. The proposed method consists of an IoT based platform to collect and process the induction motor parameters. To make fast and user friendly operation proposed system is interfaced with an IoT platform. This technology includes continuous monitoring of the IM, receiving alerts, and data availability for predictive maintenance.

Keywords- Induction Motor, Internet of Things, Gateway module

I. INTRODUCTION:

Three phase induction motors are used in industrial drives because of its robustness, simplicity of its construction and low maintenance cost, high starting torque, efficiency and reliability makes difference from other motors. An induction motor contain a magnetic circuit interlinking two electric circuits which are placed on the two main parts of the machine one is the stationary part which is stator and another is the rotating part which is rotor. With the help of electromagnetic induction power is transferred from one part to other part. Further their reliability, induction motors are also subjected to many faults i.e. stator faults, Rotor faults, bearing faults and winding faults. Considering factors for failure of industrial motors includes lubrication, motor ventilation, electrical factors, alignments and motor load that results in motor vibrations or motor temperature rise to critical levels. And also any small fault occurred in a motor will led to complete motor failure if not define in time. So parameter monitoring of induction motors is desirable to avoid downtime of any industry. So we can use the advance technology to monitor the parameter of motor. Internet of things (IOT) is providing a best way for industrial automation through remote access. And communicate with other device hence this leads to exchange of significant data, and various other parameters information between various devices to improve their performance.

2. Block Diagram :

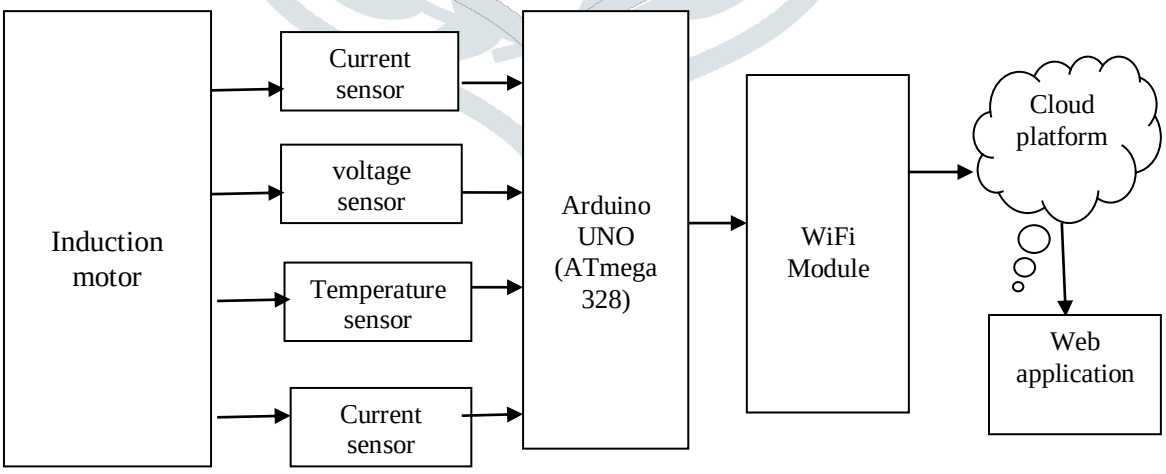

Fig 1: Block Diagram

Arduino Uno: The Arduino Uno is a micro controller board based on the ATmega328. . It has 14 digital Input and output pins in which 6 pins can be used as PWM outputs and 6 analog input pins.

Temperature sensor: The LM35 device has advantages as compared to other linear temperature sensor calibrated in Kelvin. The ratings of LM35 device is−55°C to 150°C temperature range.

Current Sensor: A current sensor is a device that detects electric current in a wire, and generates a signal proportional to that current. The generated signal could be analog voltage or current or even digital output.

Voltage Sensor: The electrical voltage sensors are used to measure both AC as well as DC voltages. The voltage provided is in analog voltage signal, analog current signal.

Speed sensor: The speed sensor is the device which is used to measure the speed of the induction motor. It will sense when the one revolution of induction motor is completed.

WiFi Module: ESP8266 wifi module is used in this proposed system

Web Application: Using blink app we can display parameter like current, voltage, speed, temperature on android device

3. Working of Proposed System:

The objective of parameters monitoring of induction motor is achieved by continuously recording the current, temperature parameters of IM using various sensors. LM35 temperature sensor is used to sense the temperature of the induction motor. ACS712 current sensor used for current measurement, and a Voltage sensing circuit to measure voltage. All the sensors are connected to Arduino micro controller board which is to be installed at the motor site. The sensors will sense the parameters and are analyzed by the micro- controller board according to the instruction coded. The data sensed by different sensors can be seen on the serial monitor of Arduino IDE. The collected data can be stored on the IoT platform using Node Wi-Fi module. Using serial communication between the micro controller and the node board the data is initially transferred to Node board which can be seen on the serial monitor. Then using Wi-Fi functionality the data available at node is uploaded to Thing speak cloud platform. In order to upload the data Thing speak platform, an account is to be created in it and then a new channel is to be created. While creating a channel Number of fields is to be selected depending on the number of parameters under monitoring. Each field is assigned with one parameter which is represented in the graphical form. A web application is developed for continuous monitoring of parameters of induction motor. Instant alert will be received on the web page for any abnormal operation of motor.

4. Experimental Setup:

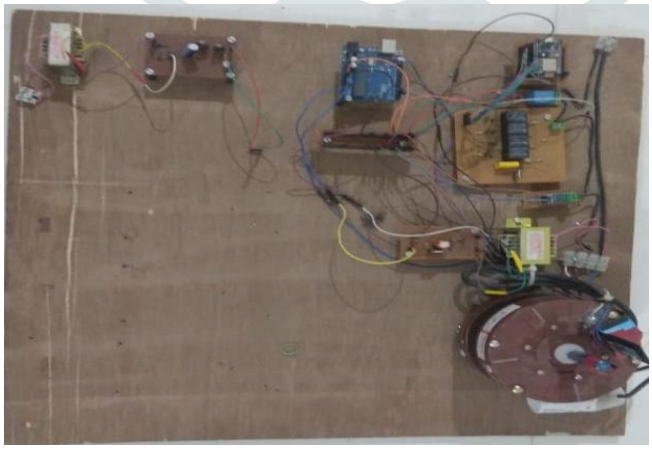

Fig 2: Prototype model

5. Rating and specifications:

Components	Ratings
Single phase Induction motor	0.14HP
voltage	240 v
speed	1440 rpm
current	1.5 amp

6. RESULT:

The main purpose of Prototype model is to operate an induction motor by wireless communication i.e. android application. The protection system will protect induction motor from under voltage condition and rotor blocking. It has embedded with digital display which shows voltage, speed, temperature. When the voltage of the induction motor goes below the 150v then the fault i.e. under voltage condition occurs and it leads to stop the motor. The motor will also stop when the speed of the motor is below 1000 rpm and this is measured by the Hall Effect sensor. During operation if the rotor of the induction motor gets blocked then the motor will be stopped. The Prototype model is designed to control the speed of single phase induction motor by using android application device.

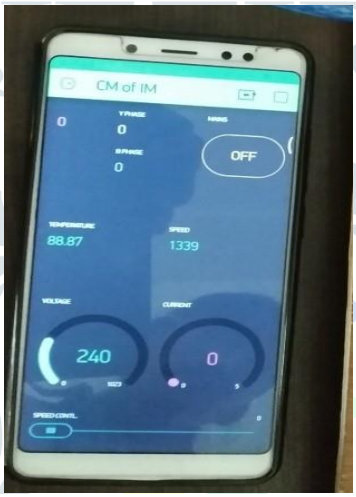

Fig 3. Parameters displayed on mobile app

7. CONCLUSION:

This paper directly contributed to effective and continuous monitoring parameters of an Induction motor by using corresponding sensors like temperature, speed, voltage and current sensors and the data obtained from these sensors is stored in the cloud platform and is accessed from different locations using web application developed. The system is designed to combine various parameter measurements in real-time, improving the ability to detect under voltage and blocked rotor fault conditions. Proposed system is easy to install and it has low maintenance cost. This technology can be used in 3 phase induction motor. In addition to this technology we will get alerts on time when the fault is occurred. We will also record the data and it can be monitored from different locations.

8. REFERENCES:

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