SINGLE PHASING PREVENTER FOR THE 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.

Keywords : Induction motor, Micro Controller, Protection.

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.

In India there are so many industries in different fields. For example steel sector, Oil sector, Irrigation etc., All industries have many drives and equipment's like conveyor belts, pumps, Mills etc., All the drives of industries use electrical motors. Most of the electrical motors are designed for three phase, 50Hz (in India) supply. These three phase motors are less expensive than starting of DC motors. Starting of AC 3-phase induction motors is less expensive than starting of DC motors as they require simple D.O.L or Star/delta starters. D.O.L or Star/delta starters generally have only over load protection. Three phase induction motors are very sensitive and get damaged, when they are subjected to Single phasing. For three phase induction motor, it is necessary that all the three phases of supply should present. While it is on load when any one of the fuse goes out, or missing, the motor will continue to run with two phases only, but it will start drawing a huge current for the same load. This high current may run the motor unless switched of immediately. A single phasing preventer avoids such a mishap with this circuit, the motor will not run unless all the three phases are present. In this context we need to design a preventer which prevents these mishaps and protects the costly motor under such conditions. The single phase preventer designed is very less expensive and protects reliably the motor which is very costly.

Three phase induction motor generally suffers from under voltage, overvoltage, overheating, single phasing and phase reversal problems. When the three phase induction motor supply with higher voltage than is rated then induction motor starts overheated. In our project a variable resistance is used when supply voltage is lower than rated then voltage drop across the resistance is higher than it protects the motor from this fault. When supply voltage is lower than voltage drop across the resistance is lower than specified value and motor fails to start. When supply is only one phase, this is single phasing problem and supply voltage fall the rated and once again motor fails to start. In the case of motor overheating a LM sensor is used which sense the temperature of winding if it is exceed the specified limit then once again motor fails to start. It is highly desired that 3 phase induction motor works freely from these all types' of faults. Details description of all types of faults is given below.

1.1. OVERVOLTAGE PROTECTION

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 résistance is higher than specified value then comparator generates signals. This signal is fed to microcontroller and microcontroller takes the appropriate action.

1.2 UNDER VOLTAGE PROTECTION

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 résistance. 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.

1.3 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. This fig.4 show the typical single phasing condition in three phase induction motor where one phase break down and motor is only supplied by remaining phases which is equivalent to single phasing condition. Single phasing occurs as a result of several possibilities. A loose wire, a bad connection, bad starter contacts, overload relay problems, a bad breaker, a blown fuse, and other things can cause this destructive condition. Obvious signs are a louder than normal humming from the motor and/or a shaft that vibrates rather than rotating.

1.4 OVERHEATING PROTECTION

Overheating protection of motor means protect the motor from overheating of its winding. This overheating in motor is generally caused by overloading of motor, bearing seizes up something locked the motor shaft from turning. Motor simply fails to starts properly, a failure to start of motor may cause by faulty start in winding in motor. For sensing the heat LM 35 sensor is used for this purpose. This sensor is connected to comparator inputs. With the help of sensor which sense the temperature of winding & its temperature exceeds to some particular level then comparator sends this signal to microcontroller

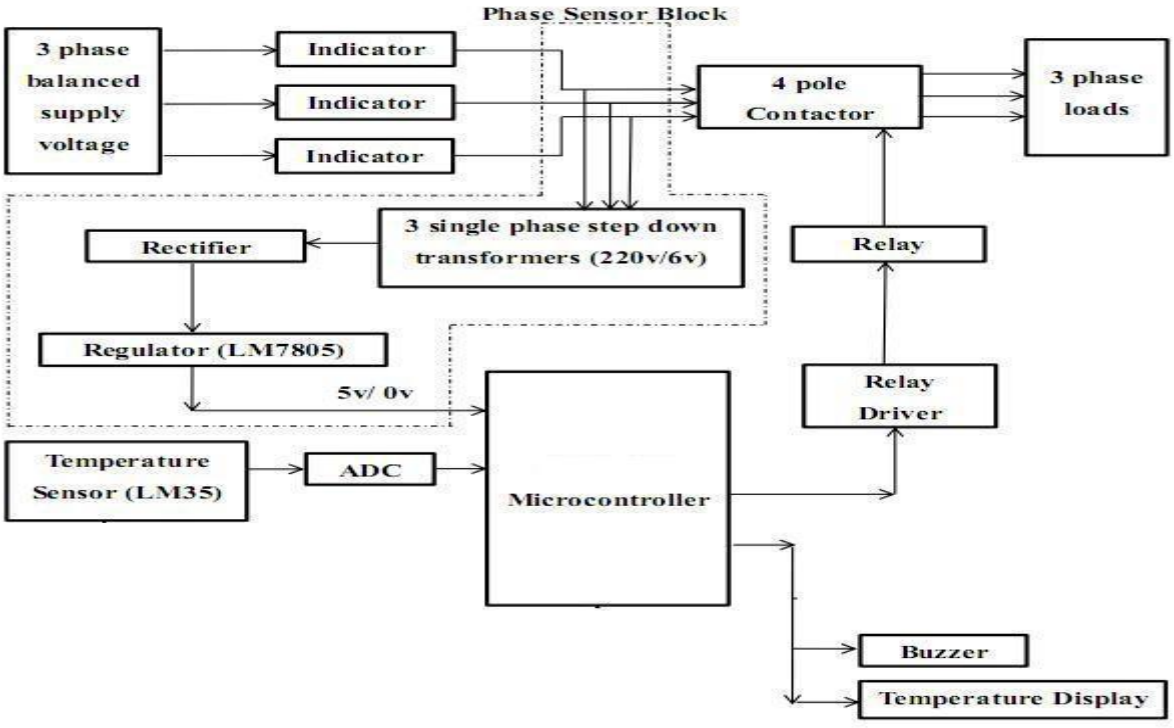
1.5 CONTACTOR

When a relay is used to switch a large amount of electrical power through its contacts, it is designated by a special **contactor**.

Contactors typically have multiple contacts, and those contacts are usually (but not always) normally-open, so that power to the load is shut off when the coil is de-energized. Contactor is an electrically-controlled switch used for switching an electrical power circuit A contactor is typically controlled by a circuit, which has a much lower power level than the switched circuit, such as a 24-volt coil electromagnet controlling a 230-volt motor switch.

II BLOCK DIAGRAM

A Controller based system which deals with monitoring control system of Induction motor is introduced in these systems the parameters are sensed with the help of analog modules, processed and displayed on LCD.



2.1 WAYS OF DETECTING VARIOUS FAULTS

The proposed of monitoring system consists of Global Service Mobile (GSM) Modem, with PIC microcontroller and different sensor. It is installed at the 3 phase devices and the finding parameters recorded using the analog to digital converter (ADC) of the embedded system. The acquired parameters are processed and recorded in the system memory. If there is any abnormality or an emergency situation the system generate tripping signal and sends SMS (Short Message Service) messages to designated mobile telephones containing information about the abnormality.

2.1.1) Measurement of Over-voltage :

To measure overvoltage we used step down transformer in our project. The transformer connect across the phase and neutral of each phases (R, Y, B), which step down voltage from 300v AC (max) to 5 volt AC, further This voltage will be converted to DC by means of rectifier and give it to the input of ADC, the ADC will convert this signals in equivalent digital signals and give it to microcontroller. Further microcontroller compares these digital signals with the settled overvoltage (250v) and under voltage (180v) If the signals is greater than 250 volt and less than 180volt then the microcontroller trips the contactor. If in case of phase failure the microcontroller treat this fault as a under voltage because if any phase is not available that means the voltage is less than 180 v (0 volt is less than 180 volt) in this case also microcontroller trips the contactor.

2.1.2) Single Phasing :

Single phasing can be prevented by using single phasing preventer. Single phasing preventer is an electronic circuit which prevents the three phase electronic operated electrical machines from single phase cut off, phase reversal and phase imbalance .

2.1.3) Temperature Monitoring:

In order to make on-line monitoring possible, thermocouples are placed externally on the transformer and provide real-time data on the temperature at various locations on the transformer. High main tank temperatures have been known to indicate oil deterioration, insulation degradation, and water formation. 4) Moisture: Online monitoring can be used to improve the accuracy of Oil .Moisture sensors available can easily detect the presence of any moisture.

III. 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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