

可再生能源发电

模糊前馈与模糊PID结合的风力发电机组变桨距控制

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摘要:

大型变桨距风电机组在额定风速以上通常采用PID控制器调节机组桨距角以达到功率恒定的目的,但由于从额定风速到切出风速之间的风速变化范围很大,一组固定的PID参数难以在不同风速下均有好的控制效果。该文在分析PID变桨距控制器缺点的基础上,提出模糊前馈与模糊PID结合的新型变桨距控制方法。模糊PID控制器能够保证在不同风速下均有较好的控制结果,而模糊前馈控制器则能够根据风电机组的桨叶气动特性,在额定风速以上的不同风速段,根据风速给出不同的适当的前馈桨距角,实现动态前馈补偿,提高控制系统的响应速度。对一个300 kW的变桨距风电机组的仿真表明,该方法在额定风速以上的不同风速段都能够有效地减小系统的超调量,缩短调节时间,具有较为满意的控制效果。

关键词: 变桨距控制系统 模糊PID控制器 模糊前馈控制器 气动特性

Variable Pitch Control of Wind Turbine Generator Combined With Fuzzy Feed Forward and Fuzzy PID Controller

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Abstract:

Large-scale variable pitch wind turbine generator usually uses the PID controller to maintain the output power unchanged above the rated wind speed. One set of PID parameters can hardly achieve satisfactory control performance because the range between rated wind speed and cut out wind speed is very large. This paper firstly analyzed the shortcomings of PID controller, then a new pitch control method combined with fuzzy feed forward and fuzzy PID controller was proposed. The fuzzy PID controller can produce a better control result than PID controller. With the analysis of the aerodynamic characteristics of the blade, the fuzzy feed forward controller can give different feed forward pitch angles according to wind speed at different wind speed range. The feed forward controller has achieved the dynamic feed forward compensation and improved the rapidness of control system. With the simulation of a 300 kW wind turbine generator at different wind speed, the new pitch control strategy can effectively reduce system's overshoot and regulation time, and has a satisfactory control performance.

Keywords: variable pitch control system fuzzy PID controller fuzzy feed forward controller aerodynamic characteristic

收稿日期 2009-08-17 修回日期 2009-09-14 网络版发布日期 2010-03-30

DOI:

基金项目:

教育部重点项目(109045)。

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