Multi-Level Converters and Switching Techniques

Arunprasanth, S , Jeyadarsan, T. and Atputharajah, A.

Abstract

The power electronic converters play major role in keeping the operations of power system continuous and stable together with fault-ride through, power quality and safety. The high power and higher controllability requirement ensure the needs of Multi-Level Converters (MLCs) in the power system with proper selection of devices and their switching techniques. The semiconductor switches in the converters, are switched using gate drive signals, developed from switching sequences depending on the converter type. The necessity of high-power transmission capacity inducts the transmission to be done at high voltage level, which reduces the transmission line losses. This paper discusses the types of MLCs and their switching techniques. The MLCs such as two-level six-pulse converter, three-level Diode Clamp Converter (DCC), Five-level DCC, Five-level Flying Capacitor Converter (FCC) and Chain Circuit Converter (CCC) are modeled and simulated in EMTDC/PSCAD software. Further this paper explains switching techniques, such as Selective Harmonic Elimination Modulation (SHEM), Carrier based Pulse Width Modulation (PWM) with different modulating functions, Rectangular PWM (Rect. PWM), Hysteresis Switching (Hys SW). This research clearly explains the switching techniques with different converter topologies.