

可再生能源发电

基于时间推进自由尾迹法的水平轴风力机气动特性分析

周文平, 唐胜利, 吕红

重庆大学动力工程学院

摘要:

建立适合于水平轴风力机气动特性分析的自由尾迹计算方法。该方法中, 桨叶模型采用Weissinger-L升力面模型, 转子自由尾迹的求解采用时间推进方法, 数值求解方法采用4阶Adams-Moulton预估-校正算法以提高计算精度。应用所建立的方法对模型风力机处于轴向来流工况时的尾迹形状和气动特性进行计算, 并与文献实验数据进行比较, 验证了该方法的有效性。最后计算了来流风偏转和桨叶桨距角增加时尾迹形状的非定常畸变及气动载荷特性, 得出一些有意义的结论。

关键词: 水平轴风力机 时间推进 自由尾迹 气动特性

Computation on Aerodynamic Performance of Horizontal Axis Wind Turbine Based on Time-marching Free Vortex Method

ZHOU Wenping, TANG Shengli, Lü Hong

College of Power Engineering, Chongqing University

Abstract:

A computational method based on rotor free-wake model was developed for horizontal axis wind turbine's aerodynamic performance prediction. The analytical method combined a Weissinger-L lifting surface model with a time-marching free vortex method to simulate the rotor flow field. Adams-Moulton predictor-corrector scheme was used to improve computational order of accuracy. The comparison between the calculated results of model wind turbine under axis flow condition, including tip vortex geometry and aerodynamic performance, and available experimental data shows that this method is suitable for wind turbine aerodynamic performance analysis. Finally, a series of numerical calculations were made to investigate the evolving of tip vortex geometry and aerodynamic performance of the wind turbine when yawing 30° out of the wind and pitch angle increasing from 2° to 4°, some significant conclusions were obtained.

Keywords: horizontal axis wind turbine time-marching free vortex method unsteady aerodynamic performance

收稿日期 2010-12-27 修回日期 2011-02-25 网络版发布日期 2011-11-24

DOI:

基金项目:

重庆市科委自然科学基金资助项目(2006BA3023)。

通讯作者: 周文平

作者简介:

作者Email: wenpz@sina.com

参考文献:

本刊中的类似文章

- 1. 郭鹏. 模糊前馈与模糊PID结合的风力发电机组变桨距控制[J]. 中国电机工程学报, 2010,30(8): 123-128

扩展功能

本文信息

- Supporting info
- PDF(293KB)
- [HTML全文]
- 参考文献[PDF]
- 参考文献

服务与反馈

- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- 引用本文
- Email Alert
- 文章反馈
- 浏览反馈信息

本文关键词相关文章

- 水平轴风力机
- 时间推进
- 自由尾迹
- 气动特性

本文作者相关文章

- 周文平
- 唐胜利
- 吕红

PubMed

- Article by Zhou,W.B
- Article by Tang,Q.L
- Article by Lv,h