Model predictive current control of six-phase induction motor drives using virtual vectors and space vector modulation

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Abstract

The use of multiphase machines has become a suitable choice in high-performance industry applications through advantages such as lesser torque ripple, enhanced current distribution per phase, and fault-tolerance capability. Among different control approaches for the regulation of multiphase drives, model-based predictive current control (MPCC) is one of the most analyzed strategies due to its adaptability and good dynamic response. However, this approach presents some disadvantages, e.g., high x–y currents and increased harmonic content in the fundamental α–β stator currents. Modulation strategies have been combined with MPCC to overcome these shortcomings. This article proposes a modulated MPCC with virtual vectors and space vector modulation for the regulation of an asymmetrical six-phase induction machine to minimize the x–y currents, reduce the harmonic content, and perform improved stator currents tracking compared with other MPCC versions. Experimental tests are provided to demonstrate the quality of the proposed current control strategy.