## A SINGLE PHASE STATIC VAR COMPENSATOR

B. ENG. (HONS) (ELECTRICAL)

MAZLIZA BINTI ZAHARI @ ZAHRI Faculty of Electrical Engineering UNIVERSITI TEKNOLOGI MARA 40450 SHAH ALAM, SELANGOR

## ACKNOWLEDGEMENT

In the name of Allah, the Beneficial and the Merciful, I would like to thank Allah for giving me the health and strength to conduct the project and study in my selected topic and thus enable me to prepare this thesis.

I would like to express my deepest gratitude to my project supervisor, Tuan Haji Ishak B Ismail for his able supervisor, careful guidance, patience and kind advice which very valuable towards the accomplish my study.

Special thanks also to Mr. Huzeir Hamzah, Mr. Abd. Yasim Ali and all the laboratory technicians who have kindly given their assistance in one way or another.

Finally, the most deeply gratitude and appreciation to my beloved family especially to my mom and dad, who gave encouragement, continuous support and assistance, throughout the course.

## Abstract

This paper describes the design, development and the operation of a single phase static VAR (voltage ampere reactor) compensator. IGBT (Insulated Gate Bipolar Transistor) were used as switches for the resonant inverter. This control reactive power by proper triggering of the inverter using certain switching function. Pspice and Matlab simulation were also undertaken to illustrate the performance of the circuit and results were compared with actual circuit output.

## **TABLE OF CONTENTS**

CHAPTER			PAGE	
I	INTF	1		
П	THEORITICAL BACKGROUND			
	2.1	Introduction	7	
	2.2	The square-wave inverter	7	
	2.3	Operation of inverter	9	
	2.4	Amplitude and harmonic control	10	
	2.5	Schematic simulation	14	
Ш	SYSTEM OVERVIEW			
	3.1	System overview	21	
	3.2	AC supply	22	
	3.3	Personal computer	22	
	3.4	Gate driver circuit	22	
	3.5	Inverter circuit	23	
	3.6	LC resonant tank	23	
	3.7	Assembly circuit	23	
IV	HARDWARE DESIGN			
	4.1	Introduction	25	
	4.2	Inverter circuit	26	
	4.3	Operation of inverter circuit	26	

4.4	Protection of the circuit			
	4.4.1 Snubber in IBGT circuit	27		
	4.4.2 Anti-parallel diode in IGBT circuit	28		
	4.4.3 Heat sink in IGBT circuit	29		
	4.4.4 Fusing in IGBT circuit	30		
	4.4.5 Inductor	30		
4.5	PC parallel printer port	30		
4.6	Gate driver circuit			
SOFT	WARE DESIGN			
5.1	Introduction	33		
5.2	C language	33		
5.3	C language work	33		
5.4	Matlab simulation	34		
RESU	ILTS			
6.1	Printer port output	35		
6.2	Gate drive output	36		
6.3	Hardware circuit output	37		
DISCU	USSION			
7.1	Discussion	41		
CONC	CLUSION			
8.1	Conclusion	42		
8.2	Recommendation	44		

v

VI

VII

VIII