DESIGN AND FABRICATION OF BLADELESS WINDMILL POWER GENERATION MODEL

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ABSTRACT

Today, India is top amongst the list of developing countries in terms of economic development. Hence the energy requirement is increasing rapidly. To meet these energy requirements non-renewable energy sources are used excessively but due to limited storage of this sources there is a need for generation of clean energy through renewable energy sources. India is having fifth largest installed wind power capacity in the world. As the region of high speed wind is limited and also the area required for installation of conventional windmill is high, bladeless windmill based on vortex induced vibrations can provide the solution for these disadvantages of the conventional windmill. Bladeless windmill basically works on the vortex shedding effect. Generally structures are designed to avoid vortex induced vibrations in order to minimize the mechanical failures. But here, we try to increase the vibrations to increase the generation of electricity.

I. INTRODUCTION

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 intern translates the mechanical energy of rotation of blades into usable form of electricity. Oscillation wind harvesting is the less common method used amongst the both methods. To understand the reason behind it we have to understand the working of it. This device works on the vortex induced vibrations (VIV). VIV are the motions induced on the body due to the interaction with the external fluid flow, produced by periodic irregularities in the flow. Basically VIV is the vibration in the perpendicular direction induced when a fluid is passed over an object. In the oscillation wind harvesting the most geometrically appropriate airfoil shape is cylindrical. The cylinder optimizes the effects of VIV because of its symmetry along its center axis.

II. LITERATURE REVIEW

This paper deals with the study of the vortex induced vibrations for harvesting energy in which the various methods of the wind power harvesting are discussed. The various phenomenon and concepts that are used in the wind power harvesting. Also the various problems which are related with the conventional wind power harvesting are discussed. The possible solution of using a piezo electric material in the oscillation wind power harvesting type model is also discussed.

III. PROPOSED METHOD

A windmill is a mill that converts the energy of wind into rotational energy by means of vanes called sails or blades. Centuries ago, windmills usually were used to mill grain (gristmills), pump water (wind pumps), or both. The majority of modern windmills take the form of wind turbines used to generate electricity, or windpumps used to pump water, either for land drainage or to extract groundwater.

a) HORIZONTAL WINDMILLS

The first practical windmills had sails that rotated in a horizontal plane, around a vertical axis. According to Ahmad Y. al-Hassan, these panemone windmills were invented in eastern Persia as recorded by the Persian geographer Estakhri in the ninth century. The authenticity of an earlier anecdote of a windmill involving the second caliph Umar (AD 634–644) is questioned on the grounds that it appears in a tenth-century document. Made of six to 12 sails covered in reed matting or cloth material, these windmills were used to grind grain or draw up water, and were quite different from the later European vertical windmills. Windmills were in widespread use across the Middle East and Central Asia, and later spread to China and India from there.

b) VERTICAL WINDMILLS

Due to a lack of evidence, debate occurs among historians as to whether or not Middle Eastern horizontal windmills triggered the original development of European windmills. In northwestern Europe, the horizontal-axis or vertical windmill (so called due to the plane of the movement of its sails) is believed to date from the last quarter of the twelfth century in the triangle of northern France, eastern England and Flanders. The earliest certain reference to a windmill in Europe (assumed to have been of the vertical type) dates from 1185, in the former village of Weedley in Yorkshire which was located at the southern tip of the World overlooking the Humber Estuary. A number of earlier, but less certainly dated, twelfth-century European sources referring to windmills have also been found. These earliest mills were used to grind cereals.

IV.CONSTRUCTION

Base is made up of the rigid iron angular structure. The base provides equidistant point for the position of the mast. It is capable of tolerating the mechanical stress acting on it. This provides the strong foundation to the mast and spring.

APPLICATIONS

Bladeless wind energy can be used in a variety of industries and applications, including marine off-grid systems, industrial applications, remote telemetry and mobile base stations and for houses, schools and farms.

When the wind strikes the mast, it starts to oscillate due to the vortices formed around the structure and rotate the structure because of the presence of the free wheel in the rib. The energy absorbed by the spring during the oscillation of the mast contributes to the increase in the amplitude of the oscillations. Each set of the rib structure corresponds to one sprocket on the shaft which is driven by the chain which is pulled by the thread. Hence t three sprockets are available in the shaft out of which one of the sprockets always is always in motion during the oscillation of the mast. The thread mechanism is provided with guide ways and pulleys for maximum transfer of the pulling force from the oscillation to the sprockets of the shaft.

It also helps to increase the tensile strength of the threads which is necessary to increase the conversion efficiency to the maximum extent.

ADVANTAGES

The wind generator does not have any moving parts in contact, which eliminates the need for lubrication and reduces the wear and tear. Also, it’s known that a structure can only have a certain frequency of oscillation, which limits the number of working hours. However, thanks to a self-tuning magnetic coupling system, it can operate in a wider range of wind speeds.

V.CONCLULSION

In the oscillation wind harvesting the most geometrically appropriate airfoil shape is cylindrical. The cylinder optimizes the effects of VIV because of its symmetry along its center axis. As a fluid flows past a cylinder placed vertically it starts to oscillate in the horizontal direction proportionate to air speed suspended by a spring. This oscillation can be compared to the rotation of turbine blades in the sense that both are mechanical motions caused by wind flow that must then be transferred to electrical energy. In the case of the oscillation wind harvesting device, the transformation is most commonly done through the use of a magnetic field. As the cylinder oscillates up and down, coils attached to either end move in tandem around magnets. The motion of the coils through the magnetic field generates current.

VI. REFERENCES

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