

ANALYTICAL FOURIER APPROXIMATION OF FIVE- PHASE SPACE VECTOR MODULATION VOLTAGE SOURCE INVERTER

This thesis is forwarded to Faculty of Electrical Engineering,
UNIVERSITI TEKNOLOGI MARA
In partial fulfilment for the award of
Bachelor Engineering (Hons) Electrical



MOHAMMAD AFIQ BIN OTHMAN
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM
SELANGOR, MALAYSIA

MAC 2013

ACKNOWLEDGEMENT

I would like to acknowledge and express my sincere gratitude towards my supervisor Mdm. Wan NoraishahBt Wan Abdul Munim for his concern, valuable time of consultation and advice, guidance and patience in supervising my project from the beginning until it done properly.

Lastly, I offer my regards and blessings to my parents, other lecturers and friends for their kindness and moral support during my study.Thanks for the friendship and memories.

ABSTRACT

To utilize AC machine with phase number higher than three, electric drives in power electronic applied. For various applications, multiphase motor usage considered as typical solution. Multiphase drives are invariably supplied from multiphase voltage source inverters and adequate methods for VSI pulse width modulation (PWM) are therefore required. Proper modelling of voltage source inverters is important in devising appropriate control algorithm. This paper study of a five phase voltage source inverters based on space vector approach. The existing technique is elaborated utilizing only large space vectors. The Fourier analysis of output phase to neutral voltage, line to line voltage, and pole voltage are performed for ten step mode of operation (large vector). Simulation results are included throughout the paper to illustrate and verify the theoretical calculation.

TABLE OF CONTENTS

DECLARATION BY CANDIDATE.....	i
ACKNOWLEDGEMENT	ii
ABSTRACT.....	iii
TABLE OF CONTENTS	iv
LIST OF FIGURES.....	v
LIST OF TABLES	vi
LIST OF SYMBOLS AND ABBREVIATION.....	vii
CHAPTER 1	1
INTRODUCTION.....	1
1.1 Background of Study.....	1
1.2 Problem Statement	4
1.3 Objective.....	4
1.4 Scope of Work	4
1.4 Thesis Organization.....	5
CHAPTER 2	6
LITERATURE REVIEW.....	6
2.1. Modelling of Five-phase Voltage Source Inverter.....	6
2.2. Voltage Source Inverter (VSI) for Five-phase System	8
2.3. Ten-step Mode of Operation.....	10
2.4. Analytical Fourier Approximation.....	13
CHAPTER 3	15
METHODOLOGY	15
3.1. Introduction.....	15
3.2. Flow Chart	15
3.3. Calculation Part on Total Harmonic Distortion.....	17
3.4. Creating Coding on Fourier Graph	17
3.5. Development of Theoretical Waveforms	17
CHAPTER 4	28
RESULTS AND DISCUSSION	28
4.1. Fourier Series Waveform.....	28
4.2. Comparison Between Theoretical Waveform & Fourier Approximation.....	41

4.3. Calculated on Harmonic, THD and Line Spectrum.....	42
4.4. Simulation Result using MATLAB	44
CHAPTER 5	47
CONCLUSION.....	47
5.1. Introduction.....	47
5.2. Future Recommendation	47
REFERENCES.....	49
APPENDIX A.....	50
Coding.....	50