

Solar Powered Car assisting A Hybrid Backup System



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Abstract : we have developed a study that includes an overview on the electrical and mechanical system of the most optimal car's system in terms of efficiency taking into consideration some of the existing newest possible technologies in the market as well as a financial analysis to estimate the car's cost and to further optimize it as much as possible. A solar car which uses solar energy to charge its batteries has been designed and built .The vehicle main body structure is made of aluminum. Most of the mechanical components are common parts available off-the-shelf. The electrical components such as the solar panels and batteries are available in the local market. However, the DC motor, its controller and the maximum power point trackers (MPPT) are used in the construction.Special technology using Controller area network is implemented.

Key words : Solar car ,MPPT Tracker solar car.

INTRODUCTION

The conceptual design and the performance of the prototype are also presented and verified the efficiency of solar car. .A mechanical system for solar tracking was designed and constructed. The idea, which lays behind this system, is based on the determination of the position of sun during its apparent movement relative to the equatorial system of coordinates. The system allows to determine the position of the sun, in relation to any given point at the surface of the planet, using a solar hour angle, the angle of solar declination and the latitude angle of the mentioned point. Two independent methods were used in order to evaluate the performance of the proposed tracking system. The first one is based on measuring the shadow of a pole vertically mounted on plate surface of the tracking unit while the second method is based on the measuring the output current of a standard solar cell mounted on a tracking unit.

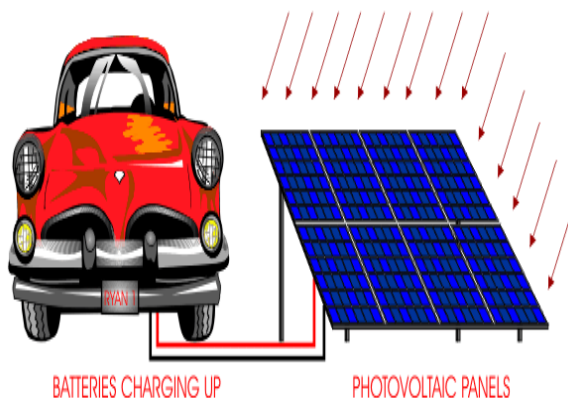


Fig 1: Enhanced method of charging the batteries

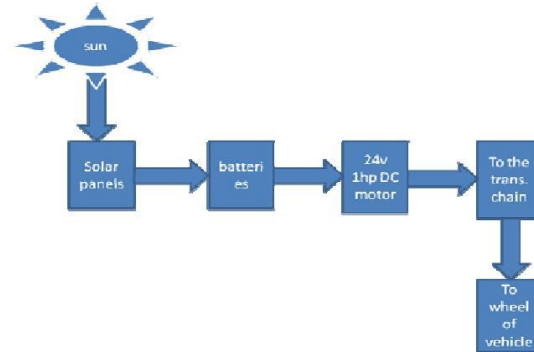


Fig. 1 Basic block Diagram Representation of Solar vehicle

The solar vehicles are the future of the automobile industry. They are highly feasible and can be manufactured with ease. The main advantages of a solar vehicle are that they are pollution less and are very economical. Since they cause no pollution they are very eco-friendly and are the only answer to the increasing pollution levels from automobiles in the present scenario. By harvesting the renewable sources of energy like the solar energy we are helping in preserving the non-renewable sources of energy. The other main advantages of the solar vehicle are that they require less maintenance as compared to the conventional automotives and are very user friendly.

Table II: Components used for prototype

Components used	Range	Quantity
Batteries	24V 190Ah	2*12V
Solar module	140Wp(Watt Peak)	1
Connecting Cables	Motor connection:-25Sq.m high voltage cables.	10 meters
	Solar module to charge controller unit:-1Sq.mm	1 meter
	Charge controller to battery unit:-2Sq.mm	1 meter
	Motor	High torque DC motor 1Hp=746W

WORKING OF THE VEHICLE

The solar module mounted on the top of car is used to charge the batteries via charge controller. The batteries are initially fully charged and then they are connected to solar module for charging. This helps to keep the battery charged always. This is also done as the efficiency of solar module is only 15%. Thus under this condition the battery gets fully charged again within 3hrs-3.5hrs. Thus to keep the full sine wave of charging this time lap is made. The maximum solar radiations are obtained between morning 10am to evening 3:30pm. Hence the panel is so mounted that maximum output may be obtained. As the supply is given through DPDT switch the motor takes a high starting current to propel the wheel to move in forward direction. On start the load on motor is nearly 250kg including the weight of person driving it. The motor after start acquires the maximum speed of 20kmph to 30kmph. The batteries get charged always from the solar panel and so it provides the continuous run for the vehicle. Motor must be started on top most gear so as to get maximum torque and speed to lift the full load. The speed may be varied later according to the driver's requirements. As the speed varies the load current also varies. So the speed variation must be low to keep battery alive for maximum duration of time. For stopping the motor, the speed control switch should be brought to minimum gear and then switch should be open; thereafter the mechanical brakes should be applied. The mechanical brakes can be applied instantly during emergency but this should be avoided as this could damage the motor and also produce unnecessary back emf.

The average battery back-up is around four hours. The batteries are continuously charged by the solar panel but to increase their rate of charging three dynamos each of 24 V can be connected to the wheels of the vehicle. As the vehicle moves these dynamos will generate EMF and will charge the batteries. Hence the charging and discharging cycle of the batteries will be complete. The operation of controller area protocol significantly applies here whenever there are any sudden changes in the surroundings then the entire system is automated and processed. For this automated operation Microcontrollers are used.

CONCLUSION

In future by using tracking system the efficiency of the solar car gets improved. MPPT system mainly increases the performance of the car. 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 and also working with controller area protocol is different approach. This technology is first to be used in solar cars. Research is still carried on this sophisticated concept.

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. We have already completed making a solar vehicle prototype as our project.

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