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A Result on Single Phase Induction Motor Protection with Forward and Reverse

Rameshwar Herkar[1], Abhishek Kamble[2], Sumer Piploda[3], Prof. M. M. Bhavsar[4]

Students, Department of Electrical Engineering, MGM'S Polytechnic College, Aurangabad, India[1,2,3*]

Professor, Department of Electrical Engineering, MGM'S Polytechnic College, Aurangabad, India[4*]

ABSTRACT: This paper is based on protection and forward and reverse direction changing of single phase induction motor with variation of current, voltage and ambient temperature. induction motor are used in many industrial, commercial applications or home appliances. The main purpose of our paper is to protect the induction motor and direction changing of the single phase induction motor when the induction motor temperature is increased then the temperature sensor sense the temperature and display the temperature on LCD screen. There are different components of fault identification and protection of induction motor such as temperature sensor, miniature circuit breaker MCB etc. In this project we use single phase forward and reverse drum switch for the operation of changing the direction of single phase induction motor

KEYWORDS: Induction motor, Forward and reverse, Protection

I.INTRODUCTION

The induction motor is one of the most important inventions in modern history. Induction motors are widely used as industrial drives and it is used extensively for smaller loads, such as household appliances like fans induction motor is the backbone for every industry. Then the protection is more important for the single phase induction motor. In the case of overheating when temperature sensor sense the temperature on LCD screen. In this project we use the ammeter and voltmeter for the direction of voltage and current consumed or rated reading of single phase induction motor. The main objective of the work is to changing the direction of motor and cheap and reliable protection system. The protection system protects the motor from overheating and over current occurrence in the motor.

II.LITERATURE SERVAY

All the faults of the single-phase a synchronous motor are analysed, and the possible faults. Advanced signal processing techniques have been used to detect faults. Physical parameters measured using sensors, such as temperature, speed, torque, and orientation. All these parameters are essential to check if the motor is working properly. Protection os very important to any system. Over the past few tears, many techniques for protecting induction motors have been developed. In an overvoltage protection system for single-Phase induction motor, the motor is protected from overvoltage protection, IM feed under voltage protection.

Protection and monitoring of single-Phase induction motors N. Patil Dattaraj, 2007, Output This paper represent the single phase induction motors.

Control-based DTG strategies, Avalino Macente, 2014, Different techniques for controlling induction motors.

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III.SYSTEM DEVELOPMENT

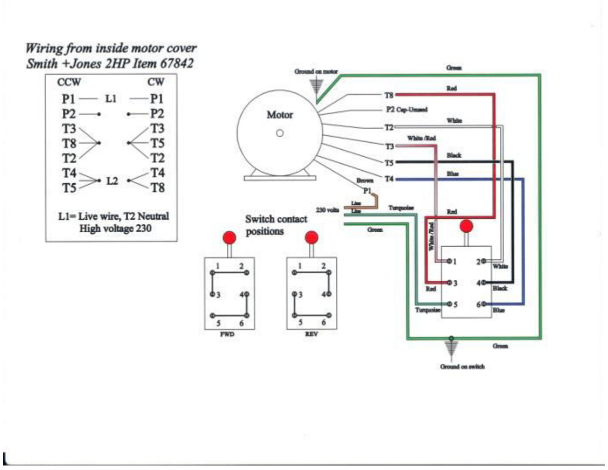

Fig. 1 (a) Circuit Diagram

Single-phase induction motors cannot self-start. When the motor is connected to a single-phase power supply, the main winding carries the alternating current. It's logical that the cheapest, leanest sort engine should be used most often. Since they are not self-starting, they have different types depending on how they start. These are split phase, shaded pole and capacitor motors. Likewise, capacitor motors are capacitor start, capacitor run, and permanent capacitor motors.

In these types of motors, the start winding may have series capacitors and/or centrifugal switches. When the mains voltage is applied, the current in the main winding lags the mains voltage due to the main winding impedance. And the current in the starting winding leads/lags the supply voltage, depending on the starting mechanism impedance. The angle between the two windings is sufficient to provide a rotational amplitude field to generate the starting torque. When the motor reaches 70% to 80% of synchronous speed, the centrifugal switch on the motor shaft opens and disconnects the start winding.

To reverse the rotation of a single phase capacitor start motor you need to reverse the polarity of the start winding. This will cause the magnetic field to change direction and the motor will follow. To achieve this, you can swap the connections on both ends of the winding. Always reverse the wires to the start winding.

Note that most motors, if still marked with the manufacturer's instructions, will indicate that they are not reversible. If this is the case, it's most likely because the wires you need to connect are inside the motor. If your organization has this warning, the easiest thing to do is not to proceed. However, if your motor is reversible, you may notice that it provides a reverse command. Usually, these instructions will tell you which wires to change. For example, some units may let you switch the red and green leads in the junction box at the end of the enclosure. In other cases, the blue and yellow wires may need to be swapped. The color of the wires is very personal and depends on the make and model of motor you have. It is best to read the instructions provided by the manufacturer before proceeding.

If you've determined which wires can be reversed, use a flat-blade screwdriver to remove the motor's end cap. Your motor probably has a junction box. In either case, you will need access to the terminals that connect the specified wires. You can use needle nose pliers to remove the wires and switch the terminals they connect to. Some systems use nuts to connect wires. If this is the case, you'll need a nut driver to access the terminal.

When you are done switching wires, replace the end cap or close the motor junction box. Restore power to the circuit and test the motor to make sure the field has switched and it is now indeed spinning in the opposite direction.

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1) MCB (Miniature circuit Breaker)

Fig. 1 (b) Miniature circuit breaker (MCB)

A circuit breaker is an electrical safety device designed to protect electrical circuits from damage caused by over current or short circuits. Its basic function is to interrupt electrical current to protect equipment and prevent fire risks. Unlike fuses, which are operated once and then must be replaced, circuit breakers can be reset (manually or automatically) to restore normal operation. Circuit breakers vary in size, from small devices that protect low-current circuits or individual household appliances to large switchgear designed to protect the high-voltage circuits that power entire cities. The general function of a circuit breaker or fuse as an automatic means of removing power from a faulty system, often abbreviated as OCPD (Over Current Protection Device).

2) Temperature sensor

Fig. 1 (c) Temperature sensor

For measurement of temperature ,temperature sensor is used. This can be air temperature, liquid temperature or solid matter temperature. There are different types of temperature sensors available, each of which uses different techniques and principles for temperature measurement.

3) Analog Ammeter

Fig. 1 (d) Analog Ammeter

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This project uses an analog ammeter in the range 0-5A. An analog ammeter, also known as an ammeter, is a measuring device that measures current in amperes. The current level is displayed on the dial and usually has a movable pointer or hands made of soft iron. Analog ammeters provide information about current draw and current conduction to help users troubleshoot irregular loads and trends. They have both positive and negative leads and are characterized by very low internal resistance.

4) Analog Voltmeter

Fig. 1 (e) Analog Voltmeter

This project uses an analog voltmeter in the range 0-300V. An analog voltmeter can be constructed from a galvanometer and series resistance by moving the pointer across the scale in proportion to the measured voltage. Meters that use amplifiers can measure small voltages below microvolts. Digital voltmeters use an analog-to-digital converter to display the voltage numerically.

5) Single Phase induction motor

Fig. 1 (f) Single phase induction motor

Single-phase induction motors are similar in appearance to three-phase squirrel-cage induction motors, except that the stator disperses the single-phase windings. The stator and rotor uniform air gap. Single-phase induction motors have two main parts, one is the stator (stationary) and the other is the rotor (rotor).

6) Forward and reverse drum switch

Fig. 1 (g) Forward and reverse drum switch

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The drum switch is a manual switch that manually reverses the direction of rotation of the motor. The switch contacts are manually opened and closed by moving the drum switch from the off position to the forward or reverse position.

IV.PRINCIPLE OF OPERATION

A single-phase motor consists of two windings, a main winding and an auxiliary winding. It is not a self-propelled motor because it does not have a rotating magnetic field like a three-phase induction motor. Capacitors are typically used to start single-phase motors. The main power supply is connected directly to the main winding and the capacitor is connected in series with the auxiliary winding and supply phase. Here we use a capacitor to create a phase shift from an existing phase. Therefore, the motor becomes two-phase and begins to rotate. Here you can use the drum switch to change the direction of the motor. Manually open and close the switch contacts by moving the drum switch from the off position to the forward or reverse position.

V. RESULT AND DISCUSSION

The following images show the working scenario and outcomes of this system.

Fig.1 wiring diagram of drum switch and induction motor

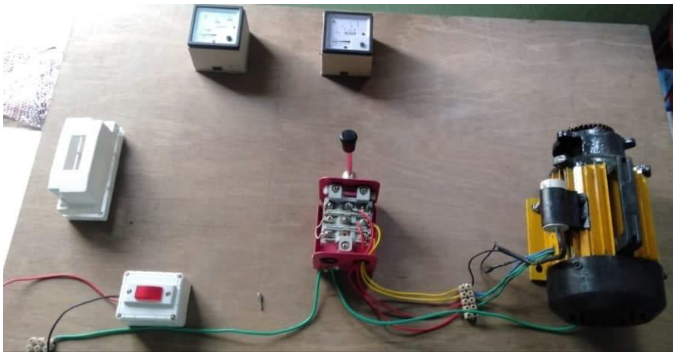

Fig.2 Overview of the system

VI.CONCLUSION

Taking into account the various research papers discussed so far we conclude that the induction machine support various faults during its operation like over voltage and over current etc and this faults needs to be quickly detected so that the induction motor is protected from getting damaged various fault detection methods discussed with their corresponding advantages and limitations.

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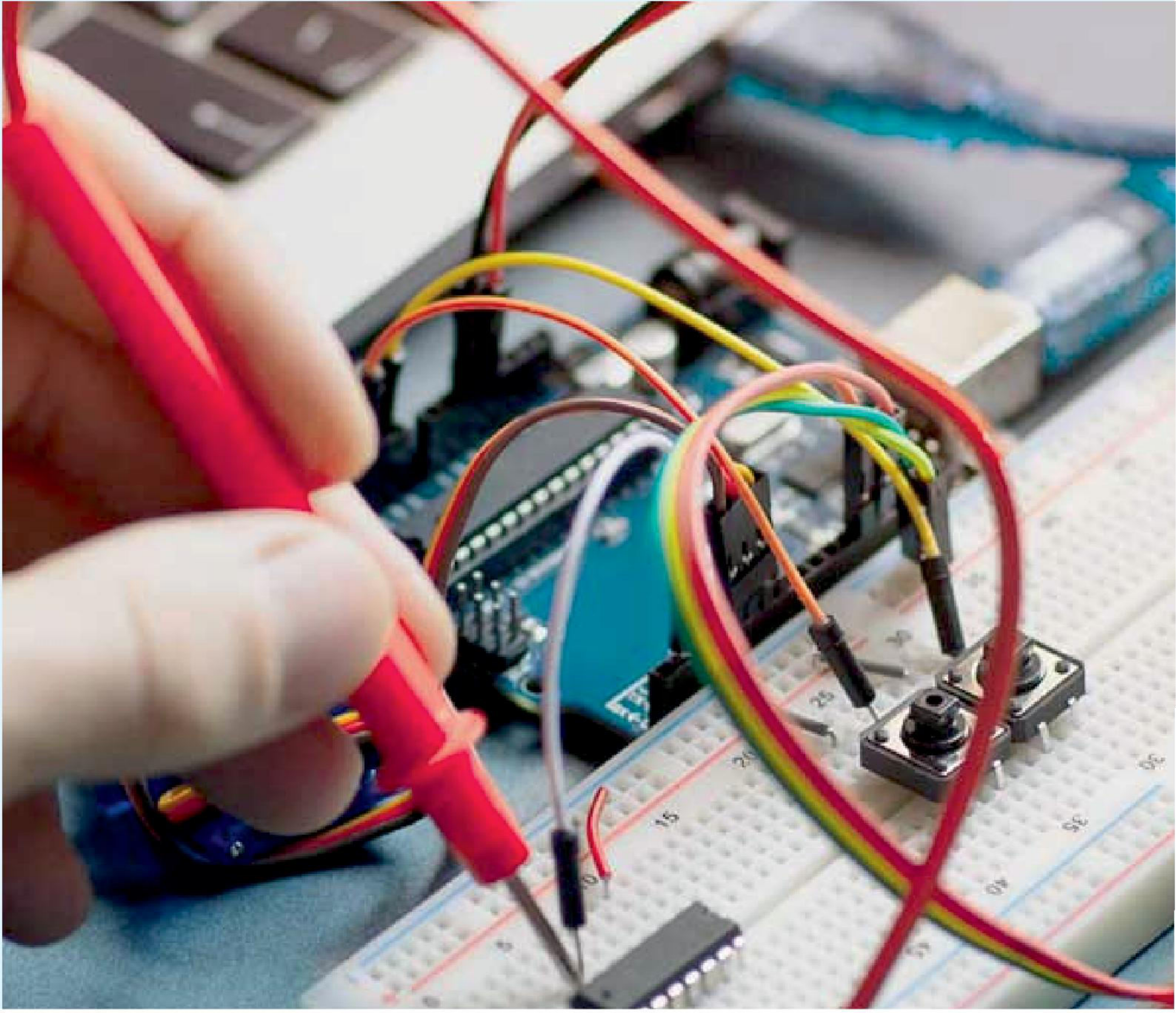

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