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AUTOMATION AND PROTECTION OF INDUCTION MOTOR BY USING PLC

Ms. Bhagyashree S. Bhosale[1], Mr. Mohit V. Burad[2], Mr. Ajay B. Chavan[3], R N Baji[4]

[1,2,3]students, Department of Electrical Engineering, Late G. N. Sapkal College of Engineering, Nashik Maharashtra, India

[4]Professor, Department of Electrical Engineering, Late G. N. Sapkal College of Engineering, Nasik, Maharashtra, India

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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 system.*

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

1. 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 protect IMs automatically by using PLC. The contribution of paper is for 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. General purpose applications of induction motors include pumps, conveyors, machine tools, centrifugal machines, presses, elevators, and packaging equipment. On the other hand, applications in hazardous locations include petrochemical and natural gas plants, while severe environment applications for induction motors include grain elevators, shredders, and equipment for coal plants. Additionally, induction motors are highly reliable, require low maintenance, and have relatively high efficiency. Moreover, the wide range of power of induction motors, which is from hundreds of watts to megawatts, satisfies the production needs of most industrial processes. However, induction motors are susceptible to many types of fault in industrial applications.

1.1 Objective

- Far superior repeatability.
- To reduced machine downtime.
- To reduced fault and increased accuracy
- Producing good quality product.
- To increase industrial profit.
- Operating time is reduced.
- Continuous production.
- To increasing the production rate.

1.2 problem Definition

Protection of a press machine against possible problems, such as

1) Over current,
2) Overload
3) Over temperature
4) Over voltage

- Occurring in the course of its operation is very important.
- 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.

2. LITERATUR SURVAY

2.1 History

Sujith John Mathew, B Hemalatha[1] designed an alternative method to prevent the failures that happen in induction motors using a Programmable Logic Controller (PLC) and sensors to measure the different parameters related to induction motors such as current, voltage, temperature, speed, and vibration. All these parameters are constantly monitored with the help of SCADA during the operation of the motor and if any faults were to occur, there will be change in one or more parameters by which we can take the necessary precautions thus preventing damage to the induction motor. The voltage and current measurement is done using a voltage transformer and a cur-rent transformer respectively. These analog values are now sent to the analog inputs of the PLC. For temperature measurement, a LM35 sensor is used to send the analog input of the PLC.A protection system has been designed for safeguarding induction motors against all possible faults. If any fault occurs, a cautioning message shows up on computer and afterward the motor is halted. Avinash Kumar, SK Biradar, Dipti Roy[2] suggested that a PLC can be associated for motor protection and de-rating indication and control apart from regular automation function so as to have overall control of process and keeping healthy condition to reduce breakdown time. Any number of motors can be monitored for unbalance, low or high voltage along with current and respective temperature which are used in process. The voltage and current will be sensed by line sensor i.e. CT / PT and given to interface card. The interface card contains the operational amplifier based circuit which converts it to compatible signal level for A/D converter module or card of PLC as per industry standard. It will then have interpreted by PLC to take appropriate action as per ladder program.

2.2 Existing Problem in Plant

2.2.1 OVER CURRENT

Over current or excess current is a situation where a larger than intended electric current exists through a conductor, leading to excessive generation of heat and risk of fire or damaged to equipment.

2.3.2 Over Voltage

When the voltage in a circuit or part of it is raised above its upper design limit, this is known as over voltage. The condition may be hazardous. Depending on its duration, the overvoltage event can be transient – a voltage.

2.3.3 Over Temperature

A temperature that is significantly higher than that encountered in normal operation over temperature is a temperature which is greater than a specific magnitude which will be causes damaged to the machine or meteorite performance of machine.

3. PROPOSED METHOD

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

In this method, all

1) Timer

2) Conversion card is 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.

3.1 Block diagram

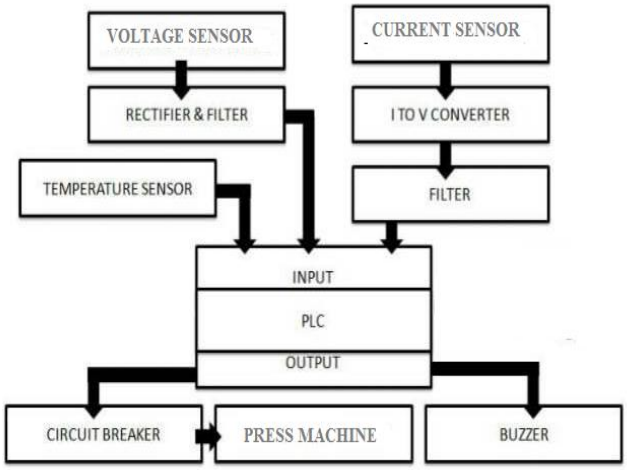

Fig No 1 Block Diagram

3.2 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 sensors, 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) then a bypass 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 centimes.

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 .

3.3 Flow Diagram

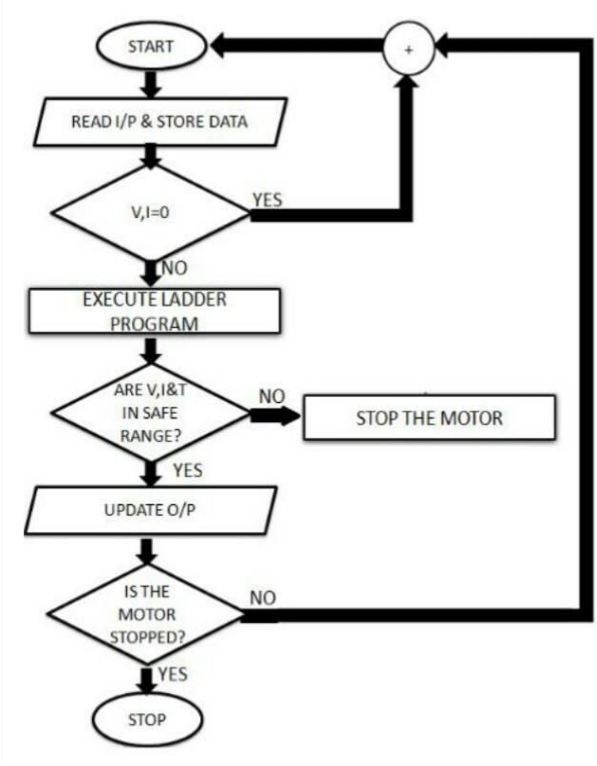

Fig No 2 Flow Chart

4. APPLICATIONS

1. Increase accuracy
2. Reliability
3. Flexibility in programming and reprogramming
4. Cost effective for controlling complex system
5. Ability to communicate with the computer in running plant
6. Easy to troubleshooting
7. Provides safe and visual environment
8. Less man power required

5 CONCLUSION

The aim of this paper is to develop a system to 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.

6 FUTURE SCOPES

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.

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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