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基于虚拟磁链直接功率控制的四象限级联型多电平逆变器简化结构

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摘要： 传统四象限级联型逆变器由多个四象限电压胞组成，需要大量电量传感器及滤波电感，造成系统体积和成本显著增加。该文提出一种四象限级联型逆变器的新型简化结构，将基于虚拟磁链直接功率控制策略(virtual-flux-linkage direct power control strategy，VF-DPC)的PWM整流器与传统H桥逆变器相结合，引入虚拟磁链的概念并用于计算瞬时有功和无功功率，无需检测输入变压器二次侧输出电压，省去了交流电压传感器，并避免计算输入电流的微分；通过适当提高变压器感抗以起到滤波作用，从而取代了电压胞输入端滤波电感。所提出的简化结构具有体积小，有效降低传感器数量，抗干扰能力强，能量自由双向传递，输入、输出电流谐波含量较低等优点。仿真和实验结果证明了该新型简化结构及其控制策略的正确性和可行性。

关键词： 级联型逆变器 四象限 虚拟磁链直接功率控制 载波移相正弦脉宽调制

A Simplified Structure of Four-quadrant Cascade Multilevel Inverter Based on Virtual-flux-linkage Direct Power Control Strategy

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Abstract: Traditional four-quadrant cascade multi-level inverter (FCMI) that consisted of a few four-quadrant power cells needs so many sensors and filter inductors that makes the system volume and cost increase remarkably. Through combining the PWM rectifier based on virtual-flux-linkage direct power control strategy (VF-DPC) with traditional H bridge inverter, a novel simplifed structure of FCMI is proposed. The active and reactive power can be calculated through the virtual flux linkage, then the AC voltage sensors are not needed and the differential calculus of input current is avoided. By increasing the inductance of input transformer properly, the function of filter is realized, thus the filter inductances of power cells are removed. The proposed simplified structure has the merits: smaller volume, fewer sensors, stronger ant-jamming ability, bidirectional power flowing freely, lower harmonic of both input and output currents. The simulation and experimental results indicate its validity and feasibility.

Keywords: cascade inverter four-quadrant virtual-flux-linkage direct power control carried phase-shifted sinusoidal pulse width

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参考文献：

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