

# DESIGN AND DEVELOPMENT OF VERTICAL AXIS WIND TURBINE FOR GENERATION OF ELECTRICITY BY USING WIND ENERGY FROM RUNNING VEHICLES

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**ABSTRACT-** Nowadays there is increase in the demand of electricity but the rate of production is much less than the demand. The motivation of our project is to generate electricity by using wind energy from running vehicles on highways. The vehicles running on highways generating more amounts of wind and this wind is used for the generation of electricity in our project. Also nowadays the percentage increase in the road accidents are happening due to the insufficient lightening on highways. This problem is overcome by using vertical axis wind turbine. This is a new idea of power generation. In our method the blades are designed in aerofoil shape and it is kept at the middle of the highways divider. The purpose of using divider is we can get wind from both directions. We can achieve higher force in the middle than the side of the road. And this blade is coupled with the generator and this generator will produce electricity. In our project we take wooden material for blades to achieve more efficiency.

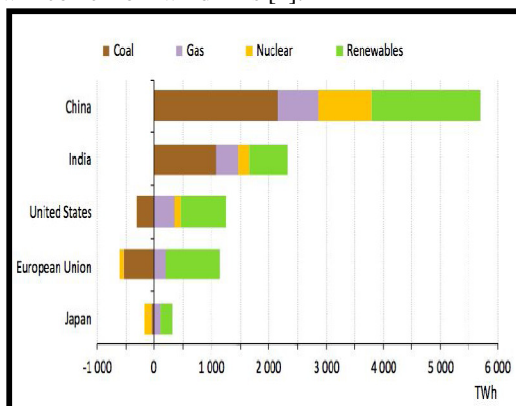
**Keywords-**Blades, Electricity, Generator, Highway, Wind Turbine, Wind

## I) INTRODUCTION

If the efficiency of a wind turbine is increased, then more power can be generated thus decreasing the need for expensive power generators that cause pollution. This would also reduce the cost of power for the common people. The wind is freely available and Power can be generated and stored by a wind turbine with little or no pollution. The main objective of our project is to produce electricity by using the force of wind created by the running vehicle on highways. On highways the vehicle suffers a lot to travel in night time because of lightening problem. This problem can be overcome by using the vertical axis wind turbine. This is a new unique technique of power generation.

In this method the vertical axis turbine blade is designed in an aerofoil shape and it is kept at the middle of the highway divider by a series combination. The force in the middle portion is higher than the side of the road. This force will rotate the vertical turbine blade. And this blade is coupled with the generator and this generator will produce electricity. The main advantage of vertical axis wind turbine is it can generate power in all direction of wind flow. And the other advantages are the maintenance is less and the height of the tower is less. Also the wind is very much eco friendly and very compactable one. So we use this as a fuel in our project. It costs nothing & gives best output.

In 21<sup>st</sup> century the use of renewable sources which are eco friendly and less pollutant is must. The vertical axis wind turbine plays significant role in renewable energy sector. Wind energy is by far the fastest-growing renewable energy resource. Scientists estimate that, by the 21st Century, ten percent of the world's electricity will come from windmills [1].



Graph no1: Power Generation 2010 - 2013

## II) EXPERIMENTAL SETUP



Fig. no.1 Actual prototype

### Parts Used

#### 1) Blades-



fig. no.2 blades

- Blades have an aerofoil – type cross section and a variable pitch. Material used is wooden.
- In the project four blades with vertical shaft are used, it has a height & width of 500mm & 300mm respectively

2) **Bearings-** The requirement of 2 pedestal bearings that are going to primarily centralize the shaft, and bearing to take the majority of the weight. This combination will provide the least amount of friction, while maximizing bearing life and maintaining safe operating conditions.



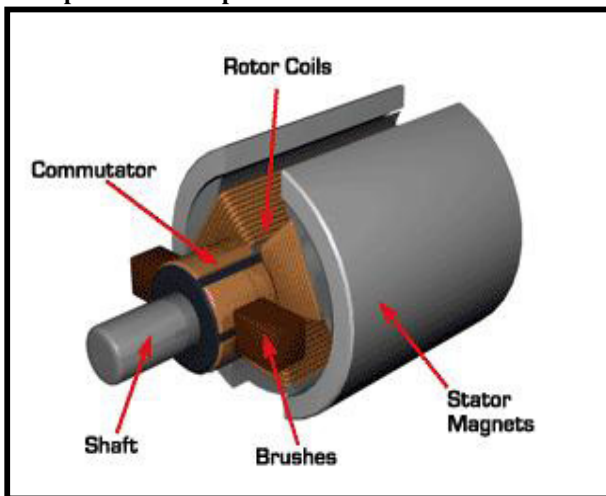
fig. no.3 pedestal bearing

- 3) **Genset-** 12v, 5watt DC Generator having Shaft diameter 10mm is used in the project. Two spur gears having gear ratio 3.4:1 is used. Compound gear train of these pairs is made to get the gear ratio 11.56:1



**Fig no.4 Genset**

**Principle of Genset operation-**



**Fig. no.5 Principle of genset Operation**

An electrical generator is a device that converts mechanical energy to electrical energy, generally using electromagnetic induction. The source of mechanical energy may be a reciprocating or turbine steam engine, water falling through a turbine or waterwheel, an internal combustion engine, a wind turbine, a hand crank, or any other source of mechanical energy.

The Dynamo was the first electrical generator capable of delivering power for industry. The dynamo uses electromagnetic principles to convert mechanical rotation into an alternating electric current. A dynamo machine consists of a stationary structure which generates a strong magnetic field, and a set of rotating windings which turn within that field. On small machines the magnetic field may be provided by a permanent magnet; larger machines have the magnetic field created by electromagnets.

The energy conversion in generator is based on the principle of the production of dynamically induced e.m.f. whenever a conductor cuts magnetic flux, dynamically induced e.m.f is produced in it according to Faraday's Laws of Electromagnetic induction. This e.m.f causes a current to flow if the conductor circuit is closed. Hence, two basic essential parts of an electrical generator are (i) a magnetic field and (ii) a conductor or conductors which can so move as to cut the flux.

**Specifications of the Wind Turbine  
Base Dimensions**

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Height: 1440mm  
Width: 450mm

## Blade Dimensions

Height: 500mm  
Diameter: 450mm  
Thickness: 25.6mm  
Angle: 45 °  
Angle b/w blades: 45°

## Shaft Dimensions

Diameter: 25mm  
Length: 1440mm

**Table no. 1 shows the iterations of readings shown on the multimeter.**

Sr. No.	RPM of Shaft	Multimeter Reading (volts)
1	00	00
2	10	1.18
3	20	2.46
4	30	3.67
5	40	4.85
6	50	5.94

## III) CONCLUSION

By using this technology all the highways can be lightened without use of non- renewable energy resources. Also, if this method is implemented in all national highways we can able to produce large amount of power. And it can also provide job for many educated fellowship. By increasing numbers we can develop more energy & light up the highways so that the percentage of accidents gets minimized.

## IV) FUTURE SCOPE OF DEVELOPMENT

1. By fixing solar panel in this vertical axis wind turbine will increase the efficiency.
2. Fixing more in series or in parallel manner will give more efficiency.

## V) REFERENCES

- [1] Design and Fabrication of Vertical Axis Highway Windmill by S.V. Saravanan, M. Varatharaj, L. Ayyadurai, S.Palani & D.Prem
- [2] A Method for Generating Electricity by Fast Moving Vehicles by S.Bharathi, G.Balaji, and M. Manoj Kumar Angel College of Engineering & Technology/ECE, Tirupur, India
- [3] A new vertical axis wind turbine design, integrated in the urban environment  
By University Transilvania of Brasov, Romania.
- [4] design and development of a 1/3 scale vertical axis wind turbine for electrical power generation by Altab Hossain A.K.M.P. Iqbal, Ataur Rahman, M. Arifin and M. Mazian