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Smart Solar Electric Vehicle

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ABSTRACT

The proposed system is to replace the usage of non-renewable fuel which we are using in day to day life. The main idea of the project is to design a solar three-wheeler vehicle that aims to tackle the problems related to pollution, shortage of fuel and to monitor various parameters that improves the safety of the driver.Thus, companies and governments had made strong investments in the automotive sector especially in the development of electric vehicles (EVs) and the technologies associated with them.The paper surveys a few existing systems and provides an overview of a solar three wheeler vehicle that incorporates various safety features.

KEYWORDS- Solar Panel, Safety Parameters, Throttle,BLDC Motor,GPS, Charge Controller,Dynamo, Brake.

I. INTRODUCTION

to Few years ago electric vehicles were invented in India to reduce the excess use of fossil fuel and to reduce the harmful emissions emitted from the electric vehicles. But in order to run these electric vehicles the fuel required for running vehicle was electric energy which is obtain from grid but the grid energy is also limited and it is not easily available hence it was the main disadvantage but due to the development of the charging stations this effect was also neglected hence the charging station is very efficient. Fast charging stations will be needed to facilitate longer EV travel distances, including inter-regional trips. They should be placed in larger cities where there is a concentrated population of EV drivers so stations can also be used by local residents. The planning for fast charging stations should be coordinated at the State level and attempt to align with regular routes for government or private fleets of EVs.

II. EXISTING SYSTEM

Electric vehicle smart charging station which is the promising alternative and environmentally sustainable solution to meet up the energy crisis. As worlds resources are diminishing, govt. agencies and nongovernment organization are pushing greener solution through the use of renewable energy sources, as electric power must become less dependent on fossils fuel and transportation must become more electric to decrease carbon emission and mitigate climate change. Hence in order to reduce the pollution through the motor vehicles, electric

vehicles are being invented and in order to run the electric vehicle the fuel required is the electricity which can be storable through the use of solar energy and run these electric vehicles through the electric vehicle smart charging station which is the promising alternative and environmentally sustainable solution to meet up to the energy crisis.

III. PROPOSED SYSTEM:

With the development of the global economy, the demand and consumption of energy in various countries have been growing steadily. Environmental pollution and the energy crisis have also attracted attention. According to a survey from the World Bank, CO2 emissions in 2013 and 2014 were 4.988 and 4.97 metric tons per capita, respectively. The high CO2 emissions are mainly a result of the coal-based energy structure. More than half of petroleum is used in transportation. Fuel vehicles account for the largest proportion of the transportation sector. At the same time, the automobile exhaust is one of the main sources of environmental pollution. The development of the electric vehicle (EV) industry is an important measure to reduce greenhouse gas emissions and reduce dependence on fossil fuels. With the advance of EV technology, especially the development of battery technology, and the strong policy support in some countries, EVs have developed rapidly over the past decade.

IV. CIRCUIT ANALYSIS

This system is based on the principle of renewable energy resources. It has Solar panel, Charge controller, Battery, Motor drive controller, BLDC motor, GPS.

BLOCK DIAGRAM:

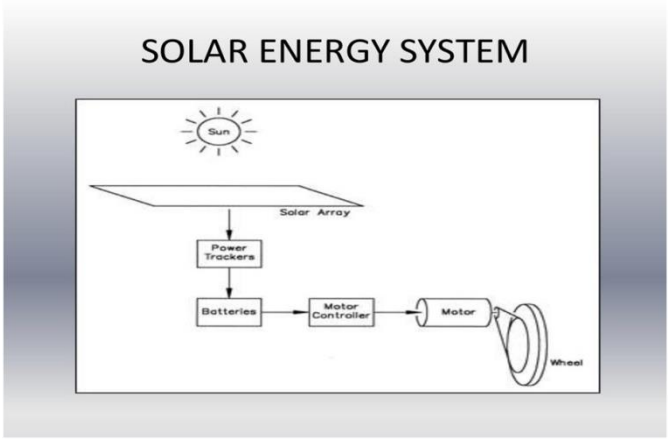

Fig 1.1 Block Diagram

1. Solar Panel:-

Solar panels [fig 1.2] and electric cars are a match made in heaven – when you install a solar energy system on your home, you can use it to both power your home and charge your electric car for emissions-free transportation. The cost of solar is falling rapidly, and companies from Tesla to Nissan are manufacturing electric cars for your daily use. Now, the ability to install a solar PV system large enough to power both your home and your car is an option within reach. But even with incentives and rebates available for both technologies, most homeowners still can't afford to install solar and buy an electric car at the same time. Luckily, it's easy to install a solar energy system today that takes your future electricity consumption into account, if you take a few additional factors into consideration

Fig 1.2 Solar Panel

2. Charge Controller :-

The Charge Controller is a switching device that can connect and disconnect the charger to the battery and it will take control over charging and to stop charging at the correct voltage. This will protect the batteries from damage from overcharging and regulate the power going from the solar panels to the batteries. A microcontroller in the circuit will read the level of the batteries and then cut off the source of the solar panels to the batteries, once it sees the battery is at the fully charged state. If this was not in place, the solar panels would keep feeding the batteries energy and the batteries would become overheated and damage the internal components. The advantage to have a microcontroller in the system is that it will open a variety of features to add to the system. For example the microcontroller will be programmed to control and display the battery level of the system. It will ensure that there is enough power to charge devices by displaying the gauge on a 7 segment LCD. If there is insufficient power, it will prevent the system from being used until sufficient power has been reached. The microcontroller will also be used in aiding solar efficiency by controlling the solar tracker, as mentioned previously.

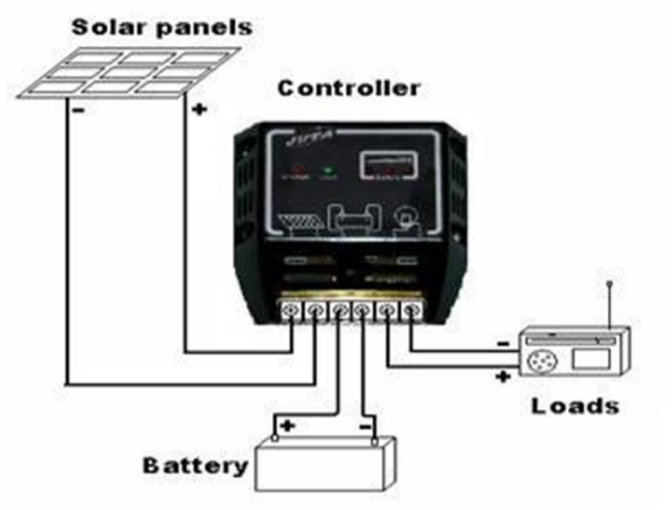

Fig 1.3 Charge controller

3. Battery:-

The team has selected two deep cycle batteries to power the system. Each battery is a 12V and has a 35 Amp-hour capacity. Batteries for PV system batteries generally have to discharge a smaller current for a longer period of time, such as at night or during a power outage, while being charged during the day. Deep cycle batteries are designed for the purpose of discharging to a lower capacity, between 50% and 80%, than a conventional battery. The most commonly used deep-cycle batteries are lead-acid batteries and nickel-cadmium batteries, both of which have pros and cons. The deep cycle batteries are able to be easily charged and discharged many times and can last for several years due to the thicker plate materials utilized. Batteries in PV systems can also be very dangerous because of the energy they store and the acidic electrolytes they contain, so you'll need a well-ventilated, non-metallic enclosure for them.

4. BLDC motor:-

Brushless DC electric motor (BLDC motors, BL motors in fig 1.3) also known as electronically commutated motors (ECMs, EC motors)as represented in Figure 4.10 are synchronous motors powered by DC electricity via an inverter/switching power supply which produces an AC/bi-directional electric current to drive each phase of the motor via a closed loop controller.

Thecontrollertimescommutation(hencerpm)andcreate scurrentwaveforms(hence torque). In this context alternating current does not imply but does include a sinusoidal waveform, with minimal restriction on waveform; it must be periodic, and its frequency will determine motor rpm, and the waveform does affect how smooth the generated torque is as well as the motors efficiency at transforming electrical to mechanical energy. In a well design PMSM the air gap magnetic flux is spatial sinusoidal and the phase commutation currents are sinusoidal, ninety degrees out ofphase.

The motor structural elements of a brushless motor system is typically permanent magnet synchronous

motor, but can also be a switchedreluctance motor, or inductionmotor.

Brushless motors may be implemented as stepper motors as well; however, the term "stepper motor" tends to be used for motors with a radically different design and controlled with an open loop (hence the controller cannot detect when the stepper does not stop due to too high shaft load; there is not shaft position sensor). They are frequently stopped with the rotor in a defined angular position while still producing torque. A well design power supply/controller/PMSM can also be held at zero rpm and finite torque.

Fig 1.4 BLDC motor

5. GPS TRACKER:-

A GPS tracking unit is a device that uses the Global Positioning System to determine the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location data base, or any internet-connected computer, using a Cellular (GPRS), Radio, or a Satellite modem embedded in the unit. This allows the asset's location to be displayed against a map backdrop either in real-time or when analysing the track later, using customized software.

V. WORKING

For charging the battery solar panel is used, at first the current will be low and the voltage will be constant. If the solar panel is kept at the sun radiation falls on it and it produces current. So, this is given to the charge controller and the output is given to battery. In the peak it takes 5 hours to charge the battery and in the normal time it nearly takes 7 hours to charge the full battery. The battery has full load of 14Ah and 24V. So, we connected the two 50W solar panel in series to get 24V and it gives 50W as output. So, it gives the direct connection to the battery from the solar panel without any buck or boost converter.

50-watt solar panel will give around 50W*4Hrs = 200 watts / day. In ideal conditions, 50 watts at 24 volts provides about 2.1 amps of current (50 / 24 = 2.0833). The usable hours of sunlight (and rounding off numbers, 2 amps could fully charge a 14 amp-hour battery in those seven hours. For charging the battery we have the charge controller. The output of the solar panel is connected to the input of the charge controller and the output of the charge controller is connected to the input of the battery and output of battery is connected to the motor. So, the motor is acting as a load.

- 50 W panels.
- Assume, 24 V panels, it translates to 50/24 = 2.08 amp
- 2.08 amp for 7 hours (Anything around Tropic of Cancer)
- So = 2.08*7 = 14.5 AH
- But battery is never fully used (Li-Ion is 70% and Lead-Acid is 50%), so, it will be around 15 AH (say)
- Typically, in North India, 1W panel generates 4 WH per day, for 12 v panel, it will be 4/12
- For 50W panel = 50*4/12 = 16 AH

So, the 50w Solar panel of 24V will charge the battery in 7hours during the peak. The battery is 24V 14Ah so it takes time to charge the battery. The solar panel is made up of monocrystalline.

The output from the solar panel is given to the solar charge controller and this will regulate the voltage to

the battery. It acts as intermediate device for solar panel and the battery. If the solar panel produces the current the controller will give it to the battery and this will charge the battery. In this controller it has the digital output voltage so we can know the voltage that is getting from the solar. The controller will not allow the back current to flow through the solar panel. In the night time if the battery is not charging the current in the battery will not flows to the battery. In the whole its charges the battery.

The battery will charge from the battery as well as through the Ac charger through the converter. The supply from the battery will be given to the motor drive controller, in which the controller will give all the connections. It will give to the motor for running and this will drive the rear wheel to run the whole vehicle. The motor has the capacity of 0.80Nm and this will be enough to drive the vehicle. So ,the motor will drive the vehicle and the front handle bar will be used to turn the vehicle.

In this the protype model so 250W motor is used. If we need more torque we can go up to 3Kwh and this drive the car model. But for this we need more capacity motor and the charging time will be increased.

VI. FRAME DESIGN

The frame is made up of square tube light weight steel. So, we bought three square tube of 20 feet and made a design with the objective. This is the base frame fig(4.1) and it is joined through the gas welding. The is frame is total of 4 feet. In this the straight length of 3feet and cross of 1.5 feet. This look a 3-wheeler design and it is joined through the gas welding and it is strong enough to carry the whole weight of the components. For this in between the gap we placed the cross bar todistribute the weight and the front end is also done with the same thing. The crossbar is cut into 1.5feet cross and 1feet straight through welding. In this the main aim is run the vehicle with all the components fixed in thevehicle. So, for this we havetakensteel frame design to hold the weight and this will make a good design to hold more weight than the components. This is a protype model to show the design how it will be in bigger design . In this we made small model to show how exactly the original model works.

Fig 1.5 Frame Design

Fig 1.6 Frame Design

VII. CONCLUSION

No Fuel Costs: Unlike the conventionally fuelled vehicles, solar vehicles have no fuel costs and a low cost of maintenance. Driving Comfort: Having aluminium and lightweight components, the solar-powered cars run faster and more smoothly than petrol and diesel engine vehicles.

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BIBILIOGRAPHY

Dr. R. Senthil Kumar was in Chennai on 24.04.1975. I have completed M.E in PED in the year 2005 and Ph.D. in Power Converter in the Year 2013 in Anna University, Chennai, Tamil Nadu, India. I am currently workingasViceprincipal and Professor – EEE in SaveethaEngineeringCollege,Chennai.Ihavegottotally 21 years of teaching experience. I havepublished12International Journal papers, 6 International conference papers and 3 National conference paper. I too published a Book named Special Electrical Machines the year 2009. My areas of research interest are renewable and non-renewable energy sources, power converters, electrical machines.I am the profession member in IEI, IEEE, ISTE IUCEEE. I have got best faculty award in the academic year 2010 and produced 100% result in more than 5 subjects which I have taught. I am one of the members in advisory committee in some of the leading engineering colleges.