Synchronous Undermodulation Control Modes of System with Three PWM Converters

Valentin Oleschuk
Institute of Power Engineering
Academy of Sciences of Moldova
Chisinau, Republic of Moldova
oleschukv@hotmail.com
Giovanni Griva, Adel Deriszadeh
Department of Energy
Politecnico di Torino
Turin, Italy
giovanni.griva@polito.it
Victoria Burcenco
Faculty of Energetics and Electrical
Engineering
Technical University of Moldova
Chisinau, Republic of Moldova

***Abstract*-This paper is focused on the operation analysis of transformer-based ac drive system with three modulated converters connected specifically to windings of power transformer. It provides multilevel voltage to induction machine by means of three sets of converter-side windings of power transformer. A special switching scheme has been disseminated for adjustment of converters, insuring synchronization of its output voltages and symmetry of voltage waveforms. The total harmonics distortion factor and weighted total harmonic distortion factor have been determined and compared for the basic voltages of this installation. The system performance with three techniques of continuous and discontinuous pulsewidth modulation (PWM) has been evaluated with accent on comparative study of voltage distortion on the converter-side windings of the transformer.**

***Keywords* – inverter; ac drive; transformer; control; PWM.**

REFERENCES

[1] J. Rodriguez, J.-S. Lai, and F. Z. Peng, "Multilevel inverters: a survey of topologies, controls, and applications," IEEE Trans. on Ind. Electron., vol. 49, pp. 724-738, 2002.
[2] M. Hagiwara, K. Nishimura, and H. Akagi, "A medium-voltage motor drive with a modular multilevel PWM inverter," IEEE Trans. on Power Electron., vol. 25, no. 7, pp. 1786–1799, 2010.
[3] J.-J. Jung, H.-J. Lee, and S.-K. Sul, "Control of the modular multilevel converter for variable-speed drives," Proc. of IEEE Int. Conf. Power Electron., Drives, Energy Syst.(PEDES'2012), pp. 1–6, 2012.
[4] Yongsoon Park, Sungjae Ohn, and Seung-Ki Sul, "Multi-level operation with two-level converters through a double-delta source connected transformer," Journal of Power Electronics, vol. 14, no. 6, pp. 1093- 1099, 2014.
[5] Sungjae Ohn, Yongsoon Park, and Seung-Ki Sul, "Multi-level operation of triple two-level PWM converters," Proc. of IEEE Energy Conversion Congress and Exposition (ECCE'2015), pp. 4283-4289, 2015.
[6] J. Holtz, "Pulsewidth modulation for electronic power conversion," IEEE Proc., vol.82, no.8, pp.1194-1213, 1994.
[7] N. Mohan, T.M. Undeland, and W.P. Robbins, Power Electronics, 3rd ed., John Wiley & Sons, 2003.
[8] F. Blaabjerg, V. Oleschuk, and F. Lungeanu, "Synchronization of output voltage waveforms in three-phase inverters for induction motor drives," Proc. of IEEE-IEEJ Power Conversion Conf. (PCC'2002), pp. 528-533, 2002.
[9] V. Oleschuk, F. Profumo, G. Griva, R. Bojoi, and A.M. Stankovic, "Analysis and comparison of basic schemes of synchronized PWM for dual inverter-fed drives," Proc. of IEEE Int'l Symp. on Ind. Electron. (ISIE'2006), pp.2455-2461, 2006.
[10] V. Oleschuk and G. Griva, "Simulation of processes in synchronized cascaded inverters for photovoltaic application," International Review of Electrical Engineering, vol. 4, no. 5, pp. 928-936, 2009.
[11] V. Oleschuk and F. Barrero, "Standard and non-standard approaches for voltage synchronization of drive inverters with space-vector PWM: A survey," International Review of Electrical Engineering, vol. 9, no. 4, pp. 688-707, 2014.