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论文**内置混合式可控磁通永磁同步电机有限元分析**

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摘要:

提出一种转子内同时放置钕铁硼和铝镍钴两种永磁体的内置混合式转子磁路结构的可控磁通永磁同步电机。它充分利用钕铁硼剩磁密度和矫顽力都很高, 铝镍钴剩磁密度很高而矫顽力很低的特点, 使两种永磁体在磁性能上合理配合。通过控制直轴电流矢量脉冲的幅值和方向来控制铝镍钴的磁化强弱和方向, 使气隙永磁磁通受控, 实现宽范围弱磁调速。介绍了电机工作原理, 进行了电磁场有限元分析, 给出了不同磁化状况下电机磁场分布图及气隙磁场曲线, 指出了增加交轴磁阻的必要性, 总结出永磁体尺寸对电机弱磁倍数影响的变化规律。

关键词: 内置混合式转子 有限元分析 可控磁通 永磁同步电机 记忆电机

Finite Element Analysis of Interior Composite-rotor Controllable Flux Permanent Magnet Synchronous Machine

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Abstract:

A new kind of flux-controllable permanent magnet synchronous machine (PMSM) with interior composite-rotor structure was proposed. Both NdFeB and AlNiCo permanent magnets are embedded in the rotor. It makes full use of the high remanent flux density, high coercive force of NdFeB, and the high remanent flux density, low coercive force of AlNiCo. By imposing a d-axis current pulse whose direction and amplitude are controllable on the stator windings, the control system can change the magnetization direction and remanent flux density of AlNiCo, control the air-gap PM-flux, and rise speed by flux weakening. The working principle of this machine was introduced. The magnetic field was analyzed by finite-element method. Internal magnetic field distribution and air-gap magnetic field waveforms in different motor conditions were demonstrated. The results show the necessity of increasing q-axis magnetic reluctance. The rule of the influence of magnet size on the number of times of flux weakening was summarized.

Keywords: interior composite-rotor finite element analysis controllable-flux permanent magnet synchronous machine memory motor

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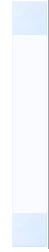
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