IMPLEMENTATION OF SINGLE-PHASE MATRIX CONVERTER AS A CONTROLLED RECTIFIER

Project report is presented in partial fulfilment for the award of the Bachelor of Electrical Engineering (Hons.)

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ABSTRACT

This thesis presents an implementation of single-phase matrix converter as a controlled rectifier by using digital microcontroller namely Peripheral Interface Controller as the main controller.

The pulse-width-modulated control was used as an alternative approach to an earlier works that was found to be complex in nature in terms of control algorithm. Basically, there are various techniques in PWM control; the multiple-PWM is the one of various techniques in PWM control. The multiple-PWM technique was used in this project in order to control the output voltage of the converter. The PIC will generate this multiple-PWM in order to get the desirable output. The simulation of model SPMC as a rectifier was done by using MATLAB/Simulink and Pspice. Then the result of simulation is compared with the experimental result.

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CHAPTER 1

INTRODUCTION

1.1 Applications of Power Electronics

Power electronics combine power, electronics, and control. Control deals with the steady-state and dynamic characteristics of closed-loop systems. Power deals with the static and rotating power equipment for the generation, transmission, and distribution of electric energy. Electronics deals with the solid-state devices and circuits for signal processing to meet the desired control objectives. Power electronics may define as the applications of solid-state electronics for the control and conversion of electric power [1].

Power electronics are based primarily on the switching of the power semiconductor devices. With the development of power semiconductor technology, the power-handling capabilities and the switching speed of the power devices have improved tremendously. The development of microprocessors and microcomputer technology has a great impact on the control and synthesizing the control strategy for the power semiconductor devices. Modern power electronics equipment uses (1) power semi-conductors that can be regarded as the muscle, and (2) microelectronics that have the power and intelligence of a brain.

Power electronic 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 energy from one form to another. The four main forms of conversion are:-

    i.   DC-to-AC Conversion (Inverter)

    ii.   AC-to-DC Conversion (Rectifier)

    iii.   DC-to-DC Conversion (Chopper)

    iv.   AC-to-AC Conversion (Cycloconverter)