

国家重点基础研究项目

注入式混合型有源电力滤波器的参数优化设计及其工程应用

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摘要:

分析了注入式混合型有源电力滤波器(injection type hybrid active power filter, IHAPF)的结构和工作原理, 着重讨论了其主电路的参数优化设计; 提出了一种无源滤波器的设计方法, 既满足谐波治理要求又可确保装置的可靠运行; 提出了基于粒子群算法的注入支路参数优化设计方法, 在确保IHAPF谐波抑制能力的同时降低了电网谐波电压对装置可靠性的影响。针对某企业整流装置导致无功不足和谐波污染的实际工况, 研制了一套IHAPF, 仿真分析和工程应用表明, 该IHAPF可以有效地进行谐波治理和无功补偿, 满足了该企业的要求。

关键词:

Parameter Optimization Design for Injection Type Hybrid Active Power Filter and Its Engineering Application

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Abstract:

After analyzing the structure and working principle of injection-type hybrid active power filter (IHAPF), the optimum parameter design of its main circuit is emphatically researched. A design method for passive filter, which can meet the demand of harmonic elimination and ensure reliable operation of power filter, is proposed. A particle swarm optimization (PSO) algorithm based optimum parameter design method for injection circuit, which ensures the harmonic elimination ability of IHAPF and reduces the affect of harmonic voltage on power filter, is put forward. According to practical working condition of insufficiency of reactive power and harmonic pollution of a certain factory due to the rectifier circuit without power filter, an IHAPF device is developed. Simulation results and engineering application show that the designed IHAPF can effectively eliminate harmonics and compensate reactive power.

Keywords:

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参考文献:

- [1] 罗安. 电网谐波治理和无功补偿技术及装备[M]. 北京: 中国电力出版社, 2006: 1-21.
- [2] 王兆安, 杨君, 刘进军. 谐波抑制与无功补偿[M]. 北京: 机械工业出版社, 1998: 1-11.
- [3] 韩学军, 刘万勋, 刘广平, 等. 基于三相旋转参考相量的并联有源电力滤波器谐波电流精确检测方法[J]. 电网技术, 2008, 32(3): 75-83. Han Xuejun, Liu Wanxun, Liu Guangping, et al. An accurate approach to detect harmonic current by use of shunt active power filter based on three-phase rotating reference phasors[J]. Power System Technology, 2008, 32(3): 75-83(in Chinese).
- [4] 忻黎敏, 许维胜, 余有灵. 基于递推离散傅里叶变换和同步采样的谐波电流实时检测方法[J]. 电网技术, 2008, 32(6): 14-18. Xin Limin, Xu Weisheng, Yu Youling. A real-time harmonic current detection method based on recursive discrete fourier transform and synchronous sampling[J]. Power System Technology, 2008, 32(6): 14-18(in Chinese).
- [5] 王晓刚, 谢运祥, 帅定新. 智能控制方法应用于APF的综述与展望[J]. 电网技术, 2008, 32

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(8): 35-41. Wang Xiaogang, Xie Yunxiang, Shuai Dingxin. Overview and prospect on application of intelligent control methods to active power filters[J]. Power System Technology, 2008, 32(8): 35-41 (in Chinese). [6] Fujita H. A hybrid active filter for damping of harmonic resonance in industrial power systems[J]. IEEE-TPE, 2000, 15(2): 215-222. [7] Dirk D, Joep J, Rik W, et al. A new hybrid filter to dampen resonances and compensate harmonic currents in industrial power systems with power factor correction equipment[J]. IEEE Transactions on Power Electronics, 2001, 16(6): 821-827. [8] 赵怀军, 庞亚飞, 邱宗明, 等. 改进的单位功率因数谐波电流实时检测方法[J]. 电网技术, 2007, 31(9): 38-42. Zhao Huaijun, Pang Yafei, Qiu Zongming, et al. Modified unity power factor harmonic current real-time detection method[J]. Power System Technology, 2007, 31(9): 38-42(in Chinese). [9] 陈东华, 纪志成. 适用于飞机电网的并联型有源电力滤波器功率电路及其控制策略[J]. 电网技术, 2008, 32(13): 75-79. Chen Donghua, Ji Zhicheng. Power circuit of shunt active power filter suitable to aircraft power supply network and its control strategy[J]. Power System Technology, 2008, 32(13): 75-79(in Chinese). [10] 曾令全, 曾德俊, 吴杰, 等. 用于有源滤波器谐波检测的一种新的自适应算法[J]. 电网技术, 2008, 32(13): 40-44. Zeng Lingquan, Zeng Dejun, Wu Jie, et al. A novel adaptive algorithm applied in harmonic detection of active power filter[J]. Power System Technology, 2008, 32(13): 40-44(in Chinese). [11] Luo A, Shuai Z, Zhu W, et al. Combined system for harmonic suppression and reactive power compensation[J]. IEEE Trans on Industrial Electronics, 2009, 56(2): 418-428. [12] 肖湘宁, 徐永海, 刘昊. 混合型有源电力补偿技术与实验研究[J]. 电力系统自动化, 2002, 26(3): 39-44. Xiao Xiangning, Xu Yonghai, Liu Hao. Analysis of hybrid power compensator and its experimental study[J]. Automation of Electric Power Systems, 2002, 26(3): 39-44(in Chinese). [13] 范瑞祥, 罗安, 李欣然. 并联混合型有源电力滤波器的系统参数设计及应用研究[J]. 中国电机工程学报, 2006, 26(2): 1-5. Fan Ruixiang, Luo An, Li Xinran. Parameter design and application research of shunt hybrid active power filter[J]. Proceedings of the CSEE, 2006, 26(2): 1-5 (in Chinese). [14] 周柯, 罗安, 楚红波. 新型大功率并联混合注入式有源滤波器的研究与应用[J]. 电工电能新技术, 2008, 27(1): 16-20. Zhou Ke, Luo An, Chu Hongbo. Research and application of new type high-capacity hybrid active power filter[J]. Advanced Technology of Electrical Engineering and Energy, 2008, 27(1): 16-20(in Chinese). [15] 帅智康, 罗安, 范瑞祥, 等. 注入式混合有源电力滤波器的注入支路设计[J]. 电力系统自动化, 2007, 31(5): 1-5. Shuai Zhikang, Luo An, Fan Ruixiang, et al. Injection branch design of injection type hybrid active power filter[J]. Automation of Electric Power Systems, 2007, 31(5): 1-5(in Chinese). [16] 赵波, 曹一家. 电力系统无功优化的多智能体粒子群优化算法[J]. 中国电机工程学报, 2005, 25(5): 1-7. Zhao Bo, Cao Yijia. A multi-agent particle swarm optimization for reactive power optimization[J]. Proceedings of the CSEE, 2005, 25(5): 1-7(in Chinese).

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