

Four-wire Dynamic Voltage Restorer Based on a Three-Dimensional Voltage Space Vector PWM Algorithm

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Abstract

A modified voltage space vector pulse-width modulated (PWM) algorithm for a four-wire dynamic voltage restorer (DVR) is described. The switching strategy based on a three-dimensional (3-D) $\alpha\beta 0$ voltage space is applicable to the control of three-phase four-wire inverter systems such as the split-capacitor PWM inverter and the four-leg PWM inverter. In contrast to the conventional voltage space vector PWM method, it controls positive, negative and zero sequence components of the terminal voltages instantaneously. Three 3-D modulation schemes are analyzed with respect to total harmonic distortion (THD), weighted total harmonic distortion (WTHD), neutral line ripple and switching loss over the whole range of the modulation index when the DVR experiences both balanced and unbalanced sags with phase angle jumps. Experimental results from a 9 kW DVR system using a split-capacitor PWM inverter are presented to validate the simulation results.