Fault Detection And Protection Of Induction Motor Using PLC

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Abstract - **The industry has investigated condition-based maintenance philosophies including new technologies developed to determine the condition of plant equipment during operation. Specifically, techniques are developed, to watch the condition of sensors and their associated instrument channels while the plant is working. Historically, process instrumentation channels are manually calibrated at each refueling outage. This strategy isn't optimal because the sensor conditions are checked periodically; therefore, faulty sensors can operate unnoticed for periods up to the calibration frequency if not detected by other surveillance tasks. Additionally, periodic maintenance strategies cause the unnecessary calibration of instruments that are operating correctly which may end in premature aging, damaged equipment, plant down time, and improper calibration under non-service conditions. Input circuits contains fire sensor. It is input to the fault detection system, RYB detection system. The output circuit are going to be given control based indications to point that fault has occurred within the system this technique also will facilitate continuous monitoring of the economic plant.**

keywords - **Induction motor, PCB, PLC, CT & PT, Rectifier, Regular.**

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I. INTRODUCTION

In an electrical power grid, a fault is any abnormal flow of electrical current for instance a brief circuit may be a fault during which current flow by passes the traditional load. In three phase systems, a fault may involve one or more phases and ground, or may occur only between phases during a "ground fault" or "earth fault", current flows into the world the potential short current of a fault are often calculated for power systems. In power systems, protective devices detect fault conditions and operate circuit breakers and other devices to limit the loss of service thanks to a failure. An induction or asynchronous motor is an AC motor during which the electrical current within the rotor needed to supply torque is obtained by electromagnetic induction from the magnetic flux of the stator winding. An induction motor therefore doesn't require mechanical commutation, separate-excitation or self-excitation for all or a part of the energy transferred from stator to rotor, as in universal, DC and enormous synchronous motors. An induction motor's rotor are often either wound type or squirrel-cage type during this project, the faults are detected and after clearing those faults motor get auto activate which depends on temporary or permanent faults. There are one PLC is employed to detect the faults like short and over/under voltage and switch off motor. Relays are wont to operate supply to modify off load just in case of short .

II. OBJECTIVES
     a) Reduction in supply recovering time & fault finding time.
     b) Proper working and protection of three phase induction motor. If short is there then it isolate the healthy a part of circuit.

III. METHODOLOGY
3.1 Block diagram

Fig. 3.1 : Diagram Representation PLC
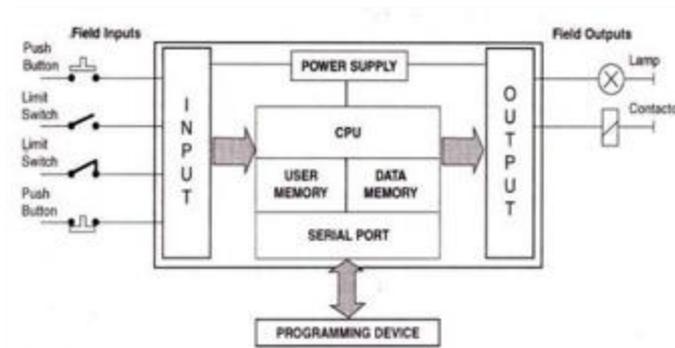
PLC can also be wont to maintain and adjust the assembly program by editing or modifying the peripheral equipment's

(personal Computer/handheld programming panel). The common program language of PLC is ladder diagram. There are stronger functions in PLC with the event and application requirements of electronic technology, like position control, network and etc. Output/Input signals are DI (Digital Input), AI (Analog Input), PI (Pulse Input), DO (Digital Output), AO (Analog Output) and PO (Pulse Output). Thus PLC plays a crucial role within the feature industry during this study, the PLC measures the present the voltage, the temperature, the vibrations and therefore the speed of an induction motor through analog inputs. Moreover, it persistently screens the inputs and initiates the initiates the output as stated by the ladder logic program which is meant to alert the user if any faults occur during the operation of the induction motor.

IV. EXPERIMENTAL SET-UP
4.1 Induction Motor
4.1.1 Introduction
The three-phase, squirrel-cage induction motor normally consists of a stator, a rotor, and two end shields housing the bearings that support the rotor head. In induction motor stationary part is understood as stator and rotating part is understood as rotor.

4.1.2 Construction
 The three-phase squirrel-cage induction motor can, and lots of times does, have an equivalent armature (stator) winding because the three-phase electric motor. As within the electric motor, applying three-phase currents to the armature creates a synchronously-rotating magnetic flux .

Fig. 4 1.2 : Cross Section of Induction Motor
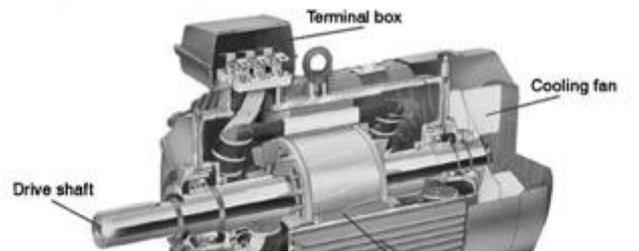
4.2 Diagram Of Automatic Fault Detection And Protection Of I.M.

In this automatic fault detection and protection system, three phase auto-transformer is employed to offer the availability voltage to the induction motor. to scale back the voltage level there's potential divider circuitry is applied and input required to PLC should be DC. Hence there's rectifier circuit is employed to convert AC to DC. Switches are connected in between the lines to make the manual fault which are Line-to-Line.

Fig 4.2.2 : Real Project Image In Running Condition

4.3 Circuit diagram Explanation

Fig. 4.3 : Circuit diagram of PLC
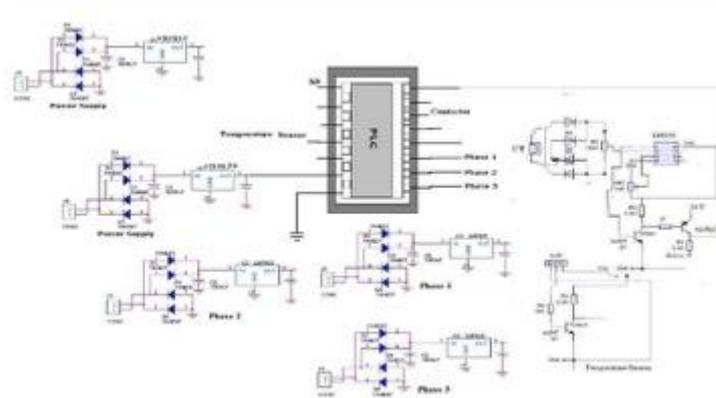
4.3.1 Design Of Control Power Supply With PCB Diagram

A three phase rectifier wont to convert ac supply to the dc in two different voltage levels of 5V and 12V as shown in Figure. phase star-delta transformer is employed to convert 230V/12V. Capacitor filter is employed to get rid of the ripples from the rectified output of the rectifier. Moves are wont to protect transformer winding from over voltage. The fixed voltage regulators 7805 and 7812 are wont to convert the rectifier output of the rectifier to fixed 5V dc and 12 V dc. Fig. shows 5V and 12V DC Power Supply Circuit PCB.

Fig 4.3.1 : Power Supply diagram

4.4 Power supply design

Power supply is that the first and therefore the most vital a part of our project. Following basic building blocks are required to get regulated power supply.

4.5 HARDWARE IMPLEMENTATION
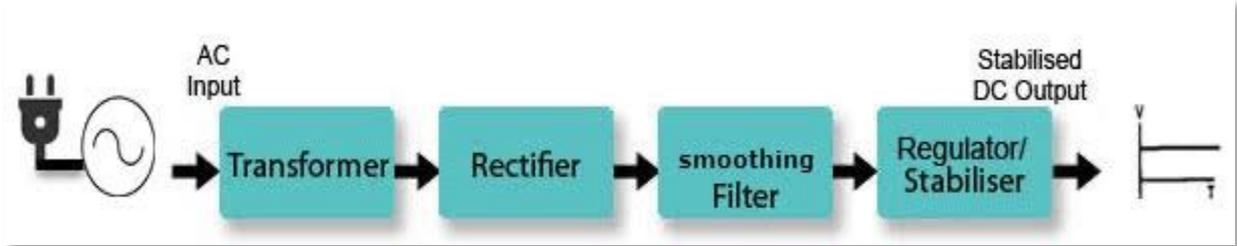
a) PCB Design

• Introduction to computer circuit Board :

Printed circuit board pattern applied to at least one or each side of an insulating base, depending upon that, and it's called single sided PCB or double Sided PCB. Conductor materials available are silver, brass, aluminum and copper, copper is that the most generally used which is employed here also the thickness of conducting material depends upon the present carrying capacity of the circuit.

4.5.1 The computer circuit Board usually serves three functions :

• It provides mechanical support to the components mounted thereon. It provides necessary electrical interconnection.
• It acts as conductor i.e. it provides a conduction path resulting in removal of most of the warmth generated within the circuit.

b) Copper (Cu) Clad

The base of laminate is either paper of optical fiber cloth Cu foil, which is produced by the tactic of electroplating, is placed on laminate and both are kept under hydraulic pressure for correct adhesive pressure for correct adhesive. These Cu clad are easily available within the market.

V. CONCLUSION

Speed control and protection of induction motor is achieved and therefore the operation is extremely reliable, sufficiently high efficient. Without changing in any hardware connection just by simply changing the program within the PLC; the motor are often made to run certain any duration of your time. Induction motor this technique not only reduces the starting current to a limit, but also develops high starting torque which is required in many of the induction motor applications. This will be applicable to run the lift, by changing the logic during a program and it also can be used for any industrial applications. Programmable Logic Controllers (PLC) are widely utilized in industrial control because they're inexpensive, easy to put in and really flexible in applications. A PLC interacts with the external world through its inputs and outputs.

VI. FUTURE SCOPE

i) In next some years GSM service are often added during this system to understand consumer, when fault occurred.
ii) The fault is automatically detected but by extending this we will automatically clear the fault in future.

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