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Design And Fabrication of Highway Wind Turbine

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ABSTRACT
To save the fuel and power and to overcome skilled labour shortage, most of the devices should be operated by non-conventional energy. The main aim of this project work is to acquire practical knowledge in the field of non-conventional energy using wind is generated through by a wind turbine which is operated by the wind. This turbine unit has three blades which are rotated by the wind force. These blades are made 1mm thickness tin sheet in order to reduce the self-weight fitted in a shaft housed with bearing. The output of the shaft is connected to DC generator which supplies the electrical energy used to charge the battery. A two-way is also connected to the battery to connect charging mode and discharging mode. This whole arrangement is mounted in a flat metal plate.
Keywords : DC Generator, Battery, Hollow Pipes, Blade

I. INTRODUCTION

To extract electricity from the wind that produced due to the speed of the vehicle in the highways. Wind energy is the fastest growing source of clean energy worldwide. A major issue with the technology is fluctuation in the source of wind. There is a near constant source wind power on the highways due to rapidly moving vehicles.

Wind is caused due to uneven heating of earth surface, atmosphere, irregularities of the earth surface and the rotation of the earth about its own axis. The amount of wind flow depends on various factors such as earth rotation speed and difference in temperature of places. Energy produced by this blowing wind is called as wind energy. About 68% of the production of the electric energy is based on thermal power plant, where fossil fuels, coals, diesel are used for power generation and which is very less available and this fuels also creates pollution, greenhouse effect and global warming.

This research discussion was to showcase the efficiency of Savonius model in varying wind conditions as compared to the traditional horizontal axis wind turbine. It evaluated some observation that showed that at low angles of attack the lift force also contributes to the overall torque generation. Thus, it can be concluded that the Savonius rotor is not a solely drag-driven machine but a combination of a drag-driven and lift-driven device.

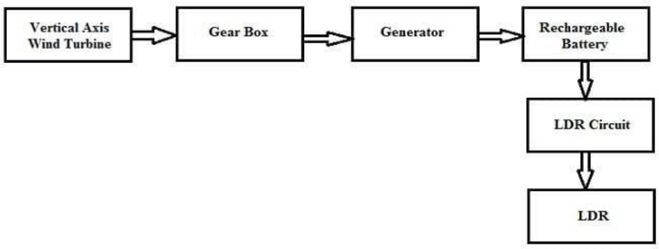
Therefore, it can go beyond the limit of Maximum power coefficient Cp established for the purely dragdriven machines.

Some of this researched conclusions are that the vertical axis wind turbine is a small power generating unit with the help of free source of wind energy. It is designed under consideration of household use. Generally, At least 10% power of the consumption can be fulfil by the Savonius model.

The research has also resulted that this turbine is generally suitable for 8 to 10m of height above ground level. Because at ground level velocity of air is very less. And finally the alternate option for turbine blade material is reinforced glass fiber because of its more elastic nature but it is costlier than aluminum alloy. To have the best efficiency of the power output from our turbine, we have done some brainstorming in what are the most significant factor that affect the turbine, the blade angle was agreed to be the most significant one

II. METHODS AND MATERIAL

- Blades fabrication of blade consist of aluminium blades, steel pipes aluminum sheet circular cross sectional base.
- Lower column fabrication of column consist of selecting the shaft on the welding of supporting discs.
- Shaft fabrication of adjustable shaft consist of hallow shaft threaded solid shaft and guide rod.
- Housing fabrication of housing consist of circular metal disc bearing and metal rods



III. RESULTS AND DISCUSSION

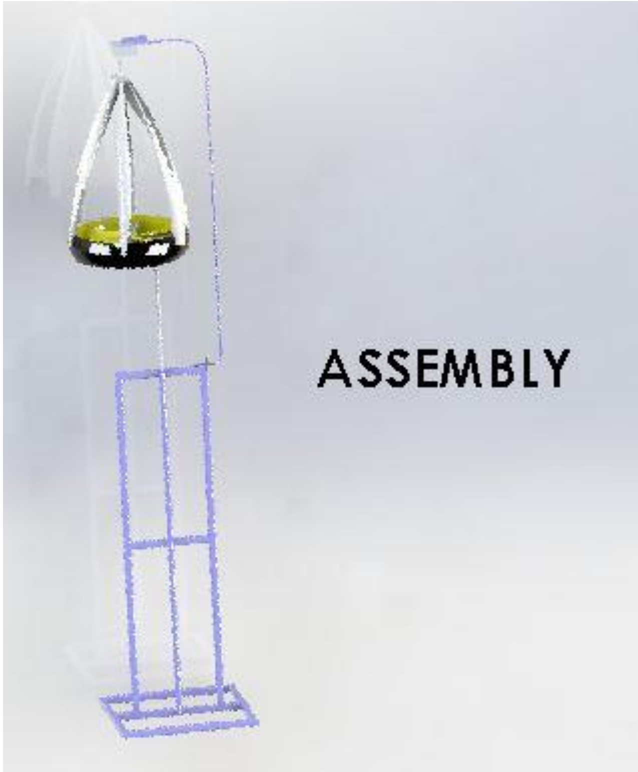


Figure 1: HIGHWAY WIND TUEBINE

CALCULATION:

1. Selection of Wheel

Distance between two plants = 1 feet = 30.43 cm.

Line covered by one rotation of wheel = 30.43*3= 91.44 cm

152 = 2πr r =152/2π r = 15 cm The diameter of wheel = 30 cm

2. Discharge calculations

Total Discharge through nozzle – 16 liter in 10 min

I.e. 1.6 liter/min =1.6 *10-3 m3/min

Discharge of single Nozzle=1.6*10-3/ 6 = 0.266 m3/min

Pump discharge per stroke=A*L

=π/4*(0.04)2*0.08

=1.005*10-4 m3

Required speed or stroke N=Total Discharge of nozzle/Pump discharge per stroke N4= 9.25*10-4/1.005*10-4

=9.20rpm Angular velocity of crank

ω4= (2*π*9.20)/60

ω4=0.96 rad/sec

Crank and slotted lever mechanism

ω2=ω4*(I14I24/I12I24)

=0.96*(14.3/5.6)

ω2 = 2.45 rad/sec

N2=23.40rpm
Human walking speed under load below 50Kg
=3 km/hrs.
N1= V*60/D*π (where V=m/s) N1=39.78rpm
For required reduction in rpm

Z2/z1=N1/N2=39.78/23.40=1.7 (3.15<3.43<4 DDB 7.71)
No. of teeth on sprocket Z1=18 Z2=18*1.7=32
Pitch=12.7mm
Optimum central distance = (30 to 50) P
=30*12.7
=381mm Selected chain =R1248
Approximate center distance in multiple of pitch ap= a0/P ap=300/12.7=23.62 Length of continuous chain in multiple of pitches tp=2*ap+Z1+Z2/2+ (z1-z2/2*π) 2/ap
=2*23.62+ (23+48)/2 + (48-23/2*π) 2/ap
=83.41=84mm
Length of chain L=Lp*P
=84*12.7=1066.88mm

IV. CONCLUSION

Our work and the results obtained so far are very encouraging and reinforce the conviction that vertical axis wind energy conversion systems are practical and potentially very contributive to the production of clean renewable electricity from the wind even under less-than-ideal sitting conditions. It is hoped that they may reconstructed used high - strength, low - weight materials for deployment in more developed nations and settings or with very low tech local materials and local skills in less developed countries. The Savonius wind turbine designed is ideal to be located on top of a bridge or bridges to generate electricity, powered by wind. The elevated altitude gives it an advantage for more wind opportunity. With the idea on top of a bridge, it will power up street lights and or commercial use. In most cities, bridges are a faster route for everyday commute and in need of constant lighting makes this an efficient way to produce natural energy

We make this project entirely different from other projects. Since concepts involved in our project is entirely different that a single unit is used to various purposes, which is not developed by any of other team members.

By doing this project we gained the knowledge of fabrication work and how the welding is doing and material selection for particular components etc.,
Once again we express our sincere thanks to our staff members

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