ELECTRICITY GENERATION USING ROOF TOP VENTILATION

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Abstract

This project is about generating electricity from RTV. Generally RTV are used for ventilation purpose. A standard RV is typically mounted on rooftops of industry/factory. We are using this RTV for electricity generation.

RTV works on the principle of hydro mechanism. It does not consume electricity for its working. It can produce electricity for low wind speed.

System can produce electricity without causing any kind of pollution. Wind energy is renewable source of energy, it can replace conventional or non-renewable sources of energy that cause pollution to the environment.

The system can produce electricity so that it can charge 12V DC battery load will use energy from battery for it operation. Here, we are using inverter to convert DC to AC and operate light load or for other applications.

Keywords: *RTV, DC generator, LED light, battery, inverter and LDR.*

INTRODUCTION

Mostly modern wind power is generated in the form of electricity by converting the rotational energy into electric energy or electric current by means of electrical generator. In wind mills (an older technology), wind energy is used to rotate mechanical devices to do physical work, such as crushing grains or pumping water.

Ventilation creates cozy and health promoting air that is odourless, dustless, droughtless, and noiseless. In ventilation system air is exchanged in a well-controlled manner. Heat is extracted with air together with post heating radiator. The replacement heat is collected from atmosphere if needed. There is no annoying drought. In case of summer, when the atmosphere is warm, the heat recovery can be bypassed.

The main function of ventilation is to import the clean air from the atmosphere for breathing and to eliminate the gaseous impurities and various particles that are created inside the building. The cleaner indoor air, the better is the well-being of the residents. In allergic conditions it is more important to plan better ventilation.

India comes under warm zone area. Hence, there is always warmness throughout the year, more specifically in summer season i.e., March to May. The temperature raises upto 33ºC to 42°C. The high temperature affects the production and hence the efficiency also gets affected. Because of this high temperature, ventilation is

essential in any workplace, industry or factory. Hence RTV is good option in this case as it works without utilizing any electric power.

In RTV hot gases that present inside rotates the vanes of ventilator. As the hot gases go out, the inside density decreases. Hence, the cool gases occupy the space. Thus, the ventilation takes place. We can use the rotation of ventilators during the process of ventilation to generate electric energy.

ROOF TOP VENTILATION (RTV):

Roof top ventilation is installed considering technical aspects and with proper engineering on the roof of a building or a shell in order to achieve ventilation in the required space. It can be used anywhere like industries, houses, workshop, etc.

The hot gases present inside the room or space exit with the rotation of vanes of the ventilator. Due to which the air density inside the room or space becomes less. This allows the cold air to occupy the emptied space. This is the simple principle of working of Roof Top Ventilator (RTV).

Roof top ventilators are round metal vane with fins in them. They rotate even at small velocity of wind. The more velocity of wind, the faster will be the speed of rotation of vanes.

The various aspects of ventilator like the size, number of vanes and installation depends on different factors like wind velocity, atmospheric and inside temperatures, environmental conditions and size of the building.

PARTS OF RTV:

Basically RTV has two important parts,

1. Stationary parts:

   These parts are stationary that is there no motion in these parts.

Example: Base and fixed shaft

2. Rotating parts:

   These parts are in rotational motion during the process of ventilation.

Example: Fan blades and bush on the fixed shaft.

Fig 1: Vertical dissection of RTV

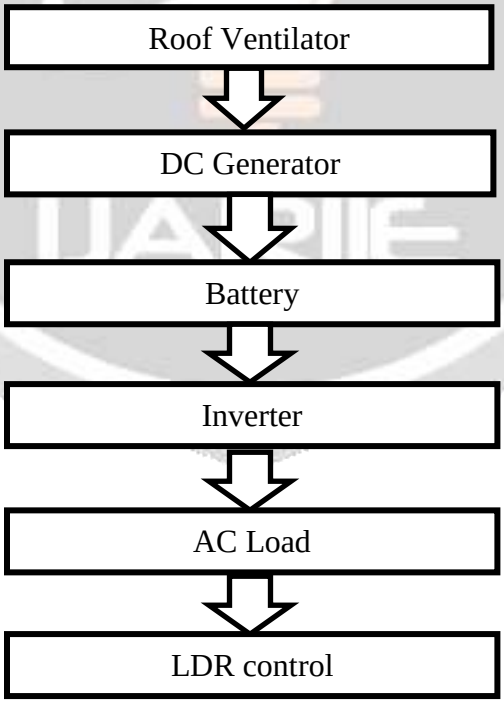

Chart 1: Procedure

DC GENERATOR:

A DC generator is an electrical machine which converts mechanical energy into direct electric current. This energy convertor is based on principle of production of dynamically induced EMF.

Working of brushed an electric motor with a two polled rotor (armature) and permanent magnet stator. DC current is applied to the commutator which supplies current to the armature coils.

SYSTEM PERFORMANCE:

In roof top ventilator, the hot gases present inside the room or space exit with the rotation of vanes of the ventilator. Due to which the air density inside the room or space becomes less. This allows the cold air to occupy the emptied space, thus ventilation is done. We are using one system for getting two outputs, first is better ventilation and other is producing electricity using RTV for applications like light load , battery charging, etc.

The main component of system is dc generator. A dc generator is an electrical machine which converts mechanical energy into direct current electricity. This free electricity has to use the battery charger because the roof ventilator is not working all the time. This to ensure that there will be no back-flow current if the roof ventilator is not functioning. Inverter is use to convert from DC to AC for our AC load usage.

An important specification of the generator is the torque must be low to enable it to start at the low speed. When the wind blows on the fins and generates enough drag forces, the roof ventilator will rotate. This is a standard roof ventilator in the market with diameter size, 22 inch. This size has 30 curves blade, net weight is approximately about 4,100 g. The production of electricity is depending upon various factors like velocity of air, rotation speed of ventilator, height of blades.

Generation of electricity depends on following factors:

Extra fins: As we increase no. of external fins, output voltage also increases
Increase in the air flow rate of the system, output voltage increase with increase in the number of external fins. If we increase the number of fins by more than 3 fins, the total weight of the system increases reducing the air flow rate further reducing the power available for energy conversion. The fin can be different in materials.

Blade Height: As we increase the height of blade the flow rate increases.

Extra Inner vane: It was practically found that with an extra inner vane of the turbine ventilator, the air flow rate had an improvement in its value. However, it was found that the size of the inner vanes does not have an appreciable amount of change in the air flow rate

Turbine Diameter: Variance of diameter variables on its ventilation performance. It was found that bigger the size of the ventilator, higher is the ventilation rate i.e. the rate of discharge of air.

The RTV start rotating at the minimum velocity of 1.5m/s.

CONCLUSION:

In this project, we have introduced the RTV. The additional work is to generate electricity using RTV. We have used DC generator. According to our desired output we have calculated parameters of generator when hot gases are produced inside the shell, RTV will start to rotate. The motor is operated due to the rotation of RTV. The output voltage is about 4.8V, 60mA. The output is achieved at 0.28 W.

For achieving this result, we have implemented RTV on top of the roof such that it can charge 12 Vdc battery.

The prototype is very small and compact and also the price is also very low.

RESULT:

In this project, energy generation is directly proportional to speed of system. As the speed of system increases system voltage also increases. Voltage is the parameter that is dependent of speed.

Sr. no.	Speed (rpm)	Voltage (V)
1	60	1.87
2	80	2.1
3	100	2.4
4	200	4.4
5	300	4.8

Table 1: Measurements of operating speed and obtained voltage values.

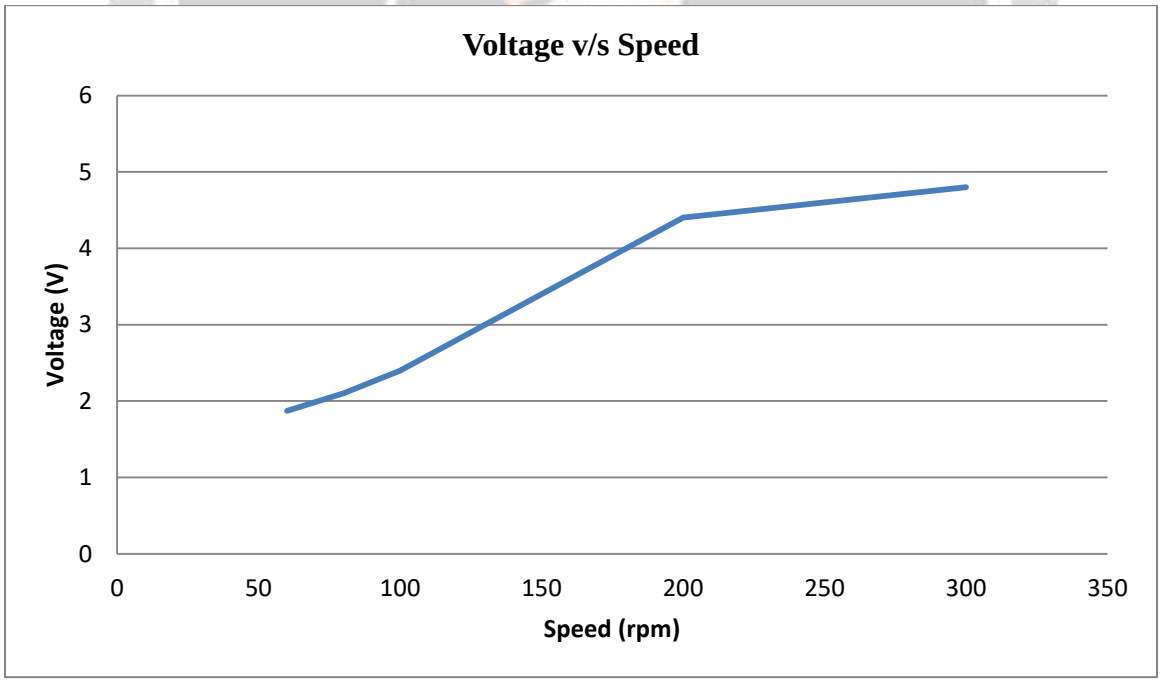

Chart 2: Voltage v/ Speed

From below information, it is stated that energy generation is directly proportional to the current of system. As the speed of system increases current of system also increases. Current is the parameter that is dependent of speed.

Sr. no.	Speed (rpm)	Current (mA)
1	60	33
2	80	33
3	100	52
4	200	58
5	300	60

Table 1: Measurements of operating speed and obtained current values.

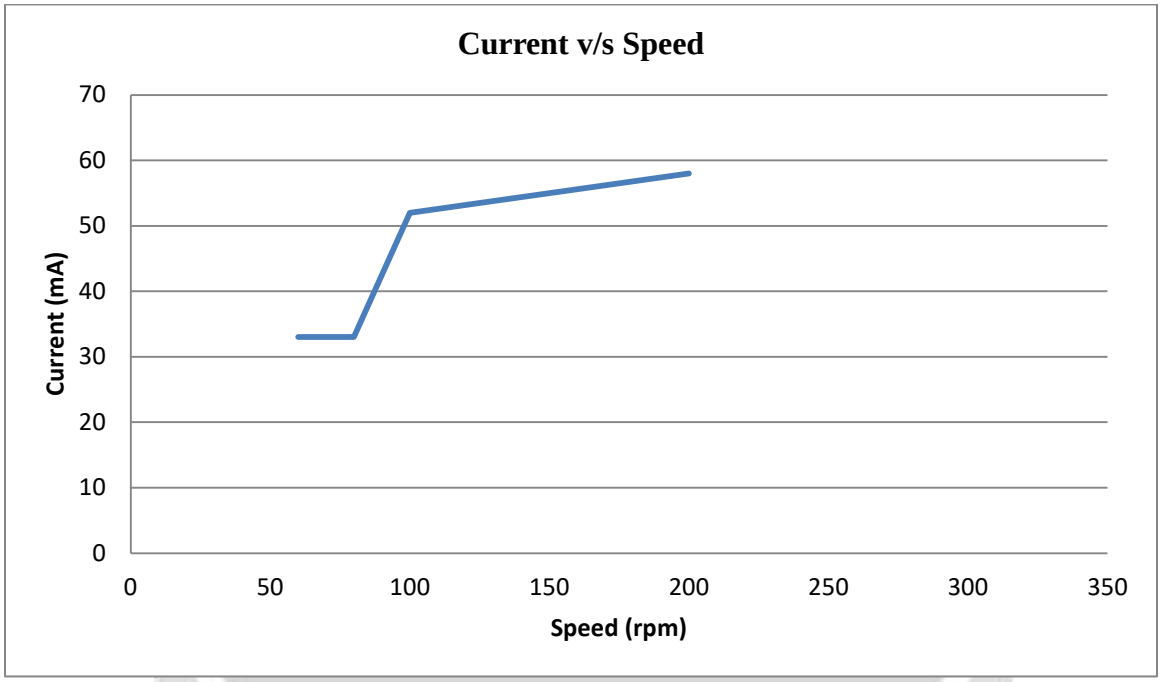

Chart 3: Current v/s Speed

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