

**SINGLE PHASE MATRIX CONVERTER OPERATE AS RECTIFIER
CONTROLLED BY XILINX FPGA**

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MALAYSIA**



MOHD NASRUL HISYAM BIN MAT RUF

Faculty of Electrical Engineering

UNIVERSITI TEKNOLOGI MARA

40450 SHAH ALAM

MALAYSIA

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ABSTRACT

This thesis presents a topology of Single Phase Matrix Converter (SPMC) that use to operate as a rectifier (AC-DC). Pulse Width Modulation (PWM) was used as a controlled signal with respect to variation of Modulation Index to synthesize the output DC voltage. IGBT was used as a power switching devices with bidirectional switch configuration to study the behavior of the converter. Computer simulation model was developed by using MATLAB/Simulink (MLS). XILINX Field Programmable Gate Array (FPGA) was used to develop Pulse Width Modulation (PWM) according to switching strategies. The selected simulation results of MATLAB/Simulink (MLS) and XILINX FPGA were presented to verify the proposed switching strategies.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND STUDY

Revolution in the power semiconductor devices has led the usage of power electronic devices to another step within modern commercial and industrial environment particularly in application for AC-DC conversion. Conventionally, AC-DC converter which is commonly called as rectifier was developed using bridge-diode without giving any control function and unidirectional power flow. Alternative, topology has been introduced such as matrix converter (MC) hold future potential in advanced power conversion. The Matrix Converter topology has offer many advantages with unrestricted switch control, possible “all silicon” solution, minimal and removing the need for reactive device in conventional converter system [1]. The topology was first introduced by Gyugyi in 1976 [2]. Matrix Converter is able to operate in four quadrant bidirectional switch which allow operating in high frequency.

Previous study was focus on Three Phase Matrix Converter (TPMC) which was first introducing in 1980 by Alesina and Venturini [3]. Their represent the circuit as a matrix of bidirectional power switch which force commutated converter use an array of controlled bidirectional switches as the main power element to create a variable output voltage with unrestricted frequency. Zuckerberger was first introduced [4], the single phase version called Single Phase Matrix Converter (SPMC) using MOSFETs as switching device based on AC-AC conversion [5]. The SPMC topology has offering