Single phase induction motor health monitoring system

Prof. Rohit Mane [1], Pankaj Phatak[2], Rutuja Walvekar3, Prathmesh Chavan[4]
[1,2,3,4] *Department of Electrical Engineering, Nanasaheb Mahadik College of Engineering, Peth*

***Abstract*—As is well known, induction motors process the majority of industrial and household appliances, such as water pumping motors, and are commonly affected by open circuit, short circuit, earth leakage, and overloading faults. These faults are difficult to diagnose and take a long time to find, which delays the critical process that drives industry production. We are going to suggest a project called the smart induction motor failure detector in order to prevent this.In this project, we will detect the type of induction motor defect and promptly notify the operator of it.therefore, depending on the sort of malfunction, the operator will take the appropriate measures. So this will cause the major production of the industry will not shunt down for a long duration.**

***Index Terms Arduino, Current Sensor, Voltage Sensors*.**

I. INTRODUCTION

One of the innovative technologies that has had a significant impact on modern life in the field of electrical machines is the induction motor. Another common name for an induction motor is an asynchronous motor. It is an AC electric motor that generates mechanical energy via an electromagnet induction medium. Scientist Nikola Tesla was the first to invent the induction motor. The induction motor operates on the electromagnetic field (emf) principle, whereby the motor's starter generates a magnetic field that subsequently rotates in synchronism. When the mechanical stress on the rotor rotation is balanced by the induced rotor current and torque, the rotor accelerates. An induction motor never runs at a speed exactly equal to that of synchronous machinery.

One benefit of induction motors is that they may operate on single or three phase electricity, with the possibility of using any number of phases. Induction motors may be broadly classified into two categories, which are illustrated in the diagram below. Single-phase induction motors are often employed in low-power applications and are infrequently found in both industrial and residential settings, such as electric shavers, mixers, compressor drilling machines, pumps, and so on. In contrast, single phase induction motors do not start themselves; three phase induction motors do. This kind of induction motor has been used in big exhaust fans, hoists, cranes, crush mills, and other applications.

Failures are a significant factor in the proposed project's debate. Whether they are single-phase or three-phase, induction motor failures are common and can occasionally result in significant losses and manpower increases. The most common causes of faults in induction motors are overloading, under-loading, under-voltage, and over-current. The recommendation to safeguard induction motors from such defects is taken into consideration. On the other side, a motor may experience early problems. Despite this worry, we concentrated particularly on fault detection concepts and created a model to consistently identify problems at any given time. The next suggested system addresses the processes and is dubbed "fault detection in induction motor."

II. PROPOSED SYSTEM

Have the effect of identifying the same kind of induction motor defects. In contrast to other current methodologies that are on the table, the notion developed was implemented as a model to identify the problem automatically without the need for human intervention, much like other systems. This model seems modest and viable in fault detection. The technique known as Motor Current Signature Analysis (MCSA) is frequently employed to find induction motor problems. Its goal is to analyze the stater current spectrum. When a machine has a defect, such as broken rotor bars, severe damage or rotor axis eccentricity, these will be identified. Even said, there were certain disadvantages to the increased identification. The original sequence it encountered was that the fault's amplitude would change as the load increased. It mostly relates to maintaining power quality, which is not entirely caused by stater craziness. By monitoring this current approach, we supported the development of a new system to address the inherent flaws in the current approach. Our "fault detection in induction motor" solution is a straightforward, dependable tool that works in any environment. Its design allows for its evolution into any component of the motor. It will function in the same way on any type of single- or three-phase induction motor. Additionally, it performs simply and quickly in classifying the shortcomings and locating errors. Our suggested model is created in accordance with supply provided in parallel with fault detection and isolation. It was all managed by a microcontroller that used a relay to complete the process. In this case, the relay serves as the primary source, detecting the fault and increasing isolation to lessen the fault effect during power outages.

III. BLOCK DIAGRAM

Figure 1 displays the observed block diagram for the system "fault detection in induction motor." In this case, the microcontroller plays a crucial role in the detection.The two main circuit movements are relay and isolation. When the designed model is attached to the induction motor, the motor operates normally. The micro-controller is pinned and normally closed, waiting for the next signal. When the induction motor forehead experiences overload or overcurrent, the supply triggers the micro-controller and relay, which then ride into a normally open condition, completely isolating the induction motor from the input supply.

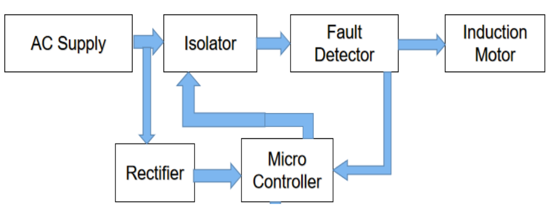

Fig.1 Block Diagram

WORKING:

Generally speaking, the suggested system is biased toward isolation. With the micro controller unit, the entire model is operational. The MCU, GSM, Relay, and Isolation make up the idealized prototype. The compact and dependable induction motor that powers the entire system is included.The relay is initially established as normally closed (NC) without any activation during normal induction. The primary AC supply is used as the circuit's supply. While the circuit's necessary DC is obtained from a separate adapter when the motor is operating, the micro controller circuit detects faults and switches the relay to normal open (NO) if a problem arises without human awareness.

Consequently, the motor is isolated or separated from the main supply when isolation receives an instantaneous supply from the relay and activates at the designated moment. Through a mobile device connected to a GSM, this segregation notifies the user. It notifies users by phone or SMS. Furthermore, it assesses the sort of defect the motor is experiencing and notifies the user when a fault occurs, such as overloading or overcurrent, excessive voltage, open circuit, etc. The circuit is redesigned into a reset option, which becomes its beginning stage, after avoiding from motor.

Fig.2 Actual Implementation

Here the Arduino attached with a micro controller containing of pins. An input pin supply is directed into relay voltage required for operation is 5 volt optimized from Arduino addition LCD display and GSM module is holds with Arduino pins induction motor which required input supply for motor operation is given to relay which is normally closed (NC).Whenever a fault is identified , this relay from supply isolates the whole unit of motor into normally open (NO) indicating that circuit separates input AC supply and induction motor. After correction of faults in induction motor the circuit which is automatically setup for reset condition which turns into its initial state. The developed circuit structured as a small model makes a huge place and duty of fault detection of fault detection in induction motor.

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