Induction Motor Monitoring Technology through IoT

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***Abstract*-- Rapid technological development is presently centered on the Internet of Effects (IoT). Especially in artificial robotization, numerous effects are efficiently connected, furnishing state and controlled monitoring to ameliorate productivity. The thing of this system is to develop and apply IOT technology for monitoring and diagnosing the condition of induction motors by recording crucial stir pointers. The proposed system includes an IoT- grounded platform for collecting and recycling induction motor parameters. The collected data is stored on the pall platform and can be penetrated from the website. You'll also admit timely cautions if you violate the asked limits of covered parameters, so you can take immediate action to avoid gratuitous machine time-out and save time and plutocrat. Benefits of this system include nonstop outfit monitoring, alert event, and data vacuity for prophetic conservation.**

***Index Terms*-- Wireless control and Monitoring System, Induction Motor, Internet of Things, Arduino, Vibration, Temperature.**

I. INTRODUCTION

This paper has been presented a review on major research and developments over the past few decades in the condition monitoring and fault detection of induction motor. Induction motors are the majority of the prime movers in industrial application for their reliability. The demand of three phase induction motor has highly expanded in recent years because of their simplicity and reliability of construction [2]. The induction motors are widely used in the industry for railway application, mining industry, wood working machines, automotive industry, chemical industry, paper mills, etc. Single phase induction motors are most useful in domestic application and industrial machines, due to their high efficiency and reliability. The authors studied various failures of three-phase induction motors such as unbalanced stator, winding failure, rotor parameters, eccentricity, bearing failure and rotor rod failure.

The performance of the induction motor depends upon the higher than electrical and mechanical parameters. Therefore the continues observation of induction motor is required for safe and reliable operation of commercial induction motors. The electrical and environmental parameters like voltage, current, temperature and close wetness of the motor, affects the nice performance of motor. And conjointly the mechanical factors like vibration and abnormal speed have an effect on the nice performance of the motor. Some electrical and mechanical factors cause the severe injury to the health of induction motor and conjointly cause severe drawback to application wherever the induction motor is employed. Today's business scripts are running as quick as attainable to finish a product/service. In several industries, induction motors are terribly wide employed in product handling. The employment of the most recent technology ensures reliable operation of the asynchronous motor. With advances in technology, observation and management ar performed mechanically. The web of Things could be a recent development for dominant and observation engines from remote locations. This methodology provides simple administration and responsibility. Continuous observation of electrical and mechanical parameters ensures engine responsibility. If abnormal values of electrical and mechanical factors may be detected, the motor is mechanically controlled (i.e. the motor turns off suddenly to scale back serious malfunctions).

II. OBJECTIVES

The main objective is to extend the dependableness of the motor application by exploitation the recent technology advancement. This work make sure the continuous watching and simple management of attitude power induction motors employed in sort of industrial fields. By guaranteeing the system dependableness abnormal conditions are simply known and simply corrected. As Induction machines are used nearly ninetieth in industries, the economic knowledge watching is needed. The productivity of industries is inflated by doing the preventive maintenance of induction machines. By taking preventive measures the failure of system and value of attitude power motors is protected.

- To observe and management an induction motor supported web of Things (Iot) for safe and economic digital communication in industrial fields.
- To start out or stop the induction machine to avoid system failures by Automatic and manual management strategies.
- To observe and management the motors employed in electrical vehicles.

III. HARDWARE & SOFTWARE

• Induction Motors
• Arduino UNO
•ESP8266 (WI-FI Module)
• Condition Monitoring Sensors
• Voltage Transformer
• Current Transformer
• Temperature Sensor
• Speed sensor
• Speed controlling device
• Gate Driver Circuit.
• LCD Display
• Mobile Application

SOFTWARE SPECIFICATIONS :
Arduino Compiler
MC Programming Language: C

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IV. COMPONENTS SPECIFICATION

- **Arduino Uno**

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo.

Microcontroller: Microchip ATmega328P
• Operating Voltage: 5 Volts
• Input Voltage: 7 to 20 Volts
• Digital I/O Pins: 14 (of which 6 can provide •
•PWM output)
•UART: 1
•I2C: 1
•SPPI: 1
•Analog Input Pins: 6
•DC Current per I/O Pin: 20 mA
•DC Current for 3.3V Pin: 50 mA
•Flash Memory: 32 KB of which 0.5 KB used by •boot loader
•SRAM: 2 KB
•EEPROM: 1 KB
•Clock Speed: 16 MHz

The Arduino/Genuino Uno has a number of facilities for communicating with a computer, another Arduino/Genuino board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer.

The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows serial communication on any of the Uno's digital pins.

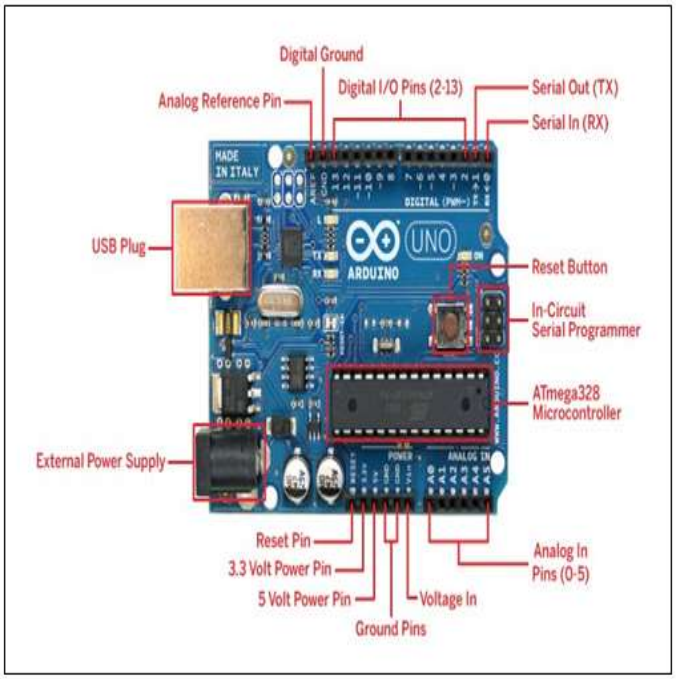

Fig. 1 -The Arduino Uno microcontroller

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

- **Induction Motor**

An **induction motor** or **asynchronous motor** is an AC electric motor in which the electric current in the ((rotor needed to produce torque is obtained by electromagnetic induction from the magnetic field of the stator winding.[1] An induction motor can therefore be made without electrical connections to the rotor.[a] An induction motor's rotor can be either wound type or squirrel-cage type.

Three-phase squirrel-cage induction motors are widely used as industrial drives because they are self-starting, reliable and economical. Single-phase induction motors are used extensively for smaller loads, such as household appliances like fans. Although traditionally used in fixed-speed service, induction motors are increasingly being used with variable-frequency drives (VFD) in variable-speed service. VFDs offer especially important energy savings opportunities for existing and prospective induction motors in variable-torque centrifugal fan, pump and compressor load applications. Squirrel-cage induction motors are very widely used in both fixed-speed and variable-frequency drive applications.

An Induction or asynchronous motor is an AC electric motor in which the electric current in the rotor needed to produce torque and this torque is obtained by electromagnetic induction from the magnetic field of the stator winding.

Three phase squirrel cage induction motors are widely used in industrial drives because they are rugged, reliable and economical. Single-phase induction motors are used extensively for smaller loads, such as household appliances like fans. Applications of three phase induction motor are for fixed-speed services, variable frequency drives, (VFDs) variable-torque centrifugal fan, pump and compressor.

V. BLOCK DIAGRAM

The block diagram shows four sensors for sensing the respective four parameters that are voltage, current, speed, and temperature. with the help of that sensor monitoring the condition parameters of motor and gives the current status of induction motor to the Arduino Uno and from Arduino Uno through the wifi, the module gives information to the cloud where the information stored and from the cloud, it will receive information on mobile application whenever necessary with the help of things speak. In case any fault takes place in Induction Motor it should be automatically disconnected from the supply. Whatever parameter is monitored that should be displayed on LCD one by one.

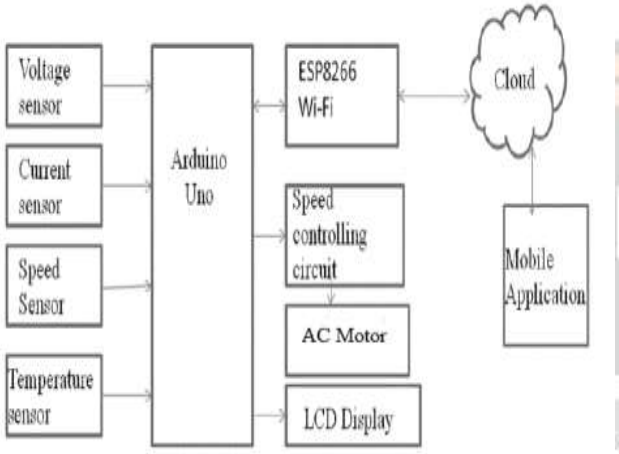

Fig. 2. Block Diagram

VI. RESEARCH METHODOLOGY

The block diagram below provides a detailed view of the proposed system. It provides complete information about the proposed system. This diagram describes how the current working system works, how real signals are transmitted from one system to another, and the main components used in the proposed system.

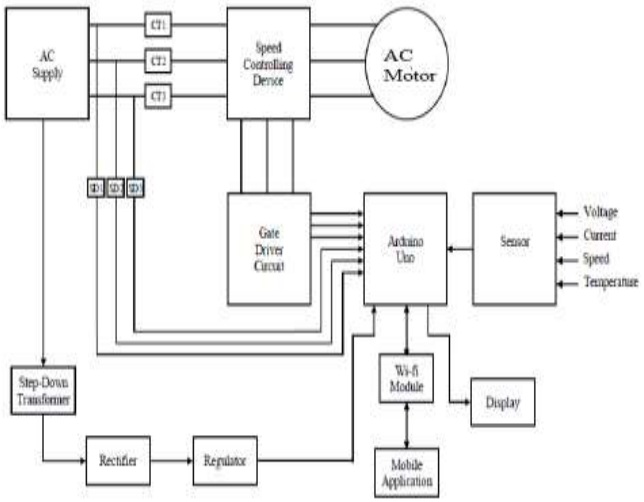

Fig. 3. Diagram of the proposed system

Here, in actual operation, one-phase AC power first enters the system, from where it is fed to the three-phase induction motor via a speed control unit and gate driver circuit. Here, the gate driver circuit acts as a logic circuit that turns a switch on and off to control the speed of the motor. There are countless ways to control the speed of the motor, but here we use the PWM method to control the speed of the induction motor. PWM technology is very difficult to use and harder to operate than other methods. By adjusting the ON/OFF period of the switch controlling the switching angle, the switching angle quietly controls the speed of the induction motor.

In this project, the Arduino Uno is the heart of the system and needs a 5V supply to work. Here the Arduino Uno is powered by a step-down transformer with a rectifier and regulator to convert and use the filter. The diagram above shows the PWM scheme for controlling the speed of an induction motor. By controlling the on-off period of the switching voltage of the induction motor, it can be easily controlled by controlling the speed of the voltage of the induction motor, and can also be controlled.

VII. CONCLUSION

In this paper the conception of internet of Things for early detection and observance of motor system failures remotely is proposed. The system has the flexibility to mix varied detected parameters in real time and improve correct detection of various faults occur in motor. The observance of the motor system presents the activity of various parameters particularly vibration of the motor, temperature, speed, encompassing humidness, offer voltage and motor current. Thus, compared to alternative typical strategies this method has additional range of fields that allows alarm, alert messages and fast dominant. The conception of IoT is bestowed here for remote observance and dominant the motor. By exploitation visual basics the information received from the controller node represent by diagrammatically .The data is additionally displayed serially. The work is updated to further fields for precious management. The appliance of the system is required these days for each electrical system (i.e. heat unit vehicle and automation of industries wherever larger safety is needed). The system has the particular advantage less maintenance, straightforward and fast dominant and accessing of knowledge remotely. Experimental results make sure the feasibleness of implementing the system.

- **Project Image**

Fig. 4 A laboratory prototype of IoT based bidirectional speed of single-phase induction motor

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