Monitoring of Induction Motor Based On IOT For Industries, EV

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ABSTRACT

In today's world, the induction motor has a important role in industrial & other applications. Because it is rugged & simple construction. Due to its ability to operate in any environment condition & low cost. Electrical machines consume up to 45% of the power of total power generated. If not maintained & serviced properly they can consume more, up to 10% excess power. As a result this will affect the production & cost of the product.

Keyword : - *Induction Motor, Arduino, Temperature, Current, Voltage, IOT(Internet of Things), Transformer.*

1. INTRODUCTION

After the industrial revolution the next great thing was industrial automation & in which DC motor played a pivotal role but after introduction of AC machines it changed rapidly due to their various advantages. As the automation is also seeing a experimental growth because of increase in demand & various innovations the industry has to keep up to the need of the hour. After the boom of Information Technology & modern power systems industry has gained huge in terms of growth in production ratio. Now in the latest stage, technologies like A.I.(artificial Intelligence), IOT(Internet of Things), M.L.(Machine Learning) are said to be the present & future for industrial revolution 4.0.

In today's situation Industries are working on the way to work as fast as possible to ramp up production/services. In many of these industries the most common product for use of automation is AC Induction motor which is most probably a three phase Induction motor as it is self-starting, rugged in construction good power factor & low cost.

As these motors are continuously in working condition. It is a responsible & serious task of maintaining & servicing this machines. Monitoring these machines has to be done by various methods & other technologies developed in 1980 to 1990. But as the recent advancement these technologies are not fully compatible with artificial intelligence. So they can't be used to their full potential intense with help of "IOT" these challenges can be tackled.

To monitor & control these machines "IOT" is very helpful as it's very dynamic network & can configure itself and can work on both standard & inter operable protocols of communication. It can connect smoothly with Information Technology control & monitoring systems. It has recently gained a huge fame due to wireless technology & connectivity of all to a central or distributed data server. It helps to integrate all the information technology divisions like Machine Learning, A.I., neural network etc. For predictive maintenance of the system & the equipments.

2. LITERATURE REVIEW

"IOT" based traction motor drive condition monitoring in electrical vehicle, The motor status was continuously monitored and supervised by help of Internet of Things (IOT)[2]. testing of prototype with ESP8266 microcontroller module for getting information of the motor is showcased and presented[3]. "IOT - based wireless induction motor monitoring", scientific conference Electronics [ET] 2017 XXVI international. IEEE, 2017 [4], By the help of this the production process was not obstructed for required maintenance repair or change of parts predictive maintenance can done and statistics from study are used for creating a model motor maintenance schedule.

3. PURPOSE & SCOPE

The main purpose of this is to monitor the motor condition for reliable application of the motor with the help of recent technology. The work here ensures the proper monitoring of high power induction motor used for various purpose in industries with their control of essential parameters. By the help of this work we can enhance system reliability and any abnormal conditions are easily rectified. The productivity of the organization can be increased with predictive maintenance of the motor. By taking care of machine with preventive maintenance industries can work without facing problems of breakdown or failure of machines and high horse power motors can be protected.
The IOT based Induction Motor monitoring and control is economical and safe for data communication in industry. Using this work we can start or stop the motor to avoid system failure in case abnormal conditions by both automatic and manual control methods. This same work is applicable for motor in Electric vehicles (EV). To monitor their condition and make the EV vehicle automatic.

4. BLOCK DIAGRAM

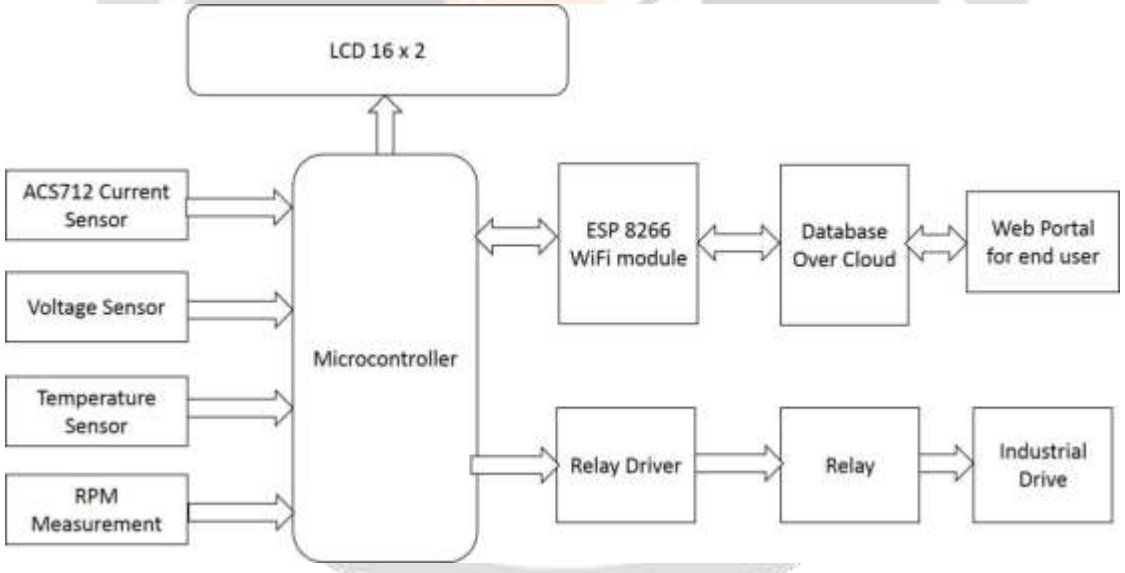

Fig-1: Block Diagram Of Proposed Work

5. COMPONENTS DISCRIPTION

5.1 Transformer

Transformer is a static device which is made of two or more stationary electric circuit interlinked. In this work we are using transformer of rating 230/12V and 2A.

5.2 Relay

A relay is a switch which is operated electrically. It always one switch to a second circuit which can be completely

separate from the first. In this work we are using electromagnet relay which consists of a multi-turn coil wound on an iron core to form a electromagnet. When the current passes through coil it is energized then the core becomes magnetized temporarily which attracts the iron. For the proposed work 5V relay is used, which is connected to the arduino directly. Pulse from the arduino is given to relay, the output of relay is the input of contactor. In case of any abnormal condition is detected from data by arduino it sends the command to relay to open contacts.

5.3 Arduino

The Arduino UNO is an open source microcontroller based on the ATmega328P microcontroller. For this work arduino is chosen because its advantages over other type of microcontroller of being open sourced and less costly. It is the heart of this work for data acquisition and controlling of motor. The condition monitoring sensors, LCD display are interfaced with input/output pins of arduino.

5.4 LCD Display

LCD (Liquid Crystal Display) is used for displaying various parameters and status of the system. The LCD here is (16*2) 16-pin device. The 5V supply is given across the anode a& cathode pins. It has a 8data pins and 2 control pins. By programming the process, the data is continuously display on screen. It is interfaced to arduino's 4 data pins, 2 control pins and 2 supply wires (i.e. 5v & ground).

5.5 Temperature Sensor (LM 35)

For this work (LM 35) temperature sensor is used which is an integrated and log temperature sensor, output of which is proportional to degree centigrade. It does not require external calibration for accuracy.

5.6 Current Sensor (ACE 712)

For the proposed work current sensor used is (ACE 712) . It is a sensor device which detects and converts current to an easily measured output voltage, which is proportional to the current through a given path.

5.7 Voltage Sensor

Here input of this sensor can be the voltage and the output is switches, analog voltage signal, a current signal, an audible signal etc. Voltage sensor can determined both AC and DC voltage level.

5.8 IR Sensor

This sensor here is used for measuring the RPM(speed) of motor. It is a device emits light in order to sense the object in surroundings. It can detect and measure heat and motion of the object. Usually in infrared spectrum, all the objects radiate some form of thermal radiation. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode. Photodiode is sensitive to IR light of the same wavelength which is emitted by the IR LED .When IR light falls on the photodiode, the resistance and the output voltages will change in proportion to the magnitude of the IR light received.

5.9 WI -FI module (ESP8266)

ESP8266 is a WI-FI module is used here for wireless communication. It is interfaced to arduino by connecting 5-pins. It needs two 3.3V supplies and one ground to operate. also it requires two soft serial parts. The data acquired by arduino is send to server with the help of ESP8266. It requires additional library file to operate. By programming the arduino microcontroller data is updated every second.

6.CIRCUIT DIAGRAM

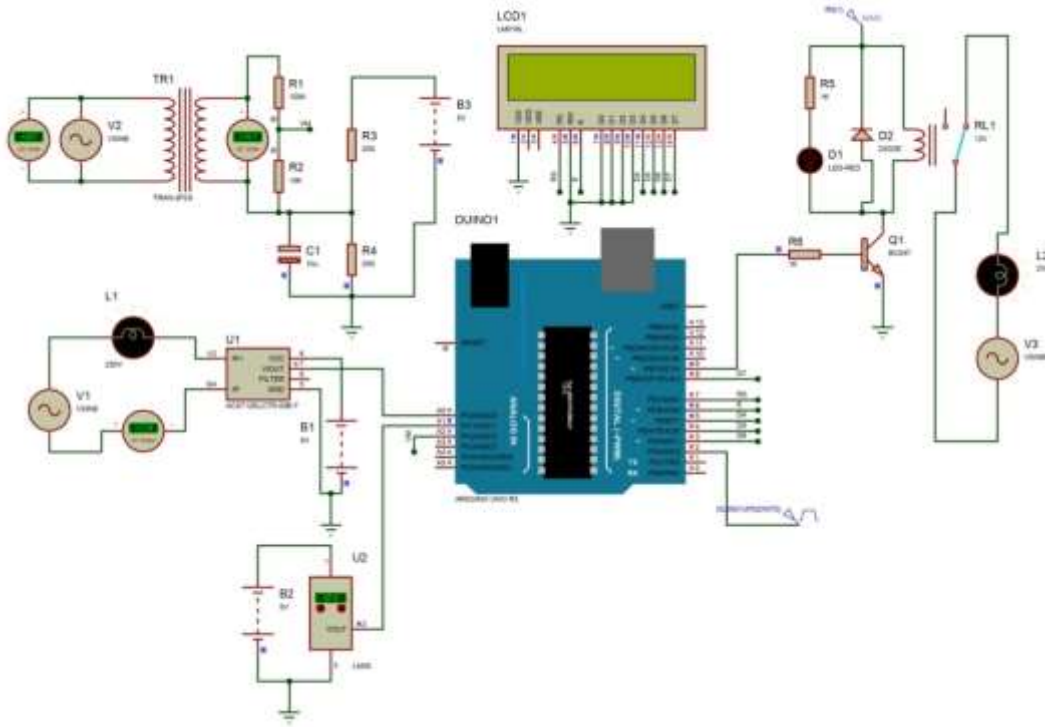

Fig 2: Circuit Diagram Of Proposed Work

This circuit diagram show the connection between the sensors and relay modules as well as pin description for each device. The connection between the microcontroller and sensors, microcontroller and relay and so on.

7. WORKING

When the power supply is turned ON all the components interfaced with arduino and itself get the power supply. The sensor component start sensing their respective parameters and send the data to the microcontroller (Arduino). Then arduino reads the data from various devices (sensors) and analyses the data according to the given instructions, after this it sends the data to LCD and to network gateway with the help of WI-FI module. Simultaneously arduino reads the commands internet and gives the control signals to the relay via contactor, which will control the motor. The control of the motor is based on the sensed parameters. and in the manual method it is controlled by alert messages displayed on LCD and from those received from web. The controlling is done through relay and contactor circuit. The motor is turned ON/OFF when there are abnormal conditions detected through the sensors. By receiving the sensed data.

8. EXPERIMENTAL SETUP

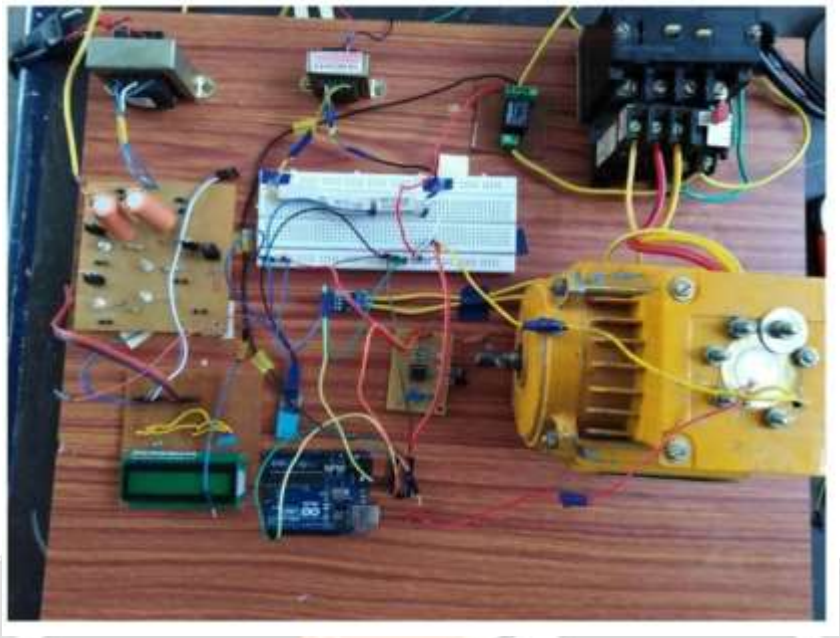

Fig 3 : Hardware Design

9. APPLICATIONS

1. It provides on industrial application to make the system become faster and friendly.
2. It can also be used in EV systems to make the vehicle automatic.

10. FINAL RESULTS

In this particular work all sensors are tested individually and implemented. The LCD display interfaced to microcontroller and also WI-FI module. In operating of motor the sensed values are made available on database server. The motor is continuously monitored for any adverse and abnormal conditions. The simulation demonstrates all parameter and if any change in parameter is observed it shows on display and operates the relay to take preventive actions.

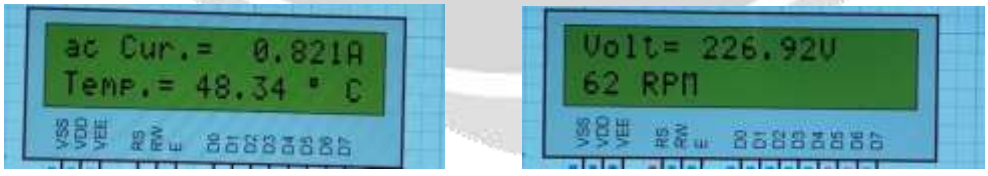

Fig 4 : Displayed values on LCD

11. CONCLUSION

In this work the concept of Internet Of Things for early working, detection and monitoring of system and monitoring of system remotely. The system has capability to combine all the sensed parameters in real time and improve the accuracy of fault detection in motor. The monitoring of motor parameters with measurement of motor temperature, speed, current, voltage etc. is done which compared to conventional methods has advantages enabling alarm alert message and quick controlling. The "IOT" here is used for remote monitoring and control of motor.
This work can also applied in the today's Electrical system (i.e. EV vehicles & Industrial automation). The system has the advantage of less maintenance, easy and fast controlling and accessibility of data remotely. Experimental results of the prototype confirm the feasibility of the system.

12. ACKNOWLEDGEMENT

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