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Multilevel converter for high-voltage high-speed switched reluctance motor

***Abstract**. This paper presents simulation results of multilevel converter for SRM drive. Simulations were carried out for different rotational speeds. The simulation results show that the application of multilevel converter reduces the number of switching events when hysteresis current control is employed.*

Keywords: multilevel converter, switched reluctance motor.

Introduction

Switched reluctance motors are an alternative for motors with permanent magnets in variable speed drive applications due to numerous merits [1]. An operation in wide rotational speed range is possible because of the DC voltage increase. Thus, high-voltage-rated switches have to be utilized in such applications. Moreover, in low speed range operation high switching frequency is required [2].

Analysed multilevel converter

Modified cascade H-bridge converter presented in [3] is analysed. The converter circuit is shown in Fig. 1.

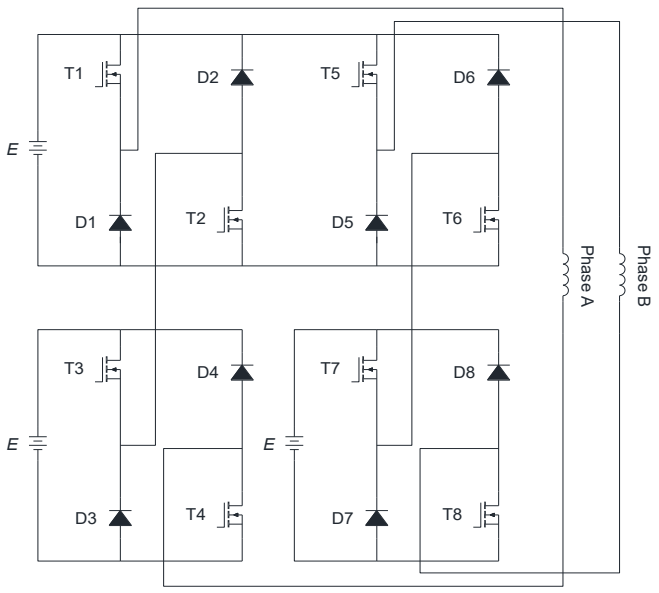

Fig.1. Multilevel converter.

The simulation model of converter and motor (2D model) was built in Ansys Maxwell-Simplorer environment.

Simulation results

Waveforms of phase current and phase voltage for rotational speed considerably lower than rated speed are presented in Fig. 2.

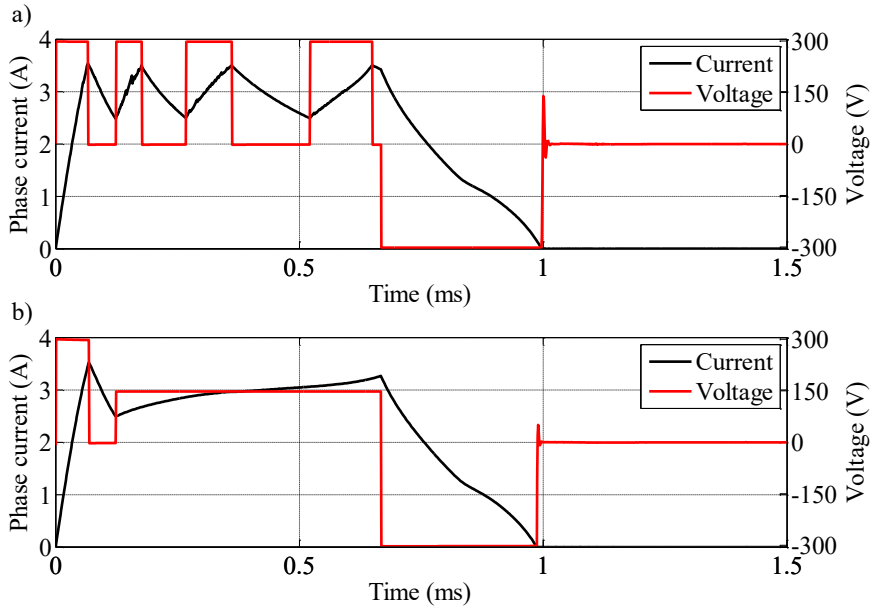

Fig.2. Waveforms of phase current and phase voltage for *n*=20000rpm a) conventional converter b) multilevel converter.

Conclusion

The application of multilevel converter reduces the number of switching events when hysteresis current control is employed. Moreover, the application of such converter enables to use low voltage rated devices. Nevertheless, it has negative influence on drive system efficiency.

References

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