SAVINOUS S-TYPE WIND TURBINE

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Abstract

The principle objective of this project is Rural Electrification via hybrid system which includes wind and solar energy.

Our intention is to design a wind turbine compact enough to be installed on Highways.

So we decided to design a S Type wind turbine over Horizontal Axis Wind Turbine (HAWT). Advantages of S Type over Horizontal Axis Wind Turbine are compact for same electricity generation, less noise, easy for installation and maintenance and reacts to wind from all directions. The wind turbine designed to generate electricity sufficient enough for a domestic use. The electricity generated will be stored in the battery and then given to the load. This project emphasizes on electrification of remote areas with minimum cost where load shading still has to be done to meet with demand of urban areas. Wind power has been receiving attention as the new energy resource in addressing the ecological problems of burning fossil fuels. Savonius wind rotor is a vertical axis wind turbines (VAWT) which has relatively simple structure and low operating speed. These characteristics make it suitable for areas with low average wind speed as in Indonesia. To identify the performance of Savonius rotor in generating electrical energy, this research experimentally studied the effect of fin addition for the 'S' shape of Savonius VAWT. The fin is added to fill the space in the blade in directing the wind flow. This rotor has two turbine blades, a rotor diameter of 1.1 m and rotor height of 1.4 m, used pulley transmission system with 1:4.2 multiplication ratio, and used a generator type PMG 200 W. The research was conducted during dry season by measuring the wind speed in the afternoon. The average wind speed in the area is 2.3 m/s with the maximum of 4.5 m/s. It was found that additional fin significantly increase the ability of Savonius rotor VAWT to generate electrical energy shown by increasing of electrical power. The highest power generated is 13.40 Watt at a wind speed of 4.5 m/s by adding 1 (one) fin in the blade. It increased by 22.71% from the rotor blade with no additional fin. However, increasing number of fins in the blade was not linearly increase the electrical power generated. The wind rotor blade with 4 additional fins is indicated has the lowest performance, generating only 10.80 Watt electrical power, accounted lower than the one generated by no fin-rotor blade. By knowing the effect of the rotor shape, the rotor dimension, the addition of fin, transmission, and generator used, it is possible to determine alternative geometry design in increasing the electrical power generated by Savonius wind turbine.

Keywords

Shaft, Generator, Gear Mechanism, Blade, Bearing, Led light, fins, metal plate.

Introduction

S - TYPE WIND TURBINE

1. Vertical axis wind turbines are advocated as being capable of catching the wind from all directions, and do not need yaw mechanisms, rudders or downwind coning. Their electrical generators can be positioned close to the ground, and hence easily accessible. A disadvantage is that some designs are not self-starting. There have been two distinct types of vertical axis wind turbines: The Darrieus and the Savonius types. The Darrieus rotor was researched and developed extensively by Sandia National Laboratories in the USA in the 1980's.

2. New concepts of vertical axis wind machines are being introduced such as the helical types particularly for use in urban environments where they would be considered safer due to their lower rotational speeds avoiding the risk of blade ejection and since they can catch the wind from all directions. Horizontal axis wind turbines are typically more efficient at converting wind energy into electricity than vertical axis wind turbines. For this reason they have become dominant in the commercial utility-scale wind power market. However, small vertical axis wind turbines are more suited to urban areas as they have a low noise level and because of the reduced risk associated with their slower rates of rotation. One can foresee some future where each human dwelling in the world is equipped with wind generators and solar collectors, as global peak petroleum is reached making them indispensable for human wellbeing. They are well suited for green buildings architectural projects as well as futuristic aquaponics; where vertical fanning in a skyscraper uses automated farming technologies converting urban sewage into agricultural products.

3. Their cost will come down appreciably once they are mass produced on a production line scale equivalent to the automobile industry. The economic development and viable use of horizontal axis wind turbines would, in the future be limited, partly due to the high stress loads on the large blades. It is recognized that, although less efficient, vertical axis wind turbines do not suffer so much from the constantly varying gravitational loads that limit the size of horizontal axis turbines. Economies of scale dictate that if a vertical axis wind turbine with a rated power output of 10 MW could be developed, with at least the same availability as a modern horizontal axis turbine, but at a lower cost per unit of rated power, then it would not matter if its blade efficiency was slightly lower from 56 to about 19-40 percent.

Literature review

The brief literature review about the prior art search on my project is described in this chapter. It includes some of the user feed backs, market survey and patent studies regarding my product.

- **USER FEEDBACK:**

I have personally met the people and their thoughts and knowledge and experience about using the wind turbine for so long. I had a typical conversation with each of them regarding how they feel using simple turbine and what problems do they face.

After talking to and interrogating them, I got a common reply that they were suffering from the problem of heavy weight and heavy wind speed that would help a lot. They also demanded a product with better design and more functions. So I decided to try something new and came up with my product called “S - type wind turbine”. It combines the attachment of shaft and driving mechanism for automatic feed of fins that can produce power. Thus, from the feedback received from the users, I managed to make a new kind of wind turbine.

- **MARKET SURVEY:**

Before developing a product, the demand and compatibility of the product in the market must always be studied. As far as my product is concerned, I have done a detailed market surveyanditresultedtobeveryhelpfultomeastheinformationofvariousotherproductssuch as mine can be gathered by researching the market. I was seeking a turbine that cans elf- generate the power from within it. I checked it in the physical market as well as in the online stores. I found various vendors and dealers in the market who traded in this. I also visited some of the brands manufacturing the wind turbines. I asked them all for what product range and varietydotheyprovide.Luckily,

noonehastheproductwhichIammanufacturing.The market will definitely accept my product and as it is a monopoly, the demand will also increase as the public will get aware about such product in the market. So, they are still in search of something more well than that.

The market now-a-days, has grown so big and wide that one can expand his product up to an extent he wishes. And product such as this is likely to be fly away from the market as soon as they are launched. So I see a bright and successful market for my product.

PATENT STUDY:

I have studied many patents before developing my product. Patent study is very necessary part of research when you are about to make an invention. It helps us to know whether there is any similar kind of product already invented by someone from all over the world. It also tells us what were the prior technologies and their limitations for which the invention is made. Here, I present some of my patent studies.

1) savonius wind turbine:

PATENTNAME: savonius wind turbine

PATENTHOLDER : Vawryk Mike

COUNTRY : United States

PATENT NUMBER: 2415542

FILEDINYEAR : 1942

ABSTRACT : It talks about the mechanism of power generation. This is a cordless wind turbine which has in built fins that provide motion for generated the power.

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Vertical wind turbine

PATENT NAME : vertical wind turbine

PATENT HOLDER: GeorgeJ.Schuller

Jr. John N. Stebbing

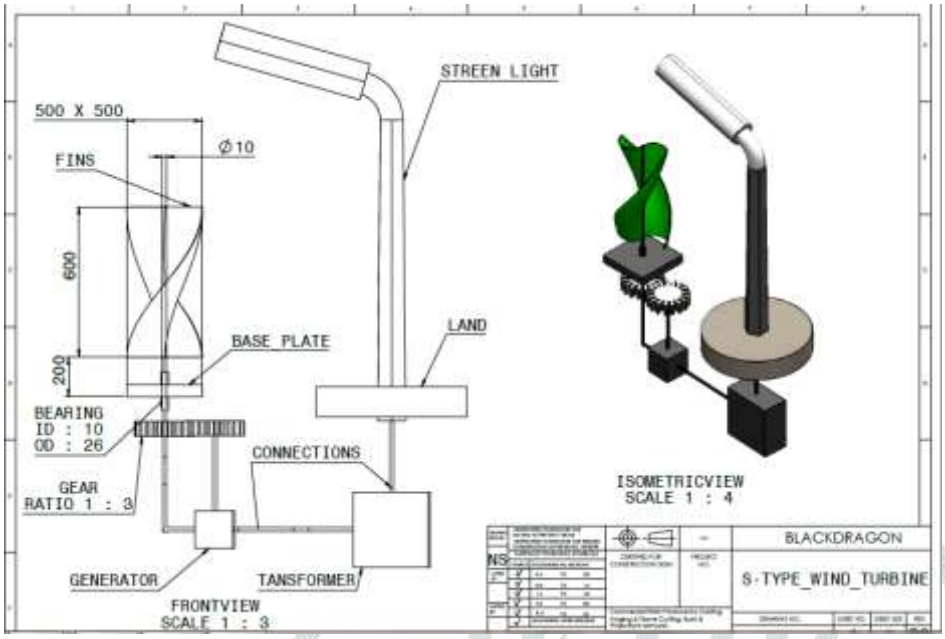
COUNTRY: United States

PATENT NUMBER: 3146747

FILEDINYEAR: 1964

ABSTRACT : This is a s type
Wind turbine. It was invented to overcome the limitations of using heavy metal as filler metal for
Producing power.

Design



Scope and Objective

- To develop a new wind turbine.
- To eliminate existing problems in generation in power.
- To design a handy wind turbine.
- To manufacture a product that is easy and convenient to use and has adaptable application.
- To make it work with single hand.
- To increase the quality of generated power.
- To develop an economic product with better configurations.
- To come up with something new that is really helpful in power generation techniques.
- To give a product that is better than all other wind turbine present.
- To change and modify the present turbine for better experience.
- To study and research on the same for more advanced techniques.
- To keep on working to develop more efficient product

Results and Discussion

Discussion

The idea for Vertical Axis Wind Turbines (VAWTs) has been blowing around for decades, but despite many advantages the technology has so far attracted little interest.

A Darrius turbine becomes unstable above a certain height. The largest Horizontal Axis Wind Turbines (HAWTs) are capable of producing 6 MW of power and stand just short of 100 meters tall, but if made any bigger they start to become less efficient. One reasonisthattheweightoftheturbinebladesbecomesprohibitive.Astheyturn,this places the blades under enormous stress because gravity compresses them as they rise and stretches them as they fall. The larger you make these structures; the more robust they must be in order to withstand these forces. In addition, the cost and difficulty of building the increasingly largest owners needed to keep this top-heavy structures table lead to a major engineering challenge.

An advantage of VAWTs is that they can catch the wind from all directions eliminating the need for a yaw mechanism. In addition, they can be built lower, so they are less visible and can withstand much harsher environments and do not need to be shut down when wind speeds exceed 64 mph, and even then the structures are claimed to withstand speeds of up to 110 mph.

Results

The main objective of this project was to improve the manual power generating process by making it automatic and it seems to be done in a pretty well manner. The other objective was to provide feed by itself which is also solved in this design. The power generation process which was a three-handed operation earlier now is just single-handed. We can use that idle hand to hold the components that are to be generated so that the quality of power is improved and time is consumed less as compared to using other wind turbines. Thus, this new designed product has each and every advanced feature needed for efficient and quality power generation**.**

Conclusion

The results obtained are summarized in a proper manner over here. Though the product is not physically tested and experimented for different conditions, virtual performance testing is done and the results obtained from them are described briefly.

References

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