A SINGLE-PHASE AC TO AC MULTI-LEVEL INVERTER

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UNIVERSITITEKNOLOGI MARA

AMRAN BIN ABDUL JALIL
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR

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ABSTRACT

This paper presents the design and development of a single-phase AC to AC multi-level inverter, which used seven levels inverter topology. Two-stage power conversions are involved. The AC supply is converted to DC by using rectifier while DC to AC is converted using inverter. The model of single-phase AC to AC multi-level inverter is simulated by using PSpice software. To validate the result, the circuit was constructed and the results obtained were compared with the simulation results.

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CHAPTER 1

INTRODUCTION

The AC variable-speed drives market has seen rapid expansion over the last decade. At lower power (3-75kW), voltage source inverters dominate the market. Most employ fast switching IGBTs (isolated gate bipolar transistors), resulting in improved output waveforms, increased efficiency and, in addition, allow the implementation of high-performance control techniques such as vector control. However, high-power variable-speed drives, particularly those requiring fast torque controls, still tend to employ DC machines with fully controlled rectifiers. Induction motor drives have encroached into the lower performance high power market with the use of current source inverters, and more recently GTO (gate turn off) based voltage source inverter. However, the performance of these systems is limited by the slow switching frequencies employed, which results in a poor output waveform and slow dynamic response. Cycloconverters can also be used with both induction and synchronous motors, but their speed range is considerably limited [1].

Recently there has been an effort towards extending the power range of voltage source inverters employing IGBT devices. Low-voltage high-power system can be produced by connecting devices in parallel, as long as simultaneous switching and correct current sharing can be guaranteed. Drives manufacturers are now introducing drives rated beyond 200kW using parallel IGBT technology. Alternatively, series connection can provide high-power medium-voltage drives, but again simultaneous switching must be ensured and correct voltage sharing (both during switching and in steady state) must be maintained otherwise devices destruction may occur. Moreover, higher voltage devices are now becoming available with most manufacturers offering 1700V IGBTs with 3300V devices now appearing [1].