

## Numerical Study of 5kW Vertical Axis Wind Turbine Using DOE Method

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**Abstract :** The purpose of this paper is to demonstrate the design of 5kW vertical axis wind turbine (VAWT) using DOE method. The NACA0015 airfoil was implemented for the design and 3D simulation. The critical design parameters are chord length, tip speed ratio (TSR), aspect ratio (AR) and pitch angle in this investigation. The RNG k- $\epsilon$  turbulent model and the sliding mesh method are adopted in the CFD simulation. The results show that the model with zero pitch, 0.3 m in chord length, TSR of 3, and AR of 10 demonstrated the optimum aerodynamic power under the uniform 10m/s inlet velocity. The aerodynamic power is 3.61kW and 3.89kW under TSR of 3 and 4 respectively. The aerodynamic power decreased dramatically while TSR increased to 5.

**Keywords :** vertical axis wind turbine, CFD, DOE, VAWT

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