

无刷双馈电机自抗扰控制方法

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Active disturbance rejection control strategy for brushless doubly-fed machine

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摘要

图/表

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摘要

针对无刷双馈电机非线性强耦合特性, 提出一种实现其高性能控制的自抗扰控制方法. 在控制电机同步坐标系下, 设计磁链自抗扰控制器和转速自抗扰控制器, 对系统内部的耦合影响和系统外部扰动进行观测和补偿, 实现非线性系统线性化控制. 该控制器具有较强的鲁棒性, 且不依赖电机模型. 仿真对比结果表明, 自抗扰控制器能够准确地估计和补偿系统的内外扰动, 控制精度高, 抗扰能力强, 能够实现磁链和电磁转矩的解耦, 进而实现磁链和转速相互独立控制, 是一种简单有效的高性能控制方法.

关键词: 无刷双馈电机, 自抗扰控制器, 解耦控制

Abstract:

Considering the nonlinear coupling effect of the brushless doubly-fed machine(BDFM), this paper develops an active disturbance rejection control(ADRC) law to achieve high performance control. The flux ADRC and speed ADRC are designed in the control motor synchronous reference frame. The inner coupling effect and the external disturbance are estimated and compensated by using ADRC law. The proposed controller has strong robustness and is independent of the parameters or model of the machine. Simulation results show that, the ADRC strategy can accurately estimate and compensate the internal and external disturbance, and is more advantageous in control accuracy and disturbance rejection. The proposed controller achieves the decoupling of flux and torque, and then the flux and speed can be controlled separately. Therefore, the ADRC strategy is a simple and effective method for the high-performance control of BDFM.

Key words: brushless doubly-fed machine active disturbance rejection control decoupling control

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