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INDUCTION MOTOR PROTECTION SYSTEM AND DATA MONITORING OVER IOT BLYNK

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ABSTRACT

In this project, we give a novel perspective on industrial automation and defect monitoring. Induction motors are used in a variety of sectors. As a result, industrial automation is required for precise and accurate operation. For safe and cost-effective data transmission in industrial settings, the Arduino-based parameter monitoring system for induction motor project presents an induction motor control and monitoring system based on the Arduino communication protocol. The current, voltage, and temperature of an induction motor are all important components in its control system. These critical characteristics have a direct impact on an induction motor's performance. Controlling the gadgets during continuous operation, on the other hand, is difficult. The Arduino system is used to collect and store data as well as provide control signals to start and stop the induction machine. Some of the issues we monitor are over voltage, over current, and over temperature. By continuously checking for problems and determining preventive maintenance, this strategy will increase machine productivity. Induction motor, Internet of Things, Arduino Uno, and Proteus software are some of the terms used in this paper.

I. INTRODUCTION

Improved efficiency and the ability to use them for a longer period of time. Single phase induction motors are utilised to drive mechanical systems and numerous production processes in an industrial setting. The motor's performance has a direct impact on the product's quality and quantity, therefore it's important to keep an eye on it. Wireless systems are now widely used for monitoring and control in a variety of fields, including manufacturing, robotics, and building automation. Wireless monitoring is being used in industry for robotics and manipulation systems in some cases. A Wi- Fi-based industrial real-time measurement and monitoring system is provided. Recently, there has been a surge in interest in this building automation standard. They were chosen because to their low energy consumption and capabilities, as well as their ease of maintenance and data collection. Another advantage of this method is that it continuously monitors the devices for changes in parameters and displays the relevant data. A high level of protection can be provided by informing the user with the appropriate message, allowing the operator to take action to protect thermometer. Remote systems can be used to monitor a variety of practical applications as a result of recent advancements in wireless technology and devices. In measurement equipment, wireless devices based on industry standards, such as Arduino kits, are commonly utilised. By allowing individuals to turn off appliances during peak hours, automation also helps to cut peak hour power consumption. Home automation, industrial automation, and other forms of automation are all examples of automation. Earlier methods, such as phone- based systems for automation and control using hardware remote controller and an intelligent system, were primarily based on the usage of telephone lines. As a result, the portable device also has the ability to rescue the entire system from numerous problems or unanticipated faults by cutting off the main supply. The use of motors, control systems, and information technology to increase productivity in the manufacturing of goods and the delivery of services is known as automation. Automation entails utilising the power of technology to lessen reliance on human presence and decision- making in any process.

1.1 The specific objectives research of the basis are as:

1) In this project the concept of the Internet of Things for monitoring motor system parameters remotely

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2) Early detection of motor failure.
3) The system has the specific advantage of less maintenance.
4) Prevent system failures by using automatic or manual control methods to start and stop an induction motor's activity.
5) The most extensively utilised fault detection method.

II. BLOCK DIAGRAM OF THE SYSTEM

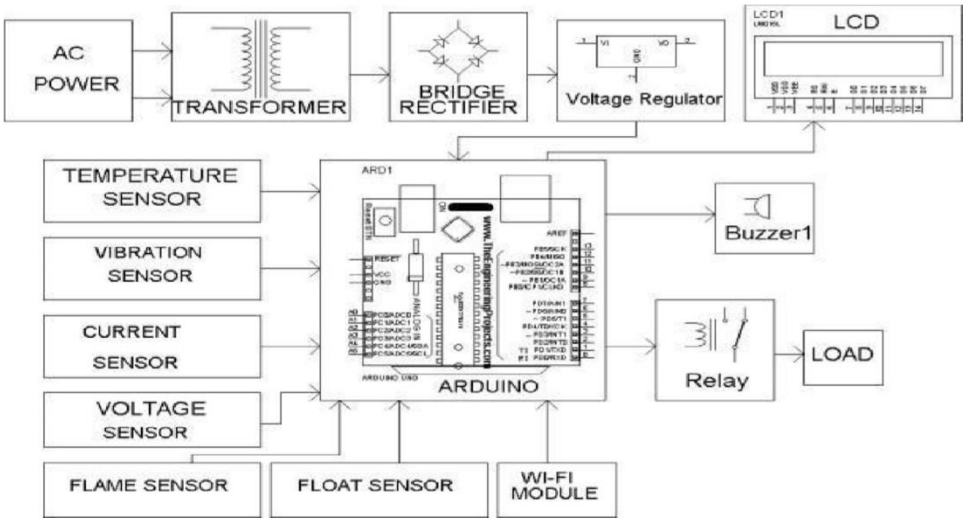

Fig 1: Block diagram of an I.M monitoring system

Thing speak:

An induction motor's overall monitoring parameters and proposed speed control mechanism are shown in the block diagram below. Four sensors are shown in block diagram for sensing the four parameters of voltage, current, speed, and temperature. With the help of that sensor, the module monitors the condition parameters of the motor and sends the current status of the induction motor to the Arduino Uno via Wi-Fi. From the Arduino Uno, the module sends information to the cloud, it will be sent to the user. With the help of object talks, you can get information on your mobile device whenever you need it. If an induction motor Fails, it should be withdrawn from the power source automatically. The LCD should show whichever parameter is being watched

III. SOFTWARE DESCRIPTION

Thing Talk is a web-based open API LoT source information platform that can store sensor data from a variety of LoT applications and display the sensed data in graphical form on the web. The Thing speak cloud retrieves, saves/stores, analyses, observes, and works on the sensed data from the connected sensor to the host microcontroller such as,,Arduino, Raspberry – pi.

1) Create a channel and start collecting data.
2) Analyse and visualise the data.
3) Act on the data with one of multiple apps.

The whole Thing Speak API for processing HTTP requests, storing numeric and alphanumeric data, numeric data processing, location tracking, and status updates isaccessible on GitHub.

3.1 Blynk App:

Blynk is a new platform that lets you easily create interfaces to manage and monitor your hardware projects from your iOS or Android mobile. You can create a project dashboard after downloading the Blynk software and arranging buttons, sliders, graphs, and other widgets on the screen. You may use the widgets to turn pins on and off, as well as display data from sensors. Whatever project you're working on, there are probably hundreds of tutorials online that may help you with the hardware, but creating the software interface is still difficult. With Blynk, though, the software side is even easier than the hardware.

Blynk is perfect for interfacing with simple projects like monitoring the temperature of your fish tank or turning

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lights on and off remotely.

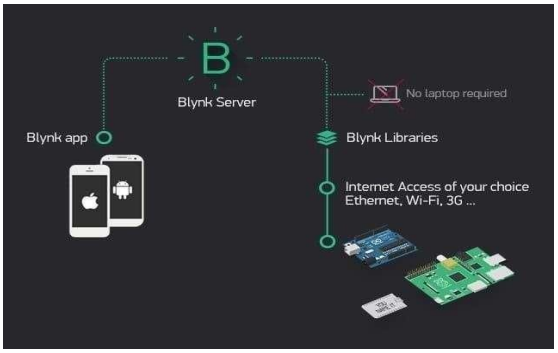

Fig 2: Control and arduino with smartphone via blank

IV. HARDWARE REQUIREMENT

Following is the required component for this proposed system that is as:

1) Induction Motors
2) Arduino UNO R3
3) ESP-32 WI-FI MODUL
4) Condition Monitoring Sensors

a) Current Sensor
b) Temperature sensor
c) Vibration Sensor

Speed Sensor

5) LCD Display
6) Buzzer and Relay

4.1 Induction Motor:

The electric current in the rotor required to produce torque is obtained by electromagnetic induction from the magnetic field of the stator winding in an induction motor, also known as an asynchronous motor. Here in this project induction motor is an essential part of the system. The following is the required parameter and the specification of an induction motor that used in this project as:

Fig 3: Induction Motor

Parameter	Volts	Amps	Frequency	Speed	Watt	Phase	Efficiency
Specification	170/230 V	0.30 A	50 Hz	1400 RPM	40W	A.C Single Phase	13%

4.2 Arduino UNO R3:

In the Arduino family, the Arduino UNO R3 is a popular microcontroller board. This is the third generation of the Arduino board, which first appeared in 2011. The major benefit of this board is that if we make a mistake, we can change the microcontroller. DIP (dual-inline-package) availability, detachability, and an ATmega328 microprocessor are all features of this board. The Arduino computer application is used to load the

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programming for this board. The Arduino community has embraced this board, making it a simple way to get started with embedded electronics and a variety of other projects. For additional information on Arduino - Basics and Design, please read the link

Fig 4: Arduino UNO R3

ESP 32 WIFI Module:

The ESP32 is a flexible System On a Chip (SoC) that may be used as a general-purpose microcontroller with a variety of peripherals, including WiFi and Bluetooth wireless connectivity. Because Espressif contains already pre-loaded low-level device drivers, wireless protocol stacks for WiFi b, g, n, Bluetooth, and BLE, as well as FreeRTOS as the core OS, using this module rather than constructing from scratch provides a number of benefits. A bootloader has also been installed to make downloading user programmes easier

Fig 5: ESP-32 WIFI Module

4.3 Condition Monitoring Sensors

The system has five sensors for health monitoring and evaluation management. The sensors used in this proposed work system are as follows:- first, a voltage transformer is used to measure supply voltage.it acts as a step down as well as a sensor for supply voltage. Second, a Current Transformer is used to measure motor current. Third, an IR Sensor is used to measure speed. Fourth, a SW 420 vibration sensor and last one is a temperature sensor DHT 11 isused to measure temperature.

A) Current Transformer:

The current transformer, which is often used to measure high alternating current, is used in this instance as a sensor to detect the current flowing through an induction motor. It is rated for 5A of input current and 5mA of analogue output current. It is a single-phase AC sensor module with a 5A range. The ratio of turns is 1000 to 1. This current sensor module's measurement function is to identify circuit overload, load reduction, and shutdown

Fig 6: Current Transformer

B) DHT 11 Temperature Sensor:

A low-cost option is the DHT11 digital temperature and humidity sensor. To detect humidity and temperature in real time, simply attach this sensor to any microcontroller, such as an Arduino or a Raspberry Pi. The

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temperature range on the DHT11 is 0 to 50degrees Celsius, with a 2-degree precision. The humidity range for this sensor is 20 degrees Celsius with an accuracy of 5% The sampling rate of this sensor is 1Hz, which means that it takes one reading per second.

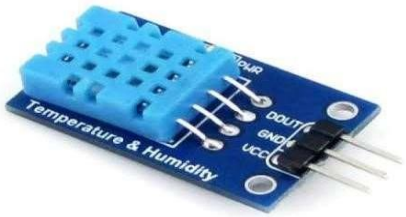

Fig 7: DHT 11 Sensor

C) IR Speed Sensor Module:

It is an electrical instrument that measures and picks up infrared radiation from the atmosphere around it. Both an LED and an infrared laser diode are present. As a digital tachometer, it functions. IR sensor used to calculate the revolutions per minute (rpm) of a single phase induction motor. Its operational voltage ranges from 3 to 5 volts. The IR sensor needs to consume 25mA of current at 3 volts and 43mA at 5 volts

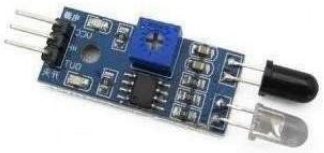

Fig 8: Speed Sensor

D) SW420 Vibration Sensor:

The Vibration Sensor Module Vibration Switch SW-420 uses a vibration sensor SW-420 and a comparator LM393 to detect vibrations that exceed the threshold. The on-board potentiometer can be used to modify the threshold. When there is no vibration, this module's output logic is LOW, indicating that the LED is turned off, and vice versa.

The Vibration Sensor Module Vibration Switch SW-420 has the following features:-

1) Sw-420 vibration sensor, normally closed
2) The comparator output is clean, has a decent waveform, and has a strong driving capacity for more than 15 ma.
3) A 3.3V to 5V operating voltage
4) Digital switch output is the output form (0&1)
5) Has a pre-drilled bolt hole for easy installation
6) Small PCB dimensions: 3.2cm x 1.4cm
7) Make use of the LM393 voltage comparator.

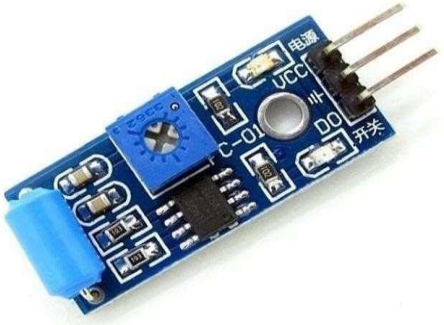

Fig 9: SW420 Vibration Sensor

4.4 LCD Display:

Electronic display modules with multiple applications include LCD (Liquid Crystal Display) panels. A 16x2 LCD

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display is a fairly simple module that may be found in many different gadgets and circuits. Compared to multi segment LEDs with seven segments, these modules are preferred. LCDs are less expensive, simpler to programme, and allow for the display of unique and even customised characters, animations, and other content without limitations (unlike seven segments).

A 16x2 LCD can show two lines of text with 16 characters per line. On this LCD, a 5x7 pixel matrix represents each character. This LCD has two registers: a Command register and a Data register. The command register contains the LCD command instructions. A command instructs the LCD to carry out a specific action, such initialising sanitising its display, positioning the pointer, or controlling the display. The data register contains the information that will be shown on the LCD. The data is the ASCII value of the character that will be shown on the LCD.

Fig 10: LCD Display

4.5 Buzzer and Relay:

A buzzer is used for fault alert. while relay is used for trip the motor. if any fault is occur like over voltage, under voltage, over current, over temperature and vibration then buzzer make the buzz sound and ESP 32 generated the signal to trip the relay .the supply of motor will cut-off

Fig 11: Buzzer

Fig 12: Relay

V. RESULT

5.1 Circuit Diagram:

The ATmega328P microcontroller needs a 5v operational voltage to get started. A 5v DC power supply is therefore necessary. This 5v is Managed using the same method. Created by first reducing the 230V voltage. The voltage is lowered to 12V by the step-down Transformer. Ac power supply that has been stepped down. Electricity is connected using the bridge. Diodes from Rectifier IN4007 where used. The rectified AC voltage is currently filtered using the "C" filter. The DC has now been Filtered and Rectified. Voltage is supplied to the voltage regulator . In the energy supply the 7805 chip provides the microcontroller with a 5V supply. A 100F Electrolytic capacitor is then used to ripple-filter the Rectified, filtered, and controlled voltage. The first section's output is now routed to the ATmega328P microcontroller and other power sources in order to supply operating voltage. The Computer chip, Pull-up resistor and capacitors with a handful of Capacitors with an ATmega328P. Along with a handful of capacitors and a 14MHZ crystal oscillator to ensure optimal operation the projected work findings for the Induction motor parameter monitoring system are listed below.

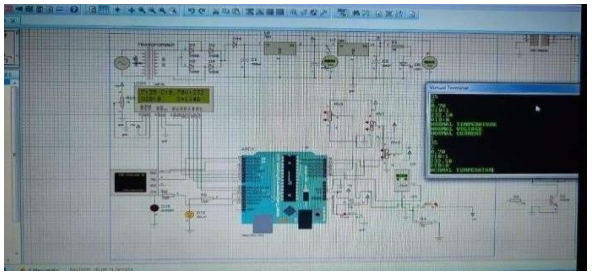

Fig 13: Simulation Based schematic Diagram For IM

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Both the system's hardware and software components kept track of the motor characteristics. In the software configuration shown below, the motor parameter is shown on the LCD. You may learn how hardware is put together, how connections are established, and component information by using this simulation model. The hardware configuration shows parameter monitoring of the motor, which is sent to the cloud and stored there. It also shows graphical visualisation of a waveform on Thing speak and displays the motor parameters one at a time on an LCD. In order to determine the voltage, current, speed, and temperature of the induction motor, we study any voltage that is applied to it Use an applied voltage as well to regulate the induction motor's speed.

HARDWARE RESULT

Controlling and safeguarding induction motors is made easier by this article. Single phase induction motor protection system and data monitoring using Arduino is the title of this research study. Technology has been employed successfully. putting things together, created and tested. Hardware components have been used in its development. Each and every module is present. carefully chosen and positioned. facilitating the device's efficient operation. It also suggested a workable fix that was affordable. Model of an induction machine monitoring and controlling Under certain circumstances, the motor trips as a system of defence. Unusual conditions. The group of criteria Values are stored in the microcontroller. Any minor discrepancies in the values are indicated. These supplied values are used to construct the relay circuit. The road excursions give me energy.

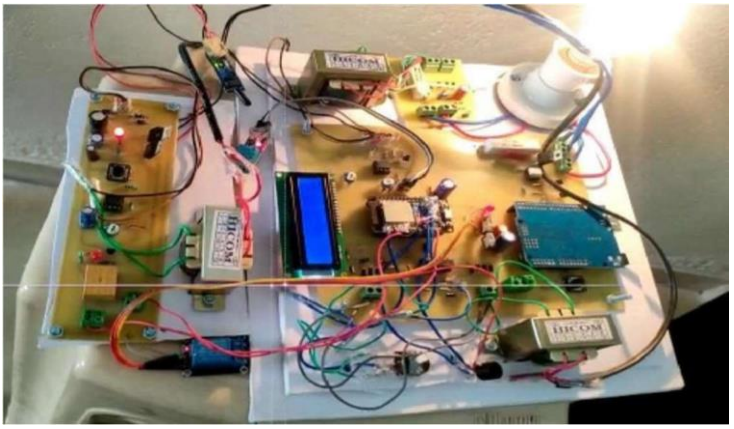

Fig 14: Hardware circuit for IM

VI. CONCLUSION

This Internet of Things concept is for remote detection and monitoring of motor system problems. The system has the ability to combine several detected parameters in real time in order to increase the accuracy of problem identification in motors. The motor system is monitored by measuring several factors such as motor vibration, temperature, speed, surrounding humidity, supply voltage, and motor current. As a result, this system offers a greater number of fields than other traditional techniques, allowing for alarms, alert messages, and quick control. The Internet of Things (IoT) is used tomonitor and control the motor remotely.

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