

The Aerodynamical and Structural Analysis of Wind Turbine Blade for Fatigue Prediction

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Abstract

The calculation of the dynamic load and stresses acting on wind turbine blades in order to predict fatigue is proposed. In this work the blade element theory was used to calculate aerodynamic loads for small wind turbine blades. This method can also estimate the power extracted by the turbine. A model analysis of rotor was performed using a finite element modeling in order to compute the frequencies and mode shapes. At last, dynamic stresses are computed for the root region of the blades, using finite element modeling. The resulting curves of stress vs. time, obtained for different wind speeds, are used for fatigue analysis in order to make an optimal choice of blades resistant to fatigue and being energetically efficient. In both modal and stress analysis two different approaches are utilized and their results are compared.