MEASUREMENT OF INDUCTANCE IN SWITCH RELUCTANCE (SR) MOTOR

Thesis is presented in partial fulfillment for the award of the
Bachelor of Engineering (Hons.) Electrical
UNIVERSITI TEKNOLOGI MARA (UiTM)

NURITA BINTI ISMAIL
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM,
SELANGOR, MALAYSIA

MAY 2011

ACKNOWLEDGEMENTS

First and foremost, I would like to state my greatest gratitude with the deepest sense of the Al-Mighty ALLAH S.W.T that gives me good health, opportunity, strength and ability to complete my final year project and thesis. All good aspirations, devotions and prayers are due to Allah whose blessing and guidance have helped me all over the entire final year project.

I would like to express my sincere gratitude and appreciation to my supervisor Assc. Prof. Dr. Chan Sei for his guidance, support and encouragement throughout the completion of this project from the beginning until the completion of the thesis. His valuable suggestions have been greatly appreciated.

I would also like to thank technician staffs in electrical engineering department for provided me the equipments that I need to finish my final year project. Special thanks to my previous mathematic lecturer, Puan Maznita for her guidance of Microsoft Excel usage.

Finally, I would like to thank my colleagues for their valuable help and motivation given in completing this project.

My deepest thanks go to my understanding parents and family.

ABSTRACT

This thesis presents the measurement of inductances for two phases 4/6 pole switched-reluctance (SR) motor. This project is mainly focused in laboratory measurement and data analysis to measure the inductance of SR motor. The current and voltage waveform need to be measured in lab in order to do the integration of flux by using MATLAB software. Then the unsaturated inductance for rotor position can be obtained by the slope of linear part of the flux linkage versus current curve. Finally, the laboratory experiment results will be compared with finite element analysis that can be obtained by using the 2D Finite Element Method Magnetic (FEMM) program.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 BACKROUND OF STUDY

Switch reluctance (SR) motors are the simplest electric motors in construction which has salient pole in both rotor and stator. Thus, it is referred as a doubly salient motor. There is wound field coil of a dc motor at the stator and no coils on the rotor. They have a highly nonlinear magnetic characteristic which is related to the change of their inductances depending on the current and its position [1]. The reason of nonlinearity is related to the change of their inductances depending on current and the position. [1]

The basic assumptions of SR motor are there is no mutual flux linkage between phase windings which means one phase is excited at a time and the ferromagnetic materials in the motor have a linear characteristic[2]. Therefore, the flux linkage of a winding can be described by an inductance. To measure the flux linked of SR motor, the rotor is locked at certain positions [3]. The measurement can be obtain by repeat the different rotor positions and it will present the flux curve for a variety of phase currents in one period time. The unsaturated inductance for the different rotor position involved is the slope of linear part of the flux-linkage versus current curve. The core losses need to be taken care in this project because the area of flux linkage versus current loop under locked rotor represents the core losses. The suitable value of resistor will minimize the flux linkage