

电力电子与电力传动

随机频率PWM逆变器的分析设计

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摘要: 应用随机PWM方法可以使逆变器的输出电压频谱呈连续分布而不影响基波分量,这样由逆变器供电的电动机的声学噪声和机械振动就会大大减小。然而,由于RPWM机理的分析和设计对于一般工程师来讲是比较繁琐的,这就限制了RPWM的应用。本文提出了一种用于驱动感应电机的随机频率PWM逆变器,并给出了可实现的设计程序。首先,直观分析了随机信号对逆变器输出电压频谱的影响,其次,进行了相关的量化设计,最后,采用SIMULINK仿真和实验的手段对整个系统进行了分析。仿真和实验结果表明本文提出的RFPWM设计方案中,逆变器输出电压的频谱是均匀随机分布的,而且声学噪声和机械振动都得到有效抑制。

关键词: 随机开关频率脉宽调制逆变器 量化设计 频谱 声学噪声

Analysis and Design of the Random frequency PWM Inverters

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Abstract: Random pulse width modulation (RPWM) approaches can make the harmonic spectrum of inverter output voltage be continuously distributed without affecting the fundamental frequency component, and thus the acoustic noise and mechanical vibration of an inverter-fed ac motor drive are greatly reduced. However, the analysis and design of the RPWM mechanisms are generally not so trivial for practical engineers that their applications are limited. In this paper, a random frequency PWM (RFPWM) inverter and its practical design procedure are presented. First, the effects of the attributes of random signal on the inverter output harmonics spectrum distribution characteristics are analyzed using intuitive concept. The quantitative design, Simulink simulation and implementation of the proposed RFPWM inverters are introduced. The proposed RFPWM inverter is employed to power an induction motor drive. The simulated and measured results indicate that uniform random distribution of inverter output harmonic spectrum and thus smaller acoustic noise and mechanical vibration are obtained by the proposed RFPWM scheme.

Keywords: random frequency PWM inverter quantitative design spectrum acoustic noise

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