A Review on Solar Powered Electric Vehicle

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ABSTRACT

Now a days, pollution rate increasing day by day with the use of petrol and diesel engine in automotive sector and it can be further decreased by enhancing non-conventional energy sources i.e. Solar Energy. A wide variety of hybrid technologies are now entered in market. With the use of electricity the solar vehicle can be charged but due to this, large amount of electricity is being consumed and thereby increasing pollution. So, utilization of solar energy in vehicles is the best option for saving electricity and reducing pollution. This paper provides an overview on a solar powered electric vehicle.

Keywords: - *Solar energy, Electric Vehicle, Automobile and PV cells etc.*

1. INTRODUCTION

A solar vehicle is an electric vehicle powered completely or significantly by direct solar energy. Usually, photovoltaic (PV) cells contained in solar panels converts the sun's energy directly into electric energy. The term "Solar Vehicle" usually implies that solar energy is used to power all or part of a vehicle's propulsion. Solar power may be also used to provide power for communications or controls or other auxiliary function. Solar vehicles are not sold as practical day-to-day transportation devices at present, but are primarily demonstration vehicles and engineering exercises, often sponsored by government agencies.

2. LITERATURE REVIEW

V V Prathibha Bharathi (2015) analyzed that One single solar panel from type standard 150 Watt/24 volts can generate a power of 150 Watt/hour, considering full sunshine. The effective sun power of one day is equal from 4 to 6 hours of a maximum measured at midday. One battery of 12V/110Ah has a capacity of 12V*110Ah=1320Wh. The deep cycle battery is recommended to discharge only 50% of the power stored. If there is no sunlight, the emergency batteries will be used. In cloudy season, these batteries will be helpful. The yield of the solar panel given by the ratio: electrical power (in kWp) of one solar panel divided by the area of one panel [1].

Abhinya Chaturvedi and team concentrate on improving the design and making the vehicle cost effective. A battery which is get charged is used to run 24V DC high torques DC series motor. In their project, they use a belt pulley mechanism in which the shaft of the motor is connected through the belt pulley system [2].

John Connor has to say that, we get the different benefits by using solar system in our day to day life. For example, No fuel costs, No emissions, Preservation of natural resources, driving comfort, etc. Use of Solar technologies is the best pollution free methods [3].

Yogesh Sunil Wamborikar & Abhay Sinha gives us the main point that should be kept in mind while making a solar vehicle is the mounting of the solar panel. The panel should be mounted where it receives maximum sun rays so it gives maximum efficiency. They have mounted the solar panel in SOUTH-EAST direction during the time 6 AM to 11:30 AM. After that they changed to a SOUTH-WEST direction. They used conventional roof-top mounting technique for the solar panel A 6 feet by 4 feet plywood and mounted on the top of the vehicle. To make the vehicle more efficient they used multi crystalline solar cells [4].

3. SOLAR PANELS

It consists of many small solar cells (Photovoltaic cells) which converts light energy into electrical energy. When sufficient light falls on the cell, 0.5V is generated at full load by one cell. Numbers of cells are connected in series, if larger voltage is needed. A semiconductor material i.e. silicon, is used in panels so, as the sunrays (photons) falls on solar surface the electrons flows from P to N junction and therefore we can say that the current flows through it.

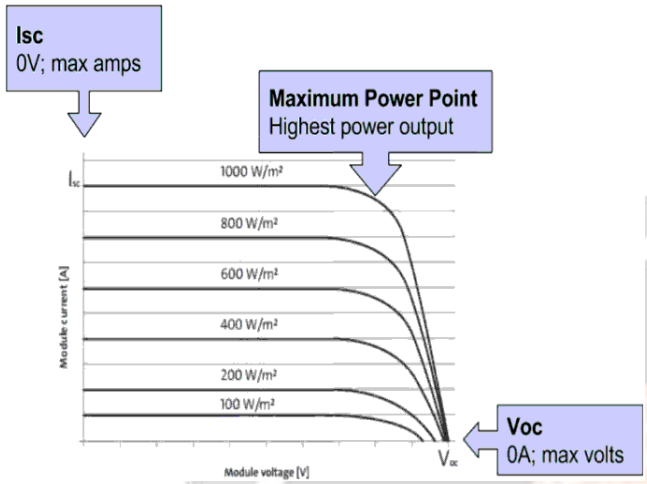

Chart -1: I-V Curve

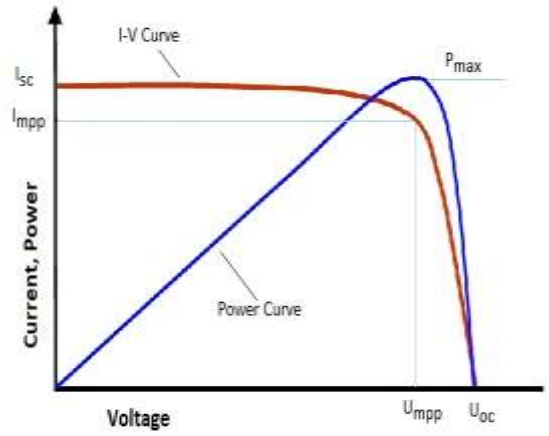

Chart -2: Power Curve

Table -1

No. of Cells	Voltage at full load	Voltage at no load
1	0.5	0.6
12	6	7.2
18	9	10.8

Solar Cell I-V Characteristic Curves shows the current and voltage (I-V) characteristics of a particular photovoltaic (PV) cell, module or array giving a detailed description of its solar energy conversion ability and efficiency. Knowing the electrical I-V characteristics (more importantly P_{max}) of a solar cell, or panel is critical in determining the device's output performance and solar efficiency. Rated power, Open circuit voltage, Short circuit voltage, Voltage at maximum power, Current at maximum power, Maximum system voltage, etc, are the points on which the solar panel is specified.

4. WORKING PRINCIPLE OF SOLAR VEHICLE

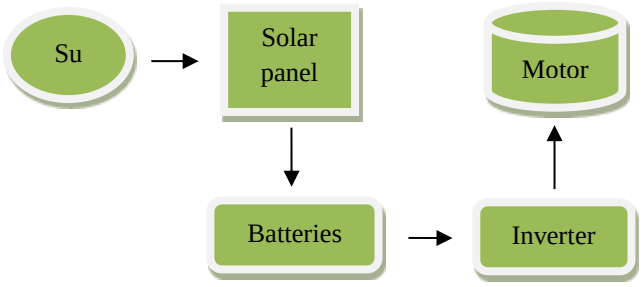

Fig -1: Functional diagram

In solar vehicles, the energy from the panel is stored in a battery. To convert the DC into AC the inverter is used in between the battery and induction motor. Inverter changes the frequency of AC current, so rpm or speed of the motor can be easily controlled. The shaft of the motor is connected to the rear wheel of the vehicle through chain sprocket. The batteries are initially fully charged and thereafter they are charged by panels. One advantage of this vehicle is that when we release the accelerator pedal, the battery of car will automatically charged. This is because of the kinetic energy of the car wheels, a wheel rotates the motor and the motor will act as a generator and this energy is used for charging the battery. This concept is known as Regenerative braking.

Fig -2: The first invention of solar vehicle

The batteries which is used is generally lead acid batteries which are of 44V rating each of 11V. The motor's rating is of 44V which gets charged through the four 11V batteries. In this way, solar car keeps the environment pollution free by using solar energy. To maximize performance and range, designers must maximize the efficiency of the electrical component.

5. CONCLUSIONS

The solar car minimizes the pollution by utilizing the available sun energy and we need to make use of them so that we can make the environment pollution free by reducing our dependence on fossil fuels. It has some disadvantages like, high initial cost and small speed range. Also the rate of energy conversion is about 15-20% only and this can be improved by conducting further research in this area; like solar cells problem can be solved by using ultra efficient solar cells that gives about 40-45% efficiency. The efficiency of the solar vehicle can be increased by using higher energy density battery. We should start using them in our day to day life.

6. REFERENCES

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