电网技术 2010, 34(7) 9-13 DOI: ISSN: 1000-3673 CN: 11-2410/TM

国家重点基础研究项目

合成试验方法在VSC-HVDC换流阀短路电流试验中的应用

罗湘,汤广福,查鲲鹏,贺之渊,高冲

中国电力科学研究院，北京市 海淀区 100192

摘要：

合成试验方法是用多套电源分别提供试品在试验中所需应力的试验方法。为检验由模块化多电平换流器(modular multi-level converter，MMC)构成的电压源换流器高压直流输电(voltage source converter based high voltage direct current，VSC-HVDC)换流阀设计的正确性及其对暂态工况应力的耐受性，研究了MMC阀暂态运行试验的试验方法，分析了与过电流关断试验和短路电流试验相关工况的应力，提出了2种等效试验方法，并将合成试验方法应用于试验电路的设计中，给出了试验电路与实际工况下阀的应力波形，结合关键应力等效性分析，验证了上述试验方法和试验电路的正确性和有效性。

关键词：

Application of Synthetic Test Method in Short-Circuit Current Tests for Voltage Source Converter Based High Voltage Direct Current Valves

LUO Xiang ,TANG Guang-fu ,ZHA Kun-peng ,HE Zhi-yuan ,GAO Chong

China Electric Power Research Institute, Haidian District, Beijing 100192, China

Abstract:

Synthetic test method is such a test approach, which provides required stresses for test sample under different operational conditions during the operation test respectively by multi-sets of power suppliers. To examine the design validity of converter valve in voltage source converter-based high voltage direct current (VSC-HVDC) based on modular multi-level converter (MMC) and its stress tolerance under transient operation condition, an approach to perform transient state operation test for valves in MMC is researched. The stresses related to overcurrent turn-off test and short-circuit current test are analyzed, then two equivalent test methods are proposed and synthetic test method is applied in the design of testing circuit and then the stress waveforms of testing circuit and that under practical operation conditions are given. Combining with the analysis on equivalence of key stresses, the correctness and effectiveness of above-mentioned test method and testing circuit are verified.

Keywords:

收稿日期 2010-05-26 **修回日期** 2009-06-15 **网络版发布日期** 2010-07-13

DOI:

基金项目:

国家重点基础研究发展计划项目(973项目)(2004CB- 217907)。

通讯作者: 罗湘

作者简介:

作者Email: lucky@epri.sgcc.com.cn

参考文献：

[1] Gunnar A，Kjell E，Kjell S. DC transmission based on voltage source converters[C]. CIGRE SC14 Colloquim，South Africa，1997. [2] 王凤川. 电压源换流器式轻型高压直流输电[J]. 电网技术，1999，23(4)：74-76. [3] 文俊，张一工，韩民晓，等. 轻型直流输电：一种新一代的HVDC技术[J]. 电网技术，2003，27(1)：47-51. Wen Jun，Zhang Yigong，Han Minxiao，et al. HVDC based on voltage source converter：a new generation of HVDC technique[J]. Power System Technology，2003，27(1)：47-51 (in Chinese). [4] Jacobson B，Jiang-Hafner Y，Rey P，et al. HVDC with voltage source converters and extruded cables for up to 300 kV and 1000 MW[C]. CIGRE Session 2006，Paris，2006. [5] Juan D，Luis M，Jose R，et al. Reactive power compensation technologies，state-of-the art review[J].

Proceedings of the IEEE，2005，12(93)：2144-2164． [6] Edris A．FACTS technology development：an update[J]．IEEE Power Engineering Review，2000，3(20)：4-9． [7] Poul S，Anca D H，Florin L，et al．Wind farm models and control strategies[R]．Denmark：Riso National Laboratory Roskilde，2005． [8] Ana D C，Rickard E，Ying J H，et al．Co-ordination of parallel AC-DC system for optimum performance[C]．Power Delivery Conference，Madrid，Spain，1999． [9] Urban A，Anders H，Christer L，et al．Gotland HVDC light transmission-world's first commercial small scale DC transmission [C]．CIRED Conference in Nice，France，1999． [10] Gunar A．HVDC using voltage source converters：a new way to build highly controllable and compact HVDC substation[C]．CIGRE SC 23 Symposium，Paris，France，2000． [11] Axelsson U，Holm A，Liljegren C，et al．The Gotland HVDC light project-experience from Trialand and commercial operation[C]．16th International Conference and Exhibition on Electricity Distribution，Amsterdam，Netherlands，2001． [12] 张文亮，汤广福，查鲲鹏，等．先进电力电子技术在智能电网中的应用[J]．中国电机工程学报，2010，30(4)：1-7．Zhang Wenliang，Tang Guangfu，Zha Kunpeng，et al．Application of advanced power electronics in smart grid[J]．Proceedings of the CSEE，2010，30(4)：1-7(in Chinese)． [13] IEC．IEC 62501 Electrical testing of voltage sourced converter (VSC) valves for high-voltage direct current(HVDC) power transmission[S]．Geneva：IEC，2009． [14] Glinka M，Marquardt R．A new AC/AC-multilevel converter family applied to a single-phase converter[C]．PEDS Conference，Singapore，2003． [15] Glinka M，Marquardt R．A new modular voltage source inverter topology[C]．EPE 10th European Conference on Power Electronics and Applications，Toulouse，France，2003． [16] Glinka M，Marquardt R．A new single-phase AC/AC-multilevel converter for traction vehicles operating on AC line voltage[C]．EPE 10th European Conference on Power Electronics and Applications，Toulouse，France，2003． [17] 罗湘，汤广福，温家良，等．电压源换流器高压直流输电装置中IGBT的过电流失效机制[J]．中国电机工程学报，2009，29(33)：1-7． Luo Xiang，Tang Guangfu，Wen Jialiang，et al．Over-current failure mechanism of IGBT within voltage source converter based high voltage direct current [J]．Proceedings of the CSEE，2009，29(33)：1-7(in Chinese)． [18] 邱关源．电路[M]．4版．北京：高等教育出版社，1999：161-163． [19] 贺之渊，汤广福，郑健超．大功率电力电子装置试验方法及其等效机理[J]．中国电机工程学报，2006，26(19)：47-52． He Zhiyuan，Tang Guangfu，Zheng Jianchao．High power electronics equipment test method and its equivalence mechanism[J]．Proceedings of the CSEE，2006，26(19)：47-52(in Chinese)． [20] 贺之渊．大功率电力电子组件等效试验方法的研究[D]．北京：中国电力科学研究院，2006．

本刊中的类似文章
