

عنوان مقاله:

Aerodynamic design of horizontal axis wind turbine using different airfoils

محل انتشار:

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خلاصه مقاله:

The blade element momentum (BEM) theory has been employed to examine the aerodynamic parameters such as lift, drag, and thrust coefficient. Tip loss factor is one of the most important parameters to improve BEM theory. Glauert and Prantl represented different expression for tip loss factor which have been used commonly at literature. But the measurements and theoretical analyses show that existing tip loss factor are inconsistent and fail to predict correctly the physical behavior in the blade tip. A new tip loss factor has proposed by Shen that remedies the inconsistency. In this study, Shen formula as the newest tip loss factor has been utilized to analyze thirteen different airfoils performance. The results indicate that the blade with the RISØ-A۱-۲۴ airfoil has the shortest chord length, approximately ۱.۸ meters, which is considered a significant advantage due to reduced material weight and construction costs. Moreover, the RISØ-A۱-۲۴ and FFA-W۳-۲۱۱ Free Transition airfoils are the most effective in terms of power generation, as their total power coefficient values versus tip speed ratio changes are higher compared to other airfoils. Additionally, airfoils such as FFA-W۳-۲۴۱ and S۸۱۴, which reach their maximum power coefficient at lower tip speed ratios, are suitable for areas with lower average wind speeds.

کلمات کلیدی:

Wind Energy, Horizontal axis wind turbine (HAWT), BEM method, Aerodynamic performances, power coefficient

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