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CONTROL CHARACTERISTICS OF ACTIVE FOUR-QUADRANT CONVERTER IN RECTIFIER AND RECOVERY MODE

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Abstract

High-speed train is supplied by alternating current (AC) power and bases on single-phase four quadrant (4Q) converter as one necessary part of the AC-DC-AC transform process. This paper introduce hysteresis control system of 4Q-converter and it's regulating characteristics. Regulating characteristics are obtained on the basis of energy balance equation and describes dependence of output voltage and regulating coefficient of the hysteresis control system ξ in rectifier-mode and recuperation-mode. The nonlinear character of the control characteristic and

its dependence on the load current is determined. It is concluded that for a steady process of rectification and recovery, the automatic control system must contain a feedback channel of the load current. A 4QS-converter model was developed in the Matlab simulation environment where the theoretical positions of output voltage regulation and high power quality parameters in rectification and recovery modes were confirmed. References 10, figures 6.

Key words: active four quadrant converter, control characteristic curve, hysteresis modulation.

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References

1. Evdokimov S.A., Myatezh S.V., Zotova E.V., Volkova O.L., Stepanov A.A., Kryshkov V.Yu. Zone Rectifier Study. *Sbornik nauchnykh trudov Novosibirskogo gosudarstvennogo tekhnicheskogo universiteta* . 2011. No 1. Pp. 105–112. (Rus)
2. Gemerov G.G., Kovalchuk O.V. Active rectifier – voltage source with hysteresis control system. *Tekhnichna Elektrodynamika*. 2011. No 2. Pp. 75 – 83. (Rus)
3. Gemerov G.G., Kolesnic Y.V. Modulation frequency of input currant in active rectifier-voltage source with hysteresis control system. *Tekhnichna Elektrodynamika*. Tematychnyi vypusk Sylova elektronika ta enerhoefektyvnist. 2008. Part. 3. Pp. 79 – 84. (Rus)
4. Plakhtiy A.A. Hysteresis control system of three-phase active rectifier with power factor correction. *Zbirnyk naukovykh prats Natsionalnoho universytetu korablebuduvannia.* 2013. No 4 (449). Pp. 82–88. (Rus)
5. Shirochenko Yu.N. Input converters of modern electric rolling stock of alternating current. *Ele ktronika i elektrooborudovanie transporta* . 2010. No 1. Pp. 15–18. (Rus)

6. Scherback Ya.V., Plakhtiy A.A., Tsekhovskoy M.V. Improvement of frequency converter electromagnetic compatibility with active rectifiers. *Elektrotekhnichni ta kompiuterni systemy*. 2014. No 15 (91). Pp. 344–347. (Rus)
7. Fen Li, Yunping Zou, Wei Chen, Jie Zhang. Comparison of Current Control Techniques for Single-phase Voltage source PWM Rectifiers. IEEE International Conference on *Industrial Technology* (ICIT), April 2008. Pp. 1–4.
8. Arpit Bohra, Divya Sajeesh, Chintan Patel and Michael Saldanha. Modulation Techniques in Single Phase PWM Rectifier. IJCA Proceedings on International Conference on *Advances in Science and Technology*, (ICAST), 2015 (3):5–7, February 2016. Pp. 5–7.
9. Lubomir German, Martin Hrasko, Jozef Kuchta, Jozef Buday. Single phase PWM rectifier in traction application. *Journal of electrical engineering*. 2011. Vol. 62. No 4. Pp. 206–212.
10. Zheng Jun, Feng Xiaoyun, Xie Wangyu, Zhang Junling. The Transient Current Control for Single Phase PWM Rectifiers. *Power Electronics*. 2009. Vol. 43. No 12. Pp. 2–4.

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