A Modified Multiband Hysteresis Controlled DTC of Induction Machine with 27-level asymmetrical CHB-MLI with NVC modulation

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Abstract The influence of Direct Torque Controlled Induction Motor Drive in the area of industrial application is very high; it presents foremost area of controllability of load at different states of operation. The major snags to the controller are maintaining Constant Switching Frequency and Infeasibility state. This paper concentrates on rectifying these problems with Modified Multiband Hysteresis Controller and Nearest Vector Control Modulated Asymmetrical Cascaded H-Bridge Multilevel Inverter for the better drive operation. In this case proper modification in MHC gives the optimal utilizations of each control vector to avoid the infeasibility states with a Lookup-Table and Multilevel Inverter gives more number of control voltage vectors with constant switching frequency for flexible operation of drive with low disturbances. Direct Torque Control equipped with these two modules achieves better operating conditions with low Torque ripples, low distorted flux and speed with different loads, and all other satisfactory load operating parameters.

1. Introduction

The escalation of Induction Machine (IM) control requirement in the industrial applications with input side qualitative power, raises the opportunity to the arrival of contemporary converters and controllers capable to machine all needed operating conditions.

The DTC induction motor drive gives better dynamic performance with a simple control strategy, but has undesired torque and speed ripples due to some internal computational drawbacks in control action such as switching frequency, bands of hysteresis controller and voltage vector selection. There is a significance of simple and better arrangement of controller to fix these flawed parameters at an optimal state to minimize the drawbacks. The most essential part of DTC is inverter and employed to get low disturbances in input side as well as to provide more number of voltage vectors to avoid infeasibility state of DTC operating conditions with fundamental switching states. Multilevel Inverter provides

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more number of vectors and levels in output, but general DTC based MHC does not utilize every vector due to constraints in bands of Hysteresis controller. Classical DTC control strategy has ONE level Flux, TWO level Torque Hysteresis controllers and THREE level inverter. Instead of inverters, Multilevel Inverters are replaced to get low distorted input to the machine; simultaneously, Hysteresis controllers are also changed. But these Hysteresis controllers are modified by the aspects of Torque Ripples, so only torque Hysteresis controllers are extended to Multiple Bands and Flux Hysteresis controller is in the same level. This modification in Hysteresis Controller gives better results in torque ripple reduction but avoiding some of the vectors generated by multilevel inverter. Modifications in MHC give the maximum utilization of voltage vectors for selection in the control strategy to get better control of induction motor without changing the estimators and conventional DTC logic.

![Figure 1](https://example.com/f1.png)

**Figure 1** General block diagram for DTC.

![Figure 2](https://example.com/f2.png)

**Figure 2** Three level space vector hexagon with sector selection approach and hysteresis bands.
دریافت فوری

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