

Effect of Thickness and Solidity on the Performance of Straight Type Vertical Axis Wind Turbine

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Abstract : Inspired by the increasing interest in the wind power associated with production of clean electric power, a numerical experiment is applied to investigate the aerodynamic performance of straight type vertical axis wind turbine with different thickness and solidity, where the incompressible Navier-Stokes (N-S) equations coupled with dynamic mesh technique is solved. By analyzing the flow field, as well as energy coefficient of different thickness and solidity turbine, it is found that the thickness and solidity can significantly influence the performance of vertical axis wind turbine. For the turbine under low tip speed, the mean energy coefficient increases with the increasing of thickness and solidity, which may improve the self-starting performance of the turbine. However, for the turbine under high tip speed, the appropriate thickness and smaller solidity turbine possess better performance. In addition, delay stall and no interaction of the blade and previous separated vortex are observed around appropriate thickness and solidity turbine, therefore lead better performance characteristics.

Keywords : vertical axis wind turbine, N-S equations, dynamic mesh technique, thickness, solidity

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