Selfhealing protection system of induction motor by using PLC

Ms.Bhagyashree S. Bhosale[1], Mr. Mohit V. Burad[2], Mr. Ajay B. Chavan[3]

[1,2,3]Electrical, Late G. N. Sapkal College OfEngg. (INDIA)

ABSTRACT

Protection of a press machine against possible problems, such as overvoltage, over current, overload, over temperature, and under voltage, occurring in the course of its operation is very important. Because it is used intensively in industry as an actuator. IMs can be protected using some components, such as timers, contactors, voltage and current relay. This method is known as the classical method i.e. very basic method and involves mechanical dynamic parts. Computer and programmable integrated circuit (PIC) based protection methods have eliminated most of the mechanical components.

However, the computer-based protection method requires an analog-to-digital conversion (ADC) card, and the PIC – based protection method does not visualize the electrical parameters measured.

In this proposed method for IMs, a new protection method based on a programmable logic controller (PLC) has been introduced in this method, all contactors, timers and the conversion card are eliminated. Moreover, the voltages, the current, the speed, and the temperature values of the motor, and the problems occurred in the system, are monitored and warning messages are shown on the computer screen. This PLC- based protection method costs less, provides higher accuracy as well as safe a visual environment compared with the classical, and the PLC- based protection systems.

Future scope of this project is SCADA stands for Supervisory Control and Data Acquisition. 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.

Keywords: **Programmable integrated circuit, Programmable logic controller, Supervisory control and data acquisition system**

I.INTRODUCTION

There are many problems in industrial production and manufacturing such as over current, over voltage and temperature rise. In previous work of industries conventional methods are used. In conventional methods IMs can be protected using some components, such as timers, contactors, voltage and current relay. This method is known as the classical method i.e. very basic method and involves mechanical dynamic parts. the purpose of our paper is protectIMs automatically by using PLC. The contribution of paper isfor superior reliability, reduced machine downtime, Reduced maintenance cost, Prevention from fault,to improve performance of the machine,to reduced fault,to increased accuracy and temperature control.

II.WORKING

In our paper we are using PLC(programmable logic controller) for controlling and detecting the variation of current , voltage and temperature of induction motor. The process of project is such as a three phase supply is given to the machine . there three current sensor, one voltage sensor and one temperature sensor. When a three phase supply is given to machine , then any of three phase the current variation like increasing in current value above the set value , then the PLC detect that type of excess current and immediately control the current . There also a potentiometer is used to check the under voltage or below set value voltage. If the voltage is increased above the set value of below 170V (volt) tyen a by pass supply is provided through the SMPS(switched mode power supply). The main moto is the continuous production of industry without interrupting supply . When a heavy current flow then without tripping if machine PLC will sense the current and correct the current value and production will become continuous.

The PLC is branded PLC of SIEMESNS company. The siemens PLC has very simple programming for the correction of programme. We are selecting this for the industry for the less time consuming and the no special person is required for programming. The monthly consumption of industry for single motor can be possible. The data can be store by using SCADA .

The data will be available for monthly also. A continuous consumption can also be also seem.
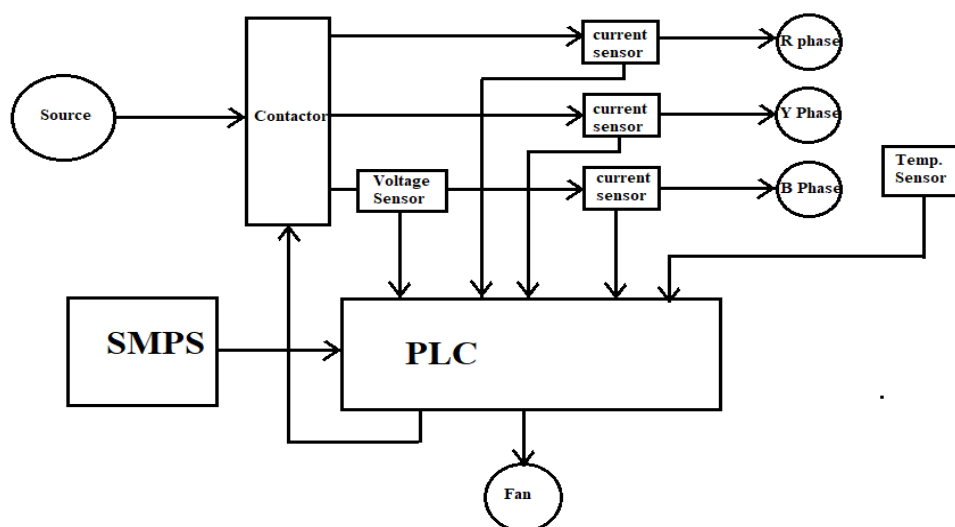

FIG (1) BLOCK DIAGRAM OF SELF HEALING PROTECTION SYSTEM OF INDUCTION MOTOR BY USING PLC
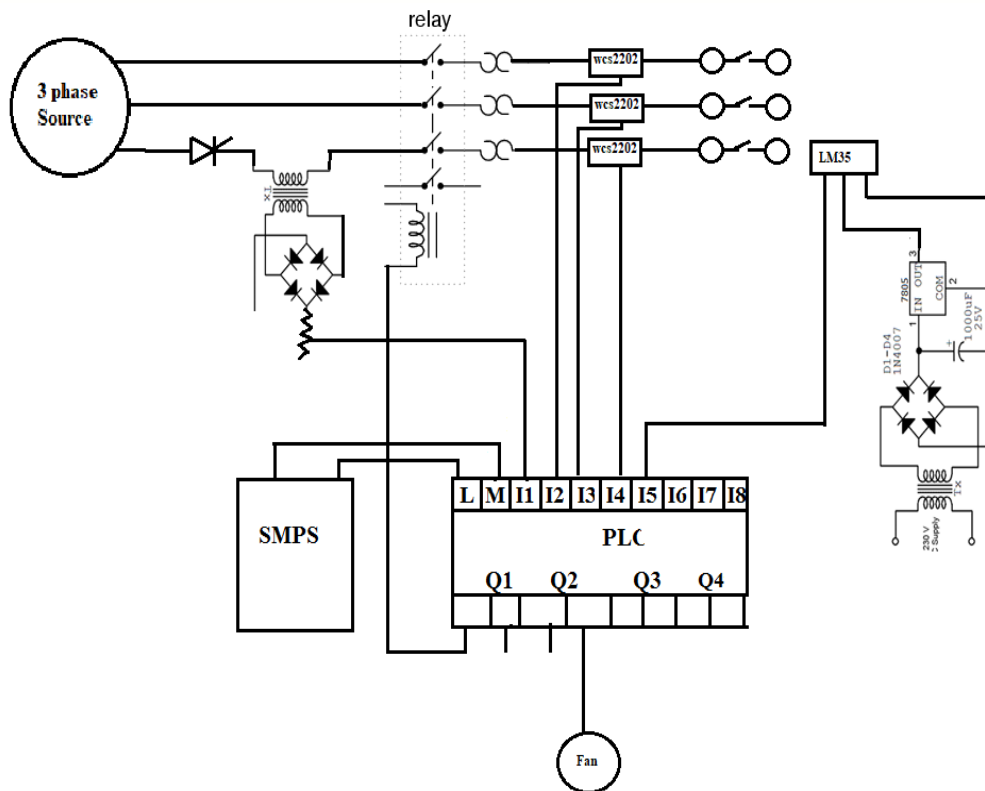
FIG (2) CIRCUIT DIAGRAM OF SELF HEALING PROTECTIONSYSTEM

III. LIST OFCOMPONENT

I.Programmable Logic Controller(PLC) – SIEMENS LOGO

II.Switch Mode Power Supply(SMPS) -24v

III.Transformer – 9V

IV.Diode

V.Pot-10K

VI.Relay (Electromagnetic Relay)-24V(DC)

VII.Current Sensor – (WCS2202)

VII.Temperature sensor – (LM-35)

VIII.Fan

IX.Switch

X.Induction motor

IV.SENSORS

The sensors are the devices that are useful for gathering the information at the point of activity such as over voltage, over current and temperature rise .

V. THE VARIOUS TYPES OF SENSORS SUCH AS;

1) WCS2202

The WINSON WCS2202 provides economical and precise solution for both DC and AC current sensing in industrial commercial and communication system

This current sensor built in AC to DC rectifier circuit so you can directly connect this sensor to your PLC for measuring AC current

2) LM35 (Temperature sensor)

LM35 is Linear temperature sensor module

This sensor can be used to detect ambient air temperature

3)   FEATURES OF LM35

Functional range = 40 to 150 $^{\circ}C$

Sensitivity = 10 mV Output voltage proportional to temperature

Output voltage proportional to temperature

VI.FACTORS AFFECTING PERFORMANCE OF MOTOR

1. **Induction motor are affected by largely various parameters such as:**
2. **Voltage**
3. **Current**
4. **Frequency**
5. **Temperature**

VII. SHUT DOWN OF PROCESS CAUSES

Lost of production time

1. **Increase maintenance cost**

2. **Waste of raw material**

3. **Large financial losses**

4. **Bad quality of product**

VIII.ADVANTAGES OF PROJECT

1. Fast process
2. Increase accuracy
3. Safe operation
4. Less running cost
5. Reliability
6. Flexibility in programming and reprogramming
7. Cost effective for controlling complex system
8. Ability to communicate with the computer in running plant
9. Easy to troubleshooting
10. Less power consumption.

IX.LIMITATION

1 Skilled Staff Required For Operation Of The Syste

2 Programming Softwares Are Required

PROPOSED METHOD

1 In this proposed method for IMs, a new protection method based on a programmable logic controller (PLC) has been introduced

2 This PLC- based protection method costs less, provides higher accuracy as well as safe a visual environment compared with the classical, and the PLC- based protection systems.

X.CONCLUSION

Speed control and protection of induction motor is achieved and the operation is very reliable, sufficiently high efficient. Without changing in any hardware connection just by simply changing the program in the PLC; the motor can be made to run in for any duration of time. This system also used for one of the starting method of three phase slip ring Induction motor this system 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.

As discussed it is possible to use PLC for motor protection as well as for de-rating indication by visual or audible alarm by assigning digital output. This is possible using analog input card for PLC. Another advantage is the parameters can be recorded to get details of parameter trends also. The trends are available using SCADA software and are useful for future analysis and production planning.

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