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Direct Torque Control of Three-Phase Induction Motor Powered by Three-Level Indirect Matrix Converter

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Abstract: In this paper, the three-phase induction machine (IM) fed by a three-level indirect matrix converter (IMC3) is proposed and investigated. Indeed, the IMC3 converter consists of a current rectifier connected to a three-level neutral-point-clamped voltage source inverter (NPC-VSI) without a bulky DC link capacitor interface. The rectifier ensures the bidirectional power transfer, where it is controlled by the space vector modulation (SVM) with the aim to obtain nearly a unity input power factor and to improve the input current waveform by the minimization of the harmonics content. On the other hand, the direct torque control (DTC) strategy is used to ensure the control of the three-phase IM, where the appropriate voltage vectors applied on the IM are generated via the control of the NPC-VSI. This combination can benefit from the advantages of the DTC and the IMC3 at the same time, allowing to improve the dynamic performances of the controlled three-phase IM compared to conventional topologies. For the validation of the advantages brought by this combination of the proposed topology of the used converter and the control strategy, simulations tests have been carried out.

Keywords: *direct torque control; induction machine; three-level inverter; space vector modulation; indirect matrix converter.*

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