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SOLAR ELECTRIC VEHICLE

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ABSTRACT

The idea of this project is to design a solar car that aims to tackle the problems related to pollution and shortage of fuel. A smart vehicle is the one that takes all our burdens on maintenance of the vehicle while ensuring safety and comfort for the driver and the passengers. Various parameters have to be taken in to account while designing such a vehicle. In this project the whole system is divided in to two major divisions namely vehicle monitoring system and safety system which includes various sensors that sense the various vital parameters. Such as engine temperature, fuel level, accelerometers and speed sensors sense abnormal vibrations in vulnerable parts and over speeding. These data after being sensed is stored in the cloud. This enables monitoring of vehicles performance and drivers actions remotely. Safety system includes sensing speed of vehicle approaching to perform safe cuts and lane change over. This also includes sensing objects in the proximity of the vehicle which helps in parking and driving in heavy traffic. An emergency shutdown system is designed to stop the vehicle at the flick of a switch when it is out of control.

Key words: -Design, maintenance of vehicle, sensors, accelerometer

1. INTRODUCTION

Importance of Renewable energy-Delhi capital city of India is one of the most heavily polluted cities in India as per figure. Recent study shows that pollution due to road dust and vehicle account for about 50% of total pollution. Number of solution was proposed which mainly includes a forestation and restriction on usage of the vehicles. Fine particulate matter PM 2.5 is an air pollutant that is a concern for people's health when levels in air are high. Air pollution in Japan, China and Germany forced government to adopt aggressive recycling and thus solar power in Japan has been on rise since 1990. Now Japan is the leading manufacturer of photovoltaic and it is also has the third largest solar PV installed capacity behind china and Germany.

Solar Power is the conversion of energy from sunlight in to electricity either directly using photovoltaic PV, or indirectly using concentrated solar power. Concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sun light in to a small beam. Photovoltaic cells convert light in to an electric current using the photovoltaic effect. The international energy agency projected in 2014 that under its high renewable scenario by 2050, solar photovoltaics and concentrated solar power would contribute about 16 and 11 percent, respectively of the worldwide electricity consumption and solar would be the world's largest source of electricity. Photovoltaic's were initially solely used as a source of electricity for small and medium sized applications, from the calculator powered by a single solar cell to

remote homes powered by an off grid rooftop PV system. As the cost of electricity has fallen, the number of grid connected solar PV systems has grown in to the millions and utility scale solar power stations with hundreds of megawatts are being built. Solar PV is rapidly becoming an inexpensive, low carbon technology to harness renewable energy from the sun. The current largest photovoltaic power station in the world is the 850 MW Longyangxia Dam Solar Park, in Qinghai China.

2. LITERATURE REVIEW/SURVEY

The review work is 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 electric 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. After giving an overview of the cars which are already in use, here is a detailed description of the solar powered vehicle. It is a four wheeler.

Two seater vehicle-In this vehicle belt pulley mechanisms used. The solar energy is harnessed using solar panels which are used for charging batteries .The batteries run the motor which drive the wheel of the vehicle .The vehicle which is made 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 400 W and they are then used for charging the batteries.

3. MATERIALS & METHODS

The various hardware components used in the project are described below: -

IR SENSOR An infrared IR sensor is used to detect obstacles in front of the robot or to differentiate between colors 'depending on the configuration of the sensor. An IR sensor consists of an emitter detector and associated circuitry. The circuit required to make an IR sensor consists of two parts, the emitter circuits

and the receiver circuits. The emitter is simply an IR LED. And the detector is simply an IR photodiode which is sensitive to IR light of the same wave length as that emitted by the IR LED. When IR LED falls on the photodiode, its resistance and correspondingly, its output voltage change in proportion to the magnitude of the IR Light received. This is the underlying principle of working of the IR sensor. IR sensor is also used to distinguish between black and white surfaces.



Figure 1: IR Module

SOLAR PANEL: Solar Panel as represented in figure refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. A photovoltaic PV module is a packaged connects assembly of typically 6x10 photovoltaic solar cells. Photovoltaic modules use light energy photons from the sun to generate electricity through the photovoltaic effects. The majority of modules use wafer based crystalline silicon cells or thin film cells. The structural load carrying member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most modules are rigid, but semi flexible ones are available based on thin film cells. The cells must connect electrically in series, one to another. Externally, most of the photovoltaic module use MC4 connector's type to facilitate easy weather proof connections to the rest of the system.



Figure 2: Solar Panel



Figure 4: Motors

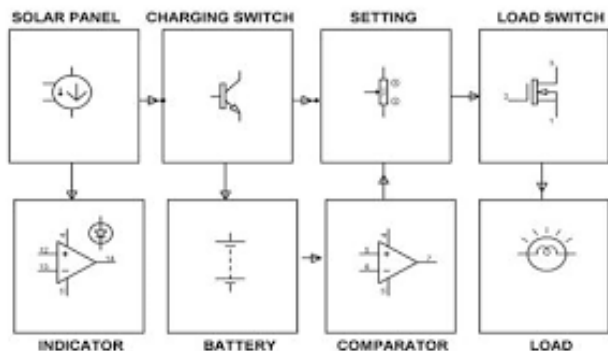


Figure 5: Tyres

Figure 3: Block diagram of charge controller

Charge controllers: The purpose of a charge controller or solar regulator is to safely charge batteries while balancing other factors such as efficiency, speed and cost. Without a charge controller it becomes very easy to damage your batteries by exposing them to overcharging and overvoltage conditions. Charge controllers are sold to consumers as separate devices, often in conjunction with solar or wind power generators, for uses such as RV, Boat and off the grid home battery storage systems. In solar applications, charge controllers may also be called solar regulators.

Motors: Machine that uses a form of energy, such as electric energy or the explosive power of a fuel, to produce mechanical motion. Involving the muscles or the nerves that are connected to them motor control a motor nerve.

Tyres: The materials of modern pneumatic tires are synthetic rubber, natural rubber, fabric and wire along with carbon black and other chemical compounds. They consist of a tread and a body. The tread provides traction while the body provides containment for a quantity of compressed air. Before rubber was developed, the first versions of tires were simply bands of metal fitted around wooden wheels to prevent wear and tear. Early rubber tires were solid not pneumatic .Pneumatic tires are used on many types of vehicles including cars, bicycles, motorcycles, buses, trucks, heavy equipment, and aircraft. Metal tires are still used on locomotives and rail cars and solid rubber or (other polymer) tires are still used in various non automotive applications, such as some casters, carts, lawnmowers and wheelbarrows.

Electrical wires-Electrical wires are usually covered with insulating materials, such as plastic, rubber like polymers, or varnish. Insulating materials such as plastic, rubber like polymers. Insulating and jacketing of wires and cables is now days done by passing them through an extruder.

LED Light- IT is used in the vehicle to check the vehicle is in proper condition or not. It is placed in the

top of the vehicle body. To check the vehicle are on or off.

Switches: Switches are networking devices operating at layer 2 or a data link layer of the OSI model. They connect devices in a network and use packet switching to send, receive or forward data packets or data frames over the network. Switch has many ports, to which computers are plugged in.

4. METHODOLOGY

Working of the whole set up-The main objective of the project is to use outgoing solar energy as a source to run a two wheeled motor bike. This project aims to create a pollution free solar powered vehicle and make a hardware model of solar electric vehicle, with an intention to reduce total carbon emission created by fossil fuel vehicles.

Working of drive system consists of BLDC Motor which is powered by a 48 V, 32 ah battery bank through a dedicated motor speed controller. The motor has a built in Rotor position sensor to sense the position of the rotor using Hall Effect. The controller has controlled inverter that converts DC voltage from the battery bank in to AC voltage that is supplied to the stator of the motor. The thyristors in the inverter on appropriate phases are switched on and off with reference to the rotor position sensor. The throttle which works on Hall Effect principle modulates the gate pulse width by giving a reference voltage of 0V to 4 V and thus controlling the voltage amplitude supplied to the motor and hence the speed of the motor is varied by pressing and releasing the throttle. The charge level in the battery bank is monitored by the charge controller which is connected to solar panels installed. When the charge in the battery goes below rated voltage.

5. RESULT & DISCUSSION

Various sophisticated safety features installed in the car are actuated in appropriate situation in which they are designed to work. Working of vehicle monitoring system and driver monitoring system:-various parameters of the vehicle such as battery temperature, power consumption, speed of the vehicle, driver vitals,

proximity of the objects nearby, speed of the approaching vehicle.

6. CONCLUSION

Solar battery helps in reducing the cost of electricity and at present mostly consumers have installed solar panels, as it's the part of renewable energy source and abundantly available free of cost and just by installing panels for the wattage required the electricity can be generated like 2 KW required by most residential purposes.

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