Fault Detection and Protection Induction Motor by Using PLC

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Abstract: Protection of induction motor (IM) against probable problems, such as overvoltage, overcurrent, overload,over temperature, and under voltage, happening in the passage of its operation is very important, as it is used in trade as actuator**.** IM can be protected using specific constituents, such as timers, contactors, and current relays. This method is well-known as the predictable method that is very mutual and contains mechanical parts. Computer and programmable combined circuit based protection devices have abolished many mechanical components. New protection way which is based on the programmable logic controller (PLC) takes been introduced. In this technique, all contactors, timers, relays, and the translation card are removed. Likewise, the voltages, currents, and the temperature values of motor, and the difficulties happened in the system, are monitored and prepared messages are shown on the computer desktop. Investigational results show that PLC- based protection process established provides higher accuracy as well as riskless operation.

Keywords – Strategy computerization, fault judgment, induction motor protection and pogrammable control.

I. INTRODUCTION

Induction motors are perplexing electro-mechanical devices used in most industrial applications for the transformation of power from electrical to mechanical form. Induction Motors are utilized worldwide as the workhorse as a part of mechanical provisions. Such motors are robust machines utilized for general purposes, as well as in risky areas and serious situations. Broadly useful provisions of induction motors incorporate pumps, transports, machine instruments, diffusive machines, presses, lifts, and bundling supplies. Then again, requisitions in unsafe areas incorporate petrochemical and common gas plants, while serious environment provisions for induction motors incorporate grain lifts, shredders, and gear for coal plants. Moreover, actuation engines are very dependable, oblige low support, and have moderately high proficiency. In addition, the extensive range of power of induction motors, which is from many watts to megawatts, fulfils the creation needs of most mechanical methodologies. In demand to protect the induction motor current technology is presented in this learning. Due to current progress in Programmable logic control (PLC) it can be used for fault judgment of induction motor.

II.PROBLEMS ALLIED

The alternating current induction motor is normally referred to as the pillar of the manufacturing. This is because it proposals users simple, sharp construction, relaxed maintenance. Unpredicted failures of IM can significantly cost the engineering applications. Below conditions may lead to induction motor failure;

1. Phase Fault
2. Over & Under Voltage
3. Over & Under Current
4. Short circuit Fault
5. Power Supply Issues
6. Load Loss
7. Stator fault
8. Rotor Fault

PLC

The PLC (Programmable Logic Controller) is an developed computer used to observe inputs, and dependent upon their state make verdicts based on its program or ladder logic, to control its outputs to automatize process. The PLC can be used in various applications suchas, automated system, PLC controller is usually the central part of a process control system and to run more complex processes it is possible to connect more PLC controllers to a fundamental computer.

Methods of Fault Finding:

1. Voltage measurement –by PT
2. Current measurement –by CT
3. Temperature measurement –LM35

Voltage Measurement by PT

Voltage transformers (VT), also called potential transformers (PT), are a parallel connected type of instrument transformer. They are designed to present minimum load to the supply being measured and have an exact voltage ratio and phase relationship to enable exact secondary connected metering. The PT is normally described by its voltage ratio from primary to secondary. A 230:5 PT will provide an output voltage of 5 volts when 230 volts are applied across its primary winding. Hence, when supply voltage increases gradually the voltage across secondary will be high this is when the PLC will detect the fault and disconnect the motor from supply.

Current Measurement by CT

Current transformers (CT) are series connected type of instrument transformer. They are designed to present minimum load to the supply being calculated and have an exact current ratio.Primary current ranges from 1A to100A & secondary current range from 5mA, 10mA, 30mA, 100mA, and 0.33A. The perfect value of secondary current becomes less important i.e. one can choose 5mA/30mA secondary current instead of 100mA, 350mA etc. We have selected CT according to requirement of is 1A:15V (i.e. when primary current is 1Amp then voltage at secondary side is 15 volt). The resistance of secondary winding is 20Ω. Hence, when supply current increases gradually the current across secondary will be high this is when the PLC will detect the fault and disconnect the motor from supply.

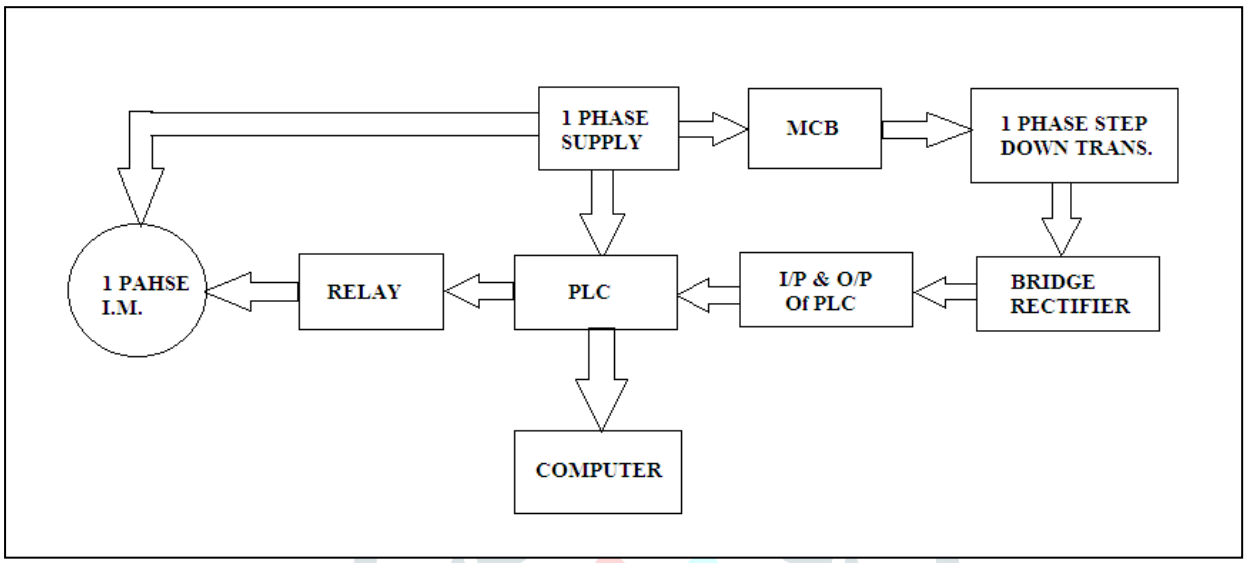
Temperature Measurement

The LM35 series are precision integrated-circuit temperature sensors, with an output voltage linearly related to the Centigrade temperature. Thus the LM35 has a value over linear temperature sensors in°Kelvin.The LM35 doesn't require any exterior calibration to provide usual accuracy. Low cost is secured by trimming and calibration at level the low output impedance, linear output, and precise inherent calibration of the LM35 make interfacing to control especially easy. The LM35 is used with single power supplies, or with plus and minus supplies. As the LM35 draws only 60 µA from the supply, it has very low self-heating of less than. So when the temperature of the motor increases the system gets disconnected from supply.

Hardware & Installation

The test rig used in the present study consists of a 0.5HP single-phase IM, one voltage transformer with transformation ratio of 230/5V connected to phase of IM, a temperature sensor with transformation ratio of 10 mV for 1 °C increasing temperature, true RMS to DC conversion circuit,phase contactor,bridge rectifier,relay circuitry & MCB.

Block Diagram



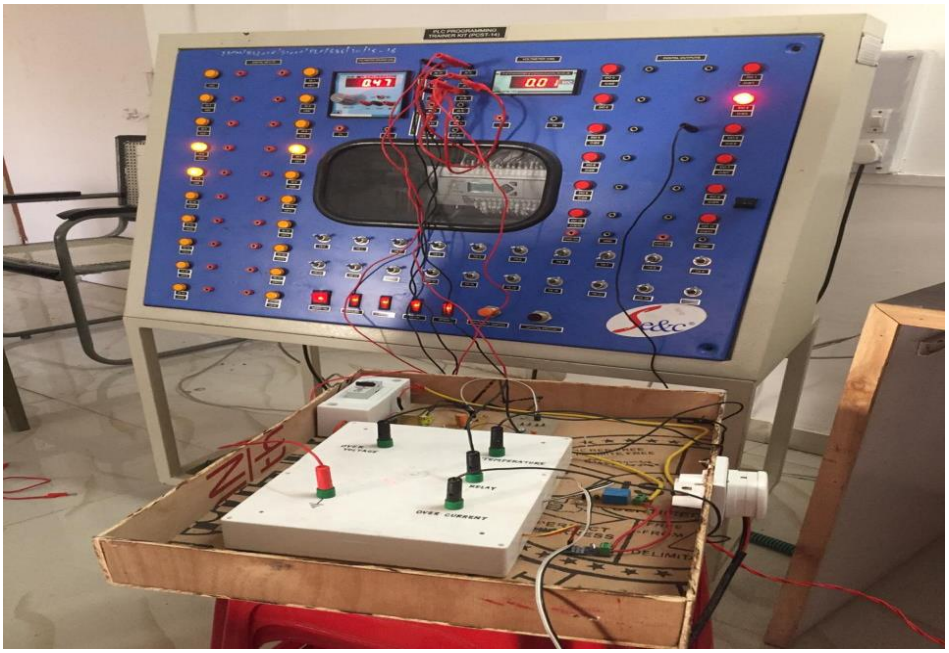
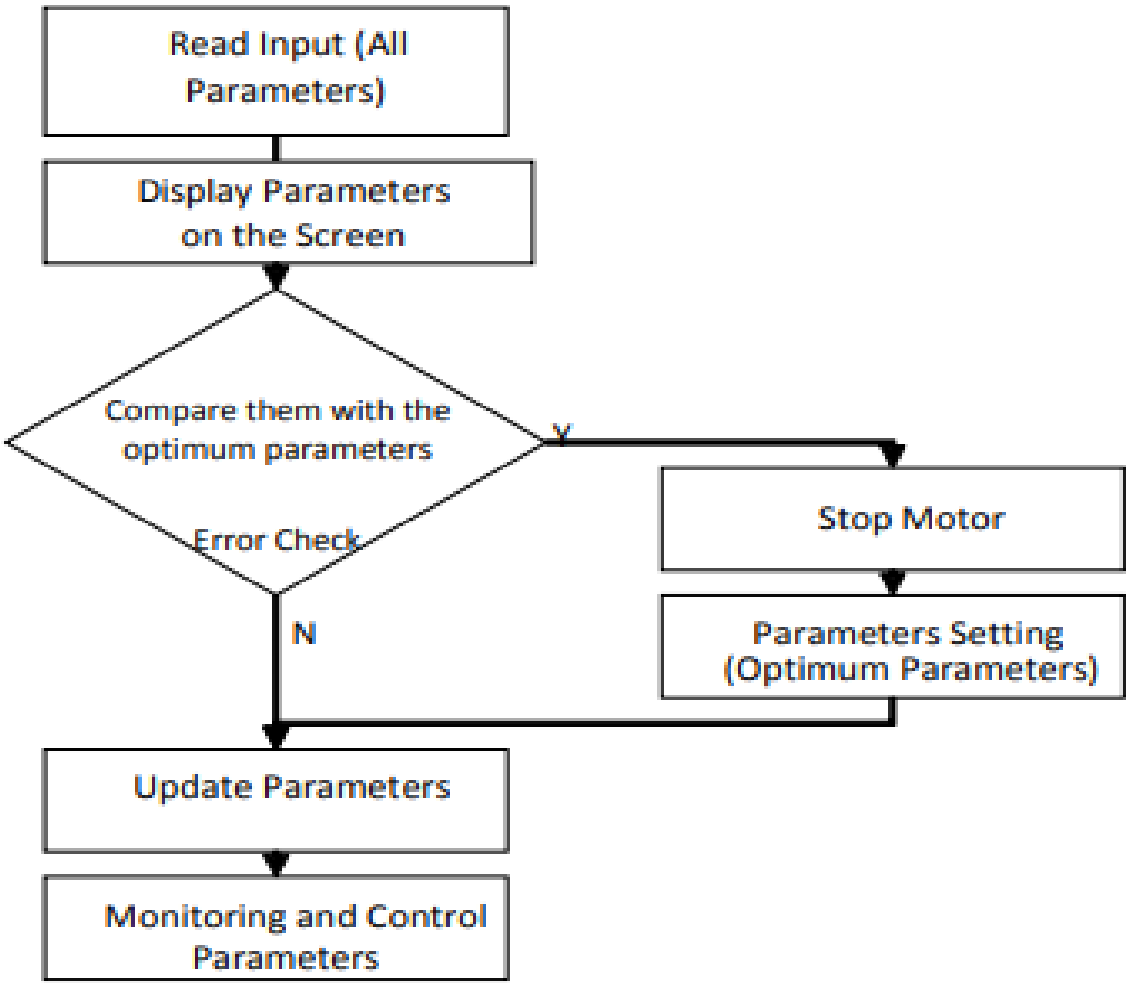


Fig: Actual View Of Proposed system

Flowchart



Conclusion

A 0.5 HP,3.5A current,230V,1500 rpm,single-phase IM has been connected to the protection system through the measuring components. The proposed PLC-controlled protective relay deals with the most important types of these failures, which are summarized as the phase lost, the over/undercurrent, the over/under voltage, the unbalance of supply voltages, the overload, the unbalance of phase currents, the ground fault, and the excessive repeated starting. If any fault is observed during online operation of the motor, a warning message appears on computer and then the motor is stopped. The most common causes of motor troubles which account for the majority of problems are highlighted. The test has been found successful in detecting the faults and in recovering them.

Future Scope:

SCADA refers to a system that collects data from various sensors at a factory, plant or in other remote locations and then sends this data to a central computer which then manages and controls the data. SCADA is a term that is used broadly to portray control and management solutions in a wide range of industries. One of key processes of SCADA is the ability to monitor an entire system in real time. The main purposes for the use of a SCADA system would be to collect the needed data from remote sites and even the local site, displaying them on the monitor of the master computer in the control room, storing the appropriate data to the hard drive of the master computer and allowing the control of field devices (remote or local) from the control room. SCADA systems are equipped to make immediate corrections in the operational system, so they can increase the life-period of your equipment and save on the need for costly repairs. It also translates into man-hours saved and personnel enabled to focus on tasks that require human involvement

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