MODELLING AND SIMULATION OF A SINGLE-PHASE AC-AC MATRIX CONVERTER USING SINUSOIDAL PULSE WIDTH MODULATION (SPWM)

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ABSRACT

This paper presents the work carried out in developing computer simulation model using the MATLab/Simulink environment for ac-ac converter. The model for the system is constructed using block diagrams in simulink library and fulfills the characteristics of the system. A direct frequency changer, Single-phase Matrix Converter (SPMC) were used in this work with the output being synthesized using the Sinusoidal Pulse Width Modulation (SPWM) Technique. The circuit is fed from 50V (rms), 50Hz supplying a passive R and L load. The result obtained is compared with Pspice simulation.

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INTRODUCTION

1.1 Background

The historical progress in power electronics applications originates with the development and introduction of the General Electric Company in 1957. Progress of power semiconductor devices along with microcomputer developments have resulted in the proliferation of power electronic application [1].

Power electronics refers to control and conversion of electrical power-by-power semiconductor devices where these devices operate as switches. The task is to process and control the flow of electric energy by supplying voltages and currents in a form that is optimally suited for user loads. Power electronic has applications that span the whole field of electrical power systems, with the power range of these applications extending from a few VA/Watts to several MVA/MW. The four main forms of conversion in power electronics include:

1.   AC-to-DC Conversion
2.   DC-to-AC Conversion
3.   DC-to-DC Conversion
4.   AC-to-AC Conversion

The AC-AC matrix topology was first reported by Gyugyi [1] in 1976 in a conceptual manner; very theoretical in nature but useful for providing insights for foundation of future research. In its basic form the matrix is a special class of Cycloconverter that was developed in early 1930s. This was later used by Alesina *et al* [2] to develop a generalized high-frequency switching strategy providing several attractive features and described as a generalized transformer synthesis.