# SAFE COMMUTATION STUDIES FOR SINGLE PHASE MATRIX CONVERTER OPERATING AS AC TO AC OCNVERTER

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## ABSTRACT

This paper describes implementation of safe commutation switching sequence for controlled rectifier operation of Single-Phase Matrix Converter (SPMC). Safe commutation strategy was developed to avoid voltage spikes due to inductive load. Sinusoidal Pulse Width Modulation (SPWM) technique was used to calculate the switch duty ratio to synthesize the output. One of those limitations is the absence of the natural free-wheeling path afforded in conventional converter topology trough 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 switching sequence is arranged by providing a continuous path for current flow during switch transition to avoid voltage spikes. A computer simulation model was developed to investigate the behaviour using MATLAB/Simulink (MLS).

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# CHAPTER 1

# INTRODUCTION

## 1.0 BACKGROUND OF STUDY

The matrix converter is a modern power conversion topology, first introduced by Alesina and Venturini in 1980 [1] and [2], representing the circuit as a matrix of bidirectional power switches. It is a force commutated converter which uses an array of controlled bidirectional switches as the main power elements to create a variable output voltage system with unrestricted frequency. There is presently considerable interest in matrix converter (MC) technology both in academic and industrial community [3]. The matrix converter permits direct AC to AC power conversion without an intermediate DC link and therefore represents an 'all silicon' solution as the power converter, removing the need for reactive energy storage components used in conventional rectifier-inverter based systems[4].

The AC to AC matrix converter topology was first investigated in 1976 and then more recently using a generalized high frequency switching strategy [5]. The basic of matrix converter are from a special class of cycloconverter that was developed in the early 1930s [6]. 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 AC type. Inherent commutation problems that lead to switching spikes are also discussed with safe