

THREE PHASE APPLIANCE DEFENDER WITH PLC

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Abstract - Earlier in many industry the appliance which were operational on three phase supply where provide with 3 phase illumination each correspond to dissimilar phases. There was no automatic system at that time and was done manually. In order to prevent the losses, we should use three phase appliances protection system which works on PLC. One PLC can protect many expensive appliances making it economically beneficial. In most of the industries, three phase power supply is used. But sometimes due to some reasons, one of the supply out of three phases turn out to be defective. Many of our expensive utilisations need three-phase AC supply for process.

Keyword--PLC, SCADA, Transformer, Rectifier, Regulator IC (LM 7812), Filter, PLC, Relay, and Contactor etc

I. INTRODUCTION

Disappointment of a few of the phases makes the electrical device level to unpredictable implementation and may smooth show the way to stoppage. Hence it is of dominant importance to retain an eye on the ease of use of the three-phase supply and detach the domestic device in the occurrence of downfall of one or two phases. The power to the electrical device should resume with the availability of all phases of the supply with certain point in time delay in order to circumvent surges and short-lived fluctuations. The complete explanation of a three phase electrical trick protector is described here. User lines coupled to power supply lines can be cut off there from by a discrete switch. A segregation rectifier circuit associated across the each phase with operational relays. Efficiency of the rectifier circuit forbidden by a PLC and from side to side that ladder logic operate the switch.[5]

In advance days many manufacturing the appliance which were functioning on three phase supply where provide with three phase illumination each represent R Y B phases. If any of the phase supply out of three phases would have got distressed or off. Wherever this situation occurs the operative had to button down the main supply. There was no automatic system at that time was done manually. Then there was introduction of Microcontroller which used to work automatic and switch off the main power supply whenever such above abnormal

Condition occurs but the microcontroller rather expensive and each every three phase appliance has to be equipped with separate microcontroller those making system are expensive. In order to prevent these losses, we should use three phase appliances protection system which works on PLC. Many variety of electric protection system are available in market, but for every appliance we have to install special equipment. But in case of PLC, there is no need of such thing. Even one PLC can protect many expensive appliances making it economically beneficial.[1]

A Programmable Logic Controller, PLC is a digitally computer used for automation of electromechanical processes, such as control of apparatus on sweatshop assemblage lines, amusement rides, or light fixtures. PLCs are used in many engineering and technologies. Unlike general-purpose processors, the Programmable Logic Controller is arranged for abundant assistances and output programs, prolonged high fever ranges, immunity to electrical sound, and confrontation to throb and result. A Programmable Logic Controller is an sample of a hard real scheme subsequently production outcomes necessity be shaped in response to effect conditions intimate a restricted time, then inadvertent process will outcome.[2][4]

II. LITERATURE SURVEY

A scheme founded on Programmable Logic Controller and formation software and the SCADA power distribution monitoring system & its scheming. The scheme uses Programmable Logic Controller to gather numerous brainy tools on position and electrical limitations of plans. They will be uploaded to the monitoring scheme by the alteration through the sequential server. The preparation plan processes Fame View monitoring conformation software to achieve data real-time act and position display for field device through preparation pictures. The rumours, folder, curves, and other schemes can also be combined so as to help query past data. The repairing and consecutively experimentations demonstration that the system is considered by easy process, constancy and safety which help in achieving the design objectives.[1][2][3][4]

III. BLOCK DIAGRAM

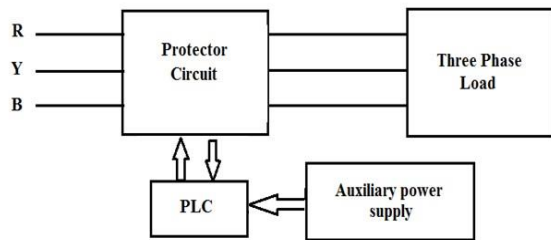


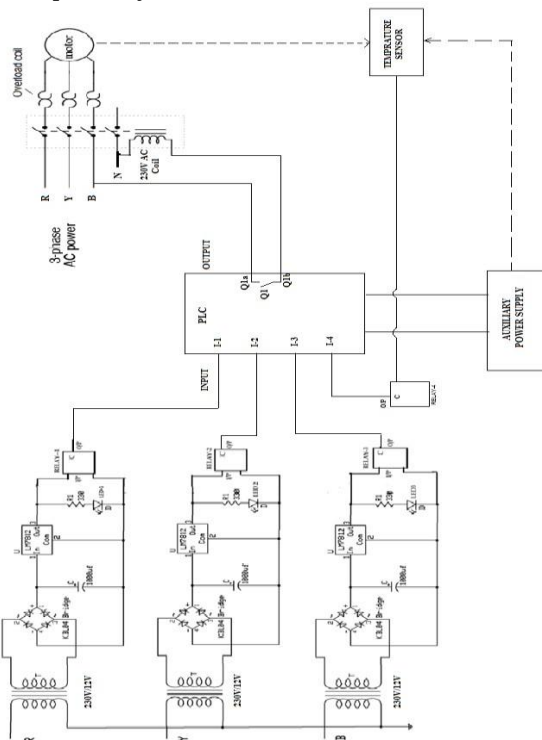
Fig.3.1 Block Diagram

In Fig 3.1, The Protector circuit is supplied with three phase R, Y & B. Protector circuit comprises of transformer, rectifier, filter, PLC, Relay, & contactor which in turn is connected to a three phase load. Auxiliary supply provides supply to the PLC, Relay, and Contactor. If any abnormal condition arises, PLC will try to arrest the fault in minimum possible time. In actual fault condition PLC will actually protect the connected load.

IV.CIRCUIT DIAGRAM

4.1 Circuit Diagram-

As show in the Fig 3.1, three separate step down transformer is connected to individual single phase supply i.e. R, Y & B respectively.



4.1 Circuit Diagram

The output of each transformer is connected to rectifier. Rectifier's output is connected to filter circuit. Input of regulated IC LM7812 is taken from filter output. The output of regulated IC is given to relay coil. Output of relay is taken from

the common point of relay which is given to PLC's input in I_1 , I_2 and I_3 . LED's are connected in parallel.

A temperature sensor is used to sense the temperature of motor. Auxiliary supply is used to switch 'ON' the PLC & temperature sensor. The output of temperature sensor is connected to relay & the common point of relay is given to PLC's I_4 as input. The output of the PLC is associated to the coil of the contactor. Once the coil gets exciting contactor becomes 'ON' and then we can become the output from the contactor to load.

V.WORKING

Working:-

The three phase application protection using programming logic controller (PLC) is used to protect the three phase applications by checking the abnormal conditions arising in the three phase supply and due to temperature. While taking the action to protect the application, the system switches off the circuit to remove the three phase load from the supply. The fig. 3.1 shows circuit diagram of three phase application protection system using PLC. In protecting circuit, we have transformer, rectifier, regulator IC (LM 7812), filter, PLC, relay, contactor etc.

A three phase supply R-Y-B inputs are given to each single phase inputs of three different transformers which are of ratings 230V/12V, 750mA each. The bridge rectifier circuit is connected to the output of the transformer to convert the AC supply into DC supply which gives 12V DC output. The capacitor filter is used to remove the ac harmonics which are present in the DC output of the rectifier circuit. The regulator IC 7812 is connected in series with the circuit which is used to regulate constant 12V DC output voltage in the system. The three LED lights and resistance are connected in parallel with each three phases to show the phase indication of power. The R-phase is connected to relay coil in relay RL1, Yphase is connected to relay coil in relay RL2, the B-phase is connected to relay coil in relay RL3. The relays 'NO' point is commonly short circuited and 12V DC input is connected in 'NO' point. The relay common points are given as an inputs to PLC i.e. I_1 , I_2 , I_3 , I_4 which gives Q_1 as an output. The PLC in working condition with input logic " I_1, I_2, I_3 and $I_4 = 1$ " gives output " $Q_1 = 1$ ". If the conditions are not satisfied the output " Q_1 will be equal to 0". The point Q_1 acts as a switch in two points Q_{1A} and Q_{1B} . The Q_{1A} is connected to the contactor coil and Q_{1B} is connected to 230V AC supply. The operation of the contactor is to switch ON or switch OFF the circuit. If the output obtained is 1 ($Q_1=1$) then the contactor gets ON and if the output is 0 ($Q_1=0$) then the contactor gets OFF.

VII. ADVANTAGES AND DISADVANTAGES

- 1) The main benefit of this security circuit is that it defends three-phase appliances from let-down of

any of the stages by separating the power supply through the contactor and automatically restores the three-phase supply to the appliance when all the stages are available.

- 2) Operating time of PLC is very less, which ultimately results in timely protection of devices during fault conditions.
- 3) It also works as R-Y-B phase cable wireless identifier i.e. helps in determining in which phase fault occur.
- 4) A single PLC can protect more than one machine thus making it economical & profitable.
- 5) A PLC system requires comparatively less space as compared to other protective system and hence is portable to use.

VIII.APPLICATION

- 1) A 3 ϕ appliance protector system using PLC can be used in waste water treatment plants, smoke house control plants, air compressors system, textile industries equipment, condensation control, wet well pump plant control, car wash house etc.
- 2) Many expensive machines like CNC machine, Lathe Machine, milling machine are used in various industry.
A 3 ϕ appliance protector system using PLC installed at such sites can help protect machinery efficiently with minimum maintenance cost thus making it economical as compared to other protection system.
- 3) At larger construction sites large number of water pumps are used for pumping water from ground to a greater height. Such sites are prone to various electrical faults due to various construction activities. In such conditions a 3 ϕ appliances protector system using PLC can be effectively used to protect the motor. Thus single PLC can replace the large protection circuitry resulting in reduction of size of overall system.
- 4) A PLC can be used for full plant mechanisation together with prominent auto-operation of refrigeration fan control, oil level control, and automatic start/stop of pump, transformer oil leakage control, and additional(replacement) of Buchholz relay by pressure sensor control, start/stop of auxiliary systems, and protection condition. In such sensitive submissions a 3 ϕ appliances protector system interfaced with PLC can provide higher degree of protection so that minimum losses are caused during faults.

IX.Result

1. In this project the protector circuit can protect three phase appliances from failure of any of the phases by disconnecting the power supply through the contactor.

2. Automatically restores the three-phase supply to the appliance when all the phases are available.
3. The fault finding and restoring of supply is made within a few second.
4. Various functions and controls can be achieved by programming the PLC.

X.CONCLUSION

The assessment scheme well-thought-out in the project is worked obtainable for the finest protection for the three phase utilization in absenteeism of every of the phase. The main dispassionate of this prospective protector is to preserve the efficiency of the application which we use with the three phase supply. The 3 pole contactor locking assures the presence of all the three phases. Due to any erratic action taking place there will be absence of any of the phase results in the un-locking of the 3- pole contactor with a quick fast off sound. This protector circuit would be beneficial to defend the applications and at the same time it would reduce the frequent money lending in fault occurrence or failure of the appliance.

XI.FUTURE SCOPE

This project can be used to protect number of three phase appliances in industries simultaneously to avoid fault such as Overload, Short Circuit, and single phasing which occurs in three phase appliances.

The modifications may be made to the model using SCADA & MATLAB programming for a more efficient controlling of faults. For visual and alarm system we can use SCADA (Supervisory Control and Data Acquisition) system. Also this project can be made proficient by using MATLAB software. MATLAB can be effectively used to deploy the conditions for various fault occurrences & thus most of the faults can be avoided through programming. Also simulink model of MATLAB can be effectively developed to test the model efficiency for various three phase loads.

Hence by using the advances techniques like SCADA, MATLAB etc. the developed model can be put to more effective use, for different load.

Functions other than control like continuous monitoring, data recording, instrumentation and protections can also be performed. For remote process, communiqué with PLC can be achieved. For nonstop intensive care purpose, a individual processer can be interfaced with PLC and non-stop data can be recorded regularly.

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