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Comparison of various technologies involved in monitoring of an induction motor with IoT

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ABSTRACT

This study will give an overview of the literature on how to use the Internet of Things (IoT) to monitor and manage induction motors in a wide range of applications, including electric vehicles, industries, and agriculture. The review compares and contrasts variety of approaches to IoT-based management and surveillance of induction motors. Induction motors have a significant advantage in terms of construction endurance and simplicity. It can function in any setting and is relatively affordable. as Temperature, vibrations, external moisture RPM, induction machine load current and voltage are all monitored by the transducer modules and sensors, which are then sent to the processing unit for analysis so that necessary actions can be taken, especially in abnormal conditions, to improve reliability and efficiency. It will examine and provide the parameters

Key words: Induction Motor, Internet of Things (IoT), Ardunio, Vibration, Temperature

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INTRODUCTION

DC motors have been widely used in a variety of industrial applications as electrical technology has progressed, Due to the sheer numerous advantages of induction motors, the outlook of industry has shifted since the advent of ac motors, particularly ac induction motors. The stationary and spinning sections of an induction motor are the two primary components [8]. Mutual induction connects two pieces, which is the transformer principle. A spinning transformer is a type of induction. The main advantages of three phase induction motors are self-starting, sturdy design, high power factor, and low cost, however the speed cannot be regulated without sacrificing efficiency [3]. The various faults that can occur in an induction motor are:

Electrical faults involve unbalanced supply voltage or current, under or over voltage and current, overloading, single phasing etc.

Mechanical faults involve stator and rotor winding failure, bearing damage, broken rotor bar, mass unbalance, air gap eccentricity etc.

Environmental related faults involve ambient temperature, external moisture and Vibrations of machine

To achieve reliable, flexible, fault less and economical operation of the Induction Motor, continuous watching of the higher than factors is important in any field of application

To achieve this, IOT primarily based watching systems were planned by several authors [4]. IOT is that the network of physical devices that connects and allows exchange of knowledge through these devices, the most purpose of IOT is to scale back intervention and supply pc primarily based automation [7]. The IOT system includes of Sensors, actuators, GSM, Wifi, process unit etc. Comparison of IOT with regular techniques for Induction Motor watching in numerous fields is mentioned in following sections as listed below sections.

CLASSIC CONTROL

The power offer is turned on and is receiving the desired power for the Arduino and every one interface parts. The sensing element block determines the relevant motor parameters and sends them to the Arduino. The Arduino reads information from numerous sensors, analyzes it in step with the given directions, and so sends the knowledge from the sensors via Wi-Fi to the digital display and also the network entranceway. In parallel, the Arduino reads commands from the net and also the sends an effect signal to the relay through a contactor that controls the induction motor sensing element info is displayed visually on the server management of asynchronous motors is predicated on measured parameters whereas in manual mode management is predicated on warning messages received from the network. The management is finished by relay and contactor circuit. The motor is flip ON/OFF once abnormal price is detected.

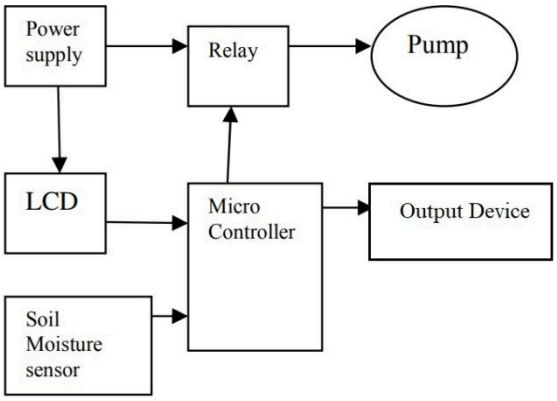

Fig. 1 Classic Control Strategy

PLCSCADA

To get reliable operation of VFD, observance of the drive is as necessary as management. Planned a IOT primarily based observance and management of Induction Motor mistreatment PLC (Programmable Logic management) and SCADA (Supervisory Control and knowledge Acquisition). PLC consists of I/O points for interfacing the electrical signals and might be simply programmed for sensing, dominant and activating the economic instrumentality. SCADA systems square measure crucial for industrial organizations since they assist to take care of potency, method knowledge for smarter choices, and communicate system problems to assist mitigate time period. PLC will be used for numerous forms of speed management ways by programming it as per the management technique. The VFD acts as negotiator between Induction Motor and PLC. VFD takes input from the PLC and processes the info and offers its out place to the Induction Motor once process the info received. Then VFD controls and adjusts the position of the rotor in Induction Motor. To run the SCADA ladder logic program, Indu Soft computer code is employed and it permits the operator to regulate and monitor the Motor from any wherever and satisfactory results were obtained by testing a zero.75KW 3ph Induction Motor with conveyer belt load [15]. However, the SCADA systems suffer from the drawbacks of high price, increase of complexness with system complexness and wish of trained workforce.

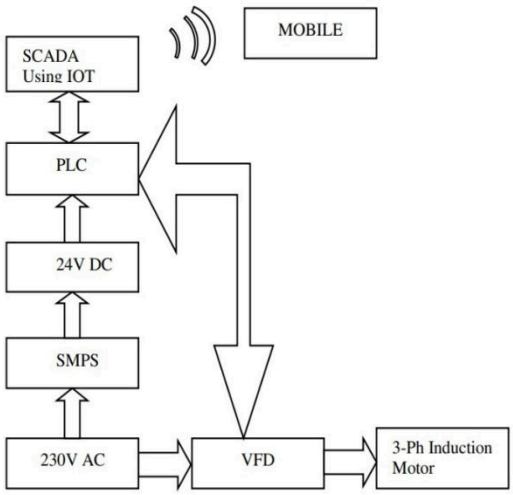

Fig. 2 PLC Scada Strategy

PLC

Most industries prefer automated monitoring using remote or computer-controlled devices. A block diagram for monitoring the health of an industrial engine using IOTis shown in Figure 1. The sensor detects the parameters and is analyzed by the microcontroller (Aurdino UNO board) according to the instructions. Now this data is sent to the node MCU and we have a monitor to display it. Data available on the NODE MCU is uploaded to the cloud platform (Thingspeak). In general, gateways can be implemented as hardware or software, or a combination of the two.

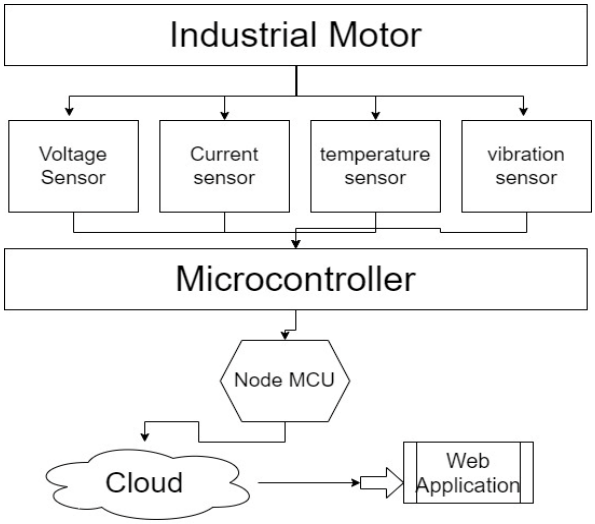

Fig. 1 PLC Strategy

RASPBERRY PI

The above system consists of various sensors and a wifi enabled Raspberry pi3. A web Application need to be developed for continuous monitoring of parameters. Once any abnormality is detected, an alert will be received on the webpage and based on the abnormality the necessary action can be taken. The data collected from the sensors is sent to local and cloud servers for analysis. The working of the architecture is described with the help of flowchart shown in Fig. 3. The data received by the nodes will be stored and graphically using Visual Basic Application. In [4], a hardware model is developed using a 1/8Hp Motor and the following analysis were carried out.

i. Temperature analysis
ii. Current consumption analysis (with or without load)
iii. Vibration analysis (with and without speed control)

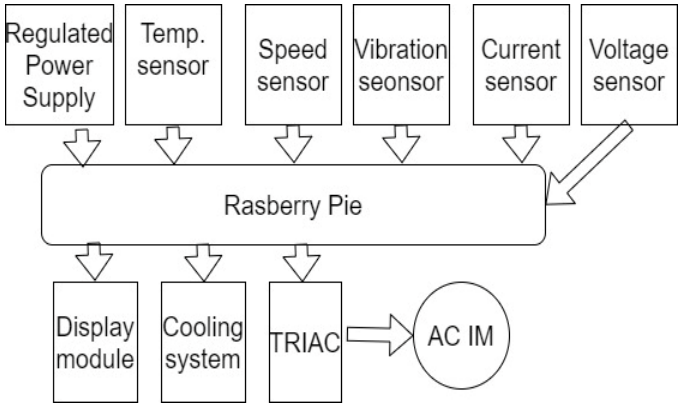

Fig. 2 Raspberry Pi Strategy

COMPARISON TABLE

The comparison is made between the various strategies discussed above. The conclusion can be made by making the comparison based on various aspects which defines the working of the strategies. The following table shows the comparison.

Table -1 Comparison of Strategies

	Classic Control	PLC-SCADA	PIC	Rasberry Pie	IoT
Development Cost	Low	Low	Moderate	Low	Low
Physical Structure	Big	Small	Small	Small	Very Small
Production Planning	N/A	Very Easy	Very Easy	Very Easy	Very Easy
Resistance To The Work Environment	Low	High	Additional Security	High	Very High
Finding Fault	Difficult	very Easy	very Easy	Very Easy	Very Easy
Communication	N/A	very Easy	Very Easy	Very Easy	Very Easy
Monitoring Data	N/A	Very Easy	Very Easy	Moderate	High
Security	Low hi	High	Moderate	Very High	Very High
Renewal Opportunities	N/A	Easy	Moderate	Very Easy	Very Easy
Adding Modular System	N/A	Possible	Additional Design	Possible	Possible
COST	Low	High	High	Low	Low

CONCLUSION

TheIn this study, a parameter observation system for induction motors supported IoT is achieved and tested with success. The system developed is capable to perform such operations as running the motor though, stopping it, measuring, observation the foremost parameters of the motor like temperature, speed. All of those values may be transferred to the IoT platform, displayed on the interface, drawn diagrammatically, transferred into associate degree surpass file to store them for a protracted time observation the fundamental values of the induction motors were done and achieved in varied ways in which. Comparison of positive and negative aspects and its value was done. Comparison of IoT with alternative dominant systems is shown in Table three. The system developed during this study has been tested by experimentation and it's been ascertained that the system operates with none failure and its additional performance than the similar ones. Throughout the experimental tests, no downside has been ascertained either communication the IoT platform, or integration the hardware units used for dominant and observation the induction motor. The system developed may be used for not solely industrial applications however additionally instructional purposes; it suggests that, the total system is also helpful to high schools that have occupation, technical, and industrial education. Instructors will use the system given as a supporting teaching material, and it may be tailored in experimental researches with success.

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