

Flow Control Optimisation Using Vortex Generators in Turbine Blade

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Abstract : Aerodynamic flow control is achieved by interaction of flowing medium with corresponding structure so that its natural flow state is disturbed to delay the transition point. This paper explains the aerodynamic effect and optimized design of Vortex Generators on the turbine blade to achieve maximum flow control. The airfoil is chosen from NREL [National Renewable Energy Laboratory] S-series airfoil as they are characterized with good lift characteristics and lower noise. Vortex generators typically chosen are Ogival, Rectangular, Triangular and Tapered Fin shapes attached near leading edge. Vortex generators are typically distributed from the primary to tip of the blade section. The design wind speed is taken as 6m/s and the computational analysis is executed. The blade surface is simulated using k- ϵ SST model and results are compared with X-FOIL results. The computational results are validated using Wind Tunnel Testing of the blade corresponding to the design speed. The effect of Vortex generators on the flow characteristics is studied from the results of analysis. By comparing the computational and test results of all shapes of Vortex generators; the optimized design is achieved for effective flow control corresponding to the blade.

Keywords : flow control, vortex generators, design optimisation, CFD

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