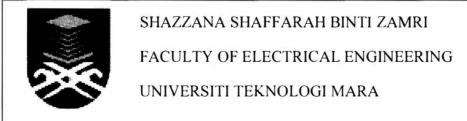
# A SINGLE PHASE CONTROLLED RECTIFIER USING SINGLE PHASE MATRIX CONVERTER TOPOLOGY

This thesis is presented in partial fulfillment for the award of the Bachelor of Engineering (Hons) Electrical

## MAY 2010



## **ACKNOWLEDGEMENT**

# In the name of Allah, the Beneficent, the Merciful

Praises to Allah S.W.T for the strength and blessing throughout the entire research and completion of the project. Peace is upon Prophet Muhammad S.A.W, who had given light to mankind. I would like to express my greatest appreciation to my supervisor, *Dr Mohammad Nawawi bin Seroji* and also to *Puan Siti Zaliha binti Mohammad Nor* for their invaluable suggestion and guidance.

I would like to acknowledge to person who gives support, guidance and teach me a lot of things. Last but not leat, special thanks to my family and all friends who had helped and also participated in this project and also gave moral support.

## **ABSTRACT**

This work presents a single phase matrix converter topology (SPMC) controlled using MATLAB/Simulink(MLS). Pulse Width Modulation (PWM) technique was used to calculate the switch duty ratio to synthesize DC output. Safe commutation strategies were developed through an arrangement of commutation switches that allows dead time to avoid spikes due to inductive load. Simulation results for commutation and without commutation strategy presented to verify the proposed operation. The result also shows difference modulation index will increase the average mean of the output voltage.

# **TABLE OF CONTENTS**

DECLARATIONi
ACKNOWLEDGEMENTii
ABSTRACTiii
TABLE OF CONTENTSiv
LIST OF FIGURESvii
LIST OF TABLESix
ABBREVIATIONSx
LIST OF SYMBOLSxi
CHAPTER 1 INTRODUCTION1
1.0 Background of Study1
1.1 Matrix Converter
1.3 Converter Classification
1.3.1 AC input to DC output
1.3.2 DC input to AC output
1.3.3 DC input to DC output
1.3.4 AC input to AC output
1.4 Problem Statement
1.4.1 Problem Identification
1.4.2 Significant of The Study
1.5 Objectives4
1.6 Scope of Work4
1.7 Research Methodology5
1.8 Thesis Organization6
CHAPTER 2 POWER ELECTRONICS7
2.0 Introduction of Power Electronics

## **CHAPTER 1**

## INTRODUCTION

### 1.0 BACKGROUND OF STUDY

Power electronics is the application of solid state electronics for control and conversion power. The objective of power electronic is to prove the quality and utilization of electrical power based on the switching of power devices such as diodes, thyristors and transistors. Power electronic converters can be found wherever there is need to modify the form of electrical energy such as modify its voltage, current and frequency.

#### 1.1 MATRIX CONVERTER

Matrix converter has been described to offer an "all silicon" solution or AC-AC conversion, removing the need for reactive energy storage components used in conventional reactive, inverter based system and hence an attractive alternative converter. The single-phase matrix converter (SPMC) was first by Zuckerberger with others works on AC-AC and DC-DC conversion. In this work the SPMC topology are used to operate as a controlled rectifier by suitable switching schemes. Simple resistive load is initially used, followed by simple inductive load.

There was four types of matrix converter, which relates to the type of power conversion DC-AC, AC-DC, DC-DC and AC-AC. Since matrix converter was originally introduced, it has received considerable attention because it offers many