SPEED PERFORMANCE OF SINGLE PHASE INDUCTION MOTOR USING VARIABLE FREQUENCY IGBT AND MOSFET INVERTER

By

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ABSTRACT

This paper presents speed performance of single phase induction motor using variable frequency IGBT and MOSFET inverter. The speed is varied from 35Hz to 65Hz by adjusting PWM inverter. The PWM inverter is controlled to produce a desired sinusoidal voltage at a particular frequency, which is filtered by a series inductance and a shunt capacitor. The simulation results are presented using Matlab/Simulink R2010a. The results show that the IGBT inverter is slightly difference compared to the MOSFET inverter in terms of the single phase induction motor rotor speed performance. The total harmonic distortion, THD spectrum for the input current of MOSFET is much better than the input current IGBT using different value of inductance and capacitor as the passive filter.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

The use of electric motors is very common in home appliances. One of the most widely used motor types in the appliance market is the AC Induction Motor (ACIM). It can be found in refrigerators, microwaves, clothes washers, clothes dryers, and air conditioners. Sometimes, users need to change induction motor speed depending on their application. However, it must meet some requirement to control of the speed [3].

AC induction motor has a fixed outer portion, called the stator and a rotor that spins inside with a carefully engineered air gap between the two. Virtually all electrical motors use magnetic field rotation to spin their rotors. Two sets of electromagnets are formed inside any motor. In AC induction motor, one set of electromagnets is formed in the stator because of the AC supply connected to the stator windings. The alternating nature of supply voltage induces an Electromagnetic Force (EMF) in the rotor (just like the voltage is induced in the transformer secondary) as per Lenz's law, thus generating another set of electromagnets, hence the name induction motor. Interaction between the magnetic field of these electromagnets generates twisting force, or torque. As a result, the motor rotates in the direction of the resultant torque. A single-phase AC induction motor depends on extra electrical components to produce this rotating magnetic field [11].