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Redesign of Wind Turbines

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ABSTRACT

On shore and off shore wind turbines have become conventional machines for electricity production. Wind is perineal source of kinetic energy in the form of moving air. As long as Earth is receiving solar heat, wind energy which is a derived form of moving atmospheric air will be available.

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Introduction

Turbines are energy receiving and conversion devices. Known Design errors should not be allowed. Error leading to loss of money, effort and Time. Presently the Wind. Turbine blades are sharper at the tip and wider at the root. This geometrical shape of the turbine rotors can be observed in the wind turbines manufactured at present by most of the commercial manufacturers all over the world.

Wider the blade Tip larger is the area of the turbine blades to receive and harness more power from the wind. The longer blades with their Tip wider can produce much higher turning moment at their roots and turn the entire wind rotor blades with a higher efficiency is the Experimental as well as physical understanding reported.

The moving air having kinetic energy can escape through the larger gap or larger area at the outer radius of the wind turbines when the tips of the blades are smaller. To prevent the air from going or passing without transferring kinetic energy to the blades of the turbine, wider area at the tips of the blade is the only best design option.

Technically it is the Swept area of the wind turbine rotor blades which becomes geometrically larger and larger starting from the inner centre to outer radius. Hence it is the Solidity ratio which is to be proportionately increased from the inner to the outer radius of the turbine for higher energy extraction from the air flow.

Error in Existing Design of Wind Turbines

Due course of time certain modifications done in the past lead to the Error of sharpening the blades rather than widening at the tips of the wind turbine. Swept area and Solidity Ratio are the two fundamental technical design parameters of wind turbines where Corrections are to be made to remove the mistake crept in in the existing design of wind turbines. Result is higher energy extraction within the swept area chosen. Once again by increasing turbine rotor tip area, the error can be removed. Historically observing the design of wind turbine rotors this error has crept in the design while aiming for larger size and higher output power from wind turbines. Larger swept area and higher solidity ratio wind turbines can work with much more efficiency.

Redesign of Wind Turbines for Higher Efficiency

Providing Larger swept area with higher solidity ratio and optimum angle of twist of the blades will end up with redesign of wind turbines.

- Hollow shaft instead of solid shaft for same twisting moment receiving capacity for the same mass of material of the shaft is the first step to be implemented in the redesign of new wind turbines.
- Increasing the blade width or rotor width at the peripheral end or tip of the blade can be supported and balanced by providing a circular support rings joining all the rotor blades.
- Structural redesign resulting from material reduction by making the regular solid shaft into an equally capable more rigid hollow shaft can compensate material addition due to the provision of circular metal rings connecting the blades.
- Suitable Bearings can be selected and placed for the hollow shaft into the hub where entire turbine is supported for its Rotation around the horizontal axis.
- Suitable physical model test combined with software simulation under dynamic conditions can be conducted well ahead of real mass manufacturing.
- Inputs from Climate conditions will impose maximum load fluctuations on the rotating and stationary parts of wind turbine. Redesign must take into consideration of all natural parameters

Conclusion

New Structural Strength added with more Rigidity for entire

wind Turbine evolved for Higher efficiency can be the outcome of this research with Global implications and implementation. Commercial Detail design can be obtained from the author of this work upon specific interest.

Reference

History of wind turbine can be referred in appropriate web site. This research is an original work prepared with physical understanding evolved from the fundamentals of wind turbine design and it does not have any previous references.