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Basic Aspects of the Theoretical and Practical Relevance of the Method of Synchronous Multi-Zone PWM for Power Inverters

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Abstract

This paper briefly reviews the development and widespread use of an alternative method of synchronous multi-zone pulse width modulation (SMZ PWM), based on a non-standard time-domain-oriented space vector approach, for the adjustment of voltage source inverters (VSINs) and inverter-based ac drives with relatively low switching frequency (SwFr) of VSINs. It is shown that basic peculiarities of the method assures better understanding of modulation processes in power conversion systems (it is an important and useful educational aspect of the method), and also insures continuous synchronization and symmetry of the basic voltages in systems with both integral and fractional ratios between the SwFr of inverters and fundamental frequency (FFr) of installations, allowing minimization of subharmonics in spectra of voltage of VSINs and VSIN-based apparatuses. Examples of the use of the method of SMZ PWM to regulate several topologies of inverter-based three-phase, dual three-phase, five-phase, and six-phase drive installations are presented.

Keywords: voltage source inverters, switching frequency, pulse width modulation, power conversion, digital modulation, speed drives, voltage control, spectral analysis, computational efficiency, electrical engineering education

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