ELECTRICAL DESIGNING OF SOLAR CAR

Pallavi Sharma, Parul Verma, Anuj Pal

Department of EEE
RKGITW, Ghaziabad

93pallavi.sharma@gmail.com, parulverma@yahoo.com, natashafriend1@gmail.com

ABSTRACT: This research paper shows the electrical designing and analysis of electrical components of solar car. This paper analysis the electrical components of a solar car because the electrical components plays a very vital role in moving solar car. The approach of selecting the appropriate components for this application is studied and each of them are simulated and subjected to various tests in real time environment. The integrated system consisting of the solar module, charge controller modules, and BLDC motor, henceforth developed into the solar powered vehicle.


I. INTRODUCTION

Solar energy is radiant energy that is produced by sun. Every day the sun radiates, or sends out, an enormous amount of energy. The sun radiates more energy in one second than people have used since the beginning of time. It comes from within the sun itself. Like other stars, the sun is a big ball of gases- mostly hydrogen and helium atoms. The hydrogen atoms in the sun’s core combine to form helium and generate energy in a process called nuclear fusion.

During nuclear fusion, the sun’s extremely high pressure and temperature causes hydrogen atoms to come apart and their nuclei (the central cores of the atoms) to fuse to become one helium atom. But the helium atom contains less mass than the four hydrogen atoms that fused. Some matter is lost during nuclear fusion. The lost matter is emitted into space as radiant energy.

It takes millions of years for the energy in the sun’s core to make its way to the solar surface, and then just a little over eight minutes to travel the 93 million miles to earth. The solar energy travels to the earth at a speed of 186,000 miles per second, the speed of light.

![Fig1: Solar energy representation](image-url)
II. HISTORY
The first car was built in Mannheim, Germany by Karl Benz back there in 1885. Although there were some car examples even before that date, this one is acknowledged as the invention of the modern car due to its own four-stroke cycle gasoline engine. Further development of automotive technology was very rapid. Merely decade later cars were factory-built and by the beginning of the 20th century the manufacture of affordable automobiles began. It was so rapid that it took only 70 year, just one lifetime, from the first motor car to the first solar car.

A solar vehicle is, by its definition, an electric vehicle powered completely or significantly by direct solar energy. Usually, there are photovoltaic solar panels installed on the car to collect solar energy and convert it to electric energy.

Cobb’s Sun mobile fulfilled the conditions from the solar vehicle definition. It had 12 photovoltaic solar cells installed onto the Sun mobile. Those solar cells were connected in series-parallel generating the electric that in turn powered small motor. The motor ran on 1.5 volts, turning the driveshaft and transferring the energy to wheels to move the car forward.

Today, more than a half century after Cobb’s Sun mobile, a mass-production of solar car hasn’t yet started. Some are flirting with the new car generation by installing solar cells on the vehicle to generate a part of required energy so at least air conditioning, communication devices and other similar car electronics could be powered by solar energy and thus giving the good foundation for a new solar car researches.

III. COMPONENT DESCRIPTION

3.1 Solar Panel
Photovoltaic (PV) cells are made of semiconducting materials that can convert incident radiation in the solar spectrum to electric currents. PV cells are most commonly made of silicon, and come in two varieties, crystalline and thin-film type.

3.1.1 Features & Benefits
3.1.1.1 More Reliable
(a) Eliminates weakest link in today’s solar systems, resulting in 2x longer life.
(b) No single point of failure.
(c) Self diagnostics catch problems automatically.

3.1.1.2 More Energy
(a) Produces 5-25% more energy
(b) Minimize impact of shading.

3.2 Lead Acid Batteries
Despite having a very low energy-to-weight ratio and a low energy-to-volume ratio, its ability to supply high surge current means that the cells have a relatively large power-to-weight ratio. These features, along with their low cost, make it attractive for use in motor vehicles to provide the high current required by automobile starter motors.

As they are inexpensive compared to newer technologies, lead-acid batteries are widely used even when surge current is not important and other designs could provide higher energy densities. Large-format lead-acid designs are widely used for storage in backup power supplies in cell phone towers, high-availability settings like hospitals, and stand-alone power systems. For these roles, modified versions of the standard cell may be used to improve storage times and reduce maintenance requirements. Gel-cells and absorbed glass-mat batteries are common in these roles, collectively known as VRLA (valve-regulated lead-acid) batteries.
3. Brushless DC Motor

Brushless DC electric motor (BLDC motors, BL motors) also known as electronically commutated motors (ECMs, EC motors) are synchronous motors that are powered by a DC electric source via an integrated inverter/switching power supply, which produces an AC electric signal to drive the motor. In this context, AC, alternating current, does not imply a sinusoidal waveform, but rather a bi-directional current with no restriction on waveform. Additional sensors and electronics control the inverter output amplitude and waveform (and therefore percent of DC bus usage/efficiency) and frequency (i.e. rotor speed).

The rotor part of a brushless motor is often a permanent magnet synchronous motor, but can also be a switched reluctance motor, or induction motor.

IV. CONCLUSION

The solar vehicle solves many problems related to 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 have some disadvantages like small speed range, initial cost is high, but these disadvantages can overcome by conducting further research in this area, like the problems of solar cells can be solved by using the ultra efficient solar cells that give about 30-35% efficiency.

V. REFERENCES

1. D. Metz, mechanical engineering 1983, 105(1), 80


5. Rizzo, G. (2010), Automotive Applications of Solar Energy, IFAC Symposium Advances in Automotive Control, July 12 - 14 2010, Munich, Germany