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REVIEW ON IOT BASED MONITORING AND SPEED CONTROL OF AN INDUCTION MOTOR

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Abstract: IoT is a recently fast-growing technology .Now a day's IoT plays a vital role in our day to day life. IoT becomes an essential part of human life. In the future millions of things should be connected to the internet. IoT comes in all over fields like industry, home automation, electric vehicle, traction, agriculture, medical field, etc. This paper deals with continuous monitoring parameters of induction motor and speed control of Induction Motor. In that monitoring parameters are as voltage, current, speed and temperature. Induction Motor monitoring parameters help in the maintenance of motor before the occurrence of any type of faults and avoids the interruptions of delay in production . i.e . Reliability of motor can be maintained by continuous monitoring Induction Motor. If any fault occurs in motor should be automatically disconnected from the supply by using IoT. Also In many applications variable speed operation is required hence control the speed of Induction Motor as per our requirement.

Index Terms **-** Induction Motor, Internet of Thing, Arduin uno ,sensors, cloud, speed control technology..

I. INTRODUCTION

Now a day's Induction Motor is the most popular type of motor in all over fields. The necessary characteristics of an induction motor like simple operation, good power factor, less maintenance, most efficient, reliable and cheaper than other any type of motor. Also Induction motor has good speed regulation, sustainable overload capacity and high starting torque because of these advantages Induction Motor is most wieldy used in an all-over application like industrial motor, electric Vehicles, agriculture motors ,etc.. In Induction Motor there are so many types of fault that occur commonly it is basically subdivided into three parts are as

1. Electrical faults: In that, there is basically a single phasing fault, oversupply voltage, overload fault, Earth fault, etc.
2. Mechanical Faults: In that basically stator and rotor winding defect, Bearing fault, Rotor bar is broken, etc.
3. Environment Faults: In that, there is basically the vibration of the motor, Induction Motor surrounding environment affects the performance of an Induction Motor such as moisture, temperature, etc[1].

This paper represents IoT based Induction Motor monitoring parameters and speeds controlling the operation of an Induction Motor with the help of the PWM technique. Monitoring parameters of an Induction Motor are of voltage, current, speed, and temperature. By monitoring the parameters maintain the continuity of production in industries i.e mass production will be increased also prevent any abnormality in the motor and detect an early fault in the motor. If there is any fault takes place in the motor that should be detected by sensor sense and gives a signal to Arduino Uno then from cloud gives command to the motor should automatically be disconnected from the system. And gives an alert message in mobile for further detailing purposes that fault was done or for future work that should not be repeated again.

THE SPECIFIC OBJECTIVES OF THE RESEARCH

1. for safe and economic data communication in industrial and other fields, Monitoring and controlling operation of an induction motor depend on the internet of Things (IoT) is to done.
2. By Early fault detection, process interruption of the motor can be reduced, also reduced damages of the motor in an industrial process to a larger extent which makes motor should be more reliable.
3. To protect Motor from overloading, over-current and high temperature.
4 To avoid system failures by start and stop operation of an Induction Motor by Automatic or manual control methods.
5. The widely used method for the detection of faults in the motor can be Analysis in the Graphical form of current and voltage waveform[2].

II. BLOCK DIADRAM OF THE SYSTEM

Below is the block diagram of induction motor monitoring parameters and the proposed control system.

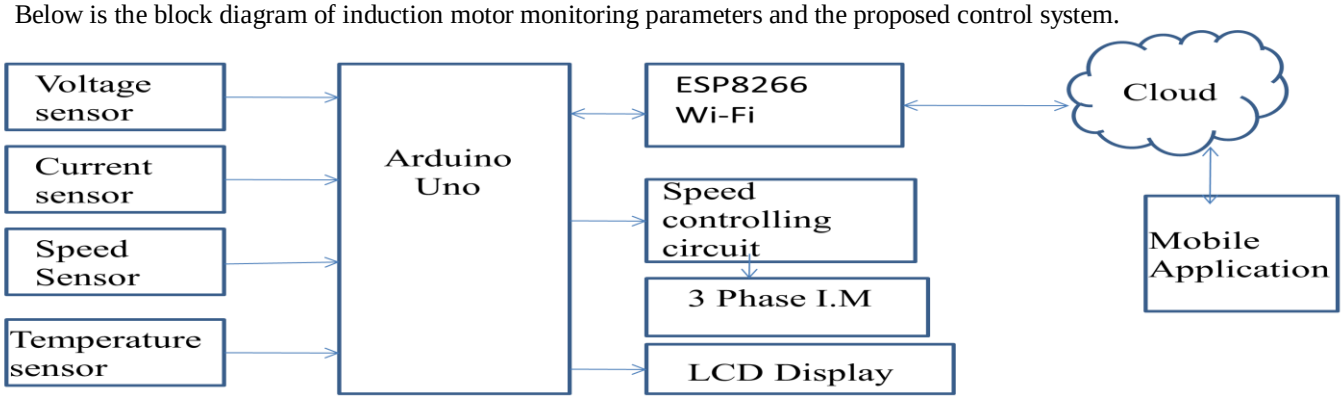

Fig. I Block Diagram Of An I.M Monitoring System

In this block diagram, there are four sensors used for sense parameter are voltage, current, speed and temperature sensors with the help of these monitored the condition of motor and gives the current status of a motor to the Arduino, from Arduino with wi-fi the module gives to the cloud to store the information and from cloud, it will receive in the message form to the mobile application. If there is any fault takes place Induction Motor should automatically disconnect from the supply. Whatever parameter monitored it will display one by one in a web page application and same it will be displayed in an LCD display that is connected to Arduino Uno[1][3].

III.PROPOSED SYSTEM

The below diagram is the overall diagram of the proposed system. This diagram gives detailed information about the proposed system. This diagram clarifies the actual working of the system. Here the actual working of the system is that firstly 3 phase supply comes into the system that gives to 3 phase Induction Motor through speed controlling device and gate driver circuit i.e it acts as a logic circuit to on-off the switches that use in the speed controlling devices. There are so many methods used for controlling the speed of the motor. This paper represents a PWM technique for speed control of the motor. The PWM method is the simplest and most commonly used method for controlling the speed of the motor. by adjusting the ON-OFF period of Triac switches controlling the firing angle from firing angle speed of the motor can control easily[4][5].

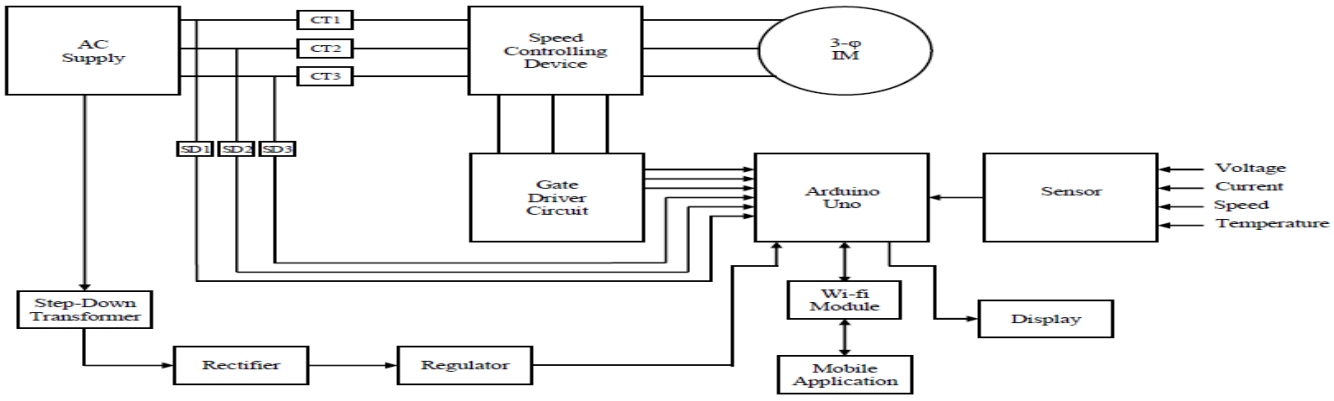

Fig . II overall Block Diagram of the proposed system

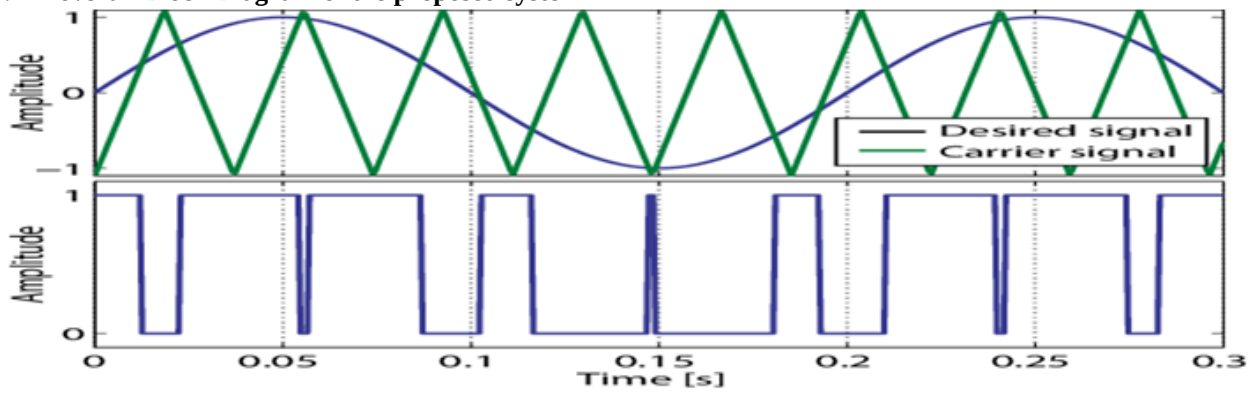

Fig. III PWM Technique for Speed control

Here Arduino Uno required 5v d.c. supply for its operation for that step-down transformer is used to convert 430 v into 5 v supply with rectifier and regulator used. The above diagram shows the PWM technique for speed control of the motor by controlling the firing angle of switches. By adjusting the on-off period of switch voltage can be controlled from voltage speed can be easily controlled[5]

IV. HARDWARE REQUIREMENT

Basically, following is the required component for this proposed system that are as:

- 1. Induction Motors
- 2.Arduino UNO
- 3. ESP8266 (WI-FI Module)
- 4. Condition Monitoring Sensors
- Voltage Transformer
- Current Transformer
- Temperature Sensor
- Speed sensor
- 5.Speed controlling device
- 6.Gate Driver Circuit
- 7. LCD Display
- 8.Mobile Application

[1].Induction Motor:

Induction Motor is the most commonly used motor nowadays. The required parameter and the specification of an induction motor used in this project are as follows:

Parameter	Specification
Volts	415v
Amps	7.5 A
Frequency	50 Hz
Speed	1440 rpm
Kw/Hp	3.7/ 5 hp
Connection	Y-Delta
Efficiency	85%

Fig. IV Table for Specification of an I.M

[2].Arduino Uno:

Arduino uno is an open source ATmeg 328 type microcontroller. It has 14 digital pins,6 analog pins. It is the most commonly used microcontroller because it is simple in programming language and cheaper than any other type of microcontroller. It requires a 5v supply for its working. Arduino Uno is a important part of the system it interfaces to all of the devices and clouds[2].

[3].ESP 8266 WI-FI Module:

In this project esp8266 wi-fi module used to exchange the information between two or more devices without connecting any wire. By putting I.P address on the mobile application, devices connected to the mobile application through wi-fi module i.e nothing but the internet of things[2].

[4]. Condition Monitoring Sensors:

For healthy monitoring purpose of an induction motor in this project, there are four sensors used i.e. the sensors in the proposed work are voltage transformer for measuring supply voltage, Current Transformer for measuring motor current, Proximity Sensor Module for measuring speed and LM35 for measuring temperature[2].

[4.1]Voltage transformer:

Basically, voltage transformer is used for measuring voltage purposes, here in this project it also acts as a sensor for the sense supply voltage of an Induction Motor.

[4.2]Current transformer:

Basically, the current transformer is used for measuring current, here it also acts as a sensor for sense current which flows in the Induction Motor. It has input current rating is 5A and the output current rating is 5mA.

[4.3]LM 35 Temperature sensor:

It has 3 pin devices. It has an operating voltage is 4 to 20 volts. And temperature ranges from -55 to 150-degree centigrade[6][7].

[4.4] IR Sensor Module:

IR sensor used for measuring the speed of 3 phase Induction Motor using Arduino Uno in rpm. operating voltage of proximity sensor is 3.3 to 5v[2].

[5]. Speed controlling device:

Here BT139 is an Triac act as a switch for speed controlling purpose of an induction motor. with the help of the gate triggering circuit, these BT139 switches can be operated. The gate driver circuit is for logical purposes to operate triac[5].

[6]. LCD Display:

In this project 16*4 display is used for continuous displaying monitoring values of an induction motor same as that on the mobile application. Here 16 indicated for the character on a single line and 4 is for line indications. It operates on 5v supply. Display the value on LCD one by one[2][7].

V. CONCLUSION

This paper represents the IoT based condition monitoring of an induction motor with the help of sensors and Wi-Fi module. Also, control the speed of an induction motor with the help of the PWM technique. The protection and safe operation of an induction motor can be obtained in a large extent. Also Due to the use of iot ,ease in accurate control of the induction motor can be achieved.

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