Design and Development of Green Car

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Abstract: This paper outlines the design and development of Green car (Solar Car). A Green car is a vehicle, which is powered by sun's energy. This car is a light weight, low power vehicle designed. They have limited seating (two people), they have very little cargo capacity. It does, however, offer an excellent opportunity to develop future technologies that can be applied to practical applications. The main components of an Green car are its solar arrays which collect the energy from the sun and convert it into electrical energy. The process of combining these mechanical and electrical components is not an easy task especially at the design stage because of the individual part specific characteristic and function. Since the development cost is one of the major constraints for this project, the sustainable design concept was implemented. Suitable parts which can be easily recycled and re-used, with desired functions that contribute to vehicle optimum performance are properly selected.

Keywords: Sun energy; Solar array; DC Motor; Battery, Motor Controller.

I. INTRODUCTION

Green car is powered by the sun energy. The main components of Green car are its solar arrays which collect the energy from the sun and convert it into electrical energy. The solar cell collects a portion of the sun's energy and stores it into the batteries of the car. Before that power trackers converts the energy collected from the solar array to the proper system voltage, so that the batteries and the motor can use it. The car makes use of high density Lead-acid batteries to account for a 4.8KWh pack, enough to travel over 50 miles without sun. After the energy is stored in the batteries, it is available for the use of motor & motor controller to drive the car. The motor controller adjusts the amount of energy that flows to the motor to correspond to the throttle. The motor uses that energy to drive the wheels through differential.

1.1. WORKING PRINCIPLE OF THE SYSTEM

This car runs with solar energy. The Schematic diagram is shown in the below figure. The electric power which is gained from the sun through solar array is connected to the battery with the help of a charge controller. The battery can store up to 48Volts this power is supplied to the motor when ever required. A motor controller is used to control the motor and it is placed between the battery and motor. The motor power is supplied to the drive wheels with the help of differential mechanism to the front wheels.

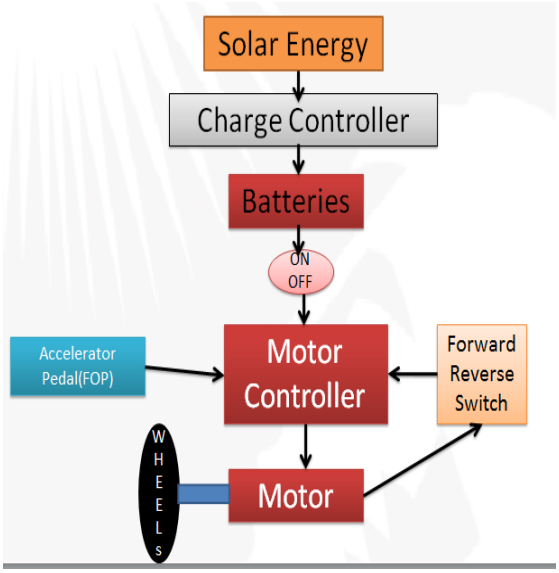

Fig:1 Schematic representation

II. EXPERIMENTAL DETAILS

1.2. selection and sizing of collector modules

Solar panels convert solar energy into electrical energy. Solar panels are arrays of photovoltaic cells (PV cells), specially designed modules that convert solar energy into electrical energy. This conversion is made possible

by the basic properties of matter. Solar Panels are a form of active solar power, a term that describes how solar panels make use of the sun's energy: solar panels harvest sunlight and actively convert it to electricity. Solar Cells, or photovoltaic cells, are arranged in a grid-like pattern on the surface of the solar panel. These solar voltaic cells collect sunlight during the daylight hours and convert it into electricity.

Converting solar energy to electrical energy

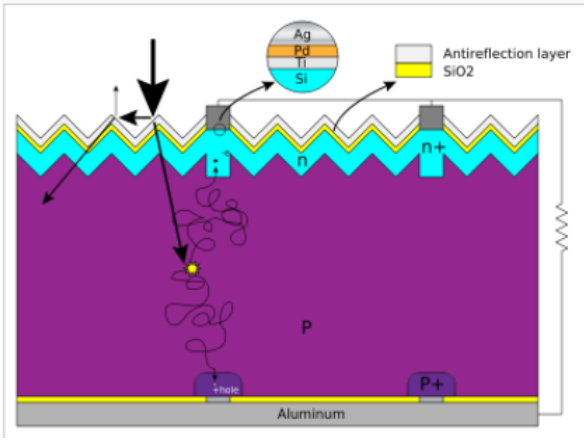

Fig:2 Converting Solar Energy to Electrical Energy.

The material of the semiconductor is most often silicon, but can be any of many different semiconductors. Some of the more common materials that are utilized in constructing solar cells are thin films, cadmium telluride, and gallium arsenide. These are only some of the materials being used in today's solar cells. Some of the materials listed are multi-junction concentrators, crystalline Si cells, thin film technologies, and emerging PV. This project is using the mono crystalline Si cells.

Fig:3. Solar panel

Specification of solar panel

Maximum power : 100 Watts

Voltage at Pmax : 20 Volts

Current at Pmax : 5 Amps

Size : 1055 * 650 * 35(mm)

Weight : 10kgs

2.2 Design of solar array frames to fix solar panels on the car

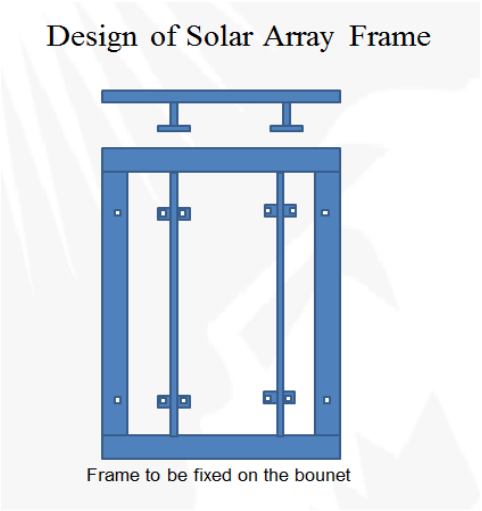

Fig: 4 frame to be fixed on the bounet

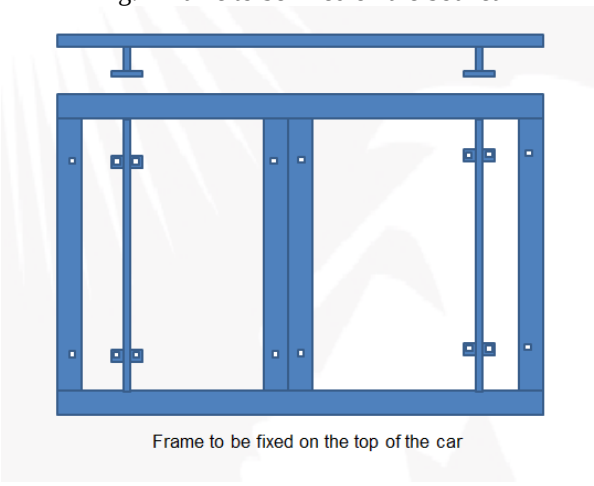

Fig: 5. Frame to be fixed on the top portion car

2.3 Selection of batteries

The batteries store energy from the solar array and make them available for the motor's use. Most high school teams use lead-acid batteries because they are inexpensive, but some teams use lithium-ion or nickel-cadmium. We have selected lead-acid batteries because they are readily available and inexpensive. The number of batteries to choose depends on the motor (system) voltage. The system voltage is 48Volts so it requires 48Volts storage batteries and 100Ah rating.

Fig: 6. battery

2.4 Selection of motor controller:

The motor controller adjusts the amount of energy that flows to the motor to correspond to the throttle. Its Features are

1. CURRENT LIMIT.
2. OVER CURRENT TRIP.
3. SETTABLE ACCELERATION TIME.
4. SETTABLE DECELARATION TIME.

Power MOSFET technology provides smooth, quiet, efficient, and cost effective operation. Easy to install and maintain. Resistor and diode for contactor are built in.

Adjustable parameters enable custom optimization of speed, torque, and braking control, etc.

Fig: 7 Motor controller used in the car

2.5 Transmission system

Transmission is device which uses gear to transfer the motor power

A PMDC motor is used here to give dynamic motion to the wheels through differential gear mechanism. The motor uses energy to drive the wheels through the differential attached to the front axle of the car.

Differential gear box:

- It receives the Power from the motor and transmit it to front axle.
- Allows the driving wheels to turn at same speed when the vehicle goes in straight path.
- Allows the driving wheel to turn at different speed when the vehicle takes a turn.

Fig: 8 Transmission system

Green Car

III. RESULTS AND CONCLUSIONS

1. The Green car designed in this project makes use of solar energy which is free of cost and environment friendly energy. No environment pollution.
2. The Green car consumes the power of 48Volts and 35 Amps. The car can run at a speed of 40-45km/hr.
3. This car is totally diverse compared to other universal cars working on fossil fuels.

4. This newly developed Green car overcomes the problem of excessive running cost due to expensive fuel price like petrol and diesel.

5. The cost of the Green car is very cost-effective compared to other cars and maintenance cost is very less.

Solar power technology is improving consistently over time, as people begin to understand all of the benefits offered by this incredible technology. As our oil reserves decline, it is important for us to turn to alternative sources for energy.

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