

Protection of Three Phase Induction Motor with Automatic Power Factor Correction

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Abstract— The intrinsic aim of this paper is to protect an Induction motor (IM) against various culpability like Over voltage, Over current, under voltage, Single phasing. The Protection of motor from such faults is very essential, because faults can diminished its efficiency. IMs can be saved using some ingredients, such as timers, contactors, voltage, and current relays. We are using the microcontroller based circuit for capability detection and it will save the motor from sundry faults. The power demand is raising day by day as the industrial load is raising. In modern power network cater to a wide variety of electrical load and power electronics loads, which fabricate a varying power demand on the supply network and warp the network environment. It is request of automatic switching operation of the worthy capacitor depending upon the load fluctuations without manual peacemaking. It can be peel by using APFC network which can maintain consistently large factor nearer to unity. Majority of load are inductive in nature in industries. So they ingest reactive power which influence the generation of plant. To give this subsidiary power we entail to raise generation or raising KVA rating of transformer.

Key words: Overvoltage, Undervoltage, Overcurrent, Overheating, Earth Faults, Single Phasing

I. INTRODUCTION

Protection of induction motors is important because most industrial applications use induction motors from the market due to their high robustness, reliability, low cost and maintenance and high efficiency. They are also critical components in many commercially available equipment's and industrial processes. Controlling an induction motor is difficult due to its strong nonlinear behavior stemming from magnetic saturation effects and a strong temperature dependency of the electrical motor parameters. Especially, the rotor time constant of induction motors can change in a wide range due to rotor temperature. These factors make mathematical modeling of motor control systems difficult. In real applications, only simplified models are used. The commonly used control methods are voltage/frequency, stator current flux and field oriented controls.

Induction motors are used in industry and domestic appliances because these are rugged in construction requiring hardly any maintenance, that they are comparatively cheap, and require supply only to the stator.

Induction motor is one of the most important motors used in industrial applications. The operating condition may sometime lead the machine into different fault situations. The machine should be shut down when a fault is experienced to avoid damage and for the safety of the workers.

II. FAULT IN THREE PHASE DEVICES AND THEIR CAUSES

A. Over voltage:

An overvoltage is a situation which occurs when the system voltage rises over 110% of the nominal voltage ratings. Overvoltage is caused due to several reasons such as sudden reduction in loads, switching of transient loads, lightning strikes, failure of control equipment such as voltage regulators, neutral displacement. This situation of overvoltage causes damage to components connected to the supply which may further lead to heating, over flash, insulation failure and may destroy electronic components.

B. Under voltage:

When the applied voltage is drop to the 90% of the rated nominal voltage, or less, it can be defined as under voltage. The main reason for causing the under voltage are short circuit, putting large load on the system suddenly, the failure in the equipment. Loose cable connection can also cause under voltage. If the voltage drop, the current will increase which means it will heat up the winding coil.

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D. Earth fault:

An earth fault occurs when an active wire or the current carrying conductor comes into the contact with earth or ground. Due to this fault the system will draw heavy current which can caused the excessive heating and this overheating can turn into fire or explosion. It can also damage to the other equipment in the system.

E. Overheating:

When the temperature of the electrical system or its equipment increases above its rated value that situation it's called as overheating. It can be caused due to the short circuit line fault and when the equipment is overloaded above its rated value. It can cause the burning of the winding of the equipment and damage the electrical system.

F. Single phasing:

When any one phase of the three phase system is lost or broken, this is called as single phasing. It is caused because thermal overload, broken wire or mechanical failure. As the load is now shifted to the remaining two phases because of