

Advance Protection for Three Phase Loads

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Abstract— This Project tends to develop for protection of three phase induction motor from single phasing, phase reversal, over voltage and under voltage. Due to this electrical fault the winding of motor get heated which lead to insulation failure and thus reduce the life time of motor. This fault is generated in induction motor due to variation in induction motor parameters. When three phase induction motor runs continuously, it is necessary to protect the motor from these anticipated faults. Three phase induction motor generally directly connected through the supply, if the supply voltage has sag and swell due to fault the performance of motor is affected and in some cases winding is burned out. When phase sequence (RYB) is reversed due to wrong connection then motor start rotating in another direction, if supply system has only one phase and other phase is disconnected then it is single phasing problem.

Key words: Fault, Over-Temperature, Over-Current, Over-Voltage, Microcontroller, LCD Screen

I. INTRODUCTION

In three phase induction motors and load when there is any fault in a single phase the motor will draw more current in other two phases and will supply reduced amount of load power. So as the efficiency of the system is decreased it is not economical to operate the load in this condition. So we design a system called single phasing preventer which will disconnect the load when there is fault in any of the phases. In this system Programmable OP-amp is used to measure all the three phase voltages and the output is then given to the driver IC. Controller circuit will acquire all the data and its algorithm will enable it to observe whether the load should be connected or not. If not then it will give the indication of the faulty phase on the LED so the maintenance person can easily resolve the problem. To measure the VOLTAGE we are using Potential transformers, here 230v/12-0-12 transformer is used and this transformer will give output in the form of voltage depends upon the load.

II. FAULT IN THREE PHASE DEVICES AND THEIR CAUSES

A. Over voltage:

In overvoltage protection system of 3 phase induction motor, protects the motor from overvoltage, the voltage which is higher than the rated voltage. In circuit diagram of overvoltage protection it consists the comparator which compare two voltages one is supply and another one is drop across the variable resistance. When the voltage drop across the variable resistance is higher than specified value then comparator generates signals. This signal is fed to microcontroller and microcontroller takes the appropriate action.

B. Overheating:

In under voltage protection of 3 phase induction motor provides the protection from the under voltage. When supply system has low voltage than the rated of induction motor then under voltage protection section of protection supply is provided to motor. Single phasing works. It has same concept as overvoltage it also has comparator which compare two voltage one form supply and another from the voltage drop across the variable resistance. When voltage drop across the variable resistance is lower than specified value, this signal sends to microcontroller and microcontroller stop the operation of motor in the case of running and fails to operate in case of starting.

C. Single phasing:

In single phasing protection to 3 phase induction motor, if other two phases is faulted and only one protection of motor section starts functioning. Generally in single phase supply voltage is lower value than specified value. On this value of voltage motor is unable to start. Comparator which compares single phasing supply voltage and rated specified voltage, and single sends to microcontroller and microcontroller generates single which stop the motor if motor is running and does not allow to motor start in case of standstill. Sometimes single phasing protection looking much motor important when the motor is tight which important function like furnishing, pump driving and crane driving etc.

III. PROPOSED SYSTEM

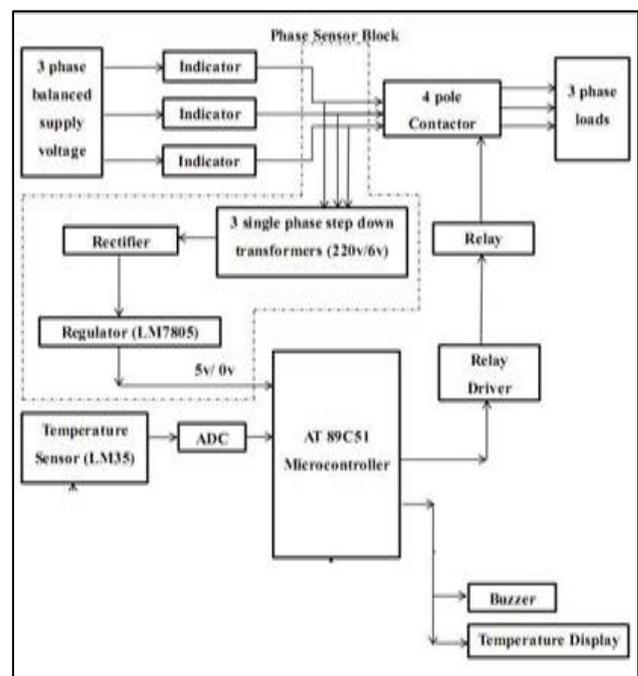


Fig. 1: Block Diagram of Fault Monitoring and Protection of Industrial Load

Fig 1 shows the block diagram of fault monitoring and protection of industrial load. The 12 v dc supply is given through adapter to the GSM modem also this 12 v dc is converted into +5v dc through voltage regulator IC LM 7805 to the microcontroller. Three single phase step down transformer are connected to the three phase respectively, the 230 volt Ac is converted into 12 Ac, and converted into Dc and fed to the microcontroller through comparator.

IV. HARDWARE DESCRIPTION

A. PIC microcontroller 18F2520

Microchip's 18F2520 8-Bit Processor. 32K of program space and 25 I/O lines, 10 of which are 10bit Analog to Digital converter capable. Runs up to 40MHz in conjunction with the internal PLL and an external 10MHz crystal, or can also be run up to 20MHz with an external 20MHz external crystal. Internal 8MHz oscillator the microcontroller like counting external pulses, interrupting the execution of the program according to external events, performing serial data transfer or connecting the chip to a computer to update the software. Each port has 8 pins, and will be treated from the software point of view as an 8-bit variable called 'register', each bit being connected to a different Input /Output pin.



Fig. 2: PIC microcontroller 18F2520

B. LCD Display



Fig. 3: LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LCDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom character (unlike in seven segments), animation and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data [4].

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling

display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

V. ADVANTAGE

- 1) Provide the smooth running of motor improves its lifetime.
- 2) Protection of three phase induction motor from over voltage, under voltage.
- 3) In three phase induction motor when running at rated voltage, faults are not generated.

VI. FUTURE SCOPE

The detection of the under voltage fault and disconnection of a faulty section or apparatus can be achieved by using over load relay in conjunction with circuit breakers. It performs both detection and interruption functions automatically but its use is limited for the isolation of motor from supply during high negative sequence current when under voltage will occur. The combination of PLC and VFD is thus used for getting continuous running of the motor even under conditions of under voltage with Reduced Space, Energy saving, Modular Replacement, Easy trouble shooting, Error diagnostics programmer, Economical, Greater life and reliability, the Compatibilities of PLC'S, Logic Control, PID control, Operator control, Signaling and listing, Coordination and communication. Here in this research, controlling a single motor with the combination of PLC and VFD is proposed. In future this can be extended to control more number of motors with the single PLC. Also we can monitor and control the operation of motor through remote operation in Human Machine Interface (HMI) with Programmable Logic Controller (PLC).

VII. RESULTS

Hence when we run this project successfully worked and we found below output result when voltage of phase a is under the rated limit the contactor open and trip the circuit instantly and LCD shows a fault which occurs in the system and protect the induction motor from damaging.

VIII. CONCLUSION

Due to daily increased load of power system it is important to maintain system Reliability. As transformer plays important role in power system by maintaining reliability it is important that we should keep transformer from daily fault occurring in it just by observing its key parameter so that such fault cannot result in bigger failure also apart from these sharing of data information is also essential using new technology at reduced cost . System to expert systems can be used to achieve all the parameters test and analysis of automation every system is automated in order to face new challenges in the present day situation. Automated systems have less manual operations, so that the flexibility, reliabilities are high and accurate. Hence every field prefers automated control systems. Especially in the field of electronics automated systems are doing better performance.

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