Wide band solution and sensitivity analysis for lower order harmonics control in multilevel converter

Zahoor Ahmad Ganie*

Department of Electrical Engineering,
National Institute of Technology Srinagar,
J&K, India
and
Department of Electrical Engineering,
Islamic University of Science and Technology,
Kashmir, India
Email: zahoor.ganie@islamicuniversity.edu.in

Abdul Hamid Bhat

Department of Electrical Engineering,
National Institute of Technology Srinagar,
J&K, India
Email: bhatdee@nitsri.ac.in

Salman Ahmad

Department of Electrical Engineering,
Islamic University of Science and Technology,
Kashmir, India
Email: salmanahmad19@gmail.com

Abstract: Low switching frequency in medium voltage and high power application of power converters is desired in order to minimise the switching losses. Pre-programmed pulse width modulation technique is extensively used in such applications as it ensures better quality output waveform. But in its implementation, the main challenge is the calculation of switching angle values from the system of highly nonlinear transcendental equations which are obtained by Fourier series analysis of the output waveform. In this paper, a differential evolution-based evolutionary intelligent technique is proposed to calculate the optimised switching instants in a wide band range. The sensitivity of the switching instants as a function of modulation index is minimised as wide band solution permits flexibility in its operation. Computational, simulation and hardware results using DSP controller TMS320F2812 are presented to corroborate the concept.

Keywords: pulse width modulation; PWM; harmonics minimisation; differential evolution; sensitivity; switching angles; DSP.

Reference to this paper should be made as follows: Ganie, Z.A., Bhat, A.H. and Ahmad, S. (2023) 'Wide band solution and sensitivity analysis for lower order harmonics control in multilevel converter', *Int. J. Power Electronics*, Vol. 18, No. 2, pp.176–200.

Copyright © 2023 Inderscience Enterprises Ltd.