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Condition Monitoring of Induction Motor

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Abstract— *The electrical motor condition monitoring is an increasing technology to diagnose the fault of an induction motor. It spots the unpredicted faults of a critical system. Non identical faults of an induction motor such as rotor, stator, bearing, vibration, air gap eccentricity and their various diagnosis techniques are also explored. In fact, the actual fault detection by using the involvement of human is widely replaced by the automated technology, namely fuzzy- logic- based systems, genetic algorithm, neural networks, wavelet technique, Vienna monitoring etc. It is surely evident that the scope of this area is large. Hence, acknowledging the necessity for future research, this review paper presents a major view on different types of faults and their detection schemes.*

Keywords— Electric machines, faults, faults detection, monitoring, fuzzy logic

I. INTRODUCTION

The condition monitoring is the policy of observing a parameter of condition in machinery, in order to recognize a significant change which is indicative of a developing fault. It is a main component of predictive maintenance . The use of condition monitoring allows maintenance to be scheduled, or other actions to be taken to prevent resultant damages and avoid its consequences. Conservation of energy is very important need of the day. The concept of energy efficient devices has come up in various sources such as lighting, air conditioning and so on. Energy monitoring is an important tool for determining the energy efficiency of various equipment and devices. This paper implements an energy monitoring system which displays the power consumed. This can help a user to detect any fault in the power system. A smart energy monitoring system can help a user to analyses the energy consumption data at device level and manage it assuming it to be fixed monthly rates. Also, it helps a consumer to replace the regular appliances by energy efficient. The monitoring system can inform and alert the user on unexpected excess power consumption caused by equipment faults, lack of proper maintenance

II. LITREATURE REVIEW

2.1 Bidyadhar Subudhi:-

In this paper they indicate the Electrical motor conditioning monitoring technology and it detects the fault of critical system. It is development of Electrical Concept. It is the most preferred fault diagnosis technique in MCSA.

2.2 Sapena-Bano, J. Perez-Cruz:-

In this paper we get to know about how to monitor faulty condition of induction motor using low computing power devices. This paper states the diagnosis of induction motor through the detection of fault frequency signatures in the current's spectrum. The key of the method is the down sampling of the current signal at specific angles of it analytic signal.

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2.3 M.E.H. Benbouzid, H. Nejjari: -

The major difficulty is the lack of an accurate model that describes a fault motor. In this paper they talked about fuzzy logic. Fuzzy logic is reminiscent of human thinking processes and natural language enabling decisions to be made based on vague information. Therefore, this paper applies fuzzy logic to induction motors fault detection and diagnosis.

2.4 S. H. Chetwani, M. K. Shah & M. Ramamoorty: -

This paper describes the utility of online monitoring technique for detection of various faults that can be applied to existing motors without dismantling or shut down. The technique can detect online the presence of various faults such as broken bar in the rotor cage of induction motor, bearing faults, Eccentricity faults and stator, by monitoring and analysing the line current.

2.5 Ramzy R. Obaid, Thomas G. Habetler: -

This paper has presented Mechanical faults in induction motors can be detected by monitoring specific components in the stator current frequency spectrum. An algorithm for detecting mechanical conditions in induction motors under any load condition using analysis

III. BLOCK DIAGRAM

The condition monitoring of induction motor consists of basic blocks mainly the Current sensor and Voltage detector, A2D convectors, Microcontroller, 12V & 5V DC supply, Relay Switch, LCD Display, Wi-Fi module, Cloud, Interface block. This is diagrammatically shown in figure 1

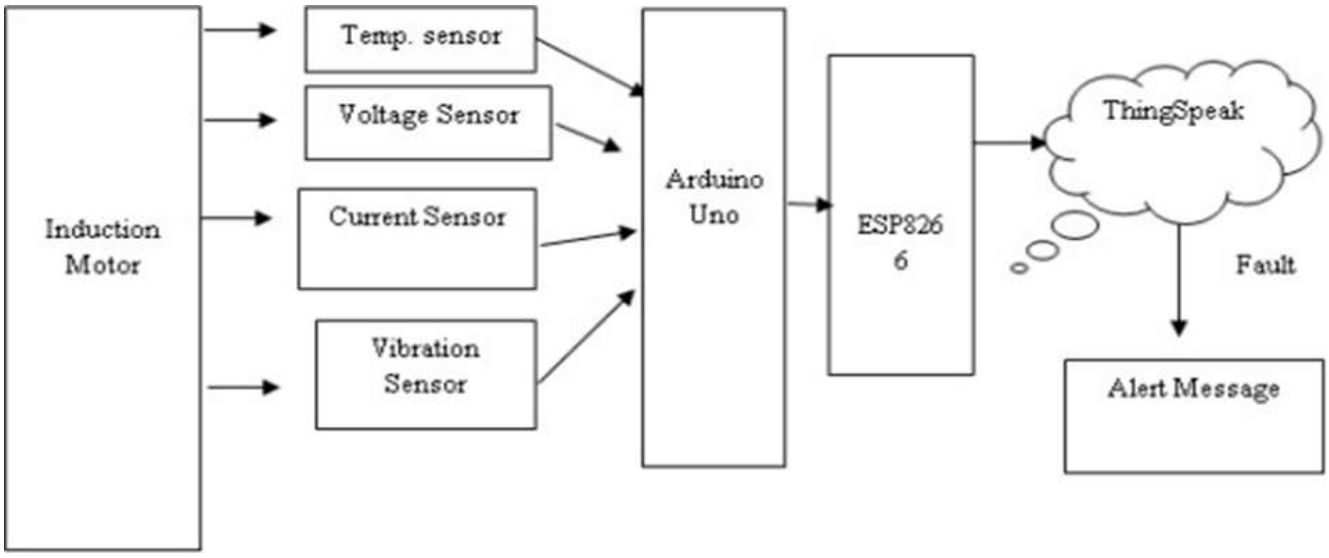

Figure 1: Block diagram of condition monitoring of induction motor

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IV. CIRCUIT DIAGRAM

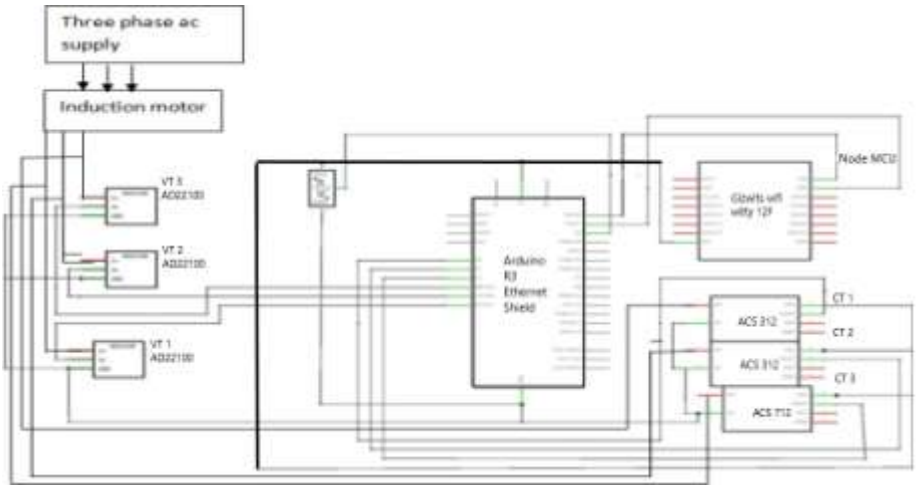

Figure 2: Circuit diagram condition monitoring of induction motor

V. WORKING

Block diagram above in Fig 2 In this work a three phase induction motor is used for experimental purpose. Sensors (accelerometer, temperature, moisture, vibration, current and voltage sensors) are attached to the motor at right positions. Sensor data will collect and processed using Arduino and compared with the threshold values in the storage to trigger alarm to avoid failure. The experimental setup of the proposed system is as shown in the figure

Tests were completed on the three stage IM at ~ 0.3 kW/1400 rpm and 2.5 kW/1200 rpm. The planned equipment utilized an ARM NXP LPC1769 Cortex-M3 processor, 802.11.bg Wi-Fi module, an ACS711 (- 25 – +25A) Hall-impact current sensor, a high speed Hall-impact vicinity sensor for cycle estimation, NTC and a 220 VAC/6 VAC/0.6 W reference transformer. The whole framework was nourished remotely with a 9-12 VDC power supply. The LPC1769 contained a 6-divert 12-piece ADC in its make- up. The ACS711 modules utilized for each stage were 2.5 V focused and delivered yield voltage of between 0-5 V, as indicated by the current drawn.

VI. COMPONENTS DESCRIPTION

6.1 Arduino IDE

The IDE (Integrated Development Environment) is a uncommon program running on PC that permits to compose portrays for the Arduino board in a straightforward language demonstrated after the Processing language. The code is transferred to the board utilizing Upload catch on IDE.

6.2 Cloud StorageIt Information that is gotten from the sensors are moved remotely to the neighborhood and cloud server for examination. When the information is gotten, a framework has been formulated that breaks down the crude information. The program has been set to process constant information and store it to the cloud with things peak distributed computing stage. This spared information is open from anyplace by means of web wireless.

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6.3 LCD Display

Figure 3: 2*16 LCD display

LCD (Liquid Crystal Display) is the technology used for displays in notebook, TV & other appliances. Like LED and gas-plasma technologies, LCDs permits displays to be too thinner than cathode ray tube (CRT) technology. It displays the Energy Meter reading units and balance. A 16X2 LCD is connected with microcontroller at 7,8,9,10,11 and 12 pins to display the reading of various sensors.

6.4 Arduino UNO

The Arduino Uno is a micro controller board shown in Fig.1 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 having a 16 MHz crystal oscillator, an USB connection, power jack, an ICSP header, and the reset button [8]. Its operating voltage is 5v. TheAtmega328 has 32 KB of flash memory for storing code (of which 0.5 KB is used for the boot-loader); it has also 2 KB of SRAM and 1 KB of EEPROM. The power pins are as follows: VIN. The input voltage to the Arduino board when it's using an external power source 5V supply. The regulated power supply used to power the microcontroller and the other components on the board. 3V3. A 3.3 volt supply is generated by on-board regulator.

Figure 4: Arduino UNO

6.5 Sensors

As per the data acquisition of the induction motor various sensors are used for the data collection such as voltage sensor for voltage measurement, current sensor for current, temperature sensor for the temperature, vibration sensor for vibration detection and speed sensor for speed measurement.

VII. ADVANTAGE

- Lowering maintenance cost.
- Increasing lifespan of machine.
- Maximizing production output.
- Decrease the losses

VIII. DISADVANTAGES

- Increasing of some amount of cost.
- Increasing investment of staff training

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IX. APPLICATIONS

1. In large industries high performance equipment and for maintenance purpose.
2. In food manufacturing system.
3. Petro-chemical and oil companies.

X. CONCLUSION

In this task the idea of Arduino use for early discovery and checking of motor framework disappointment remotely. The framework can join different detected parameters progressively and improve precise identification of various shortcomings happen in motor. The checking of the motor framework displays the estimation of various parameters to be specific vibration of the motor, temperature, speed, encompassing dampness, supply voltage and motor current. In this manner, contrasted with other ordinary strategies this framework has more number of fields which empowers caution, ready messages and speedy controlling. The idea of Arduino is displayed here for remote checking and controlling the motor.

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