ABSTRACT

Nowadays Direct AC-AC converters have received considerable interest as a viable alternative to the conventional back-to-back PWM (Pulse Width Modulation) converter in the ac/ac conversion. Inherent four-quadrant operation; absence of bulky dc-link electrolytic capacitors; clean input power characteristics and increased power density are few of the attractive characteristics provided by direct ac/ac converter. However, industrial application of the converter is still limited because of some practical issues such as common mode voltage effects, high susceptibility to input power disturbances and low voltage transfer ratio. The dissertation thesis proposes some of the topologies with suitable control techniques that are able to answer above serious issues

To analyze the above-mentioned converter, a generalized switching model has been proposed. Using this static converter model along with two different modes of control a systematic and comprehensive design approach is established. This established design approached is then further applied to analysis and design of various structures that are capable of transformation of voltages, frequency transformation ranging from low frequencies to high frequencies and also the phase transformations from three phase to single phase and vice versa.

Further a new converter topology is proposed that is most suitable solution as an interconnection link between variable frequency distributed generation sources supplying to same load (which may be one common grid). A reduced number configuration can be a suitable alternative for compact and low profile requirements where the four-quadrant operation is not required.

Finally an experimental prototype is developed and tested to establish the feasibility of the proposed converter topologies and the experimental results verify the computer aided simulation analysis.