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Review Paper on Wind Turbine

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Abstract - *Traditional energy sources are near to end thus world is shifting towards renewable energy sources. In renewable energy major energy generation is done by Wind Energy Sources. Existing wind turbine has some drawbacks which can be overcome by bladeless turbine. Study of different wind turbine is done through various research papers. After the analysis of all papers is found that bladeless turbines are superior to bladed once, occupies less space & produces equivalent power. This paper investigates the latest associated technology with wind turbine system and future research direction for bladeless wind turbines.*

Key Words: **Renewable Energy, WindTurbine, Bladeless Turbine.**

1.INTRODUCTION

This In the process of wind power generation there are mainly two methods are considered, Rotational wind harvesting and Oscillation wind harvesting. Though both allow the transfer of mechanical energy to electric energy there is major difference in the mechanical system of transmission of energy from one form to another. Rotational wind harvesting is the basic principle used in the conventional windmill. In this type the spinning turbine blades are connected along a center shaft to gearbox. This gearbox transmits the mechanical energy obtained from the rotation of the blades by the flowing wind to the generator which translates the mechanical energy of rotation of blades into usable form of electricity. Wind energy harvesting technologies have gained remarkable importance in the energy industry for past few years. The fact about conventional wind turbine is costly to manufacture, bulk in weight and maintenance is also difficult. Wind technology is projected to have significance role in production of electricity for upcoming decades. World-wide energy policies now strongly promote for development of wind turbine and their technologies.

1.1 History

Utilizing the wind is not a new technology. From past years the humans are using the wind power to ease the everyday life, in household, farming and industry. Until the last decade of the 19th century, the wind power has been used in graining, water pumping and to drive sail boats. During the last century the wind turbine has been used as a device for generating electricity. Developments in the field of aerodynamics, mechanical/electrical engineering, control technology, and electronics provide the technical basis for wind turbines commonly used today.

2.LITERATURE REVIEW

According to the availability of required components and their working is essential for implementation of the project. This Paper provides information about the wind turbine theory and types which is important for designing of wind turbines.

2.1 Blade Wind Turbine.

S V R Wilson, et al. describe the measurement of Root bending moments on a three bladed 500 W horizontal axis wind turbine, which are obtained wing a purpose build to rotating data acquisition system. The main aim of this research was to integrate the moment when turbine was yawing in response to wind direction changes, particularly when yow rates were large. This situation usually causes the largest load on operating small turbine. At sufficiently high yaw rates, the moment receives a significant contribution from the cyclic Coriolis acceleration of the rotating and yawing blades. Consequences of the dominance of the Coriolis term for the assessment of blade safety are discussed [1].

Peter J. Schubel. et al. gives a brief review about a current state of art for wind turbine blade design is presented including theoretical maximum efficiency, propulsion practical efficiency, HAWT blade design and blade 100 ds. The revised study gives complete picture about wind turbine blade design and shows the dominance of modern turbine almost exclusive used of horizontal axis rates. The aerodynamics design principles for modern wind turbine blade are detailed, including blades plan shape / quant aero fail selection and options attack angles. A detail review of design loads wind Turbine blade is offered, described aerodynamic, gravitational, centrifugal, gyroscopic and operations conditions [2].

S. Bahramiasl, et al. gives the information about offshore wind turbines. They fabricate & test of an off-shore wind turbine under different rotor rotation velocities and different heading angle of wind so as to obtain the effects

of these parameters on structure responses. They study on the response of a wind turbine under environmental loads has had a notable importance due to the fact that structure behavior can strongly affect procedure of modeling and optimizing wind turbine structures. After the all calculations they comes on the result that wind heading angle may change behavior of spectrums which can be affected by rotor velocity as well [3].

Hiromichi Akimoto, et al. describes the Floating Axis Wind Turbine (FAWT) concept a rotating cylindrical float (spar buoy) becomes the turbine shaft of the Vertical Axis Wind Turbine (VAWT). The heavy rotor is directly supported by buoyancy and its connection to the power take off system is through flexible joints, so that do not have to keep the fixed upright position of the turbine. They try to reduce the supporting structures of the turbine design including the float system and the cost of device. The gyroscopic effects on the VAWT rotor contribute to the stabilization of the flexibly supported turbine. The motion of the proposed turbine is tested in the regular wave conditions. They come on result shows that the turbine axis shows precession motion around the balanced tilt position [4].

2.2. Bladeless Wind Turbine.

Abhijit Mane, et al, studied that wind turbines are considered be only 59% efficient and more over with large rotors a large area wake formation means that spacing between two turbine has to be kept very large. Hence, the conventional method of wind power generation has through off again with innovative approach. After some research they done project work include the design and development of vortex wind bladeless turbine a gyro action-based e- generator to be couples to it generator to generate the electricity. Prototype working model development has been done using 3.D. printing for vortex turbine and e-generator to more scale model that will demonstrate electricity generation and testing was done to determine the effect of wind speed on turbine speed, voltage, current and power generated by the model [5].

David Jesús Yáñez Villarreal compares new wind generators with different characteristics & conventional wind turbines to improve the exploitation of this clean energy source. They brief about the application of magnetic forces to the resonant structure allows to passively modify the structure rigidity, which leads to an increase of the lock-in range and consequently a higher number of working hours per year & Electromagnetic induction is also one of the available strategies to transform the energy of the oscillatory movement into electricity [6].

Akshay Agrawal et al, they design windmill is entirely different from a traditional windmill. Instead of the huge tower, nacelle and blades, this device has a conical frustum mast made up of fiber-glass (pivoted at one-third length from bottom), a crankshaft, a crank, a connecting rod and a hinge joint. The hollow and light weight mast makes this device portable and user-friendly. Also, this low-cost component opens a way for low-cost renewable source of energy [7].

Rishabh Ojha et al, they design such device is completely different from a traditional turbine. This puts the technology at the very low range of capital intensity for such projects; it also makes it highly competitive not only against generations of alternative or renewable energy, but even compared to conventional technologies. From research they get some fundamental results on the bladeless wind system and serve as stepping stones for the future development of bladeless wind power generating system. The forces that is beneficial or useful to generate power in bladeless are different from those in conventional horizontal axial wind turbine [8].

Davang Shubham s. et al, they give information about the bladeless wind turbine, from that information it is clear that the Bladeless turbine wind generator is the best option for electricity generation using wind power due to its various advantages. It helps to increase percentage of renewable energy for electrical power generation and provides electrically as well as economically efficient power to the consumers [9].

Pratik Kumar Shah et al, gives innovative concept to generate clean energy using wind energy which is distributed and flows across the globe. The bladeless wind turbine harnesses the kinetic energy persisting in the wind due to virtue of its motion and converts this energy into electric energy in similar manner to that of conventional wind turbines. However, if compare a bladeless wind turbine to a conventional wind turbine with similar energy generation, the bladeless wind turbine would cost significantly less, around 45% less. They done various simulations on solid works to simulate and test various parameters to determine the effect of turbine speed, wind speed on turbine, voltage, power and current produced by the model [10]

3. METHODOLOGY

Information was collected from various sources like technical research papers, webinars, YouTube videos and websites. After attending the lecture series of Wind Resources for Renewable Energies from Coursera. The information was then sorted into two topics i.e., Blade Wind Turbine and Bladeless wind turbine as per content of papers. After studying all the information from research paper and lectures. The comparison of Blade wind turbine and Bladeless Wind Turbine has been done. And the detailed information of both turbines is as follow.

3.1 Blade Wind Turbine

Power has been extracted from the wind over hundreds of years with historic designs, known as windmills, constructed from wood, cloth and stone for the purpose of pumping water or grinding corn. Historic designs are typically large, heavy and inefficient, were replaced in the 19th century by fossil fuel engines and the implementation of a nationally distributed power network. A greater understanding of aerodynamics and advances in materials, particularly polymers, has led to the return of wind energy extraction in the latter half of the 20th century. Wind power devices are now used to produce electricity, and commonly termed wind turbines. The orientation of the shaft and rotational axis determines the first classification of the wind turbine. A turbine with a shaft mounted horizontally parallel to the ground is known as a horizontal axis wind turbine or (HAWT). A vertical axis wind turbine (VAWT) has its shaft normal to the ground. A comprehensive look at blade design has shown that an efficient blade shape is defined by aerodynamic calculations based on chosen parameters and the performance of the selected aero foils. Aesthetics plays only a minor role. The optimums efficient shape is complex consisting of aero foil sections of increasing width, thickness and twist angle towards the hub. This general shape is constrained by physical laws and is unlikely to change. Currently manufacturers are seeking greater cost effectiveness through increased turbine size rather than minor increases through improved blade efficiency. This is likely to change as larger models become problematic through construction, transport and assembly issues.

3.2 Bladeless Wind Turbine (Vortex)

The main principle behind bladeless wind generator is the conversion of linear oscillation of mast to rotational motion. As the mast is subjected to wind energy, it tends to oscillate due to the vortices formed around the structure of the mast, which can be converted to rotational force to generate electricity. In the bladeless wind system configuration, the mast is fixed with respect to the ground and the rib structure at the top of the mast comprising of thread arrangement is used for pulling the threads attached to it. Energy is obtained by continuously oscillation of the mast the vibrations from the wind turbine are given to e-gyro generator. Gyro Torque is a new type of infinitely variable transmission system based on gyroscopic reaction. Gyro Torque is capable of large speed ratios, without the need to utilise gears for generating electricity from wind and wave power resources. The infinitely variable nature of Gyro Torque means that more power from wind and wave sources can be captured and controlled to generate electricity at reduced costs. By not transmitting the peaks and troughs of wind gusts Gyro Torque avoids severe mechanical and electrical loading from the turbine onto other parts of the system including the generator. Hence electrical power is getting from generator.

As per study the above information from research paper, it found that bladeless wind turbine is superior then conventional blade turbine. Then, design of new technology has been developed to overcome this problem, The New design of Bladeless wind turbine is done in Creo PTC software and principle of working is selected on the basis of above research paper. Material was selected according to the standards; Design analysis of bladeless wind turbine was performed in the Anysis software.

4. EXPECTED OUTCOMES

To generate electricity.
Get rid from bird deaths and noise pollution.
Reduced the cost of installation and time.
Save fossil fuels by using renewable energy source.
Make the world pollution free by using renewable energy with zero drawbacks.

5. FUTURE SCOPE

The From the research it is clear that the Bladeless wind turbine electricity generator is the best option for electricity generation using wind power due to its various advantages. The country like India which having more rural population and condition suitable for wind generation through bladeless wind turbine is the best solution. It will help to increase percentage of renewable energy for electrical power generation and provides electricity as well as economically efficient power to the consumers. Hence, we have to spread this concept because only renewable energy can survive the world in coming future and in that wind, energy is efficient option. Since most of states of India has many villages where there is still very less amount of available electricity distribution. So, at that place's establishment of this type of bladeless wind turbine will help them to available electricity as well as job for family Persons. It must be established in every state of India because of it is environment friendly as well as seeking available amount of non-renewable energy source.

6. CONCLUSIONS

This work is mainly study on different aspects for harnessing wind energy. It has been suggested that it is desirable to collect wind energy with a device that minimizes maintenance needs, especially as far as distributed generation is concerned. However, from above analysis and results obtained it can be concluded that bladeless wind turbine can be proven as a better alternative for conventional windmills if installed at large

numbers since it can produce outputs even at low wind speeds.

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