

SIMULATION OF SINGLE PHASE MATRIX CONVERTER OPERATING AS A CONTROLLED RECTIFIER FOR POWER SUPPLY APPLICATION

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ABSTRACT

This paper proposed a boost rectifier using single phase matrix converter (SPMC) topology. SPMC main function is to convert AC supply voltage to DC output voltage. A new boost rectifier is presented that could synthesize a greater DC output voltage from a given AC supply voltage. Basic operation on single-phase matrix converter which implement as boost operation is outline. The PWM technique is used to synthesize the output voltage. Safe commutation strategy was developed to avoid voltage spikes due to inductive load. One of those limitations is the absence of the natural free-wheeling path afforded in conventional converter topology through the use of diodes. In this work a simple commutation strategy for implementation in single phase matrix converter provides the required free-wheeling operation similar to those available in other converter topologies is proposed. The commutation scheme establishes a current path for energy to flow during dead-time, the avoiding the generation of voltage spikes. The simulations have been carried out using by MATLAB/Simulink software to evaluate the behavior and feasibility of the proposed technique.

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CHAPTER 1

INTRODUCTION

1.0 BACKGROUND OF STUDY

In this work the SPMC topology are presented to operate as a controlled rectifier by suitable switching schemes, where IGBTs are used for the main power switching devices. The converter converting AC input supply to a various level of DC voltage. It offers an all silicon for AC-AC conversion, removing the need for reactive energy storage components used in conventional rectifier-inverter based system. The key aspect in a matrix converter is the fully controlled four-quadrant bidirectional switches which allow high circuit topologies with single phase matrix converter (SPMC) rising with works on AC-AC, DC-DC, DC-AC conversion and more recently the AC-DC rectifier[1,2]. Inherent commutation problems that lead to switching spikes are also discussed with safe commutation algorithm being proposed [1]. In this work the IGBTs are used for the main power switching devices, where SPMC topologies are presented to operate as a controlled rectifier by suitable switching schemes. The proposed design is base on modulation index of 0.1 until 0.9 and the switching frequency of 5 kHz and 10 kHz. The simulations of a conventional single-phase controlled rectifier is carried out using PSIM software will be compared with the simulations by MATLAB/Simulink using SPMC topology to verify the propose operation. Further investigations are then carried-out to implement rectifier boost technique to ensure that the supply current waveform is continuous, sinusoidal and in phase with the supply voltage. In this thesis, the basic SPMC topology will be reviewed based on controlled rectifier operation. The IGBTs are