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Review paper on fabrication of wind turbine

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Abstract- Recently rapid population growth, high volume of energy demand and depletion of fossil fuels intend to search for an alternative energy source in new energy field. A wind energy is better option to solve such kind of problems and wind energy is source of renewable energy. Wind energy technologies have developed rapidly , and are about to play a big role in new energy field. Wind power generation is propotional to the wind speed cubed .therefore, a large increase in output is brought about if it is possible to create even a slight increase in the velocity of the approaching wind to a wind turbine. This paper shows the Fabrication of wind turbine.

Index Terms- *Renewable energy, Alternator, Blade, Diffuser, Shaft.*

1. INTRODUCTION

In recent years, due to energy crisis, wind energy, as an in- exhaustible and clean energy, is widely utilized in the world. The wind energy convert into electricity is the most popular utilization of wind energy, because wind energy is a type of clean energy.

The non-renewable energy resources such as oil, coal and gas are majorly used as energy nowadays. The main problem behind the non-renewable energy resources are not sustainable and create global warming which is hazardous to the environment. The renewable energy resources are best way to solve this issue. The renewable energy resources such as solar, wind, tidal and bio gas are available in abundant and sustainable which can be utilized for the requirement. Wind energy is the purest form of renewable energy which is available highly for the production of electricity. Wind is the natural resources which cannot affect the environment. Most of the countries including India understand the importance of wind energy and used as a primary source of renewable energy because of low cost compared to other renewable energy resources. The wind energy is produced by converting the kinetic energy of atmospheric air into mechanical energy. The vertical axis wind turbine (VAWT) and horizontal axis wind turbine (HAWT) are the turbines used to convert the mechanical energy from the kinetic energy.

2.LITERATURE REVIEW

1. Niranjana.S.J investigated the power generation by vertical axis wind turbine. In this paper the power is generated by fixing the wind mill on the road high ways .when the vehicle is passed through the road at high speed the turbine of the wind mill rotates and generates the power sources. This analysis indicates that the vertical axis wind turbine can be able to attain the air from all the direction and produces the power of 1 kilowatt for a movement of 25 m/s. The efficiency of vertical axis wind turbine can be increases by modifying the size and shape of the blade.

2. Abmjit N Roy et al. analysed the design and fabrication of vertical axis economical wind mill. This paper indicates that vertical axis wind mill is one of the most important types of wind mill. In this main rotor shaft is connected to the wind turbine vertically with the generator and gear box which can be placed near the ground. Performance characteristics such as power output versus wind speed or versus angular velocity must be optimized in order to compete with other energy sources which make the process economically and eco-friendly. The experimental result shows that wind turbine is placed on the top of the building in an ideal position to produces electricity. The power generation becomes easy and it is used for various applications such as street light, domestic purpose, agriculture etc.

3. Altab Hossain et al. investigated the design and development of A 1/3 scale vertical axis wind turbine for electrical power generation. In this

paper the electricity is produce from the wind mill by wind power and belt power transmission system. The blade and drag devices are designed in the ratio of 1:3 to the wind turbine. The experiment is conducted by different wind speed and the power produced by the windmill is calculated. The experimental result indicates that 567 W power produced at the speed of 20 m/s while 709 W power produced at the speed of 25 m/s. From this, the power production will increases when the velocity is high.

3. THEORY AND CONCEPT

3.1 Aim

This renewable source of energy can be used to reduce problem of power in our country which is suffering from power shortages. (Almost 87% of rural area in India is still suffering from power shortage)

3.2 Problem statement

Average wind velocity available in India is in the range of 0.5 to 7m/s which is insufficient for the working of a horizontal Wind turbine, therefore only option is vertical wind turbine.
But some efficiency was drop because of drag generated by opposite blade. To solve this problem we develop flapper type wind turbine which remove opposite blade drag and allow wind mill to rotate at very low air velocity

3.3 Objectives

Main objective of wind turbine is cost of wind turbine is affordable by common people.
Our objective is to build small scale wind turbine which run on low air velocity and can be install on roof top of building and charges a minimum12 volt battery and runs various 12 volt appliances without invertors.

3.4 History

Darrieus Wind Turbine: French aeronautical engineer Georges Jean Marie Darrieus patented in 1931 "Turbine having its shaft transverse to the flow of the current".Darrieus Wind Turbine is not self-starting, i.e. it needs to be initially started before it starts to rotate with the help of wind. Savonius Wind Turbine: The Savonius is a drag-type VAWT, so it cannot rotate faster than the wind speed. Savonius has low rotor speed which is not suitable for generating electricity but has high torque which is used for grinding purpose and for pumping water. Giromill Wind Turbine: The straight-bladed wind turbine, also named Giromill or H-rotor, is a type of vertical axis wind turbine developed by Georges Darrieus in 1927. Giromill model can't completely make use the available air flow. The gap between the central shaft and the blades allows the air to escape.
Hence the design of Flapper Wind Turbine came into play. This model uses many flaps which are closed to make use of the available air flow. While on the other arms the flaps will be partially or completely open to reduce the opposite force acting on it.

3.6 Scope of the project

Wind energy is the fastest-growing renewable energy resources. For utilize the available wind resources and to reduce the usage of non-renewable energy resources.

3.7 Factor affecting the performance

Wind Speed: The wind turbine only generates power with the wind. The wind rotates the axis and causes the shaft on the generator to sweep past the magnetic coils creating an electric current.
Blade Length: Length of the blade is directly proportional to the swept area. Larger blades have a greater swept area and thus catch more wind with each revolution. Base Height: The higher a windmill is, the more productive it will be due to the fact that as the altitude increases so does the winds speed.
Base Design: Base is important in the construction of the windmill because not only do they have to support

the windmill, but they must also be subject to their own weight and the drag of the wind.

4. SELECTION OF AEROFOIL:

4.1 Aerofoil

When the aerofoil shape body is moved aerodynamic force can be produce in a fluid. Characteristics of the blade performance is the lift and drag forces**.** Various standard aerofoils are available through which the blade profiles can be developed and can be characterized by their camber, thickness and chord length. The aerofoil must be attributed with sound aerodynamic data that accounts for the rotation effect as it is essential to perform high fidelity CFD.

4.2 Design calculations

The various common wind design calculations [6][8] are as follows

- The power in the wind, $\mathbf{P_w} = 1/2\rho AV3$
- Maximum extractable power from wind, $\mathbf{P_{Max}} = 16/27(1/2\rho AV3)$
- Practical power available obtainable from wind P_0=0.35 *nt * $\mathbf{P_{Max}}$
- Solidity = total area of blades / swept area of rotor
- Angular velocity of the wind turbine is related to velocity at the tip of the blade as $V_{tip}= \omega$ x (D/2)
- Rotational Speed corresponding to this angular velocity,N_c = (60 x ω_c)/ (2Π]
- As the maximum centrifugal force acting on the blade Fc = m x r x ($_{wcf}$)2
- Total axial force acting on turbine, F_t= Π/9 x ρ x d2 x (V1)2
- Forces acting on the blades: Lift Force = Fl = Cl x ½ x Ab x Vr2 x ρ Drag force = Fd = Cd x ½ x Ab x Vr2 x ρ

5 BLADE DESIGN PROCEDURE

1. The power output, P=cpη(1/2)$\rho\pi R2V3$ From the site conditions and using the power output expression the required rotor diameter can be calculated.
2. Choose the suitable tip speed ratio. Normally 4<λ<10 can be used for power generation
3. Determine the number of blades, B such that the structural dynamic problems should reduce. The following table-2 shows the required number of blades of the rotor with appropriate tip spee ratio.
4. Select an aerofoil. If λ<3, curved plates can be used. If λ>3, use a more aerodynamic shape.
5. Generate lift and drag coefficient curves for the selected aerofoil.

6 ADVANTAGES

- Wind power system being non-polluting has no adverse effect on the environment.
- Fuel provision and transport are not required in wind energy conversion system.
- Economically competitive.
- Ideal choice for rural and remote areas which lack other energy sources.

7 DISADVANTAGES

- Owing to it irregularity, the wind energy need storage.
- Availability of energy is fluctuating in nature.
- Wind energy system are noisy operation.
- Wind farm require flat, vacant land free from forest.

8 CONCLUSIONS

When power coefficient of wind turbine is maximizes power output of wind turbine is increased. it should be simple to construct and inexpensive for marketability.

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