A NOVEL TECHNIQUE FOR ELIMINATING SWITCHING TRANSIENTS OF VARIABLE RELUCTANCE DRIVE INVERTER

This project is presented in partial fulfillment for the award of the
Bachelor of Electrical Engineering (Honours)
UNIVERSITI TEKNOLOGI MARA

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ACKNOWLEDGEMENT

In the name of Allah, the Beneficent and Merciful. It is with the deepest sense of gratitude to Allah who has given me the health, strength and ability to complete this project and thus enable me to prepare this thesis as it is today.

I would like to express my deepest gratitude to my project advisor, Prof. Madya Dr. Chan Sei for his continuous support in giving ideas and provides devices from the beginning until the success of this project.

Special thank to staff of Faculties of Electrical Engineering, especially technicians from the Power Machine Lab (Mr. Abu, Mr, Nordin, Mr. Bakri and Mrs Rosni) for their full cooperation.

I am also expressing my special thanks to my family, my housemates, and all individuals who have given me their fullest and constant support during the preparation of this thesis.

ABSTRACT

This thesis describes a new method for eliminating switching transients of variable reluctance drive inverter [7]. In standard VR converter, rapid current commutation is achieved by forcing the motor phase current against the supply voltage via a pair of diodes. Hence the commutation diodes tend to chop the phase current and as a consequence a small amount of residue energy remains in the phase winding. The experimentally observed high frequency transient immediately after current chopping is mainly due to this residue energy. The proposed technique is based on modifying the basic half-bridge inverter circuit by adding a suitably sized resistor in parallel with the load to provide a path for the residue energy to dissipate smoothly. This project includes the experimental and simulation results, the parameters that affect this type of transient and proposes procedures for designing such transient eliminating circuit.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The basic variable reluctance (VR) motor drive system consists of a rotor-position sensor, a controller and an inverter [1]. This project is concerned on a switching transient that occurred on variable reluctance motor by using the standard half-bridge inverter as shown in figure 1.1. The inverter used one phase of VR motor. The power MOSFET is used as a switching devices. The fast recovery diodes used in inverter and as a freewheeling diode.

In most inductive load applications, current commutation is normally achieved by a freewheeling diode. In which case, the inductive energy is almost completely dissipated by the freewheeling loop when current ceases to flow and thus no disruptive transient is produced. For the standard half-bridge inverter for variable-reluctance (VR) motor as shown in figure 1.1, the commutation current is clamped rapidly to zero by forcing the current into the source via D1 and D2. The inductive current is chopped when its rate of change could no longer produce a voltage higher than the source voltage plus the voltage drops of the two diodes. A small amount of energy thus remains the inductive circuit. The experimental observed large magnitude of switching transient that occurs after the diodes cease to conduct is mainly due to this residue energy. Conventional snubbers do not seem to provide a good remedy for this transient.

The aim of this project is to produce adequate empirical data for sizing Rp in general VR drive applications. The final product is Rp sizing program based on measured and simulated data. The actual involves extensive simulations for various configurations of VR drive inverter with various ranges of output voltages and currents.