

Abstract Details

Title: Harmonic Analysis of Various SPWM Techniques for Three Phase Diode Clamped Multi-level Inverter in MATLAB/Simulink Environment

Authors: Krishan and Chetan Praveer

Abstract: With advances in solid-state power electronic devices and microprocessors, various pulse-width-modulation (PWM) techniques have been developed for industrial applications. For example, PWM-based three-phase voltage source inverters (VSI) convert DC power to AC power with variable voltage magnitude and variable frequency. This thesis discusses the advantages and drawbacks of three different PWM techniques: the sinusoidal PWM (SPWM) technique, the third-harmonic-injection PWM (THIPWM) technique, and the bus-clamped PWM (BCPWM) technique. These three methods are compared by discussing their ease of implementation and by analyzing the output harmonic spectra of various output voltages (pole voltages, line-to-neutral voltages, and line-to-line voltages) and their total harmonic distortion (THD). The simulation results show that both the THIPWM and BCPWM techniques have lower total harmonic distortion than the SPWM technique. The THIPWM and SVPWM techniques in the under-modulation region can both increase the fundamental output voltage by 15.5% over the SPWM technique. Moreover, the SVPWM technique can increase the fundamental output by about 5% in each of the over modulation regions 1 and 2, respectively.

Keywords: PWM, THD, VSI, SVPWM.