



Modelling of Modular Multilevel Converter Based Electric Drives

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ABSTRACT

This paper presents a control scheme for the modular multilevel converter (MMC) to drive a variable-speed ac machine, especially focusing on improving dynamic performance. MMC topology essentially requires advanced control strategies to balance energy and suppress the voltage pulsation of each cell capacitor. This paper proposes a control strategy for the robust dynamic response of MMC even at zero output frequency employing leg offset voltage injection. The ac machine has been driven from standstill to rated speed without excessive cell capacitor voltage ripples utilizing this proposed strategy.

KEY WORDS: Multi-Level Inverter, Electric Drives, PWM Technique and Harmonics.

1. INTRODUCTION:

A MODULAR multilevel converter (MMC) with focus on high-power medium voltage ac motor drives is presented. The use of an MMC makes it possible to save bulky reactive components in a medium-voltage motor drive application, such as a line-transformer, harmonic filter, and dc-link reactor. Compared with conventional medium voltage source converters, the MMC has a modular structure made up of identical converter cells. Because it can easily provide higher number of voltage level for medium voltage applications, the quality of the output voltage waveform is better. In addition, because of the modular structure it has advantages, such as easy maintenance and assembly. Theoretically, the magnitude of the cell voltage fluctuation is proportional

to magnitude of the output phase current and inversely proportional to operating frequency. For this reason, special effort is demanded to drive the ac machine through MMC, which requires considerable starting torque and low-speed steady state operation. In recent studies of and the principles and algorithms for ac motor drives with the MMC have been introduced. However, they did not address the actual control strategies, such as changing output frequency, including standstill and covering load torque disturbance. The energy balancing control is one of the main issues of an MMC system. In many literatures the energy balancing controls of an MMC that uses circulating current control and modulation scheme have been introduced. The leg offset voltage is used to regulate the circulating current and has little effect on ac