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# Solar Powered Vehicle

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***Abstract:*** **The face of the automotive industry is being re-shaped by concerns over oil supplies, international policy and fuel costs. A wide variety of hybrid technologies are now available including discussion of hydrogen possibilities. The solar powered car, one of the oldest alternative energy vehicles, has many applications to the emerging electric vehicle market. The development of a telemetry system for a solar powered race car aids in a better understanding of the energy usage of a vehicle and the aspects applicable to electric vehicles as a whole. This paper surveys the history and future of solar and electric vehicles and provides an overview of a typical solar car.**

***Keywords:*** **automotive, electric vehicles, powered, solar car.**

## I. INTRODUCTION

This paper discusses about the usage of solar energy to power up the vehicle. In order to achieve the required voltage, the Photo Voltaic (PV) Module may be connected either in parallel or series, but its costlier. Thus to make it cost effective, power converters and batteries are been used. The electrical charge is consolidated from the PV panel and directed to the output terminals to produce low voltage (Direct Current). The charge controllers direct this power acquired from the solar panel to the batteries. According to the state of the battery, the charging is done, so as to avoid overcharging and deep discharge. The voltage is then boosted up using the boost power converter, ultimately running the BLDC motor which is used as the drive motor for our vehicle application. In the course work, the characteristic features of the components: solar panel, charge controller, battery, power converter and BLDC motor required for the vehicle application were studied in real time and also were modelled individually and the complete hardware integration of the system is tested to meet up the application's requirement.

## II. HISTORY OF SOLAR VEHICLES

The first combination of photovoltaic devices and electric vehicles happened in the late 1970's. To generate more publicity and research interest in solar powered transportation, Hans Tholstrup organized a 1,865 mi (3,000 km) race across the Australian outback in 1987. Called the World Solar Challenge (WSC), competitors were invited from industry research groups and top universities around the globe. General Motors (GM) won the event by a large margin, achieving speeds over 40 mph with their Sunraycer vehicle.

In response to their victory, GM teamed with the US Department of Energy (DOE) to hold the GM Sunrayce in 1990. The North American Solar Challenge in 2005, is held every two years across different routes. In 2005, the race set a new record for the longest solar vehicle race, covering 3960 km from Austin, Texas, USA to Calgary, Alberta, Canada.

Despite initially being dominated and funded by General Motors, the design and construction of solar vehicles has produced its own unique development process.

Due to the unique nature of the solar community and events, these technologies remain an untapped resource. Significant improvements and understanding of electric vehicles has been developed that can be applied to a broader range of automobiles to provide more efficient and cleaner alternatives over combustion engine vehicles.

**Fig.1 First solar car**

**BASIC FUNCTIONAL DIAGRAM**

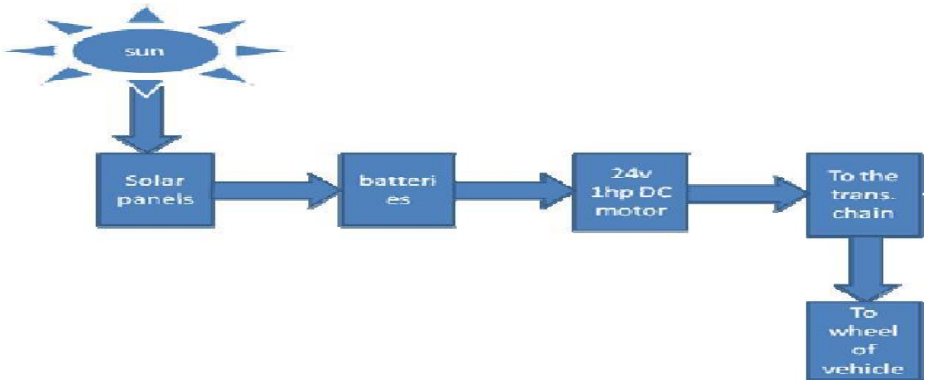


**Fig.2 Basic block Diagram Representation of Solar vehicle.**

## III. REVIEW WORK

In this paper, the study of all previous works related to the electric and solar cars have been done. Solar powered vehicle is a three wheel drive and has been used for shorter distances. The main concentration was made on improving the design and making them cost effective. Energy from Sun is captured by the solar panels and is converted to electrical energy The electrical energy thus obtained is being fed to the batteries that get charged and is used to run 24 V DC high torques DC series motor. 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.

**Fig.3 Solar Car**

## IV. WORKING

After giving an overview of the cars which are already in use, here is a detailed description of our solar powered vehicle. It is a four wheeler , two seater vehicle. In this vehicle we have used a belt pulley mechanism. The solar energy is harnessed using solar panels which are used for charging the batteries. The batteries run the motor which drives the wheel of the vehicle. The vehicle which we have made as our project uses a belt pulley mechanism in which the shaft of the motor is connected through the belt pulley system. The power supplied to the batteries is from the solar panels which are giving a total output of 4ooW and they are then used for charging the batteries. The batteries which we are using are lead acid batteries which are of 48V rating each of 12V. The motor's rating is of 48V which gets charged through the four 12V batteries. The belt used in our project is a timing belt which has teeth that fit into a matching toothed pulley. When correctly tensioned, they have no slippage, run at constant speed, and are often used to transfer direct motion for indexing or timing purposes. They are often used in lieu of chains or gears, so there is less noise and a lubrication bath is not necessary. Timing belts need the least tension of all belts, and are among the most efficient. We have laid emphasis on the economical part so that it can be used to cover short distances without consuming energy from external sources and at the same time keep the environment pollution free.

**Fig.4 BLDC Motor**

**Fig.5 Battery Bank**

## V. APPLICATION

Electric vehicles can become more practical and usable by applying many of the technologies refined within the solar vehicle community. To maximize performance and range, designers must maximize the efficiency of the electrical components while minimizing the power requirements for motion. The power needed to maintain a constant velocity V must overcome the aerodynamic drag, road grade and rolling resistance of the vehicle and is written as

$P(V) = P_{aero} + P_{grade} + P_{roll}$

where

$P_{aero} = 0.5\rho_{air}C_dA_f V^3$

$P_{grade} = mgzV$

$P_{roll} = mgV C_r$

for $\rho_{air}$, the density of the air, $C_d$, the coefficient of aero-dynamic drag of the vehicle, $A_f$, the frontal area of the vehicle, V, the velocity, m, the mass of the vehicle, g, the acceleration due to gravity, z, the road grade and $C_r$, the vehicle's coefficient of rolling resistance. In any given environment, $\rho_{air}$, g and z are constants not within the control of the vehicle.

## VI. CONCLUSION

The solar vehicle solves many problems related to the environment and is the best pollution free method. We need to make use of them so that we can reduce our dependence on fossil fuels. Solar vehicles do have some disadvantages like small speed range, initial cost is high. Also, the rate of conversion of energy is not satisfactory (only 17%). But these disadvantages can be easily overcome by conducting further research in this area; like the problem of solar cells can be solved by using the ultra efficient solar cells that give about 30-35% efficiency. As this field of automobiles will be explored the problems will

get solved. The solar automobiles have a huge prospective market and we should start using them in our day to day life.

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