

Vortex Bladeless Wind Turbine

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ABSTRACT

The formation of electricity by the use of wind source makes use of especially new access to produce wind electricity. The energy vortices will be captured in the atmosphere due to the flow of air. When the wind eludes over a propylene sheet the potency will get transferred to the spring. In this manner it will strive to apply the force in the internal path. These forces are acted at the magnet and coil which can be setup underneath the propylene sheet. The structure is not as same as conventional windmill. The system will consist of mast which will be stable, a propylene sheet, magnet & coil. The investment, operating and manufacturing cost is reduced as the system will have of no blades in comparison to standard technologies. The experimental measures will be carried out after which the results and conclusion will be portrayed.

Keyword – Mast, Rod, Generating system, Foundation, Inverter, Piezoelectric sensor, Propylene sheet.

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I. INTRODUCTION

In present time, India is stepping towards spiralling into international anticyclone in terms of energy. Which processes that it is foremost the misplaced of mounting nations in expressions of financial improvement. Consequently with amplify in inhabitants its energy condition is free to boost in quick ratio. The non-renewable energy sources are declining there is a need to produce energy from renewable sources in order to meet the energy requirement. Wind turbine is the one existing equipment providing an alternative solution. Current wind turbines suffer many drawbacks. As the regions with excessive wind speed are less available, the setup of conventional windmill is restricted. On the contrary, bladeless windmills are secure, quiet, easy, and less costly .It works on lesser wind speeds which is the need of the hour. It moves back and forth from the vortices created by the movement of air around the structure. Normally, system are considered to moderate shaking in instruct to fall mechanical screw ups but absolutely at this point , we strive to enlarge the vibrations in order to trap the electricity . This concept specializes in Bladeless Wind Turbine; it will generate electricity by using oscillation due to wind. We believe that results provided in this paper

may be representative and this system can be helpful to design a tool to extract useful electricity from VIV.

WIND POWER TECHNOLOGY:

Wind power technology has an important role to play in the future as part of a diverse portfolio of energy resources supplying cities. Current of air turbines exchange the kinetic energy in the twist into mechanical power. The mechanical energy produced is used to perform certain task such as granulating grains in farms, supplying water to villages.

A generator can be used to convert this mechanical power into electricity. The generation of electricity with the help of this system can be used for future used by storing the energy in battery or can be used immediately.

Wind power energy:

Wind energy is the most important and most developed in India .The wind energy is produced by the atmospheric occurrence. This wind when accumulated by new wind turbines can be used to generate electricity.

Classes of Wind Turbines:

There are two types of wind turbines:

1. Horizontal Axis

In this type the blades move on the pole aligned to the ground. It consists of blade or rotor which converts the wind energy into rotational shaft energy.

2. Vertical Axis

It has its blades moving on pole and are aligned perpendicular to the ground, it is light in weight and the tower cost is low. Though the vertical axis type has certain benefits, but this design is not as effective in comparison with the horizontal axis in terms of capturing energy.

II. LITERATURE SURVEY

[I]Antonio Barrero-Gil, Santiago Pindado, Sergio Avila; Extracting Politecnica de Madrid, Plaza Cardenal Cisneros 3, E-28040 Madrid, Spain; energy from Vortex-Induced Vibrations: A parametric study; Universidad in this he studied that Vortex-Induced Vibrations (VIVs) of a circular cylinder are analysed as a potential source for energy harvesting. To this end, VIV is described by a one-degree-of-freedom model where fluid forces are introduced from experimental data from forced vibration tests. The influence of some influencing parameters, like the mass ratio m^* or the mechanical damping C in the energy conversion factor is investigated. The analysis reveals that: (i) the maximum efficiency η is principally influenced by the mass-damping parameter m^*C and there is an optimum value of m^*C where η presents a maximum; (ii) the range of reduced velocities with significant efficiency is mainly governed by nf , and (iii) it seems that encouraging high efficiency values can be achieved for high Reynolds numbers. [1]

[II] Saurav Bobde, Sameer Jadhav, Study of Vortex Induced Vibrations for Harvesting Energy; IJRST – International Journal for Innovative Research in Science & Technology, Volume 2, Issue 11, April 2016, in this he studied that India is leading the list of developing countries in terms of economic development. Hence its energy requirement is going to increase manifold in the coming decades. To meet its energy requirement, coal cannot be the primary source of energy. This is because coal is depleting very fast. It is estimated that within few decades coal will get exhausted. The next clean choice of energy is solar power, but due to its lower concentration per unit area, it is very costly. India is having fifth largest installed wind power capacity in the world. As the regions with high wind speed are limited, the installation of conventional windmill is limited. Windmills that would provide safe, quite, simple, affordable and work on lesser wind speeds are need of the hour. The Bladeless Windmill is such a concept which works on the phenomenon of vortex shedding to capture the energy produced. Generally, structures are designed to minimize vortex induced vibrations in order to minimize mechanical failures. But here, we try to increase the vibrations in order

to convert vortex induced vibrations into electricity. The paper studies the scope and feasibility of the bladeless windmill. [3]

[III]J.C. Cajas, D.J.Yanej; SHAPE Project Vortex Bladeless: Parallel multi-code coupling for fluid structure interaction in wind energy; www.prace-ri.eu; in this he studied that; Vortex -Bladeless is a Spanish SME whose objective is to develop a new concept of wind turbine without blades called Vortex wind turbine. This design represents a new paradigm in wind energy and aims to eliminate or reduce many of the existing problems in conventional generators. Due to the significant difference in the project concept, its scope is different from conventional wind turbines. It is particularly suitable for offshore configuration and it could be exploited in wind farms and in environments usually closed to existing ones due to the presence of high intensity winds. The device is composed of a single structural component, and given its morphological simplicity, its manufacturing, transport, storage and installation has clear advantages. The new wind turbine design has no bearings, gears, etcetera, so the maintenance requirements could be drastically reduced and their lifespan is expected to be higher than traditional wind turbines. It is clear that the proposed device is of prime interest, and that scientific investigation of the response of this wind energy generator under different operation scenarios is highly desirable. Thus, the objective of this SHAPE project is to develop the needed tools to simulate Fluid-Structure Interaction (FSI) problems and to reproduce the experimental results for scaled models of the Vortex Bladeless device. In order to do so the Alya code, developed at the Barcelona Supercomputing Center, is adapted to perform the Fluid-Structure Interaction (FSI) problem simulation. The obtained numerical results match satisfactorily with the experimental results reported. [5]

III. MATERIALS AND METHODS

1. Components and brief about each components- Components-

1. Mast
2. Rod
3. Generating system
4. Foundation
5. Tuning passive system
6. Piezoelectric material
7. Inverter
8. Propylene sheet

1. Mast: The structure is light in weight and build-up of fibre glass and carbon fibre. It is the oscillating part at the centre which has a conical shape. It is lighter in weight to increase the oscillations.

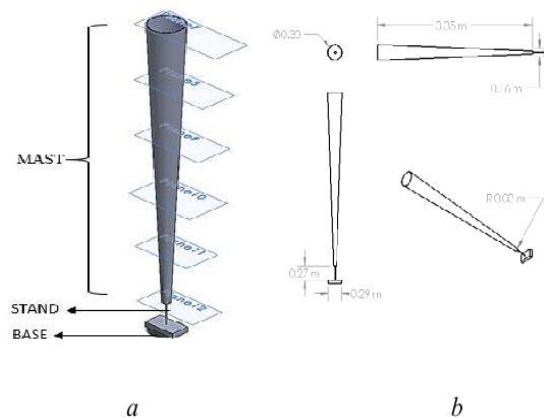


Figure 1. Mast

2. Rod: The rod consists of a carbon fibre. The rod provides the power and firmness to the motion of the structure.

3. Generation system: Due to the piezoelectric sensor the kinetic energy turns into electricity.

4. Piezoelectric Material: Piezoelectric plates are made up of quartz crystal. When force is applied there is a deformation which produces electric signal.

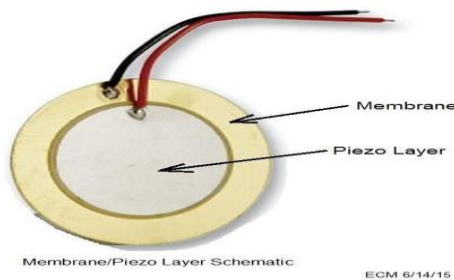


Figure 2. Piezoelectric material

It is reversible, an applied mechanical stress will generate a voltage and an applied voltage will change the shape of the solid by a small amount (up to a 4% change in volume). If we are going to use the piezoelectric material for energy production then we have to use the inverter. Piezoelectric material produces dc voltage. So we have to convert it into the ac voltage for use. There will be some power loss in the inverter.

5. Propylene sheet-

Polypropylene is known for its excellent chemical resistance in a corrosive environment. Polypropylene sheet is easily welded and machined. Homo-polymer and copolymer grades are used in various applications throughout the chemical and semiconductor industries. Polypropylene (PP) is a thermoplastic "addition polymer" made from the combination of propylene monomers. It is used in a variety of applications to include packaging for consumer products, plastic parts for various industries including the automotive industry, special devices like living hinges, and textiles.

2. Working of the system-

The bladeless windmill is based on the phenomenon of vortex shedding effect. The energy is obtained by means of rotational motion of a generator, the windmill takes benefit of the vortices which are familiar. An aerodynamic effect which takes place when wind hits against an enduring structure. The structure starts to move backward and forward and catches the energy which is produced.

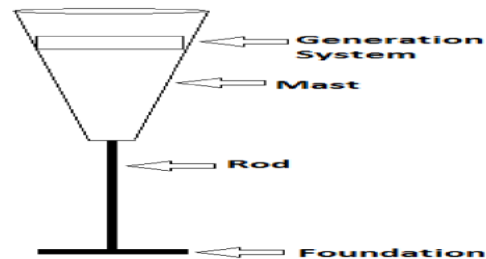


Figure 3. Proposed model

This structure is based on the idea of vibrations. The electricity is produced by wind energy. It starts moving back and forth when the wind hits on the mast. The structure consists of a rod which is made of fibre glass due to the vibrations created the rod also starts vibrating. These vibrations are then transferred to the lowest part of the structure. Here the lowest part is known as the base which consists of an electric generator that produces electricity. There will be production of voltage which will be ac in nature. We don't have to use an inverter when we are using the linear generator as the voltage produced will be ac in nature so we can feed it to the load directly. This bladeless windmill has very high efficiency than the traditional turbine.

3. Block Diagram-

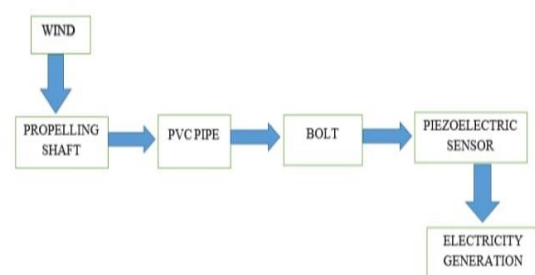


Figure 4. Block diagram of bladeless windmill

As shown in the block diagram, when wind will flow at some specific speed oscillations surrounding the pole of the windmill due to this the pole will oscillate. These oscillations will be applied to the steady part of the windmill which will be placed at the bottom. In the steady part we will have to place either piezoelectric material or a linear generator. Due to the oscillation produced by the pole, vibrations will be created in the piezoelectric material. Due to

vibrations there will be production of voltage which will be dc in nature. We have to convert it into the ac voltage and step it up and then will give to the load. If we are going to use linear generator then the shaft of the linear generator will move horizontally due to oscillations of pole losses and this windmill will start energy production at very low speed of wind.

IV. ADVANTAGES AND DISADVANTAGES

Advantages-

1. Utilizing less area.
2. Generation of high power.
3. Economical.
4. It can operate in a wider range of wind speeds.
5. Low cost.
6. This windmill has no blades. Thus there will be no friction due to less contact with air.
7. It also has no rotating parts with it. There will be zero friction losses due to rotation.
8. This windmill has no noise problem as there will no rotation.
9. With the implement of this windmill no bird will get harm or killed.
10. It requires very less maintenance due to less moving parts.

Disadvantages-

1. The potency accumulated from the wind is not as much as in comparison with the traditional turbine.
2. It requires starting torque; output power depends directly on the height of the mast.

V. RESULT

1. Depending upon the length of mast we get the mechanical power output.
2. Power output depends on the velocity of the wind.
3. Output varies from 3 to 4 volt.

1] Mathematical analysis-

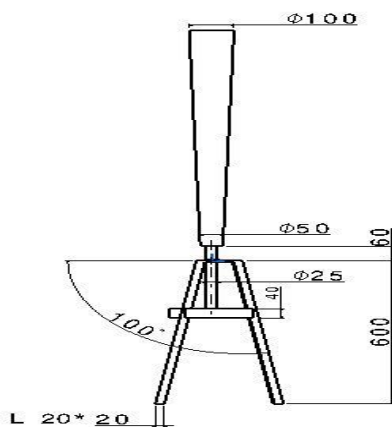


Figure 5. Theoretical model

2] Analysis

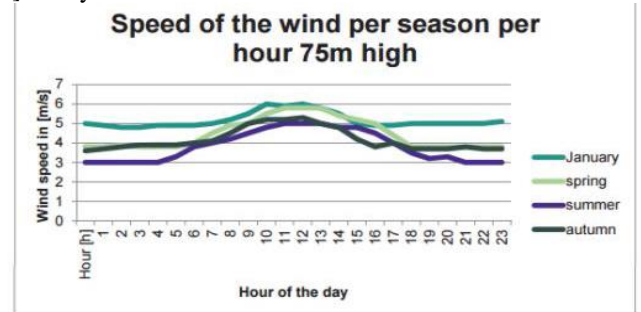


Figure6. Wind speed analysis over seasonal days (24)

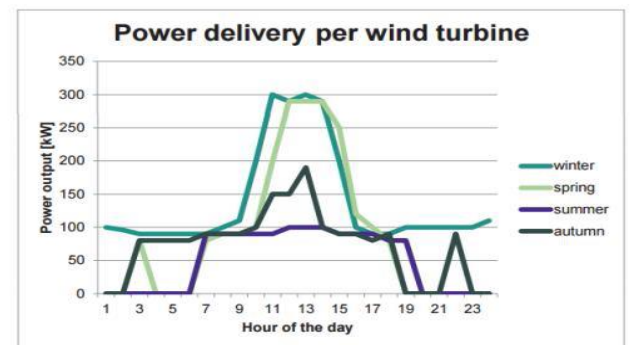


Figure7. Power output over seasonal days (24)

Limitations and assumptions

The issue of this mission seems to be that it's far an era in an improvement section and have to rely upon investor taking a risk. It calls for extra renovation because of equipment mechanism concerned. The potency obtained from the wind is not as much that that of traditional turbine.

VI. CONCLUSION

This assignment is Eco friendly and decrease price as evaluate to the windmill. As traditional windmills requires excessive capital and preliminary investment. Also it calls for greater space and initial hazardous for birds .So vortex bladeless windmill is the nice choice for power technology from wind electricity because it has much less maintenance value.

The blade less windmill calls for much less area and has excellent efficiency. The want of strength in rural areas may be fulfil by the usage of this form of windmill .This can be applied close to Sea shore, on highways facets, farms, hilly areas, roof top and so forth.

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