

## **A Design Method for Wind Turbine Blade to Have Uniform Strength and Optimum Power Generation Performance**

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**Abstract :** There have been substantial incidents of wind turbine blade fractures and failures due to the lack of systematic blade strength design method incorporated with the aerodynamic forces and power generation efficiency. This research was to develop a methodology and procedure for the wind turbine rotor blade strength taking into account the strength, integration, and aerodynamic performance in terms of power generation efficiency. The wind turbine blade designed using this method and procedure will have a uniform strength across the span to save unnecessary thickness in many blade radial locations and yet to maintain the optimum power generation performance. A turbine rotor code, taking into account both aerodynamic and structural properties, was developed. An existing wind turbine blade was used as an example. For a condition of extreme wind speed of 100 km per hour, the design reduced about 19% of material usage while maintaining the optimum power regeneration efficiency.

**Keywords :** renewable energy, wind turbine, turbine blade strength, aerodynamics-strength coupled optimization

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