中国电机工程学报 2011, 31(23) 129-134 DOI: ISSN: 0258-8013 CN: 11-2107/TM

可再生能源发电

基于改进叶素动量理论的水平轴风电机组气动性能计算

曾庆川[1]，刘浩[1]，LIM Che Wah[2]，罗维奇[3]，杨云胜[3]

1. 河海大学水利水电学院
2. 香港城市大学建筑系
3. 江苏中亚新材料股份有限公司

摘要：

综合考虑到风剪切、塔影效应、三维旋转效应的影响，本文对传统的叶素动量理论(blade element momentum，BEM)进行改进，建立风电机组气动性能计算模型，基于该模型编制计算程序，以商用 1.5 MW风电机组为计算实例，计算出其在不同的风速、转速和桨距角配置下的轴向和切向气动荷载分布，以及推力、功率和风能利用系数，与传统BEM模型及风电设计分析软件FOCUS5计算值对比，验证了该模型的正确性和优越性。

关键词： 叶素动量理论 水平轴风电机组 气动性能

Computation of Aerodynamic Performance for Horizontal Axis Wind Turbine Based on Improved Blade Element Momentum Theory

ZENG Qingchuan[1],LIU Hao [1],LIM Che Wah [2],LUO Weiqi [3],YANG Yunsheng [3]

1. College of Water Conservancy and Hydropower Engineering, Hohai University
2. Department of Building and Construction, City University of Hong Kong
3. Jiang Su Zhongya New Material Co,Ltd.

Abstract:

By considering the effects of wind shear, tower shade and three-dimensional rotation, an improvement of the classical blade element momentum (BEM) theory was presented and a model for wind turbine aerodynamic performance was further established. Based on this model, a numerical algorithm and a program code were developed. Using a commercial 1.5 MW wind turbine as an example, the tangential and transverse aerodynamic load distributions, thrust and generator power, aerodynamic power coefficient were numerically analyzed for various conditions of wind speed, rotor speed and pitch angle. The numerical model and results were verified by comparing with the results of FOCUS5, a well-known software for wind energy design and analysis.

Keywords: blade element momentum (BEM) theory horizontal axis wind turbine aerodynamic performance

收稿日期 2010-10-29 修回日期 2010-12-13 网络版发布日期 2011-10-09

DOI:

基金项目:

通讯作者: 曾庆川

作者简介:

作者Email: qinzeng@hhu.edu.cn

参考文献：

本刊中的类似文章

1. 祝贺 徐建源 滕云 齐宏伟.风力机风轮气动性能三维流场数值模拟[J]. 中国电机工程学报, 2010,30(17): 85-90