DOI: https://doi.org/10.15407/techned2016.02.029

IMPROVEMENT OF THE INPUT CURRENT WAVEFORMS OF A MATRIX CONVERTER IN THE CASE OF BALANCED SINUSOIDAL POWER SUPPLY VOLTAGES AND UNBALANCED LOAD

Journal	Tekhnichna elektrodynamika
Publisher	Institute of Electrodynamics National Academy of Science of Ukraine
ISSN	1607-7970 (print), 2218-1903 (online)
Issue	№ 2, 2016 (March/April)
Pages	29 – 34

Authors
V.M. Mykhalskyi*, V.M. Sobolev, V.V. Chopyk, I.A. Shapoval**
Institute of Electrodynamics National Academy of Science of Ukraine,
Pr. Peremogy, 56, Kyiv-57, 03680, Ukraine.
e-mail: mikhalsky@ied.org.ua
ORCID ID:* href="/eng/*ID http://orcid.org/0000-0002-8251-3111
ORCID ID:** http://orcid.org/0000-0002-9107-5061

Abstract

The matrix converter (MC) control method based on the general algorithm of input reactive power regulation is aimed to improve the quality of the input currents in conditions of unbalanced load when powered by undistorted balanced voltage system has been proposed and studied. For this purpose, the formation of the input current space vector as the sum of its active and reactive symmetrical components has been considered. The scope of the dynamic modulation of reactive component of the input current as converter control parameter depending

on constant and variable components of the instantaneous power or on the degree of unbalance of the load and the output phase shift has been analytically determined. The effectiveness of the proposed approach is approved by the MC input currents simulation taking into account the actual conditions of switching and discrete formation of these currents. References 10, figures 6, table 1.

Key words: matrix converter, input current, reactive power, unbalanced load.

Received: 22.01.2016
Accepted: 25.01.2016
Published: 18.03.2016

References

1. Mykhalskyi V.M., Sobolev V.M., Chopyk V.V., Shapoval I.A. Maximizing the control range of a matrix converter. *Tekhnichna Elektrodynamika*. 2015. No 1. P. 7–13. (Ukr)
2. Mykhalskyi V.M., Sobolev V.M., Chopyk V.V., Shapoval I.A. Improvement of the input current waveforms of a matrix converter under unbalanced and/or nonsinusoidal input voltage conditions. *Tekhnichna Elektrodynamika*. 2015. No 3. P. 17–24. (Ukr)
3. Akagi H., Watanable E.H., Aredes M. Instantaneous power theory and applications to power conditioning. Piscataway, NJ: IEEE Press, 2007. 379 p. DOI: https://doi.org/10.1002/0470118938
4. Ali S., Wolfs P. An improved modulation method for matrix converters with unbalanced output loading. Proceedings of the 2014 Australasian Universities *Power Engineering* Conference, AUPEC 2014. Perth (Western Australia). 28 September-1st October, 2014. P. 1–6. DOI:

https://doi.org/10.1109/AUPEC.2014.6966577
5. Blaabjerg F., Casadei D., Klumpner C., Matteini M. Comparison of two current modulation strategies for matrix converters under unbalanced input voltage conditions. IEEE Trans. on *Industrial Electronics*. Vol. 49. No 2. April, 2002. P. 289–295. DOI: https://doi.org/10.1109/41.993261
6. Casadei D., Serra G., Tani A. Reduction of the input current harmonic content in matrix converters under input/output unbalance. Proc. of IEEE-IECON '95, Orlando, Florida, 6-10 Nov. 1995. Vol. I. P. 457–462. DOI: https://doi.org/10.1109/IECON.1995.483452
7. Casadei D., Serra G., Tani A. Reduction of the input current harmonic content in matrix converters under input/output unbalance. *IEEE Trans. on Industrial Electronics.* 1998. Vol. 45. No 3. P. 401–411. DOI: https://doi.org/10.1109/41.678998
8. Casadei D., Serra G., Tani A. A general approach for the analysis of the input power quality in matrix converters. Proc. IEEE-PESC '96, Baveno, Italy, June 23-27, 1996. Vol. II. P. 1128–1134. DOI: https://doi.org/10.1109/PESC.1996.548723
9. Mykhalskyi V.M., Sobolev V.M., Chopyk V.V., Polishchuk S.Y., Shapoval I.A. Matrix converter control strategy maximizing reactive power transfer. Proceeding of the International Conference on *Intelligent Energy and Power Systems* (IEPS), Kyiv (Ukraine). June 02-06, 2014. P. 26–31. DOI: https://doi.org/10.1109/IEPS.2014.6874193
10. Nielsen P., Casadei D., Serra G., Tani A. Evaluation of the input current quality by three different modulation strategies for SVM controlled matrix converters with input voltage unbalance. Proc. of IEEE-PEDES '96, New Delhi, India, Jan. 8-11, 1996. Vol. II. P. 794–800. DOI: https://doi.org/10.1109/PEDES.1996.536375

PDF