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Abstract

An optimization procedure for stall regulated Horizontal Axis Wind Turbine (HAWT) rotors is presented in this paper. The planform characteristics of the rotor, including the span-wise distribution of the chord and the lift and drag optimum polar curves of the sections are the design variables, which are determined by maximizing the annual energy capture at a certain site with known wind-speed Weibull characteristics. Constraints are put on the maximum lift of the blade sections, on the maximum value of the root flap-wise bending moment and on the blade area. The optimization is performed through a blade element aerodynamic code coupled to a downhill simplex optimizer. Application of the method to improve an existing reference rotor, operating at a high mean wind speed site, shows that an energy capture increase of the order of 20% is feasible.

Keywords

Wind Turbines, Rotor Optimization