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Harnessing Electricity from Drag Force Experienced by Vehicles

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Abstract: The shortage of fossil fuels and their negative effects lead to the rapid growth in utilization of renewable sources of energy and the concerned technology. However, these renewable sources suffer from limitations such as large requirement of land, cost and also the potential to be tapped effectively. This paper introduces a way to tap wind energy without such limitations. Here a method of harnessing free energy from the drag force experienced by a moving vehicle is introduced. The drag force is used to turn a wind turbine connected to the shaft of a dynamo, the output of which is stepped up by a DC-DC booster converter and stabilized to charge electronic gadgets like mobile phones or batteries for later use.

Index Terms: Free energy, drag force, wind turbine, dynamo.

1. INTRODUCTION

Ever since the shortage of fossil fuels and their negative effects on environment, renewable sources of energy such as solar and wind energy have served the increasing demand for electricity. However, these have their own limitations. For instance, solar energy can only be harnessed during day and wind energy can be harnessed only when there is wind of sufficient strength. And most importantly these require a huge piece of land which in the current times is in shortage due to industrialization. Thus, the exploiting of free or waste energy that results due to some activities around us and converting it into desired form will be the next sustainable way to meet the growing energy needs. In physics, the law of conservation of energy states that the total energy of an isolated system remains constant, that is, it is said to be conserved over time. Thus, energy can neither be created nor destroyed, but can be transformed from one form to another. Free energy refers to a source of energy conveniently ignored by modern science, but has the potential to be tapped and utilized with apt technologies. Free energy technologies use a small amount of one form of energy to control or release a large amount of a different kind of energy.

2. PROPOSED MODEL

When vehicles move on the road, there is an opposing drag force experienced by the vehicle which is proportionate to the speed of the vehicle in motion. This free energy can be seen analogous to wind energy with a potential to rotate a small fan placed anywhere on the vehicle, such that the drag force rotates the fan. If this fan is fixed to the shaft of a dynamo, DC current is available as output. That is, the rotational energy of the fan has been converted into electricity(DC). This is in accordance with Faraday's law, which states that an electromotive force is generated in an electrical conductor which encircles a varying magnetic flux.

Here a model is proposed to charge electronic gadgets that require 5V of input DC supply such as mobile phones and tablets.

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3. DESIGN CONSIDERATIONS

The output of renewable sources of energy after immediate conversion to electricity is very low to be used directly for any applications. Thus, the output from the dynamo, that is the DC voltage has to be amplified to a DC voltage value that can either be used directly or further stepped down and regulated based on the load at the output side. Additionally, the limit on wind energy to electrical energy conversion require the optimization in wind turbine and dynamo.

A. Maximum Possible Efficiency

Betz's law indicates the maximum power that can be extracted from the wind, independent of the design of a windturbine in open flow. The Betz's limit is equal to 0.593. The wind energy incident on the wind turbine due to drag force experienced by the vehicle is directly proportional to the speed of the vehicle. But, according to Betz's law, however strong the wind, only 59.3% of the available wind energy can be effectively tapped [1], thus requiring optimization in the design for better output power.

B. Propeller (Fan) and Dynamo

- A propeller of larger size and more number of blades taps the wind energy better when compared to one of smaller size and lesser number of blades.

  Custom designing of a fan with flat blades is easier and economical. In the case of flat blades, the angle of tilt of the blades of the wind turbine with respect to the air flow determines how much amount of wind energy can be captured for useful work. The force balance on the blades is determined by the equation [2]:

$$F = \rho \times v^2 \times A \times \sin\theta \times \cos\theta \times D \times \cos\theta$$

  Here, F = Force experienced by the turbine blades

  ρ = air density

  A = area of the blades

  v = speed of the wind

  D = diameter of the base of the assumed cylindrical volume of air that is to flow through blades

  θ = angle of tilt

  The maximum output power is achieved when ($\sin\theta \times \cos\theta \times \cos\theta$) is maximum. An angle of tilt of 35.5 degrees results in a maximum conversion of 38.5% of wind force to rotational energy as shown in Figure 1 below.

- A dynamo of higher voltage and power rating contribute to better power output.
- A dynamo with bigger armature winding results in higher output voltage.

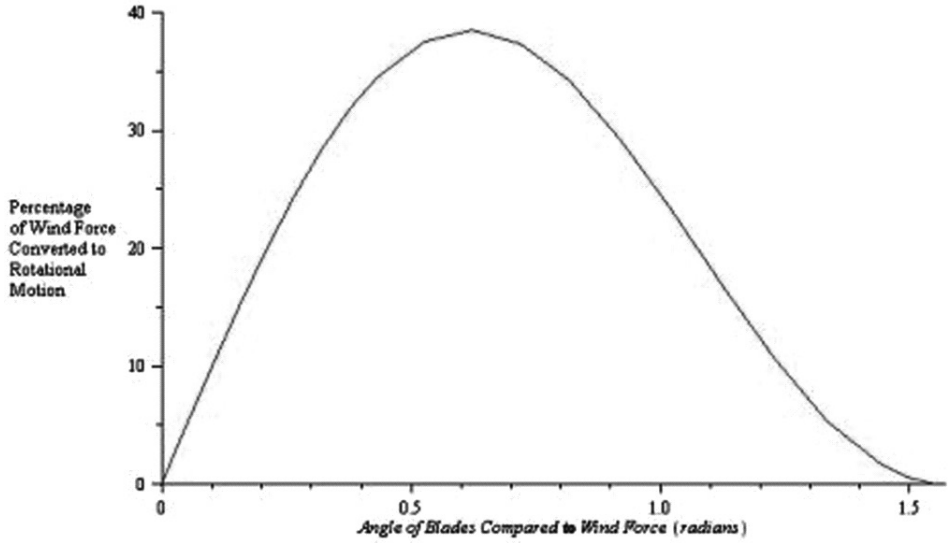

Figure 1:

C. DC to DC Booster Circuit

The output energy of any free energy technology is very less to be utilized for any application after immediate transducing. Here a booster circuit (Figure 2) that is sensitive to voltages as low as 70 mV is used to amplify the output of the dynamo [3].

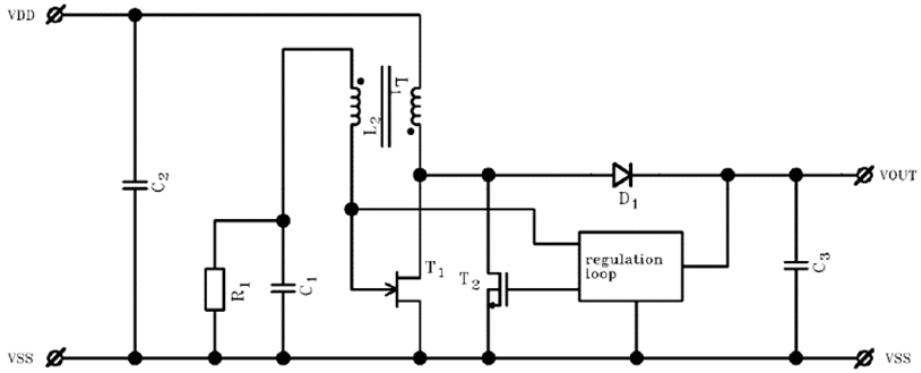

Figure 2: Simplified schematic of the boost converter

The regulation loop has the circuit diagram as below (Figure 3).

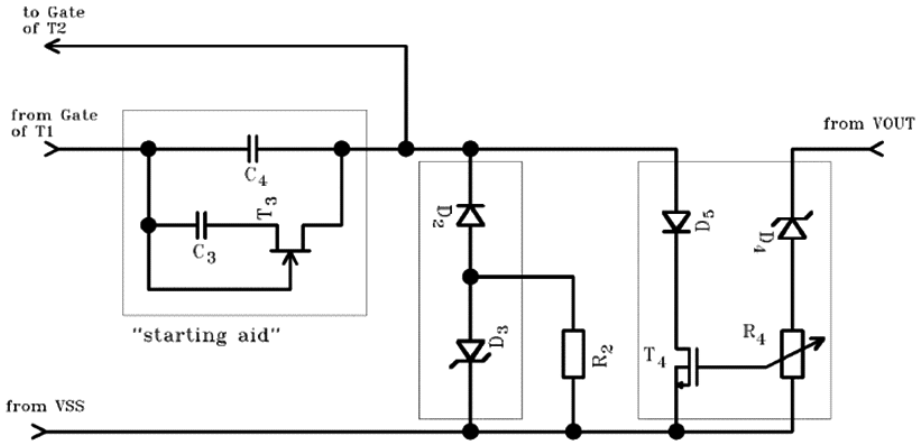

Figure 3: Regulation loop circuit of the converter

D. Charging the Load

- To charge mobile phones, tablets or other such gadgets, the voltage input to be supplied for the load is 5 V. Any value of input current charges the gadgets. However, the higher the current, the faster the Charging.

  If the output of the boost converter is greater than 5 V, to obtain 5 V of voltage supply, the voltage output of the booster circuit has to be stepped down to 5 V using LM317, an adjustable positive voltage regulator.

- To store charge for later use, the output voltage has to be accordingly stepped down with respect to the specification of the charger or storage device.

4. FUTURE SCOPE/CONCLUSION

With advancements in technology the methodology proposed in the paper can be implemented as part of the structural design of automobiles to serve as an additional backup to the automobile battery.

Also it can be used as a supportive source of energy for electric vehicles.

Free energy technology is a promising technology to meet the ever rising demand for energy. At the current rate of usage of fossil fuels, the world is likely to meet an energy crisis very soon. Thus, Renewable energy technologies and newly emerging Free energy technologies will be the most sustainable solution.

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