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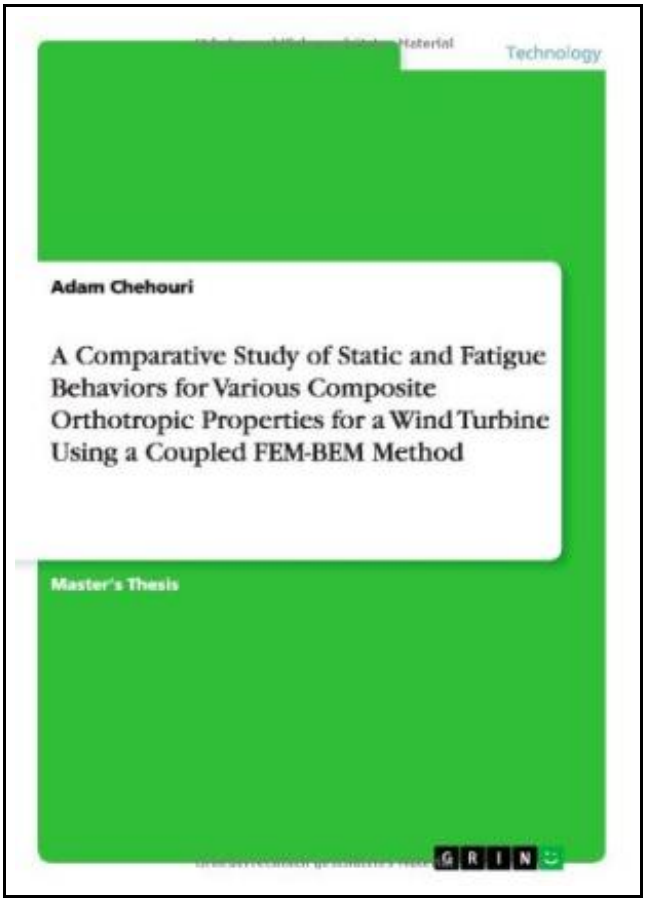

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(Neal Homenick IV)

A COMPARATIVE STUDY OF STATIC AND FATIGUE BEHAVIORS FOR VARIOUS COMPOSITE ORTHOTROPIC PROPERTIES FOR A WIND TURBINE USING A COUPLED FEM-BEM METHOD

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GRIN Verlag Gmbh Jan 2014, 2014. Taschenbuch. Book Condition: Neu. 213x152x12 mm. Neuware - Master's Thesis from the year 2013 in the subject Engineering - Mechanical Engineering, grade: 4.06/4.5 GPa, , language: English, abstract: In the wind industry, the current trend is towards building larger and larger turbines. This presents additional structural challenges and requires blade materials that are both lighter and stiffer than the ones presently used. This work is aimed to aid the work of designing new wind turbine blades by providing a comparative study of different composite materials. A coupled Finite-Element-Method (FEM) - Blade Element Momentum (BEM) code was used to simulate the aerodynamic forces subjected on the blade. The developed BEM code was written using LabView allowing an iterative numerical approach solver taking into the consideration the unsteady aerodynamic effects and off design performance issues such as Tip Loss, Hub Loss and Turbulent Wake State therefore developing a more rational aerodynamic model. For this thesis, the finite element study was conducted on the Static Structural Workbench of ANSYS, as for the geometry of the blade it was imported from a previous study prepared by Cornell University. Confirmation of the performance analysis of the chosen wind turbine blade are presented and discussed blade including the generated power, tip deflection, thrust and tangential force for a steady flow of 8m/s. The elastic and ultimate strength properties were provided by Hallal et al. The Tsai- Hill and Hoffman failure criterions were both conducted to the resulting stresses and shears for each blade composite material structure to determine the presence of static rupture. A progressive fatigue damage model was conducted to simulate the fatigue behavior of laminated composite materials, an algorithm developed by Shokrieh. It is concluded that with respect to a material blade design cycle, the coupling between a...

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