

电力电子与电力传动

级联型多电平变流器新型载波相移SPWM研究

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摘要: 将单极性正弦脉宽调制(sine pulse width modulation, SPWM)引入到级联型多电平变流器中, 提出一种新型载波相移SPWM策略。该策略较传统的载波相移SPWM可以节省一半的脉宽调制(pulse width modulation, PWM)脉冲发生器, 对级联型多电平逆变器的数字化实现有重要的理论和实用价值。给出新型载波相移SPWM的2种调制方式, 分别推导频域调制模型, 并对其谐波特性进行分析、比较和仿真验证。仿真结果表明, 对于单相系统, 2种方式基本相当; 对于三相系统, 方式二的谐波特性更好。分析新型载波相移SPWM技术的热稳定性问题, 并给出其解决办法。实验结果验证了理论分析和仿真研究的正确性。

关键词: 新型载波相移SPWM 级联型多电平变流器 PWM脉冲发生器 频域调制模型 热稳定性

Novel Carrier Phase-shifted SPWM for Cascade Multilevel Converter

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Abstract: A novel carrier phase-shifted sine pulse width modulation (SPWM) strategy was proposed in this paper by introducing unipolar SPWM into cascade multilevel converters. The amount of pulse width modulation (PWM) pulse generators of the proposed modulation strategy is only the half of that of the traditional modulation strategy, which is of significant theoretical and practical value for the digital implementation of cascade multilevel converter. The two modes of novel carrier phase-shifted SPWM were given. The frequency domain modulated model of both modes was deduced. The harmonics feature of both modes was analyzed and compared, which is verified through simulation. Simulation result includes that both modes are equivalent for single phase system, and mode 2 is better than mode 1 at harmonic feature for three phase system. The thermal stability of novel carrier phase-shifted SPWM was analyzed and settled by an easy scheme. Experimental results proved the correctness of theoretical analyses and simulation research.

Keywords: novel carrier phase-shifted SPWM cascade multilevel converter PWM pulse generator frequency domain modulated model thermal stability

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