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A Review of Parameters Monitoring and Controlling System for Industrial Motors using Wireless Communication

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Abstract: ***Single Phase and Three Phase Industrial motors are very popular in industries because of their vast applications. Hence it becomes necessary to protect them against faults to ensure uninterrupted operation and functioning. The Various parameter controlling and monitoring systems are present for other types of machine, but in case of industrial motors the controlling and monitoring systems are not widely used due to a high value of installation and physical constraints. In this review work, the study was done to monitor and control the industrial motors using sensors and wireless communication. Automation done in industrial motor monitoring and controlling is shown here by using the literature review. Various authors have worked in the same industrial automation field. Automation is done by different authors and they used different techniques like VLSI embedded system, algorithms, programming, using sensors and some used the electronic applications. The main purpose of this article is to revise the main alternatives for monitoring and controlling the industrial motors by using the wireless communication and find out various techniques that can be useful for automation for condition monitoring and controlling of induction motors.***

Keywords: condition monitoring, IOT, Fault Detection, Wireless Sensor Networks, Industrial machine

I. INTRODUCTION

Electric motors are the workhorse of industrial machines hence regular inspection and maintenance is essential to locate potential issues. The problem is that many times the companies neglect to include motor analysis as part of maintenance processes, either due to high cost or knowledge constraints or simply due to a lack of oversight. Hence equipment failure and excessive downtime are occurring due to neglecting the condition of induction motors. Inspection of motor condition is used to find out the faults in the induction motor. Issues with current, voltage, speed, temperature are uncovered by using this analysis. These faults are measured by detecting an electrical imbalance; a motor will create excessive heat due to irregularities, and other greater issues. That excessive heat leads to insulation degradation, inefficient operation, and weak control techniques. Excessive heat will be responsible for the shorter life span of motors and often die without warning. traditional analysis methods were costly and time-consuming. Using modern tools we could reduce the motor downtime as well as collect valuable data. By using this data, we can predict and avoid future motor breakdowns. Nowadays the automation has become a basic requirement for emerging technologies. Motors are the nerves of many industries. Hence Industrial automation is essential for precise and accurate operation.

II. LITERATURE REVIEW

Md. Mahmudul Islam et al., (2018) published work on A Wireless Process Monitoring and Control System with Zigbee. In this study they focused on a prototype model of industrial process monitoring and control scheme was designed based on ZigBee wireless protocol. Models interfaced with a computer by using the ZigBee based wireless sensor network and XCTU software. They use De Lorenzo DC Series Motor for implementation. In this work they mentioned limitation of this system is that the maximum range is not covered by this system. For monitoring and controlling the machines it is very essential to cover longer distance by system. By using zigbee it is not suitable to cover longer distance because of high cost of zigbee and low data speed. [1]

Tejas P. Borade et al., (2018) published work on a parameter monitoring system for induction motor using Zigbee protocol. It is capable of performing some operations like running and stopping the induction motor. Phase voltages, phase currents, winding temperature, speed can monitor and control by using this system. The measured values are transferred to the computer and that values are displayed graphically on the controlling computer using Matlab GUI also it can store into excel file for a long time monitoring. [2]

Sneha maske et al., (2018) published work on Induction motor monitoring which is a fast emerging technology for finding machine faults. Wired connectivity is more expensive or impossible due to physical conditions. The wireless monitoring system is usefull to avoid faults occurs at the instant of operation. They focused on a low priced system for monitoring the parameters such as current temperature, voltage and speed of Industrial Motor also it can control the system with wireless ZigBee technology.they uses four sensors in this system to measure the parameters of Induction Motor. These measured values current temperature, voltage and speed are sensed by ZigBee coordinator .sensed data is transferred from ZigBee to the ZigBee End Device and by using USB to TTL it is connected to computer. Motor can start and stop by using the computer interfacing with ZigBee module. Parameters like current temperature, voltage and speed of single phase induction motor are monitor as well as control by ON/OFF mechanism with the help of ZigBee Module which supports Wireless Personal Area Network (WPAN).[3]

vaibhav Khairnar(2018)studied on a quick and reliable minimum cost system for monitoring and controlling the three-phase induction motor . The data parameters from the motors such as like as phase currents, phase voltages, active power, reactive power, motor temperature, Motor speed, Power factor are recorded. The database from the digital signals is recorded and built to ON /OFF motor from remote location using MATLAB GUI. The motivation of this paper is to monitor and control the motor at the remote location with low cost and less time-consuming. Electrical parameters like Currents, Voltages, Power Factor, Temperature, speed are monitored using the digital controller and can be controlled using the wireless communication. To achieve this, a ZigBee prototype and an ADE7758 Energy Metering IC are interconnected which would communicate the motor parameters to ZigBee protocol which will be communicated and display on MATLAB GUI using RS232 as a serial communication. The implementation results convey that the prescribed system is of minimum hardware and data communication and also optimum cost, gives higher definite and also safe for human as it switches ON/OFF remotely. [4]

K. Karthikumar et al., (2017) published work on a wireless control and monitoring system for various industrial machines based on Zigbee communication protocol for safe and economic data communication in industrial fields. Wired communication is costly and complex due to physical conditions. They use Sensor module to monitor the parameters of any industrial machine and transmit the data through Zigbee Protocol. Temperature sensors Dallas DS1820 Direct to digital temperature sensor, Current transformer, Inductive Proximity Sensors are used to sense the temperature, current and speed respectively. They implemented alternative standby system which works when faults are occure in main machine. If any fault is occurs in the main machine, the controller analyse the data from sensor and automatically sends signal to the alarm circuit and relay circuit which switches to the standby machine and also monitors the parameters. [5]

Elizabeth Kadiyala et al., (2017) published work on the advancement of a modern checking system in view of internet technology. The system is appropriate for real time industrial machine monitoring. The design is implemented on Atmega board. Here sensors like temperature, light intensity, water level, voltage and current are used which are interfaced to raspberry pie through zigbee. Interfacing Atmega with raspberry pi values of sensor are checked through IOT. All the sensors are sensing the values at different conditions and displaying the values in LCD also it can be the stored in the cloud.[6]

A.Ajitha(2017) published work on design and implementation of IOT technology to monitor and diagnose the condition of Induction motors by recording key operation indicators. The proposed method comprises of an IoT based platform to collect and process the induction motor parameters. The collected data are 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. An advantage of this method includes continuous monitoring of the equipment, receiving alerts, and data availability for predictive maintenance. 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 analysing 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 different location, are added advantages of this method. [7]

Amit Dhondiram Magdum et al (2016) published work on Monitoring and controlling the industrial motor parameters remotely using LabVIEW. The industrial environment contains various kinds of motors. Parameters like speed, position, temperature are controlled and monitored for various applications in industry. Virtual Instrumentation tools in LabVIEW are used here to collect the motor parameters. They used LabVIEW software to build up a system which can be connected to all the motors in industry and the parameters of that motors like speed, position, temperature are monitor from the remote location. Web publishing tool in labview is used to create the Internet based automation and control of electric machines. Web publishing tool is used in transporting the front panel of the LabVIEW program anywhere on the web without need of sending code over the web and hence code will be protected. Interfacing various kinds of sensors is also easy in LabVIEW and by sensor values. LabVIEW based design techniques have been

described to control and monitor the different types of motor parameters. With the help of special national instruments hardware's, data acquisition task is very simple in LabVIEW. Data acquisition in LabVIEW is also possible with the simple Arduino boards in integration with LIFA add-on. The graphical programming language used in LabVIEW provides easy way of programming and the web publishing tools in LabVIEW enables effective monitor and control of industrial environment from remote locations. [8]

Sridhar.S et al., (2016) published work on a Real Time Wireless Condition Monitoring of Induction Motor. In this work WSN has been effectively designed in order for the seamless IM stator current data acquisition and the subsequent detection and classification of the operating condition of the IM using ANN. The WSN clocks a sampling frequency of 1.8 kHz. Digital signal processing has been incorporated to obtain wavelet coefficients from the wirelessly acquired stator current data. [9]

III.CONCLUSION

Fault finding in industrial motors is a challenging task for researchers. Finding faults as well as monitoring and controlling it using wireless communication is still an open topic of research. In the present paper a comprehensive review of monitoring and controlling the induction motor using wireless communications carried out .It has been observed from previous years research papers that the wireless communication is useful and reliable also cost effective. This paper present many technologies such as zigbee communication, WiFi, IOT. Therefore it has been observed that wireless monitoring and controlling system is used in industry for its better reliability, low power consuming profile, excellent capability, high flexibility and low cost.

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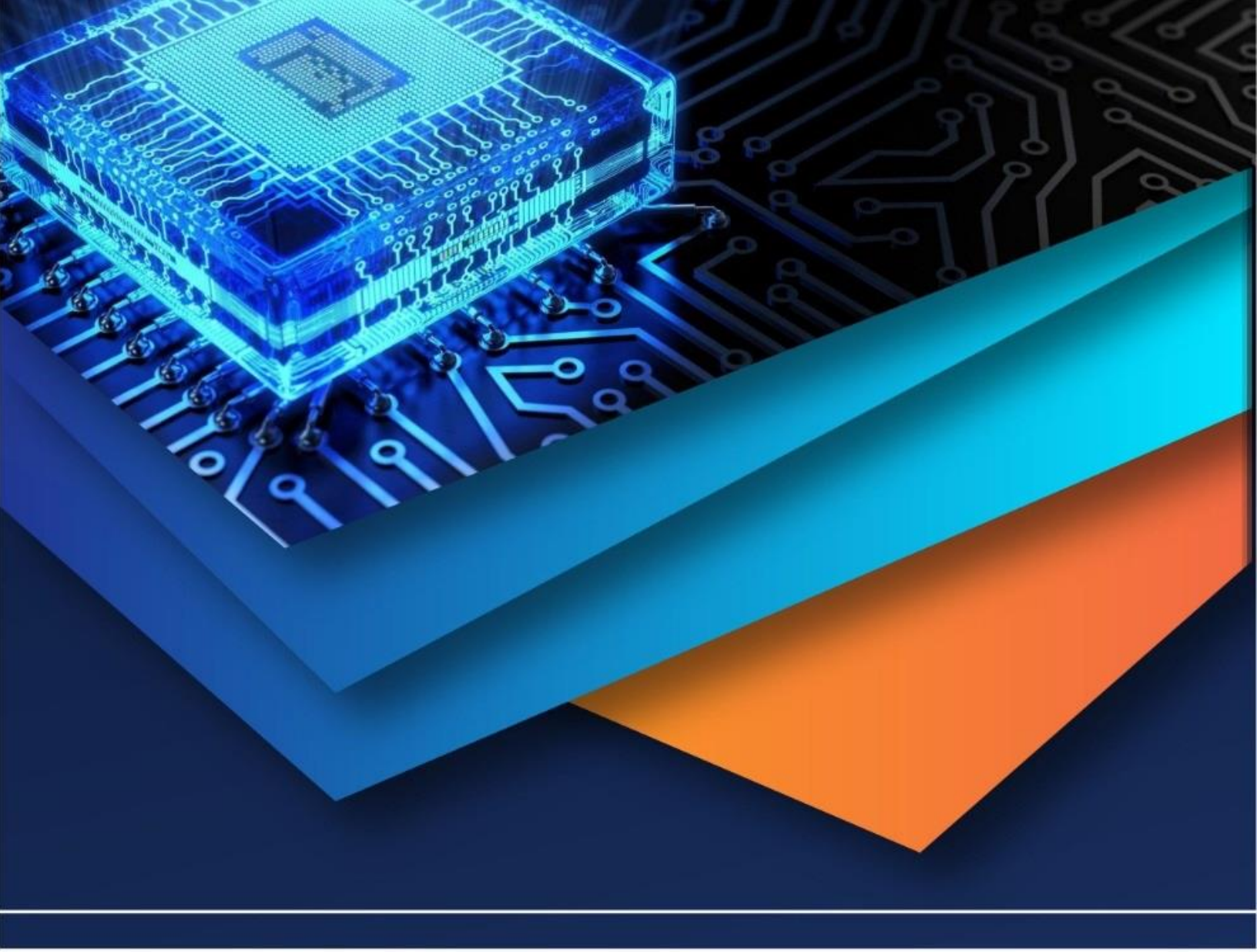

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