

CONTROLLED RECTIFIER USING SINGLE PHASE MATRIX CONVERTER (SPMC) WITH COMMUTATION

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ABSTRACT

This paper presents the study of a Single – Phase Matrix Converter (SPMC) operated as a single phase AC – DC controller rectifier with safe commutation to ensure that the supply current is continuous, sinusoidal, and in phase with the voltage. The Pulse Width Modulation (PWM) technique as switching was used to calculate the switch duty ratio to synthesize the output. The combination of modified LC-Filter produced good results and avoid voltage spikes. Basic loads represented by R load are used for this investigation. In this work, a simple commutation strategy for the implementation in SPMC provides the required free-wheeling operation similar to those available in other converter topologies is proposed. The commutation strategy used in this work has also shown reduction in spikes, a common phenomenon in matrix converter topologies. The commutation scheme establish a current path for energy to flow during dead-time, the avoiding the generation of voltage spikes. The simulation has been done by using MATLAB/Simulink software to validate the design approach of SPMC.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The major task of power electronics is to control and convert electrical power from one form to another form by using electronic devices. The conversion of electric power to other form is necessary for the control of electric power and the switching characteristics of the power devices permit the conversions. Power electronic circuits function is to control or modify a voltage and current by using semiconductor devices as switches. Then the applications range is from high power conversion equipment likes dc transmission and to low power such as power supply for netbook computers [1].

The Matrix Converter (MC) is an advanced circuit topology that capable of converting all converters. This new application also could be realized in practice as a powerful solution of making an all silicon solution system. Since there are no large reactive components for energy storage, the size of converter is reduced [2]. The MC circuit topology was first identified by Gyugyi [3] in 1976 and have many advantages like sinusoidal input and output current, the ability to regenerate energy to the utility, and controllable input current displacement factor [4]. Four types of MC which relates to the type of power conversion; AC-DC, AC-AC, DC-AC, and DC-DC. The first study of Single Phase Matrix Converter (SPMC) was realized by Zuckerberger [2].

The most important things of matrix converter is switching strategy for the four quadrant switches since it will result in the input source being converted to the desired output through matrix conversion. The use of Pulse Width Modulation