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"Detection and analysis of stator and rotor fault of motor using PLC"

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ABSTRACT
The goal of this project is to protect induction motors against possible failures by increasing the efficiency, and the performance. The proposed approach is a sensor-based technique. For this purpose, currents, voltages, and temperature values of the induction motor were measured with sensors. When any fault condition is detected during operation of the motor, PLC controlled on-line operation system activates immediately. The motor protection by using PLC can be achieved faster than the classical techniques, and applied to larger motors easily after making small modifications on both software and hardware. While many types of motor fault detection and protection methods have been proposed, practical detection techniques for three-phase IMs are generally provided by some combination of mechanical and electrical monitoring techniques. Digitally condition monitoring of electrical machines has received considerable attention in recent years. These methods are containing microcontroller, microprocessor, computer and programmable logic controller (PLC).
Keywords: PLC current ,voltage sensor temperature sensor

I. INTRODUCTION

The induction motor is one the most common electromechanical energy conversion devices. It is a critical component in production processes and is widely used in domestic, commercial, and industrial motion control devices and systems. An induction motor is considered reliable due to its relatively simple design and construction. The motor annual failure rate is conventionally estimated at 3–5% per year, and in extreme cases, up to 12% in pulp and paper industry. A method for condition monitoring and reliable protection has become necessary in order to avoid catastrophic failures (breakdowns) to ensure long motor life. Monitoring reduces maintenance costs and prevents unscheduled downtimes. Therefore there has been a substantial amount of research to provide new condition monitoring techniques for AC induction motors. We divide faults in into three main categories: stator winding faults, broken rotor bar problems, bearing problems. Turn-to-turn and turn-to-earth faults in an IM stator winding lead to asymmetry between the three phases, causing undesirable motor behavior and heat. Heat generation in the stator windings, in turn, causes insulation breakdown, followed by stator winding fault. This is nearly 30–40% of the total motor failures. Generally the term "stator faults" is used for IMs and they can be classified into two different categories: laminations or frame faults and stator winding faults. A new IM protection method is presented by using programmable logical controller (PLC). The voltages, currents, speed, and temperature of the IM are monitored. One of the biggest problems in IM failure issue from the bearings, accounting for over 40% of all faults .A successful bearing condition monitoring scheme must be able to detect location of faults and their severity levels. Bearing faults have been traditionally detected at incipient stage through vibration and stator current monitoring. Experimental results reveal the nature of vibration harmonic frequency bands which do not have any relationship to characteristic frequencies that have previously been used for bearing fault identification.

II. FAULT DETECTION TECHNIQUE OF MOTOR

These are the technique of fault detection

1. over current sensing
2. over Voltage /Under Voltage
3. Bearing and winding temperature

A. **OVER Current sensing :** Current of the running motor can be sensed by using current transformer and some conversion unit so we can sense the current ,so we can conclude is the current is normal or is it crossing its defined range.

B. **Over Voltage /Under Voltage:** Over Voltage /Under Voltage of running motor can be sensed by using voltage transformer and V to I conversion circuitry, so we can judge the voltage lavels.

C. **Bearing and winding temperature:** Bearing and winding temperature of the motor can be sensed by using the RTD and its Transmitter so the Bearing and winding temperature of motor can be monitored .

III. METHODOLOGY AND SYSTEM ARCHITECTURE

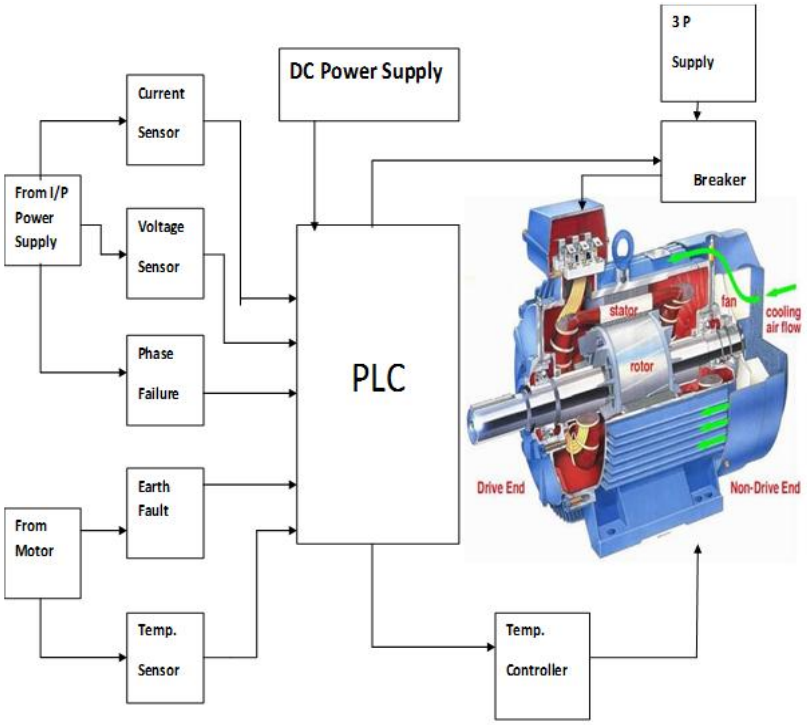

Fig.1 System Architecture

A. **PLC: Programable Logoc Controller** it is a Centralised process unit it scan the input and gives output according to predefined program.its scan time is 10ms and its IO handeling capacity is high so we can prefer it when IO is high .

B. **Input modules:** Voltage ,Current and Temperature sensors are the input modules .

C. **Output Modules:** Contactor and relays are the output modules .these out put modules are acts accordingaly to predefined progrmas.

IV. RESULTS AND DISCUSSION

The above model works in normal condition and gives the following results

TABLE

Table I. Result Orented Comparison Table

Sr. NO	Faults	PLC Action	Motor Status
1	Overload	Gives Alarm/takes action	OFF
2	Under ,Over voltage	Gives Alarm/takes action	OFF
3	Bearing and winding Temp.	Gives Alarm/takes action	OFF

V. CONCLUSION AND FUTURE WORK

With the help of PLC it can be possible to overcome drawbacks in motor protection .Thus, we can securely protect the electrical device and control the damage of device, and consume the Power.

Future work:

1) Online monitoring of motor parameter of various motors in control room.
2) Fault logger and event history will be produced so we can analyze the problem.
3) Trends of any day any time we can generate so we can take any days data for analysis and calculate the breakdown time of that motor.
4) Depending up on history and trends of motor parameter we can Plan the preventive maintenance of that motor.

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