

PROTECTION OF 3 PHASE INDUCTION MOTOR BY SINGLE PHASING

Mr. Khute Yogesh R¹, Mr. Avhad Deepak. R², Miss. Jadhav Madhuri B³,
Miss. Kolhe Vijaya S⁴, Miss. Labhade Punam⁵, Mr. Mundhe Sagar A⁶

^{1,2}Lecturer, Department of Electrical Engineering, Santosh N Darade Polytechnic, Yeola, Maharashtra, India.

^{3,4,5,6}Students, Department of Electrical Engineering, Santosh N Darade Polytechnic, Yeola, Maharashtra, India.

ABSTRACT

This paper is to develop for protection of three phase induction motor from single phasing or phase reversal or over voltage and under voltage. Because of this electrical fault the winding of motor get heated which causes to lead 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 operates continuously, it is our need to protect the motor from these anticipated faults. Three phase induction motor 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.

Keywords: Single Phase, Induction Motor, electrical fault.

1. INTRODUCTION

Now a days there are lots of development work has been pending but there are still some labor power which requires lots of income distribution for a small work. So this is required that some work should have some other alternative so that the labor power wastage can be avoided. So in our project we are trying to make a daily purpose robot which is able to cut the grasses in lawn. The project work will be done according to the proper application based fabrication. The system will have some automation work for guidance and other obstacle detection. The system will have a power source that is battery and a solar panel will be attached on the top of the robot.

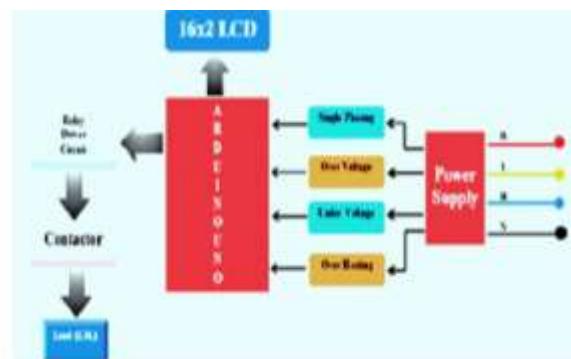
2. METHODOLOGY

This is the block diagram for complete protective system. Each circuit for separate fault protection i.e. single phasing, phase reversal, over temperature, over voltage, and under voltage sis designed. Outputs of these circuits are given to Arduino unit. Programming for Arduino is done so that in the event of any of above mentioned faults occurs, that fault name will be displayed on LCD along with this operate command will be given to the contactor switch. Contactor switch will be connected to the load and power supply is provided to the Ardsuin unit and all other circuits. In this way the fault on three phase induction motor is detected as well as motor is isolated from supply in faulty condition to avoid any damage to motor or to avoid spreading of fault in healthy sections of system.

3. COMPONENT OF ATTACHMENT

- The main components of the single phasing protection
- 1. C.T
- 2. Microcontroller
- 3. 3phase induction motor
- 4. LCD
- 5. Circuit breaker
- 6. Relay
- 7. Digital Display
- 8. Contactor

4. BLOCK DIAGRAM



5. TYPES OF FAULTS

1. Single phasing

It occurs when one phase of the three-phase supply is open. Single-phasing condition is the worst case of voltage unbalance. If a three-phase motor is running with the single phase condition, it will attempt to deliver its full horsepower of the load. The motor continuously trying to drive the load, until the motor burns out or until the properly sized overload elements make the motor off.

➤ **Causes:**

Open winding in motor, any open circuit in any phase anywhere between the secondary of the transformer and the motor, primary fuse open.

➤ **Effects:**

The effects of single phasing on three-phase motor vary with service conditions and motor thermal capacities. When single-phased, the motor temperature rise is greater than the increase in current.

2. Under Voltage Causes:

Causes:

The under voltage occurs when a reduced supply voltage with a rated mechanical load on the motor.

Effects:

Increased currents, excess heating of machine, Stator and Rotor losses increase.

3. Over Voltage Causes:

Causes:

One of the line voltages is greater than 110% of rated value, over voltage fault occur.

Effects:

Harmful effects on machine insulation, burning of insulation, deterioration of insulating properties.

4. Overload Condition Causes:

Causes:

When there is increase in mechanical load on the motor beyond the rated value, the overload situation occurs. Due to high load torque, motor begins to draw more current.

6. PROBLEM IDENTIFICATION

In a 3-phase induction motor, single phasing occurs when one of the three phases supplying power to the motor is lost or disconnected. This results in the motor running on only two phases, leading to an unbalanced power supply and several operational issues. Single phasing is a common fault and can severely impact the motor's performance and lifespan if not addressed promptly.

7. ADVANTAGES

1. Its maintenance cost is additionally low-cost.
2. Prevent potential damage to motors.
3. There by sustaining operational reliability.

8. APPLICATION

- Protection against Damage.
- Maintaining Operational Efficiency.
- Automated Protection.
- Application in Critical Operations.
- Integration with Control Systems

9. CONCLUSION

Protection of three phase induction motor from over voltage, under voltage, single phasing, and overheating and phase reversal provide the smooth running of motor improves its lifetime and efficiency. Generally these faults generated when supply system is violating its rating. In three phase induction motor when running at rated voltage, current and load these faults are not generated. For smooth running of motor generally concentration on supply voltage under the prescribe limit and load which is driven by the smotor should also be under the specified limit.

10. FUTURE SCOPE

As this system is used for protection of all three phase induction motors, now days and also in future it will be very demanding in all applications where induction motor is used. Every good system is subjected to certain limitations; these limitations can be overcome by making some improvements in the system.

1. We can add GSM to this system, this helps to give message on mobile phone about the occurrence of fault. Due to this amendment in system it is possible to supervise motor from anywhere.
2. Similar to under or over voltage, current sensing element can also be added in this system, which also helps to reduce over temperature on motor.
3. Phase reversal protection can also be provided just as other types of protection.

11. REFERENCES

- [1] Benbouzid M.E.H., Vieira M. and Theys C. (1999)‘ Induction Motors faults detection and localization using stator current advanced signal processing techniques’, IEEE Transactions on Power Electronics, Vol.14, No.1, pp. 14 -22.
- [2] Brighton A. and Ranade P. (1998), ‘Why Overload Relays do not always protect motors’, IEEE Transactions on I-18, No.6.
- [3] Devesh Kumar and Piyush Kumar Verma, “Single phasing, phase reversal, overvoltage, under voltage and overheating protection of three phase induction motor” International Journal of Scientific Research and Management Studies (IJSRMS) ISSN: 2349-3771 Volume 1 Issue 1, pages:7-10
- [4] M. Sudha1 and P. Anbalagan, " A protection scheme for threephase induction motor from incipient faults using embedded controller" Asian Journal of Scientific Research, 2009 ,Asian Network for Scientific Information ISSN 1992- 1454