ISSN: 2348-2079

Volume-11 Issue-2

International Journal of Intellectual Advancements and Research in Engineering Computations

Vortex bladeless wind turbine

A.V. Balan[*1], G.Kishor[2], V.Dharunprasath[3], M.Logeshwaran[4], K.Sakthivel[5]

[1]*Head of the Department, Department of Meachanical Engineering, KSR College Of Engineering, Tiruchengode.*
[2]*Project leader, KSR College of Engineering, Tiruchengode*
[3,4,5]*KSR College of Engineering, Tiruchengode.*

Corresponding Author: A.V. Balan
Published on: 24.04.2023

ABSTRACT

As non-renewable energy sources have already been depleted to the depths of the earth, renewable energy sources are clearly a viable option for energy production. Throughout the past few decades, wind energy has earned the right to be considered a credible energy source. Blade windmills are used to generate electricity, however they are expensive and have a number of drawbacks, such as high startup costs, ongoing maintenance costs, friction loss, etc. As a result, in this project, we will generate electricity with a windmill without blades. It is an entirely novel way of capturing wind energy. In addition, the operating concept, design, and fabrication of a tiny prototype will be covered in this study. This is a new generation turbine with better performance that is cost-effective, environmentally friendly, and requires less sophisticated generating. Bladeless turbines are also the only ones that have nearly no negative environmental consequences.

Keywords: Windmill, bladeless turbine, Vortex, modified turbine.

INTRODUCTION

Vortex Bladeless Windmill is a new approach which harness wind energy from the phenomenon of vortices that is known as Vortex Shedding. This windmill controls the energy vorticity, for example, the turning movement of air or different liquids. At the point when the wind strikes the cone like pole, the progression of the breeze gets isolated in light of the impediment and along these lines causing swirls flows to shape. This swirl current at that point applies power on the mast, making it vibrate. The active energy of the swaying can be changed over to electrical vitality. The development of the bladeless windmill is very straightforward. The cone shaped mast is rotated vertically with the assistance of a round and hollow bar held inside so that it can vibrate in just a single course. The segment underneath the purpose of the rotate is secured with the assistance of a metal sheet so the fundamental minute is produced by wind power striking the anticipated surface region over the turn.

Satish et al has purposed to provide some fundamental result 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 convectional horizontal axial wind turbines. Our device captures the energy of vorticity, an aerodynamic effect that has plagued structural engineers and architects for ages (vortex shedding effect). This system it has been designed to being energy to an off-grit locations a matching it with solar panels. Sudarshan et al – Vortex Bladeless is a vortex caused vibrations resonant wind generator. It harnesses wind strength from a phenomenon of vorticity referred to as Vortex Shedding. Basically, Bladeless era consists of a cylinder regular vertically with an elastic rod. The cylinder oscillates on a wind range, which then generates electricity through a trade system. In exclusive words, its wind generators which is not genuinely a turbine. In other words, wind turbines are not real turbines. In this current paper we have tried to upgrade the Vortex windmill which is more comparable to solar panels in terms of functionality and cost-effectiveness compared to everyday wind turbines and entire project uses less planetary area. Through the improvised model we look forward to produce 238.60Wh of power. The work is designed in such a manner that it can be portable i.e., can be carried from one place to another.

Vishnu et al – the Bladeless turbine wind 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 electrically 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. Sandeep et al has discussed about the windmill which will provide simple, eco-friendly and efficient alternative to the conventional windmill and named it as Vortex Bladeless Wind mill. This is also known as green turbine with almost no harmful effect on environment. Vortex created vibration is utilized to develop a gadget that can gather wind and change it into electrical vitality by using vortex shedding and piezoelectric material. Also, the components are of low cost which creates a way for low-cost renewable source of energy. The main aim of this paper is to bring a new model of turbine with improved performance that will be economic as well as reliable. This paper will also focus on working principle, design and fabrication of a small prototype. The gadget is made out of a solitary basic part. For the most part, structures are intended to maintain a strategic distance from vortex-initiated vibrations so as to limit the mechanical failures.

Haridass et al – to generate electricity by using BLADELESS WINDMILL. Bladeless wind generation uses radically a new approach of capturing wind energy. It works on principle that when wind is allowed to strike the column mast, it tends to vibrate and this vibrational energy is further converted to mechanical energy. The spring is provided inside mast which is connected to crank shaft. The vibration is transmitted to crankshaft which is then supplied to generator. It is an eco-friendly project and it reduces the friction losses. Sai Charan and Vasudev has intended to create a fuel-free wind turbine that can effectively replace conventional wind turbine since it is both environmentally benign and cost- effective. It makes use of a completely novel method for gathering wind energy. The hallow mast is made to vibrate at a resonant frequency, creating vortices that are later transformed into electrical energy using piezoelectric sensors. Because there are fewer moving components, there is no moving, sharp blades, the structure also provides better safety for birds flying about. Additionally, because less space is needed, more units may be put in for huge power generation.

The problems that are associated with the conventional windmills are very much solved in the oscillation type wind power harvesting. Bladeless windmill is less costly and require less maintenance than the conventional windmill. The bladeless windmill has fewer moving parts than the conventional windmill. It requires less area and wind speed for its area. The bladeless windmill works on a principle of vortex shedding effect. The vortex shedding is the effect which set the object in oscillations when a fluid flow is passed over an object.

MATERIALS AND EXPERIMENTAL METHODOLOGY

1. Acrylic

Acrylic is a transparent plastic material with outstanding strength, stiffness, and optical clarity. Acrylic sheet is easy to fabricate, bonds well with adhesives and solvents, and is easy to thermoform. It has superior weathering properties compared to many other transparent plastics. Acrylic sheet exhibits glass-like qualities clarity, brilliance, and transparency but at half the weight and many times the impact resistance of glass.

2. Neodymium Magnet

A neodymium magnet (also known as Nd FeB, NIB or Neo magnet) is the most widely used type of rare-earth magnet. It is a permanent magnet made from an alloy of neodymium, iron, and boron to form the Nd2 Fe14 B tetragonal crystalline structure. Developed independently in 1984 by General Motors and Sumitomo Special Metals, neodymium magnets are the strongest type of permanent magnet available commercially. NdFeB magnets can be classified as sintered or bonded, depending on the manufacturing process used. They have replaced other types of magnets in many applications in modern products that require strong permanent magnets, such as electric motors in cordless tools, hard disk drives and magnetic fasteners.

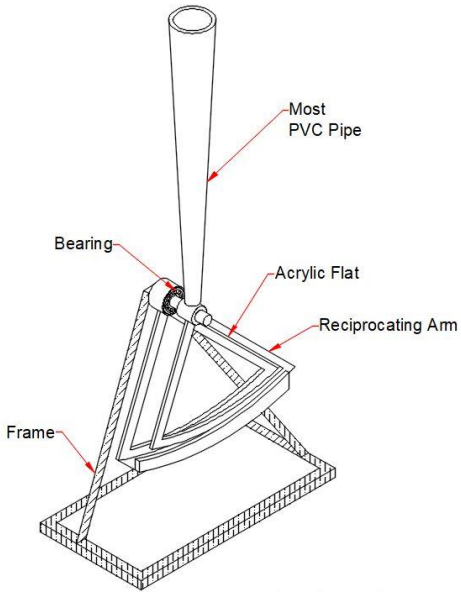

Fig 1: Fabrication Layout

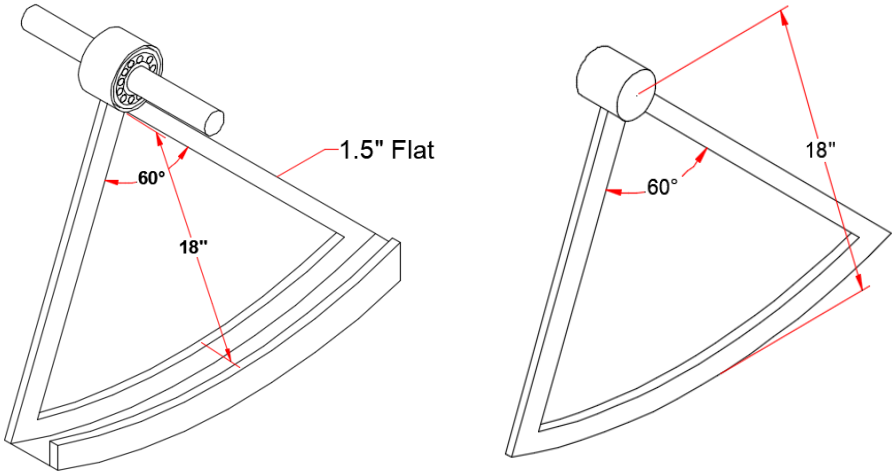

Fig 2: Pendulum Arch Dimensions

The bladeless wind turbine consists of tapper mast (PVC), pendulum arch, bearing, neodymium magnet, armature coil, LED, humidity sensor, etc. The pendulum arch is made up of acrylic glass and mounted with help of bearing in frame setup. The magnets have to be placed in the pendulum arch in between the armature coil. The armature coil is aligned opposite poles of magnets. The mast structure is mounted at top of the pendulum arch using PVC material. The output connection from armature coil is coupled with LED lights. The mast creates the swing motion when wind passed over atmosphere. So, the magnets rotate oscillates in between the coil winding. By this motion, the emf has generated and then DC power to be produced.

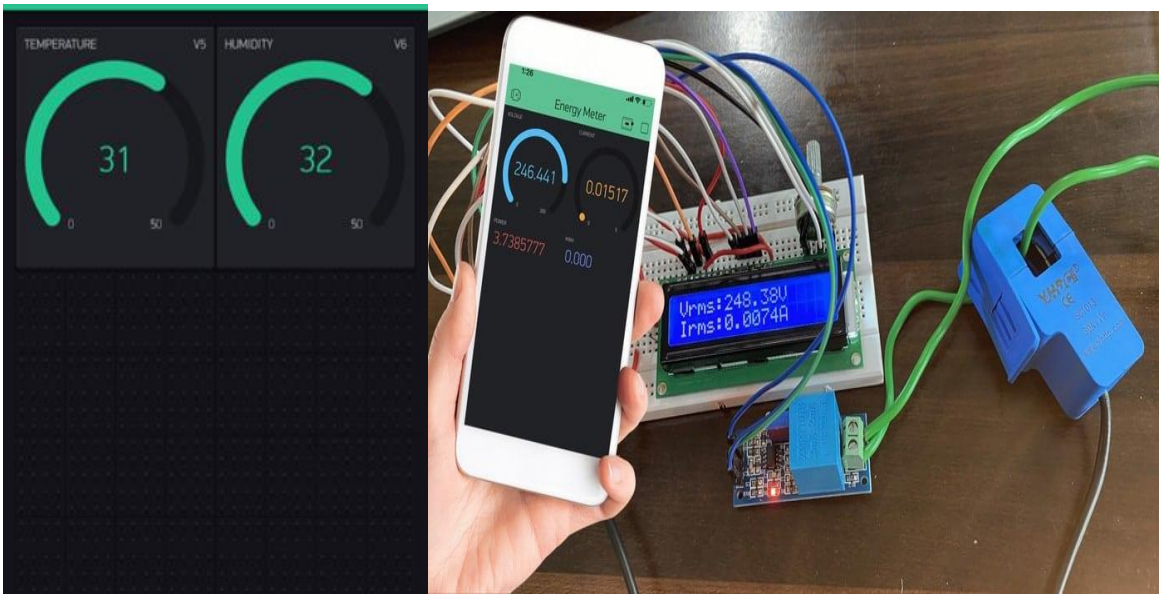

Fig 3: Humidity & Voltage Reading

The outcomes of bladeless wind turbine have been observed by support of Blynk android application. The voltage sensor and current sensor has interfaced with Blynk to observe the amount of voltage and current produced by bladeless turbine. The humidity of atmosphere has also monitored by Blynk. The below figure represents the sample results of wind turbine by Blynk.

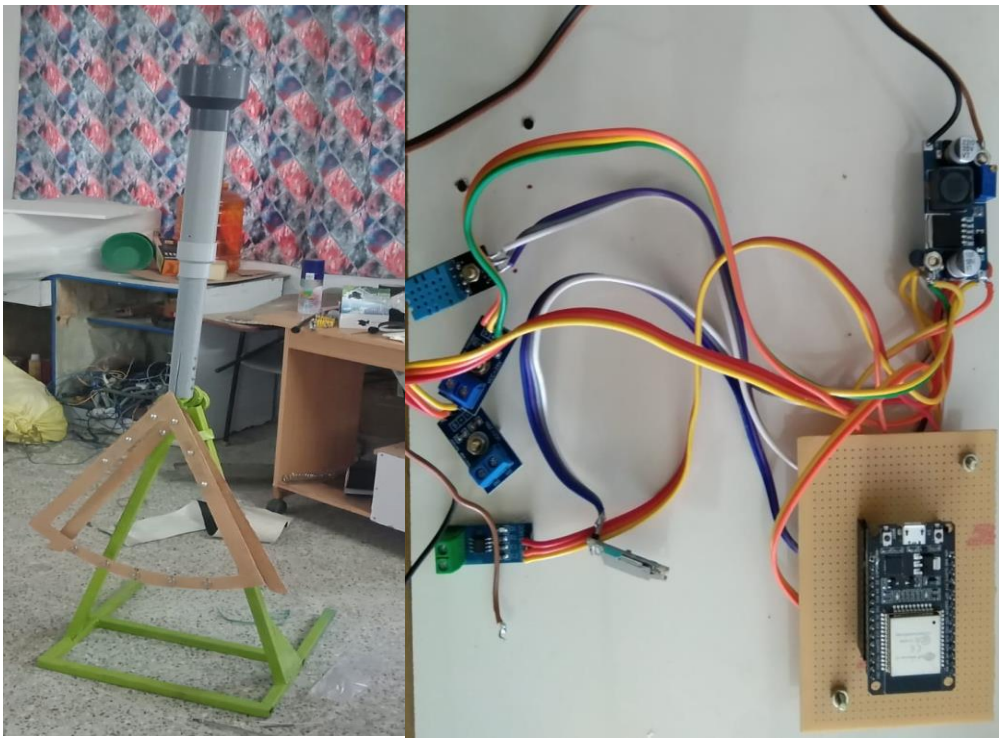

Fig 4: Prototype Model of Bladeless Wind Turbine

ADVANTAGES

- The frequency of oscillation that a structure may have been understood to be finite, which reduces the possible number of working hours.
- However, it can function over a larger range of wind speeds because of a self-tuning magnetic coupling mechanism.
- By automatically varying stiffness and "synchronising" with the speed of the incoming wind, this technology enables oscillation amplitudes to be maximised while maintaining resonance without mechanical or human intervention.
- Because there are no mechanical components in the design that may be damaged by friction, maintenance costs should be reduced by around 53%.
- This windmill has no noise problem as there will no rotation.
- With the implement of this windmill no bird will get harm or killed.

CONCLUSION

In comparison to convenient wind driven harvesting, bladeless wind powered harvesting is more convenient, requires less investment, and also occupies less space. The bladeless windmill produces energy with a high level of efficiency. The bladeless windmill design is crucial to the future of wind power harvesting since it only requires very little wind speed. As non-renewable energy sources run out in the future, the device's clean, renewable energy will offer a replacement. The purpose of this study is to provide some fundamental result on the bladeless wind system and serve as stepping stones for the future development of bladeless wind power generating system. In summary, the generation of electricity is made possible by the small structure of bladeless turbine. Efficient power is generated. This project will satisfy the need of continuous generation of electricity. The overall project uses less space area.

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