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INSTANTANEOUS POWER THEORY OF POLYPHASE POWER SYSTEMS WITH REGARD OF TRANSMISSION LINE RESISTIVE PARAMETERS

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Authors

M.Yu. Artemenko[1]*, Y.V. Kutafin[1], V.M. Mykhalskyi[2], S.Y. Polishchuk[2]***, V.V. Chopyk[2]****, I.A. Shapoval**

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[1]- National Technical University of Ukraine Igor Sikorsky Kyiv Polytechnic Institute,
pr. Peremohy, 37, Kyiv, 03056, Ukraine
[2]- Institute of Electrodynamics National Academy of Sciences of Ukraine,
pr. Peremohy, 56, Kyiv, 03057, Ukraine
e-mail: mikhalsky@ied.org.ua
* ORCID ID : http://orcid.org/0000-0001-9341-9238
** ORCID ID : http://orcid.org/0000-0002-8251-3111
*** ORCID ID : http://orcid.org/0000-0002-6978-2747
**** ORCID ID : http://orcid.org/0000-0002-5046-5223
***** ORCID ID : http://orcid.org/0000-0002-9107-5061

Abstract

In the paper, the theory of instantaneous power of polyphase power supply systems has been further developed by substantiating the new relations for instantaneous active current and instantaneous apparent power taking into account the dependence on the transmission line resistance and corresponding to analogous integral values of the periodic mode of the

three-phase four-wire system. As a result of the application of the matrix-vector algebra formulas, new formulas for the decomposition of instantaneous loss powers in the transmission line have been obtained, in which the minimum possible losses due to instantaneous active current were identified. The new calculated relation for the improvement factor for the power loss in the transmission line is obtained by using a shunt active filter with a control strategy providing a minimum possible losses. As a consequence of the general theory of instantaneous power of polyphase systems, its basic concepts for a three-phase three-wire power supply system in the coordinate system of the two-wattmeter method were defined. This does not require matrix transformations of the coordinates inherent in the classical theory of instantaneous power, which increases the accuracy and speed of the control systems of semiconductor converters in the active filters and renewable energy sources. The results of computer modeling confirmed the adequacy of all modified concepts of the instantaneous power theory for polyphase power systems. References 17, figures 5.

Key words: instantaneous power theory, polyphase power system, parallel active filter control strategy.

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