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一种新型交流恒功率负载仿真模型

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A New Simulation Model of AC Constant Power Load

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摘要

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摘要 根据闭环控制的高功率因数 (HPF) 脉冲宽度调制 (PWM) 整流器的恒功率工作特性, 对交流(AC)恒功率负载 (CPL) 仿真模型进行了研究。采用输入电流波形跟随电压波形的办法, 利用MATLAB建立了交流恒功率负载的仿真模型。在模型两端加载的电压不含谐波和含有谐波的情况下, 模型均可以自动计算出输入电流有效值 (RMS), 使得模型输入平均功率保持恒定, 并能生成电流波形, 反映出电压谐波对电流波形的影响。模型仿真结果与实际高功率因数PWM整流器的输入波形进行了比较, 验证了该模型的正确性。

关键词: 功率变换器 谐波畸变 恒功率负载 功率因数 电力系统

Abstract: According to the operational principle of a closed-loop regulated high power factor (HPF) pulse width modulation (PWM) rectifier, a simulation model of alternating current (AC) constant power load (CPL) is proposed. This model is implemented in MATLAB software. The input current of this model is made to follow the input voltage and the consistence in their waveforms is achieved. Whether the harmonics contained in the input voltage are considered or neglected, this model can calculate the root mean square (RMS) of the input current and then generate an appropriate current waveform. Therefore the input power of the model is kept constant and the influence of harmonics is reflected in the waveform of the input current. Compared with the experimental results of a practical PWM rectifier behaving as a constant power load, the simulation results in MATLAB software verify the covalidity of this model.

Keywords: power converters harmonic distortion constant power load electric power factor electric power systems

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