

**THREE-PHASE PERMANENT MAGNET SYNCHRONOUS MOTOR
SPEED CONTROL USING PULSE WIDTH MODULATION
TECHNIQUE**

**A thesis submitted in partial fulfillment of the requirement for the award of
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ABSTRACT

Three-phase permanent magnet motor has some performance advantages over induction motor and has become predominant in fractional horsepower applications. They are more efficient and reliable. However, users need to control the speed of the motor depending on the desired speed and application. So, this project presents the three phase permanent magnet synchronous motor speed control by varying the electrical frequency. In this project, the frequency is adjusted by using insulated gate bipolar transistor (IGBT) and pulse width modulation (PWM) technique based on Matlab simulation as a variable frequency drive. The speed of permanent magnet motor will depends on the rate of rotation of its magnetic field. So, the objective is to study the general characteristic of the three-phase permanent magnet motor and the speed control technique by using IGBTs and PWM. Simulation results are presented, with design PWM control algorithm for switching of IGBTs to control the speed of permanent magnet motor. The simulation results were carried out using Matlab/Simulink R2007a (version 7.4.0.207).

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CHAPTER 1

INTRODUCTION

1.1 Background of study

Permanent Magnet Synchronous Motors (PMSMs) are increasingly applied in several areas such as traction, automobiles, robotics and aerospace technology. The PMSM has advantages over other machines that are conventionally used for ac servo drive. Compared with the inverter-fed induction motor drive, the PMSM has no rotor loss and hence it is more efficient than other machines.

Since there is no winding and no copper loss in the rotor of PMSM and since at the synchronous operation the iron losses in the rotor core of such motor can be omitted in most cases so not appear in the rotor of the motor the sum of individual losses in the motor with permanent magnets is smaller than in induction motor. The efficiency of the motor is higher, and consequently thermal load of motors with permanent magnets is much lower.

Therefore, the need of using the simplest way to control the speed of permanent magnet motor is highly demanded by the user. The three-phase permanent magnet motor is a rotating electric machine designed to operate from a three-phase source of alternating voltage. Thus, this project was launched specifically to control the speed of three-phase permanent magnet motor.