MODELLING AND SIMULATION OF A CONTROLLED RECTIFIER USING AC-AC MATRIX CONVERTER THEORY

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

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ACKNOWLEDGMENT

All praise is to Allah S.W.T. The Most Gracious and Most Merciful who has given me the strength, ability and patient to complete this project.

I would like to express a special gratitude to my project supervisor En.Mustafar Kamal Hamzah for the guidance and support throughout the development of this project. I would also like to express my utmost gratitude to all who have been involved directly or indirectly.

I would like to give my sincere thanks to my family, especially my father and my mother for their support and inspiration for me to do all this. Not forget a Million of thanks also to all my friends for their moral support and guidance. May Almighty Allah blesses and rewards them for their generosity.

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ABSTRACT

This project illustrates the use of Power System Block Set (PSB) within MAT Lab/Simulink. The Power System Block provides the ability to model and simulate electrical power system and drives within Simulink Environment. The SPMC as a direct frequency changer were used in this work and using three-phase AC-AC matrix converter and the resistor as a load. The TPMC circuit composed from nine ideal power switches used as a frequency converter. The desire output voltage will be synthesized using SPWM technique.

It is well known that a PWM-controlled rectifier can offer advantages of reduced low-order harmonics and unity input power factor when compared to a conventional thyristor converter. However, theoretically optimum PWM strategies are often difficult to implement physically or are not easily extended to regenerative operation. This paper proposes an alternative PWM strategy based on AC-Ac matrix converter theory, which generates only high-order switching harmonics, presents a unity power factor to load to the supply, implicitly extends to regeneration (and operation with a center tapped DC output), and is feasible to physically implement for real-time output voltage control. Both the theory and physical simulation results are presented in the paper.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Power electronics has applications that span the whole field of electrical power systems, with the power range of 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.

For the control of electric power or power conditioning, the conversion of electric power from one form to another is necessary and the switching characteristics of the power devices permit these conversions. A converter may be considered as a switching matrix. The power electronics circuits can be classified into six types:

- Diode Rectifiers
- AC-DC Converters (controlled rectifiers)
- AC-AC Converters (AC voltage controllers)
- DC-DC Converters (DC choppers)
- DC-AC Converters (inverters)
- Static Switches

The devices in the converters are used to illustrate the basic principles only. The switching action of a converter can be performed by more than one device. The choice of particular devices will depend on the voltage, current, and speed requirements of the converter [12].