iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** IV **Month of publication:** April 2022

DOI: https://doi.org/10.22214/ijraset.2022.41206

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue IV Apr 2022- Available at www.ijraset.com

Fabrication of Vertical Axis Wind Turbine and Application

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Abstract: ***Wind energy is one of the renewable energy sources and the trend is positive and increasing year by year. This technology is applied widely in several regions in the world and already has maturity in technology, good infrastructure, and relative cost competitiveness. The application of structural health monitoring (SHM) is crucial especially to evaluate the performance of wind turbines in real-time assessment. One of the main advantages of this type of wind turbine is the fact that is the only one that was accepted by the environmental agencies because the special shape of the rotor doesn't kill birds that fly in the area where these turbines are mounted.***

Keywords: Wind turbine, Green Energy, Energy Management, respect for the Environment, Vertical Axis Wind Turbine.

I. INTRODUCTION

Environmental pollution, greenhouses effect, intensification due to the wide range of organic fuel, as well care of energy supply to the future generations caused the expeditor development of technologies oriented to the entelechy of renewable energy sources. Environmental concerns are growing, interest in environmental issues is incrementing and the conception of engendering electricity with less pollution is becoming more and more captivating. Unlike conventional generation systems, "fuel" of solar photovoltaic energy and wind energy is available at no cost. According to rough estimates, a paramount number of isolated consumers are spread all over Europe, including mainly country houses, inaccessible farms, shelters, telecommunications stations, minuscule islands, lighthouses, etc. VAWTs are types of wind turbines that were firstly designed by Croatian inventor, Veranzio Fausto in 1595. Components are located at the base of the turbine. Gearbox to be located on the ground that's why service and repairing are easily done by the workers. VAWTs don't need to be pointed towards the wind.

A. Types of VAWT

1) Darrius Wind Turbine
2) Savonious Wind Turbine
a) Semi Circular Blade
b) Semi Elliptical Blade

II. LITERATURE REVIEW

Niranjana. S.J investigated the puissance generation by vertical axis wind turbine. In this paper, the potency is engendered by fine-tuning the windmill on the road high ways. when the conveyance is passed through the road at high speed the turbine of the windmill rotates and engenders the power sources. This analysis betokens that the vertical axis wind turbine can be able to procure the air from all directions and engenders the puissance of 1 kilowatt for a kineticism of 25 m/s. The efficiency of the vertical axis wind turbine can be increased by modifying the size and shape of the blade.

Abmjit N Roy et al. analyzed the design and fabrication of a vertical axis economical windmill. This paper denotes that a vertical axis windmill is one of the most consequential types of the windmill. In this main rotor shaft is connected to the wind turbine vertically with the engenderer and gearbox which can be placed near the ground. Performance characteristics such as power output versus wind speed or angular velocity must be optimized in order to compete with other energy sources which make the process economically and eco-cordial. The experimental result shows that the wind turbine is placed on the top of the building in an ideal position to engender electricity. The power generation becomes facile and it is utilized for sundry applications such as street lights, domestic purport, 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 engendered from the windmill by wind power and belt power transmission system. The blade and drag contrivances are designed in the ratio of 1:3 to the wind turbine

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III. COMPONENTS

1) Base
2) Bearing
3) Storage Battery
4) Dry Nickel Cadmium Cell
5) Dynamometer
6) DC Motor
7) Spur Gear

A. *Comparison Between VAWT and HAWT*

Table 1

Geometry	VAWT	HAWT
Tower sway	Small	Large
Yaw Mechanism	No	Yes
Self Starting	No	Yes
Overall Formation	Simple	Complex
Generator Location	On Ground	Not on Ground
Height from Ground	Small	Large
Blades Operation Space	Small	Large
Noise Produce	Less	Relatively High
Wind Direction	Independent	Dependent
Abstraction for Birds	Less	High
Ideal Efficiency	More than 70%	50-60%

IV. WORKING PRINCIPLE

The working principle of this project is so simple. There are four blades are used in VAWT. In which the main rotor shaft is connected to the gear rotates on a vertical axis. these blades are wrapped around the shaft and the engenderer is mounted at the base of the tower. the output power engendered by the wind engenderer is quantified by utilizing a multimeter.

there are actually two different designs out there. One's called a Savonius rotor, which essentially, if you take a 55-gallon drum and cut it in half, then offset the two halves and put them on a shaft that rotates, you've built a Savonius rotor. It's similar to an anemometer. A lot of what we see today are Savonius rotors. They're very crude, very low-tech, and very inefficient. We're talking about something that operates in the, say, 5 to 10 percent efficiency range. People have been able to tweak the efficiency rate ideally, they might be as high as 15 percent. Then there's the Darrieus model — the type that resembles an egg beater. Essentially, you have two vertically oriented blades revolving around a vertical shaft. But the Darrieus models use an airfoil design. A wind turbine airfoil works in the same way as an airplane wing. An airfoil has a flat side and a curved side.

The result of air passing over the two sides is a force known as "lift." When an airplane speeds down a runway, air passing on both sides of the airfoil wings, the lift force literally lifts the airplane into the air. This will continue as long as there is forward motion over the airfoil to generate the required lift. A wind turbine uses this same principle, but instead of flying up and away, the airfoils are secured to a hub, which in turn is attached to a generator shaft. The air passing over the airfoils (wind turbine blades) is converted into rotational momentum which spins the generator. On the Darrieus rotor, since the airfoils are the same as horizontal axis wind turbines, they will operate at the same efficiency. However, the difference occurs because a horizontal axis turbine's swept area always faces the wind. But with a vertical axis wind turbine, the swept area is a cylinder perpendicular to airflow. As such, part of the "swept area" is working, while part is simply being blown around, not at an optimal angle to generate lift. This results in a vertical axis wind turbine rotor

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Fig.1 VAWT

A. Advantages of VAWT

1) VAWT is simple to design and fabricate
2) It is drag driven turbine
3) It is a wind direction independent turbine so it is not necessary to mount the turbine in the front of wind direction.
4) It is small as compared to HAWT.

B. Disadvantages of VAWT

1) VAWT as low efficiency.
2) Due to its vertical shaft mounting of alternator and gearbox may become a problem
3) HAWT generates high power and has high capacity.

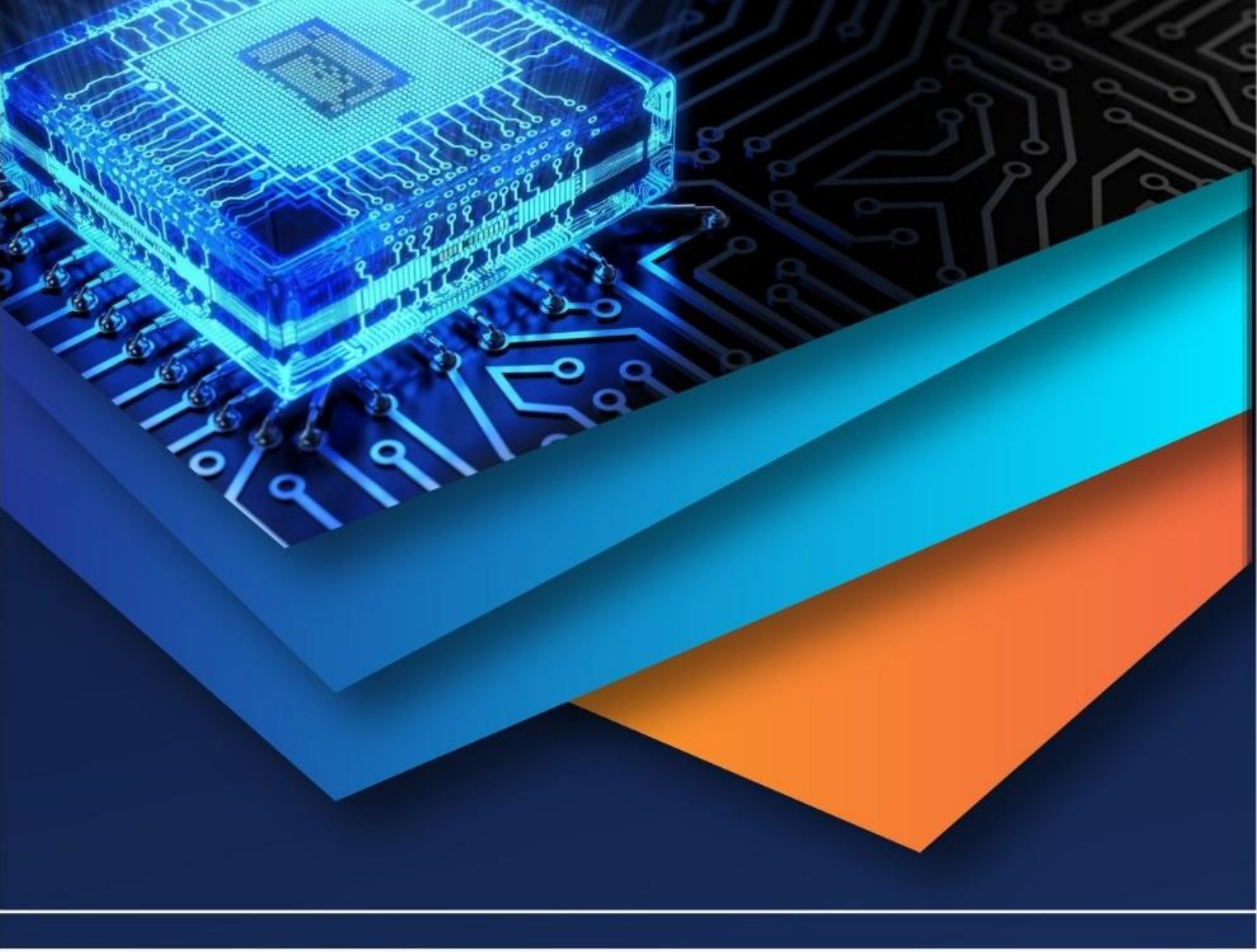
V. CONCLUSION

As testing is conducted for the turbine with a wind speed of 5.7 m/s satisfactory results are not getting. The minimum wind speed for the turbine to rotate is between 3 to 4 m/s. VAWT is very useful in regions having continuous wind supply or at the seashore. VAWT can also be used for pumping water.

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10.22214/IJRASET

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