Numerical Investigation of Aerodynamic Characteristics of a New Wind Turbine During Its Design Stage

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ABSTRACT

ABSTRACT Present work conducts computer simulations with the Computational Fluid Dynamic (CFD) software package Fluent as a modeling tool to explore aerodynamic characteristics of a new Wind Turbine named M1. In this research, the governing equations consisting of two-dimensional, steady and three-dimensional, time-dependent conservation of mass and momentum are solved. Both laminar and turbulent flow fields are solved. For the turbulent flow computation, the k- ε two-equation turbulent model is adopted. The three-dimensional, tapered and twisted M1 wind turbine blade used in this study employs a hybrid HH-10/HH-12 non-symmetrical airfoil in the design. The important aerodynamic properties, including pressure, torque, and aerodynamic power, are determined under broad ranges of wind speed and pitch angle. The results of the predictions can provide the designers with references for stress analyses as well as the input loading conditions for further areoelastic analysis.

Keywords : Computational Fluid Dynamic, aerodynamic, wind turbine, torque, aerodynamic power, pitch angle

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