Generation of Electricity By Using Vertical Axis Turbine

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Abstract- *This paper focuses on the use of air on highway divider with the help vertical axis wind turbine. When the vehicle passed on the highway it produces a considerable amount of air due to its speed. This air tangentially strikes on the blade of the vertical axis wind turbine and it makes a rotation of the turbine in both directions depending upon the direction of flow of air and result of rotation of turbine we get a considerable amount of electrical energy.*

Keywords- Vertical axis Turbine Design, renewable energy source, battery system, Invertor, Highway medium.

I. INTRODUCTION

In a day to day life, the demand for electricity is much higher than the production of electrical energy. One of the major problems ever since the natural resources are going to finish one day. The fossil fuel major role in production global warming, a greenhouse gas, etc. currently 68 percent of the electrical energy produced by the thermal power plant and remaining 22 percent included hydropower plant, nuclear power plant, gas power plant and as we realized the fossil fuel is finished in one day. Solar and wind both are renewable energy sources. Solar energy out there begins of day and therefore the wind energy is most on the route because of the speed of the vehicle.

The motivation of this project contributes to the global trend toward clean energy. The main motive behind this project is to style a vertical axis turbine that effectively uses the wind energy generated by the vehicle speed on the road. So the most wind energy is often extracted by the vertical axis turbine as compared to the horizontal axis turbine. We have styled changed savonius vertical axis turbine that is additional economical than previous savonius design

II. TYPES OF TURBINE

There are two types of turbines, the first one is a horizontal axis turbine and second one vertical axis turbine.

In the horizontal axis turbine, the shaft axis of the turbine is parallel to the direction of air flow. In the vertical axis, the turbine shaft axis is the perpendicular direction of air flow. The concept of a vertical axis turbine was given by Darrieus asearly as 1931. Vertical axis turbine is further classified as,

1. Savonios
2. Darrieus

III. RELATED WORK

Turbine should be able to the rotation without any force other than wind, even at very low wind speed. This principle is called the self-starting of the turbine. Thus, the objective is to design a self-starting vertical axis turbine that is capable of producing power in the real-life world. Yet, there is some issue like,

1. Choose the correct size of components
2. Optimize energy management within the system
3. Find the optimal configuration in order to reduce the cost of production

IV. OBJECTIVE OF PROJECT

The main objective of our project is to use the utmost quantity of wind energy from the vehicle running on highways. The unused wide quantity of controlled air accustomed drive the vertical axis rotary engine turbine from that the mechanical energy of the turbine is reborn into voltage. The main aim of this project to reduce the pollution produced burning of fossil fuel. The generated energy by VAWT is stored in a battery and this stored energy which can be used street lighting, toll gates or in future to provide the charging node to the electrical vehicle.

V. METHODOLOGY

5.1 Vertical axis wind turbine

The vertical axis wind turbine is used to convert the kinetic energy into mechanical energy. The light weight blade

material (ABS plastic) are used for making the vertical axis wind turbine.

Turbine specification

Hight of blade = 0.75 m
Diameter of blade = 0.1 m
Rim diameter = 0.6 m

5.2. Battery

A battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as electric cars and smartphones etc. and Batteries convert chemical energy directly to electrical energy.

Battery specification = 12 V (DC)

Fig.1: Battery

5.3 Booster

Use of booster for boosting the voltage which is get from DC motor. Output of DC motor is connected to booster.

Fig.2: Booster (35V to 50V)

5.4 Inverter

Inverter is used for converting DC into AC. The output of Booster is connected to invertor.

Fig.3: Inverter

5.5 Tripod

In this project Tripod is used for holding whole assembly of turbine.

Fig.4: Tripod

VI. BLOCK DIAGRAM

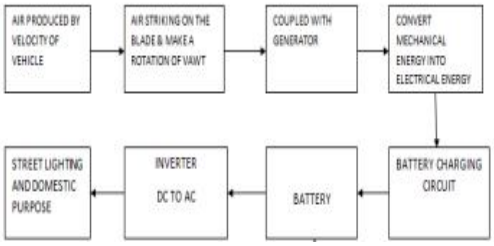

Fig.5: Block Diagram

VII. WORKING PRINCIPLE

The moving vehicle on the highway may be all types such as small or heavy vehicles. Whenever vehicle moves on both side of the highway divider then some pressurized air is produced due to the speed of the vehicle. This pressurized air is a strike on the blade of the vertical axis wind turbine and turbine makes a rotation. The shaft of the vertical axis wind turbine is connected to DC motor which gives output in term of voltage. The output of a motor is connected to voltage booster; hence we get a boost in voltage. An inverter is connected to booster basic reason of connecting the inverter to the booster is to convert DC output into AC input hence we

can connect a load to input. The battery is used to stored energy.

VIII. CALCULATION

Devices used for taking readings are follows

Anemometer: it is used for checking velocity of air flowing on highway. It gives reading in (m/s) by using this we can directly calculate power
Formula, power= 0.5*e*A*V^3

Where,
p= power in watt
e= Density of air (1.23 kg/m^3)
A= Swept area (HIGHT * WIDTH)
V= Volocity (m/s)

Voltmeter: it is used for checking output voltage at the end of DC motor.

SPEED(M/S)	GENERATED ENERGY
1	0.00042
2	0.01496
3	0.09183
4	0.26648
5	0.52208
6	0.94843
7	1.05041
8	1.42313
9	1.45895
10	1.89334
11	2.45621
12	3.894

IX. ADVANTADES

1. Vertical axis wind turbine has ability to generate electricity in any wind direction.
2. It has easy installation compared to other wind turbines.
3. It has a low maintenance cost.
4. Blade moves at very low speed due to which there is a minimum risk for human and bird lives.
5. A strong supporting tower is not needed as all other equipment such as generator, gearbox and other components are placed on the ground.
6. Design can be scaled down to small sizes according to need, as in urban areas there is a small place to install a vertical axis turbine, so it will become optimal to install on an urban rooftop.

X. FUTURE SCOPE

Vertical axis wind turbine can replace on the roadside or in between divider as it has ability to generate electricity in any wind direction, for purposes of lighting.

Electricity produced by windmill can be stored in a battery and used for home appliances as well as a roadside lamp.

It can be used at any location as the size of design can be scaled down. Vertical axis wind turbine is eco-friendly as well which will help to nature and human also by producing power with minimum hazardous effects on nature.

XI. CONCLUSION

First, required data such as the velocity of wind produced by a vehicle running on both sides of the highway is measured. Then the turbine is placed on the divider of the highway. The efficiency of the turbine depends on the designed and material of the blade. We use ABS material and semi-circular shape of the blade. The prototype is not too costly. The Power generated by one turbine is not adequate, if we placed a number of turbines along the divider of highway then an abundant amount of energy will be generated. So that, wind energy produced due to a vehicle running on a highway which is going to waste is utilized.

Power produced is sustainable and eco-friendly without affecting the environment. So, the energy produced by using the number of a turbine can be used for lighting streetlight, store in battery and transfer to remote areas away from the integrated electricity grid system for used in daily purpose.

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