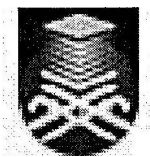


**MODELLING AND SIMULATION OF VOLTAGE SOURCE  
INVERTER (VSI) FOR USE IN ACTIVE FILTER APPLICATION  
USING SINUSOIDAL PULSE WIDTH MODULATION (SPWM)  
TECHNIQUE.**

**This is presented in partial fulfillment for the award of the Bachelor of  
Engineering (Honours) in Electrical  
MARA UNIVERSITY OF TECHNOLOGY**



**AZRIL HISHAM BIN ABU HASSAN  
FACULTY OF ELECTRICAL ENGINEERING  
MARA UNIVERSITY OF TECHNOLOGY  
40450 SHAH ALAM, SELANGOR**

## **ACKNOWLEDGEMENT**

All praises be to Allah , Lord of Universe , the Merciful and Beneficent Salam to Nabi Muhammad S.A.W, his friends, companion and the people who follow his path.

The author wishes to express his sincere gratitude to both of his supervisor, Dr. Mohd Fadzil Saidon and Mr. Mustafar Kamal Hamzah for their professional guidance and support.

Recognition is given to various members of the academic and technical staff of Faculty of Electrical Engineering, MARA University of Technology. Particular appreciation is given to Mr. Aris Ramlan for his assistance. Thanks are also due to present members of Power Electronics Research group for their help and friendship.

Finally, a heartfelt of thanks to both of my parents and Wan Zakiah for their love and support throughout the years, for without them, I would never have gone this far.

## **ABSTRACT**

A power converters incorporates an array of power switching devices that helps to convert and control electrical energy transformations under the guidance of control electronics. The general classification of converters on functional basic includes ; AC – DC converters ( rectifier) , DC – DC converter (Chopper) , DC – AC converter (inverter) and AC – AC converter at the same frequency ( AC controller ) or different frequency ( Cyclo – converter ) . Often a practical power electronic system may combine one or more forms of circuit to achieve the final conversion process.

This report is concerned on the modeling and simulation to facilitate the study on the behavior , switching strategy , and control of the sinusoidal pulse width modulation voltage source inverter (SPWM-VSI) for active filter applications. The simulation of the circuit where carefully done with two different software simulation package in the form of PSPICE and MATLAB/SIMULINK. This is to ascertain the accuracy of the simulations in the absence of a complete experimental verification. Using the same topology the operation of a controlled rectifier and inverter were presented illustrating the behaviour of an active filter with its bidirectional power flow capabilities. The result obtained using both the simulation tools are as presented..

## TABLE OF CONTENTS

<b>CONTENTS</b>	<b>PAGE</b>
DECLARATION	ii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
TABLE OF CONTENTS	vi
LIST OF FIGURES	x
LIST OF PRINCIPAL SYMBOL AN ACRONYMS	vii

### CHAPTER 1: INTRODUCTION

1.1	Main Task of Power Electronic	1
1.2	Power Conversion	3
1.3	Inverters	3
1.4	Additional Insight in Power Electron	4
1.5	VAr Compensation	5
1.6	Importance of VAr Compensation	6
1.7	Power Quality and Active Filter	6

## TABLE OF CONTENTS

<b>CONTENTS</b>	<b>PAGE</b>
DECLARATION	ii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
TABLE OF CONTENTS	vi
LIST OF FIGURES	x
LIST OF PRINCIPAL SYMBOL AN ACRONYMS	vii

### CHAPTER 1: INTRODUCTION

1.1	Main Task of Power Electronic	1
1.2	Power Conversion	3
1.3	Inverters	3
1.4	Additional Insight in Power Electron	4
1.5	VAr Compensation	5
1.6	Importance of VAr Compensation	6
1.7	Power Quality and Active Filter	6

# CHAPTER 1

## INTRODUCTION

The historical progress in power electronics applications originates with the development and introduction of the thyristor by the General Electric Company in 1957. Progress of power semiconductor devices along with microcomputer developments have resulted in the proliferation of power electronic application.[1]

Power electronics refers to control and conversion of electrical power by power semiconductor devices wherein these devices operate as switches. Advent of silicon-controlled rectifiers, abbreviated as SCRs, led to the development of a new area of application called the power electronics. Prior to the introduction of SCRs, mercury-arc rectifiers were used for controlling electrical power, but such rectifier circuits were part of industrial electronics and the scope for application area spread to many fields such as drives, power supplies, aviation electronics, high frequency inverters and power electronics originated.[2]

### 1.1 MAIN TASK OF POWER ELECTRONICS

Power electronics has applications that span the whole field of electrical power systems, with the power range of these applications extending from a few VA/Watts to several MVA / MW. The main task of power electronics is to control and convert electrical power from one form to another. The four main forms of conversion are: