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Study and Design of Vertical Axis Wind Turbine

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Abstract: ***The use of wind energy for energy generation is one of the oldest ways for harnessing renewable energy. This paper is based on vertical axis wind turbine that will eliminate the environment hazard and improve India communities' health and lifestyle. Streets, public parks, schools, and public facilities' are consider as main power consumers, these consumers should be susceptible to wind from time to time. The idea of this project is to convert this wind by using Vertical Axis Wind Turbines (VAWT) to a useful energy by using it as a power source that can serve these consumers. , it is expected to produce more power. The turbine blades are made of aluminum alloy. The turbines can start working under low wind speed and may cut-off if the speed is just too high.***
Keywords: Vertical Axis Wind Turbine (VAWT), Turbine Blade.

I. INTRODUCTION

The main aim of our project is to, design an easy vertical axis wind turbine. This mission is meant to design and manufacture an easy vertical wind turbine will be connected to streetlights in an effort to offer sufficient power to light one or greater. The layout includes a vertical wind turbine coupled with an electrical generator, so that it will be connected to a battery to keep the extra power. The mission goals now no longer most effective to apply an easy supply of power to energy regular needs, however additionally to offer a price discount with inside the big quantity of finances which can be spent every year on producing the energy. The generators which can be going to be created are secure in nature, and are very price efficient. The efficacy in price will permit for plenty humans to without problems get a keep of them and for large scale wishes together with to the energy companies, in addition to powering normal ordinary things. This mission will show to be very useful for the Nation as whole, thinking about how the Nation has currently had a trouble with the fluctuation of the oil prices. The mission will without problems be capable of counter this issue, via way of means of introducing a new greater dependable supply of power.

Nowadays humans had begun out searching after Non-Conventional reassets of power. People in large part use Non-Conventional Energy with inside the shape of Solar Energy as Solar Cooker. Solar Heater. Solar Pumps, etc. As it's miles handy and is reasonable than the opposite Non-Conventional Energy reassets application. Wind Energy also can be used alternatively to the Solar Energy. It is a easy and herbal supply of strength. Throughout history wind power has been harnessed for small-scale programs including pumping water from wells or working the grain and fabric turbine. Today, wind energy can be converted into electricity, and the costs of producing wind energy have reduced by 80% since the last century. Now, wind energy **is** taken into account the most cost effective sort of renewable energy available.

The Design and construct a vertical wind turbine to produce renewable energy which will reduce the pollution. Allow the creation of mentioned turbine to be cost effective. Make it accessible and easy to use by others.

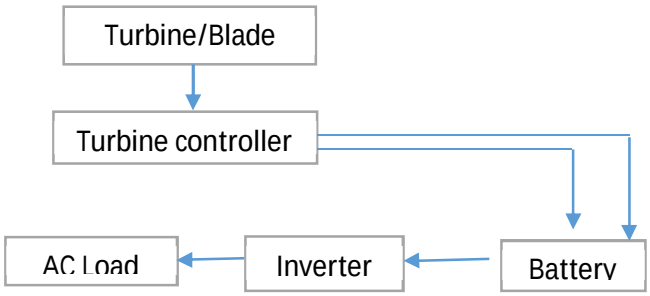

Fig.1.1 Block Diagram of Proposed System

The block diagram consists of Vertical Axis Wind Turbine, a controller, a battery, an inverter. The vertical Axis Wind Turbine consists of two blades which are made up of an alluminum alloy. As we use wind energy as the main power. Which in turn rotates the turbine blades to produces Kinetic Energy .

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This Kinetic Energy had then converted into Rotational Energy to moves the mechanical part. The mechanical part i.e. Generator connects to the turbine by gears which adjust/control the speed coming from the turbine to be given to the Generator. Then variac output power from Generator is to be controls. As it is not controllable and this variac power can damage the equipment. Controller is connected to maintain the output power . Then the controlled the power is given to the Battery. Where the power is stored which can be further used. Then the stored DC voltage is to be converted into AC to use the power in the household purpose. To use the convert DC power into AC Inverter is connected in the block diagram.

Sr No.	Parts	Function
1.	Electrical generator	Convert rotating speed into electrical
2.	Inverter	Converting AC to DC(if required ac)
3.	Bearing	To support the turbine and helps in free movement of turbines
4.	Controller	Is use to control the output generated from turbine

Table (1.1)-Parts and their Function

II. METHODOLOGY

1) Rotor blades take the energy out of the wind; they capture the wind and convert its kinetic energy into the rotation of the hub. The arc angle was selected supported the pervious study, which recommended an angle of 160".
2) The shaft is the part that gets turned by the turbine blades. It successively is connected to the generator within the most housing. Means shaft coupled with generator.
3) The conversion of rotational mechanical power to electric power is executed via way of means of generator. Different varieties of generator had been utilized in wind power. As horizontal wind turbines are already established in lots of parts of India alongside different countries. But horizontal wind have a few trouble such because it need to be device over the years. Usually the rotational velocity of the wind turbine is slower than the equal rotation velocity of the electric network - traditional rotation speeds for wind turbines are 5- 20 rpm even as a immediately related system could have an electrical velocity among 750-3600 rpm. So we use wind flow generator which ran on low velocity.
4) The turbine controller control the output power and charges are stored in battery.
5) When we needed electrical power the battery can supply the power.

A. Designing and Implementation

The Blade of turbine is made up of aluminum sheet. The blade height is 0.15 m. The blade width is 0.5 m. The diameter of blade is 0.5 m. And angle of corner cut is 160^0which is selected from the previous study on Savonius model.

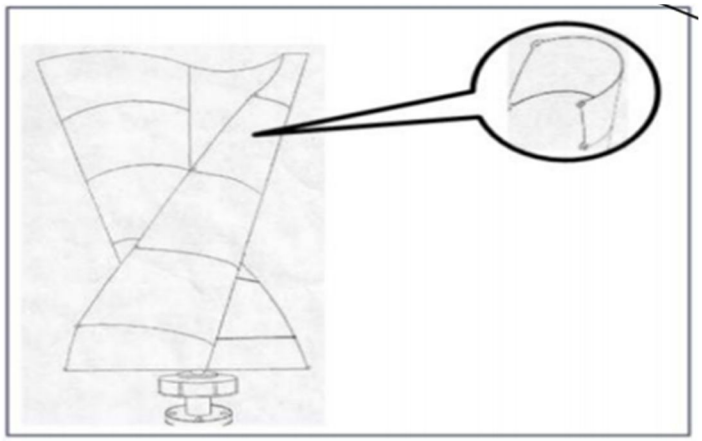

Fig.2.1 Turbine Design

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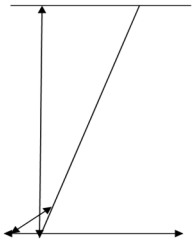

The length of change in angle is length when the turbine rotates from 0 degree to 160 degree they cover 1.128cm of a length. As per calculation in shaft blade angle.

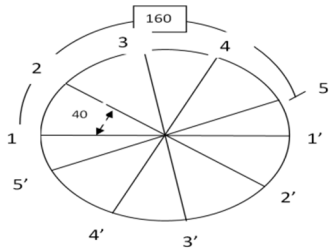

Fig.2.2 Blade Angle

The layout of the character blades additionally impacts the general layout of the rotor. Rotor blades takethe endegy out of the wind: they seize the wind and convert its kinetic power into the rotation of the hub. The perspective became decided on basedon the records of Savonius model, which encouraged an perspective of 16.

Case	Blade angle	Maximum Co-efficient of power	Coefficient of power gain percentage
1	150	0.2687	2.67%
2	160	0.2836	8.37%
3	170	0.2835	8.33%
4	180	0.2617	00%

Table (1.2)-Maximum coefficient of power for different blade angle [6]

The consequences of this newsletter imply that the turbine with a blade arc perspective of 160° generates the most strength coefficient cp 0.2836, that's the best that advantage from the experiment.

B. System Design

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III. CONCLUSIONS

Vertical Axis Wind Turbine has the remarkable influence in developing more ideas for the use of the Renewable Energy Source. By using Vertical Axis Wind Turbine we can save and reduce the power consumption. The main focus in our project is to make efficient and reliable means to minimize the power consumption forms the system by installing Vertical Axis Wind Turbine. As the wind is a Renewable Energy and the wind flowed almost hours in a day so that we can use at most of wind to convert it into Renewable Energy. As it can be installed on the streetlight and gardens will reduce the load on the system and also decrease cost of the electricity.

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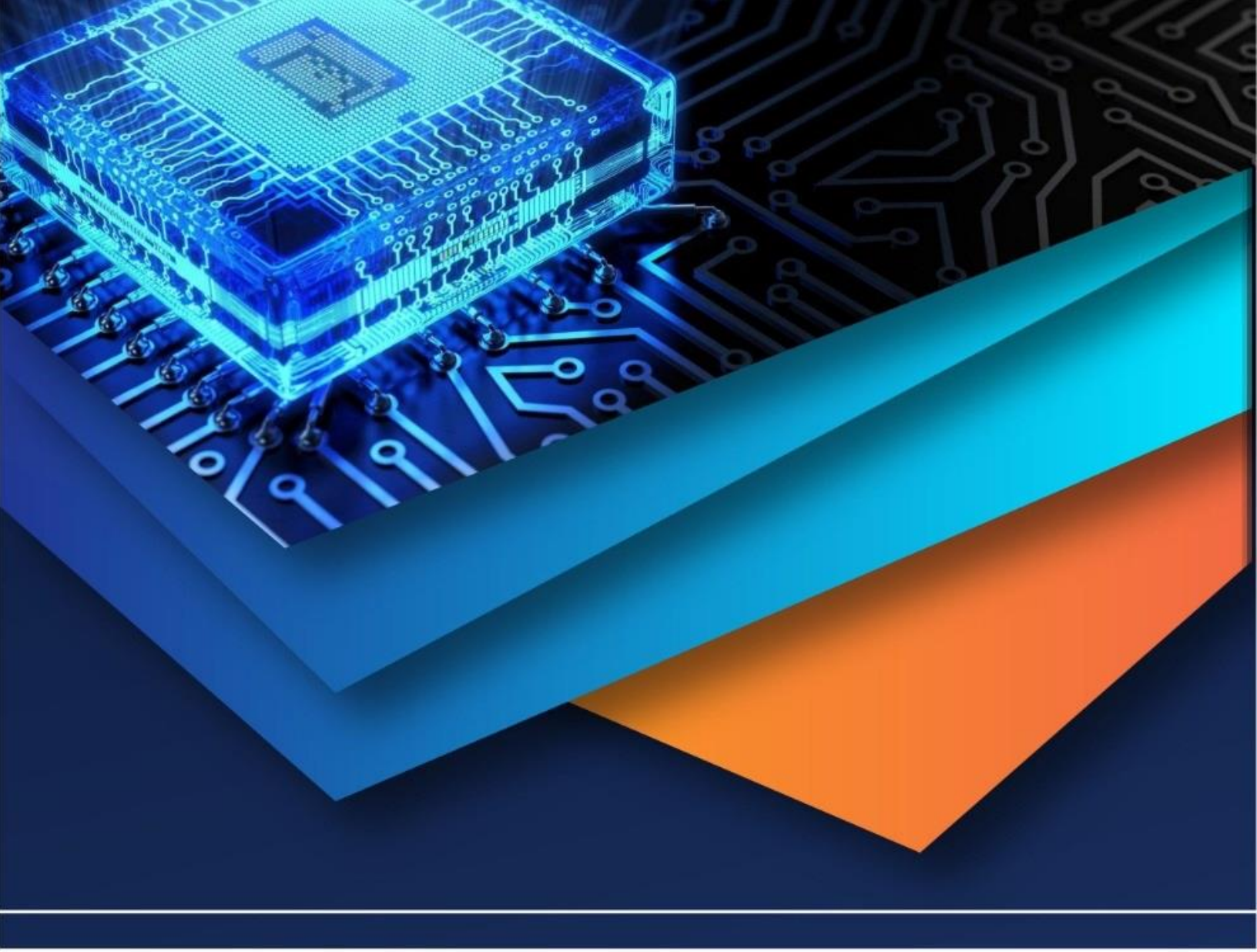

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