EFFECTS OF DIFFERENT TYPES OF FAULT ON THE PERFORMANCE OF AN ASYNCHRONOUS MOTOR

Prepared by: Emmanuel Mangwegape

ABSTRACT

Induction motor is one most widely used machine industrial wise. It is important that it works all the time and its efficiency is of high performance. However this is not always the case because in power system faults occur sometimes and they bring about problems like voltage sag, phase imbalance, under voltage, line noise and swells which affects the overall performance of the motor. This project's goal is to investigate the effects of these faults in different form and to provide a way to avoid them in order to sustain a higher performance of an induction motor.

The AC-DC-AC converter is used as an alternative solution to the problems presented in this project. It is used after finding all results of different types of fault. These outputs of different types of fault are discussed and compared using the percentage of sag and their speed to find out the fault that causes more harm to the asynchronous motor. The AC-DC-AC converter is then connected to this selected type of fault (three phase fault) to simulate and compare the output results to find its efficiency. Comparing results to the simulated circuit with no fault also determines the converters efficiency.

Since MATLAB/Simulink is software that provides icons of real components, it makes it easy to build the AC-DC-AC converter because block parameters of the icons dragged into the model block are easy to define. This saves time when comparing this programming to the text command programming. The AC-DC-AC converter is made out of blocks of rectifier; inductor, capacitor and inverter to convert AC to DC then filter the signal at the same time boosting the DC link to maintain voltage above trip level during voltage sag and then convert the signal back to AC using pulse width modulation. This invention creates a better output performance of an induction motor with or without fault.

When simulating a circuit model without fault the performance of the motor gain some small effects which in this case are considered to be of normal condition. When simulating a circuit model with a three phase fault the performance of the motor gain vast effects which are considered to be the worst and risky to the motor. But when the AC-DC-AC converter is connected to a three phase fault circuit model the effects reduces at a higher percentage hence higher efficiency of the performance of the motor. During fault period of a three phase fault the voltage sag is 88.4% in average of the nominal voltage and the speed is reduced by 8.66% from the initial speed, but when connecting the AC-DC-AC converter to the same model design improvements are made. The voltage sag increase by 12.8% of the nominal voltage instead of decreasing and the speed reduces up to only 3.34% from the initial speed.