

## Fabrication of Solar Car

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**Abstract-** Recently rapid population growth, high volume of energy demand and depletion of fossil fuels intend to search for an alternative energy source in automobile industry. A solar energy is better option to solve such kind of problems and solar energy is source of renewable energy. The solar vehicle has no emissions like IC engines so, by using solar vehicle it is easy to control greenhouse effect. The design consists of Photovoltaic cell, Motors and other mechanisms for environment friendly to optimise the energy efficiency. This paper shows the Fabrication of solar car and its performance test in terms of mileage, speed.

**Keywords-** Solar panel, Renewable energy, Battery, Solar car, PV cell

### 1. INTRODUCTION

The Solar car is a vehicle which is compact, simple, lightweight and easy to operate. It is used for land transport, automotive industries so, its ground clearance is same as that of other cars.

The principle aims of the research work are to develop a strategy for the transformation of electric vehicle technology and to develop local expertise in the design and fabrication in automotive, composite materials as well as renewable energy.

The parts of solar car are solar panel, motor, controller, batteries, tyres, axle and steering. To best optimize these balances the solid modeling and design on CATIA software is extremely useful in addition conventional analysis.

### 2. LITERATURE REVIEW

A Paper by Amar kumar Das et al on “Design and Fabrication of a Solar Powered Vehicle and its Performance Evaluation” was examine that, solar vehicles have the easiest energy output around, yet our technology is still far. The solar vehicle can solve the problems of environment for IC engine cars and is the best pollution free method. And this research is concluded some problem like, solar vehicles have some disadvantages like less speed, initial cost is high, low battery life. For solving this problem improvements in technology led to use of nickel-metal hydride and nickel-cadmium batteries which better than lead acid batteries in our solar car.

A Paper by Abhishek Verma et al on “Design and Fabrication of Solar Car” was examined that by the use of Solar car we can reduce our dependence on fossil fuels ,also the problems of solar cells can be solved by using the ultra efficient solar cells that give about 30-35% efficiency.

A Paper by V V Pratibha Bharati et al on “Car Runs by Solar Energy” examined that processes, starting from the design concept, fabrication to

power generation. In coming years the major problem is depletion of ozone layer which is caused by release of CFC’s from vehicles. So the implementation of solar energy cars should be progressed.

### 3. DESIGN CONSIDERATION OF CAR

1. Simple operation.
2. Light weight and compact.
3. High reliability.

We used CATIA software for designing three dimensional model of the chassis of the solar car. by using CATIA software our team able to visualise the design in 3-D space and reduces the errors in fabrication. The main aim behind chassis design is to achieve perfect balance between spacious and ergonomic driver area with in and out for driver in a solar car and compact dimension to achieve the required weight and torsional rigidity. After changes in design by considering comfort. Using CATIA software the final chassis design was decided upon.

### 4. MAKING OF CHASSIS

The chassis is designed considering the factors like factor of safety-maximum load carrying capacity.

The main component of the frame is divided into two major parts first the front block for steering and seat positions etc. and second rear block for transmission and brake assembly.

Force absorption capacity, required space for accessories and driver with specific dimensions. The design of chassis is performed by using software such as CATIA. The load distribution in the chassis should be uniform. The structural design gives the idea about the chassis. Design gives the optimum shape and size of the chassis.

The chassis is an important aspect of a solar car. The chassis of such a vehicle is either preferred to be made up of hollow pipes or Super tabular section so as to make it light weight and shock absorbent. Chassis design should be such that it should not be subjected to twist during sharp turns, therefore it must have sufficient tensile and elastic enough to resist effect of centrifugal force.

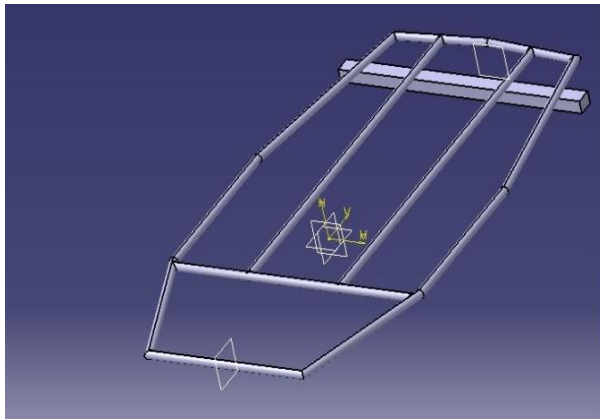


Fig.4.1. 3D drawing of solar car



Fig.4.2. Model of solar car

## 5. FABRICATION / MACHINING PROCESSES

- 5.1 **Bending:** - The parts of the chassis are bend according to design by using bending machine.
- 5.2 **Cutting:**-Various components are cut by using hand cutter.
- 5.3 **Drilling:** - For drilling holes of required diameter.
- 5.4 **Grinding:** - For finshing of vsrious parts.
- 5.5 **Welding:**-Components are joined according to specification by using electric arc welding.

## 6. COMPONENTS OF SOLAR CAR

- 6.1 **Axle:** - The required shaft is taken as per the dimensions and MS material is used for axle.
- 6.2 **Sprocket:** - The sprocket is fitted on the rear axle at the right side of the rear axle.



Fig. 6.2.1. Sprocket

- 6.3 **Brakes:** - Brake is adjusted to the left pedal of the solar car. The brake is positioned at rear axle at the left side.
- 6.4 **Solar Panel:** - It is a device is used to absorb the light energy from the sun to generate electricity through the photovoltaic effect. It is placed at an angle 30° at the top of solar car.



Fig. 6.4.1. Solar Panel

- 6.5 **Controller:** - The motor controller adjusts the amount of energy that flows to the motor to correspond to the throttle.



Fig. 6.5.1. Motor Controller

**6.6 Motor:** - Electrical motor is a device used to convert electrical energy into mechanical energy and this energy is supplied to rear axle .



Fig. 6.6.1. Electrical Motor

**6.7 Rear wheels & Tyres:** - At the both ends of the axle two wheels are connected and bolted together then the assembly is connected to the chassis using roller bearing.

**6.8 Steering:** - The steering spindle and steering are made as per the dimensions and bolted together. This is connected by four bar chain mechanism to the front wheels.

**6.9 Electric Start:** - For electric start Minature circuit breaker (MCB) is used when load on the motor get increases it get automatically off.

**6.10 Batteries:** - Batteries are used to store energy and supply to motor. Four batteries are used and connected in series to obtain 48V.



Fig. 6.10.5. Battery

**6.11 Accelerator:** - Accelerator is used to varies the speed of car and which is placed at the right side in front of the car and is connected to the motor.

#### **7. SELECTION OF BRAKING SYSTEM:-**

Braking system could have been optionalised between disc and drum brakes. In solar car disc brake are used and which get mounted on the rear axle at left.

According to the solar car specification hydraulic disc brake is used in car. The brake pedal is mounted on the left foot of the driver, thus resulting into complex fabrication and favoring design simplicity.

#### **8. SPECIFICATION OF SOLAR CAR**

1. Wheel base:- 123 cm
2. Track width (rear) :- 62 cm
3. Track width (front) :- 65 cm
4. Steering diameter:- 20 cm
5. Length of car:- 163 cm
6. Height of car :- 1117cm
7. Ground clearance :- 32 cm

#### **9. CONTROLLER SPECIFICATIONS**

Voltage:-48V DC  
Current:- 70 amp  
AC voltage: - 1.1-4.3V DC  
Low voltage protection: - 41.5 DC

#### **10. MOTOR SPECIFICATIONS**

BLDC motor  
Power: - 2000W  
Voltage: - 48V DC  
Speed: - 3000 rpm

#### **11. BATTERY SPECIFICATIONS**

Current: - 35 Amp  
Voltage: - 12 V

#### **12. SOLAR PANEL SPECIFICATIONS**

No. of cells: - 108  
Maximum power: - 74W  
Voltage at maximum power: - 17.60V  
Current at max power: - 4.20 Amp  
Open circuit voltage: - 21.50 V  
Short circuit current: - 4.50 Amp.

#### **13. CONCLUSION**

1. Solar vehicles have the easiest energy output around, yet our technology is still far. The solar vehicle can solve the problems of environment for IC engine cars and is the best pollution free method
2. The solar car is fabricated within Rs.50,000 using the standard materials.

3. The Solar car designed and fabricated is recommended for speed of 35-40 km/hr.
4. At fully charged solar car runs upto 32-38 km

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#### **14. FUTURE SCOPE**

Solar energy can also utilized by solar panels they are pollution free with moderate cost. Suspension system can also be added in system to lower vibrations and shocks. Also the alternator can be used to recharge the battery while in running condition. Also by providing aero dynamic shape of body increases its speed.

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