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IOT based Induction Motor Parameter Monitoring and Controlling

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ABSTRACT: Now a days single phase induction motor is commonly used so, to control and monitoring of motor IOT is used. IOT monitoring the data online with remote distance like temperature, humidity, overload, fault condition and speed of motor etc. This data can be access from different place and by the different authorized person and can control the operation of motoring by applying signal to motor controller. This data can be stored in cloud through internet. Monitoring of single phase induction motor can be on mobile, personal computer and any electronic portable device devices.

KEYWORDS:IOT, induction motor, speed control, relays etc.

I.INTRODUCTION

The single phase induction motor mostly used in daily used as in industry, commercial, home appliances and small tools application because of their high reliability, less cost and maintenance. The single phase induction motor used in various application required different speed for different applications. The speed controlled in single phase induction possible through VFD (variable frequency drive), the variable frequency drive is electronic equipment which changes the frequency of supply to single phase induction motor and regulated desired speed. The most of the application areas the speed control as well as the monitoring of single phase induction motor parameter is necessary to check the status of performance. The performance of single phase induction is affected due to change some parameters like change in speed, torque, current, change in load, operating temperature of motor and humidity around the motor.The temperature of motor increased due to sudden increased in load that will increased current and result in increased the temperature of motor. The over temperature will permanently damage the insulation of motor, winding of motor. This is can prevent by using monitoring techniques, in monitoring system the sensor are connected in motor that detect the over temperature condition and send signal to monitoring system then authorized person will off the motor and prevent the permanent damaged to motor. But in that case person required time to off the motor during this motor may damage and authorized person have to seat in that location continually. This problem is solved by the IOT(internet of thinks) concept, this concept protect and monitor motor automatically from any distance with perfect time. The sensor sense the over temperature give this signals to IOT will communicate the signals to authorized person and also generate the tripling signal.

II.LITERATURE REVIEW

[1] Piyare, R., 2013. Internet of things: ubiquitous home control and monitoring system using android based smart phone. International journal of Internet of Things, 2(1), pp.5-11.

This paper presents the construction and laboratory investigation of an IoT (Internet of Things) based smart system to control, measure, and monitor the bidirectional speed control of single-phase induction motors (SPIM) remotely. The design prototype consisting of two single-phase induction motors demonstrates multi-motor control. The motors are turned ON and OFF by a specific relay operation.

[2] Singh, R.R., Yash, S.M., Shubham, S.C., Indragandhi, V., Vijayakumar, V., Saravanan, P. and Subramaniyaswamy, V., 2020. IoT embedded cloud-based intelligent power quality monitoring system for industrial drive application. Future Generation Computer Systems, 112, pp.884-898.

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The rapid development of technology currently revolves significantly around Internet of Things (IoT). Numbers of things are efficiently interconnected, especially in industrial automation which leads to condition and controlled monitoring to increase productivity. The aim of this project is to design and implementation of IOT technology to monitor and diagnose the condition of Induction motors by recording key operation indicators.

[3] Silva, B.N., Khan, M. and Han, K., 2018. Internet of things: A comprehensive review of enabling technologies, architecture, and challenges. IETE Technical review, 35(2), pp.205-220.

Technology has been developing throughout the world as system moved from manual to auto. This paper is on the smart control panel for controlling the appliances. Appliances are Inductive, resistive and capacitive in nature. Inductive type are mostly motors. Three-phase Induction motor is one of the most common types of electrical machines with vast amount of applications in the entire power system all over the world due to its various advantages such as low starting power, lower maintenance cost etc.

[4]S. L. Herman, Industrial Motor Control. 7th Ed. Cengage Learning, Uttar Pradesh, India, 2013.

The motors are turned ON and OFF by a specific relay operation. To achieve the desired motor speed, the stator voltage control method has been applied by using Pulse Width Modulation (PWM) technique. For reversing the motor direction of rotation, the stator magnetic field is reversed by swapping the contacts of auxiliary winding by relay operation. Whenever the desired value is submitted for a specific operationfrom a specially designed website, the desired control signal is generated from a programmed microcontroller according to the user's command via a webserver using GSM communication. Motor status data is measured using an IR sensor and observed remotely on the monitoring panel integrated with a web application. The result shows little deviation compared to direct field measurement.

[5] Gubbi, J., Buyya, R., Marusic, S. and Palaniswami, M., 2013. Internet of Things (IoT): A vision, architectural elements, and future directions. Future generation computer systems, 29(7), pp.1645-1660.

The installation of smart meters in the industry to monitor induction motors (IMs) provides easy access to the measurements of the electrical and mechanical variables, which improves the installation process. Using smart meters in industry requires temporary high-resolution data to improve the energy efficiency (EE) and power factor (PF) of IMs.

[6] Ningbo Peacefair Electronic Co., Ltd. Available online: https://peacefair.en.made-in-china.com (accessed on 22 June 2019).

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[7] A.AjithaDepartment of EEE Anurag Group of Institutions Hyderabad, India tirumuruajitha@gmail.comIoT platform for Condition Monitoring of Industrial Motors.

The proposed method consist of an IoT based platform to gather and process the induction motor parameters. The data collected can be stored in the cloud platform and same can be accessed through the web page. And also timely alerts will be received for any violation in desired limits of parameters under monitoring, So that immediate action can be taken to avoid unwanted downtime of the motor that saves time and money. The advantages of this method includes continuous monitoring of the equipment, receiving alerts, and data availability for predictive maintenance.

III.SYSTEM DEVELOPMENT

A. ***Sensors:*** The sensor senses the value of change in parameter and generate the signals. To sense the different parameters of induction motor different sensor are connected in motors, temperature sensor to sense bearing and winding temperature, current sensor to sense over current, over voltage sensor to sense over voltage, vibrations sensor, speed sensor and humidity sensor'

1. ***Temperature sensor:*** For measuring winding and bearing temperatures a temperature sensor called LM 135 is used and is shown in Fig.3. The LM 135 is a precision temperature sensor and can be easily calibrated. It has a linear output. It operates over - 55°C to 150°C range.It has three pins namely Vcc, output and ground pins.

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2. ***The vibration sensor:*** The vibration sensor or accelerometer used is ADXL 335 which is a small, thin, low power and 3 axis accelerometer containing signal conditioned voltage outputs. It measures a full scale acceleration with a range of ±3g. It measures both static and dynamic accelerations The dynamic acceleration resulting from motion,shock or vibrations is measured in here.

3. ***Current sensor:*** Current is measured by a hall effect current sensorcalled ACS712 is as shown in Fig.5. It is not only economicalbut also provides precise solution for AC and DC currentsensing in different applications including industrial. It workson the principle of Hall effect. It has an output sensitivity of 66 to 185 mV/A

4. ***Voltage sensor:*** Voltage is measured by a voltage sensing circuit which produces an output voltage as per micro controller requirement and is shown in Fig.6. A potential transformer of 230v/9v is used whose output is converted to DC with a rectifier as required. A capacitor is used to ripple out the rectifier output. The output is still high to fed to microcontroller. So a potential divider circuit is used to get required voltage of 5V and is given to micro controller's input.

B. *Technology Used:* In this paper industrial motor is monitored using Internet of Things technology (IoT).

1. ***Internet of Things (IOT):***Internet of Things is a network of devices/objects that are made smarter by equipping with sensors, actuators and network connectivity which enable them to collect and interchange data among them and also users becoming an integral part of the network.

2. ***IoT/cloud Platform:*** The central piece of the Internet of things architecture is IoT platform which enables the connection between the real and virtual worlds hence providing communication between objects. The IoT platform used in this paper is Things peak which is an analytic platform service that allows to visualize and analyze live data available in the cloud and is operated by Math works. It produces visualizations for the data uploaded by the devices to the platform instantly. Prototyping and proof of concept IoT systems regularly uses Thing speak.

C. ***Power circuit:***The Power circuit is the circuit meant to provide supply to optocouplers, driver IC and Voltage divider ICs. This circuit includes 12 V and 5 V Voltage regulator, which is used to convert 220V AC to, two outputs 12V and 5V DC.

D. ***Speed Sensing Circuit:***Speed sensing is done using IR Sensor which is connectedto ESP8266 Wi-Fi Module. The speed is monitored and Controlled in Web. In this paper, experiment is carried out for 3 reference speeds, using relay.

E. ***Web Page:*** IOT implementation is done using adafruit,Adafruit IO is the easiest way to get projects onto the Internet. By Sign in to adafruit, modification in the web page can be accomplished according to user's requirement. Number of switches can be altered based on the number of control required, such as speed, temperature, voltage, current frequency and power factor. Thus power can be calculated and displayed on web page.

F. ***Materials:Arduino:***Arduino is an open source physical computing platform based on a simple input/output (I/O) board and a development environment that implements the processing language.

1. ***Arduino board:*** The Arduino Uno is a micro controller board is based on the ATmega328 (data sheet). It has 14 digital input/output pins in which 6 pins can be used as PWM outputs and 6 analog input pins. It also has a 16 MHz crystal oscillator, an USB connection, a power jack, an ICSP header, and a reset button Its operating voltage is 5v.

2. ***Arduino Integrated development environment (IDE):***The IDE (Integrated Development Environment) is a special program running on computer that allows to write sketches for the Arduino board in a simple language modeledafter the Processing language. The code is uploaded to the board using Upload button on IDE.

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3. ***Gateway:*** Gateway is a network node which connects two networks operating with different base protocols, that it joins two networks with dissimilarities A gateway can be implemented either in software or in hardware or in combination of both

4. ***ESP8266-12E (Node MCU 1.0 Development Board):*** Basically ESP8266 has been designed for mobile, wearable electronics and Internet of Things applications withan aim of achieving the lowest power consumption with a combination of several proprietary techniques.

IV. RESULT AND DISCUSSION

Sensors are connected to micro controller Arduino Uno and serial communication arrangement is made between the Arduino and Node Mcu boards. By powering the boards respective codes are uploaded to respective boards. Then the parameters data sensed is received on the serial monitor of arduino IDE. Then by serial communication data from micro controller is transferred toNode mcu board. Using its Wi-Fi connectivity, the data is uploaded to cloud platform and each parameter is represented in the form of graphs A web application is designed in such a way that it needs an authentication for cyber security Authorized personnel is provided with login credentials to enter and monitor the motor condition and performance. Web page has options to monitor all the parameters including Number of hot starts and cold starts

V.CONCLUSION

In this paper Industrial motor is effectively and continuously monitored by using different sensors and the obtained data is stored in the cloud platform and is accessed from different locations using web application developed. The health of the motor is assessed by analyzing the continuous parameter data obtained. In addition to continuous condition monitoring, receiving of timely alerts, storage of recorded voluminous data for future use and data monitoring from any

REFERENCES

[1] AjithaDepartment of EEE Anurag Group of Institutions Hyderabad, India tirumuruajitha@gmail.comIoT platform for Condition Monitoring of Industrial Motors.

[2]Ningbo Peacefair Electronic Co., Ltd. Available online: https://peacefair.en.made-in-china.com (accessed on 22 June 2019).

[3]Gubbi, J., Buyya, R., Marusic, S. and Palaniswami, M., 2013. Internet of Things (IoT): A vision, architectural elements, and future directions. Future generation computer systems, 29(7), pp.1645-1660.

[4] Singh, R.R., Yash, S.M., Shubham, S.C., Indragandhi, V., Vijayakumar, V., Saravanan, P. and Subramaniyaswamy, V., 2020. IoT embedded cloud-based intelligent power quality monitoring system for industrial drive application. Future Generation Computer Systems, 112, pp.884-898.

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[6]S. L. Herman, Industrial Motor Control. 7th Ed. Cengage Learning, Uttar Pradesh, India, 2013.

[7] Gubbi, J., Buyya, R., Marusic, S. and Palaniswami, M., 2013. Internet of Things (IoT): A vision, architectural elements, and future directions. Future generation computer systems, 29(7), pp.1645-1660.

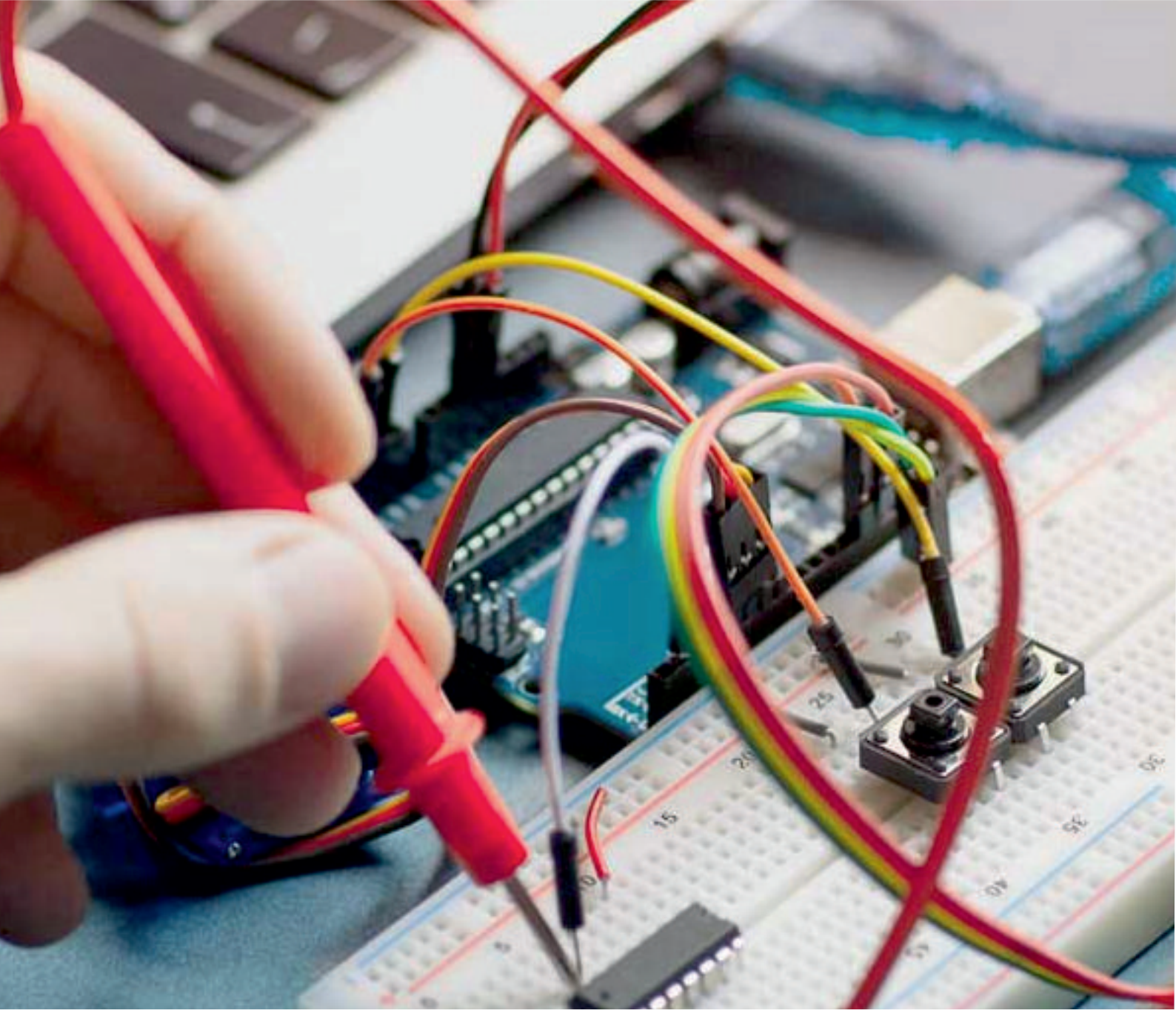
[8]Semtech SX1276/SX1278 LoRa Chip. Available online: https://www.semtech.com/products/wireless-rf/loratransceivers /sx1276 (accessed on 22 June 2019).

[9]DraginoLoRa Gateway LGO Family. Available online: http://www.dragino.com/products/lora/item/143- lg01n.html (accessed on 22 June 2019).

[10]DranginoLoRa Gateway OLG0 Family. Available online: http://www.dragino.com/products/lora/item/136-olg02.html (accessed on 22 June 2019).

[11]Wydra, M.; Kubaczynski, P.; Mazur, K.; Ksiezopolski, B. Time-Aware Monitoring of Overhead Transmission Line Sag and Temperature with LoRa Communication. Energies 2019, 12, 505.

[12]Ferreira, F.J.T.E.; De Almeida, A.T. Induction motor downsizing as a low-cost strategy to save energy. J. Clean. Prod. 2012, 24, 117–131.



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