

电力系统

新型模块化多电平换流器空间矢量脉宽调制的通用算法

李强<sup>1</sup>, 贺之渊<sup>1</sup>, 汤广福<sup>1</sup>, 包海龙<sup>2</sup>, 王熙骏<sup>2</sup>, 王韧<sup>2</sup>

1. 中国电力科学研究院, 北京市 海淀区 100192; 2. 上海市电力公司, 上海市 浦东区 200122

摘要:

模块化多电平换流器是一种新型的多电平结构, 模块化程度高, 结构上更易于扩展。但是现阶段对于这种换流器调制策略的研究相对较少。本文结合模块化多电平逆变器的结构特点, 分析了其空间矢量状态。在两电平基础上, 衍生出了一种适用于模块化多电平换流器的空间矢量脉宽调制通用算法, 并且该算法可以扩展到任意电平数。本文以降低开关损耗和输出电压波形畸变率为目标, 详细讨论并确定了冗余电压矢量选择方法、其最优的电压矢量合成顺序和广义零矢量的最优时间分配方法; 并在两电平SVPWM基础上, 衍生了适用于MMC的多电平SVPWM通用算法。多种电平数下仿真实验的结果证明了算法的正确性。

关键词: 模块化多电平换流器 子模块 空间矢量脉宽调制 冗余电压矢量 广义零矢量

A Generalized Algorithm of Space-Vector PWM for a New Type of Modular Multilevel Converter

LI Qiang<sup>1</sup>, HE Zhiyuan<sup>1</sup>, TANG Guangfu<sup>1</sup>, BAO Hailong<sup>2</sup>, WANG Xijun<sup>2</sup>, WANG Ren<sup>2</sup>

1. China Electric Power Research Institute, Haidian District, Beijing 100192, China; 2. Shanghai Municipal Electric Power Company, Pudong District, Shanghai 200122, China

Abstract:

Modular multilevel converter (MMC) is a newborn multilevel topology. They are of great flexibility and capable to be extended to high levels. However, in this case less investigation has been reported on modulation strategy. Combined with characteristics and mechanism of this structure, the space vector states were developed first. A generalized space vector pulse width modulation (SVPWM) algorithm was proposed, which is available for the MMC topology, is independent of the number of the converter levels and is totally an extension of a 2-level SVPWM. Aiming at low switching losses and low wave distortion, a final solution was presented to redundant voltage vector selection, optimum synthesis sequence and optimum distribution of the dwell time of broad sense zero vector through detailed analysis. Based upon 2-level SVPWM, the relationship between dwell time and switching time of a MMC and a 2-level converter was uncovered. Simulation results have demonstrated a good performance which identifies its feasibility and validity.

Keywords: modular multilevel converter submodule space vector pulse width modulation redundant space vector generalized zero vector

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通讯作者: 李强

作者简介:

作者Email: liqiang@epri.sgcc.com.cn

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