EFFICIENT MODEL FOR GENERATING POWER FROM WIND TURBINE

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***Abstract*- Demonstrate energy efficient wind turbine by implementing certain modifications in the present design of wind turbine and thus achieving maximum generated power through this turbine.**

I. INTRODUCTION

- Wind power is one of the most efficient energy sources for sustainable development and is the fastest growing energy technology in the world.
- Aided by scientific and technological advances, wind turbines have become larger, efficiencies and availabilities have improved and the concept of wind farm has become popular.
- The nation is facing power crises as per the present scenario, there is a need to develop more efficient and sustainable ways for generating energy.
- The cost has become reasonably competitive to conventional energy and new design concepts continue to be researched to further improve performance and decrease the cost.

Category Preference:

Energy and Environment

II. IMPLEMENTATION METHODOLOGY

Principles of wind energy conversion:

There are two primary physical principles by which energy can be extracted from the wind;
These are through the creation of either lift or drag force (or through a combination of the two).

Drag forces provide the most obvious means of propulsion, these being the forces felt by a
Person (or object) exposed to the wind.

The basic features that characterize lift and drag are:

• Drag is in the direction of air flow
• Lift is perpendicular to the direction of air flow
• Generation of lift always causes a certain amount of drag to be developed
• With a good aero foil, the lift produced can be more than thirty times greater
Than the drag
• Lift devices are generally more efficient than drag devices

The power in the wind is proportional to:
• The area of windmill being swept by the wind
• The cube of the wind speed
• The air density - which varies with altitude
The formula used for calculating the power in the wind is shown below:
Power = density of air x swept area x velocity cubed/2

$P = ½. \rho.A.V3$

Where, P is power in watts (W)
ρ is the air density in kilograms per cubic meter (kg/m3)
A is the swept rotor area in square meters(m2)
The Equation of Continuity: One of the fundamental principles used in the analysis of uniform flow is known as the Continuity of Flow. This principle is derived from the fact that mass is always conserved in fluid systems regardless of the pipeline complexity or direction of flow.
Flow rate through A_1 = flow rate through A_2

$$\rho 1A1V1 = \rho 2A2V2$$

Where,
ρ = Air density (kg/m3)

A = Area (m2)
V = Speed (m/s)

Or for incompressible flows (where $\rho 1 = \rho 2$):

$$A1V1 = A2V2$$

This equation represents law of conservation of energy.

APPLICATION: The applications of this design are as follows:

1. This design can be employed in areas with low wind speed.
2. It can be used to produce energy at domestic levels where high energy is produced at low manufacturing and installation cost.
3. Most efficient design for minimizing environmental hazards by reducing the margin for the elements of the eco system getting harmed.(elements such as birds and other flying creatures)
4. Can be used in place of current existing model of the wind turbines where utilization of fresh air is more with less production of energy as compared to the model we have designed.

JUSTIFY CHOICE OF CATEGORY: The nation is facing power crises as per the present scenario, there is a need to develop more efficient and sustainable ways for generating energy.

Wind power is one of the most efficient energy sources for sustainable development and is the fastest growing energy technology in the world. Even though wind turbines to generate electricity have been around from the early 20th century, the oil crisis in the early 1970s gave the impetus to its large scale commercial use. Aided by scientific and technological advances, wind turbines have become larger, efficiencies and availabilities have improved and the concept of wind farm has become popular. The cost has become reasonably competitive to conventional energy and new design concepts continue to be researched to further improve performance and decrease the cost.

III. BASIC EXPLANATION OF THE PROJECT

As the per the requirement of project we have created a design of wind turbine in which two sets of turbine blades kept at a considerable distance are mounted over a single shaft with varying dimensions .

The whole system is then surrounded by a circular ring to achieve maximum efficiency.

When the air passes through first set of turbine blade there is an induction of tangential flow along with the rotating flow of air to the next turbine blade. Hence the second set of blades utilizes the residual air of the first set.

we have varied the dimensions of second set of blades by keeping the length of each blade equals to the root of 3 times the length of blades of the first set to attain equilibrium of the whole system.

We have also applied continuity equation to increase the rotor speed by surmounting the first set of blade by a circular ring of greater radius as compared to the next set of blades and then joining both circular rings to form a frustum of cone like structure.

IV. FEASIBILITY OF THE PROJECT

Performance Improvements due to:

- Better siting
- Larger turbines/energy capture
- Technology Advances
- Higher reliability
- Reduction in cost

V. SCOPE OF THE PROJECT

- Wind energy is the most efficient renewable and sustainable source for generating power.
- The wind blows day and night, which allows windmills to produce electricity throughout the day. (Faster during the day)
- Energy output from a wind turbine will vary as the wind varies, although the most rapid variations will to some extent be compensated for by the inertia of the wind turbine rotor.
- Wind energy is a domestic, renewable source of energy that generates no pollution and has little environmental impact. Up to 95 percent of land used for wind farms can also be used for other profitable activities including

ranching, farming and forestry.

- The decreasing cost of wind power and the growing interest in renewable energy sources should ensure that wind power will become a viable energy source in the United States and worldwide.

VI. CONCLUSION

With enhancement in technology and on -going research in field of aerodynamics we can develop more efficient wind turbine by varying the dimensions of turbine blades and by changing the angle between the blades all though wind energy is safest and most conventional form of generating power but there are still some areas on which we can work to make it more efficient and eco-friendly.

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