A Five Phase Three-Level Neutral Point Clamped Converter Using DSP and FPGA Based Control Scheme

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Abstract

Recently, increasing attention is being paid to the development of multi-phase motor drives because they have such advantages as reduction of pulsating torques, reduction in harmonic currents, increase in current per phase without the need to increase the phase voltages and reduction in the voltage-level in the direct-current link. Other important features of multi-phase motor drives are increased reliability and an increased torque/ampere relation per unit volume of the machine. This paper presents the development of a five phase 3-level neutral point clamped converter proposed for five-phase motor drives. The power circuit of the converter uses IGBTs while the control scheme is implemented by employing DSP and FPGA devices. The continuous and discontinuous carrier-based pulse-width modulation strategies for the converter has been designed and experimentally implemented. Some computer simulation and experimental results of converter waveforms feeding a passive load are presented.

Keywords: PWM power convertors; digital signal processing chips; field programmable gate arrays; insulated gate bipolar transistors; machine control; motor drive