

ECO-FRIENDLY CAR USING SOLAR AND ELECTRICAL ENERGY

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Abstract - This project is mainly designed to build solar and electrical powered car. The greater community on alternative energy and its applications, as well as to build a practical solar and electrical powered car that could have real world applications upon further technological advances. This project has a strong desire to innovate and use local technology and resources. When sunlight falls on the solar panel then solar energy gets converted into electrical energy and stored in the battery, Dynamos are employed that will convert mechanical energy into electrical energy, regenerated energy from a dynamos stored in a supplement batteries and controller supplies required power to the motor .Since petrol and diesel is not required it uses solar energy which is abundant in nature. Sunlight is now-a-days considered to be a source of energy which is implemented in various day to day applications. Solar energy is being used to produce electricity through sunlight. With the help of this technology we aim to make solar and electrical energy (using dynamo) powered car. Preliminarily our objective would be to implement our idea on a remote control toy car and afterwards with help of this prototype we can extend our future work on building an actual car powered by the solar and electrical energy which is both cost effective and of course environment friendly.

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1. INTRODUCTION

Now-a-days, dealers of natural resources like fuel, coal etc. are facing a hard time to keep pace with the increasing demand. At one hand, there are more cars or motor vehicles are dominating the transport medium, on the other hand these cars are being dominated by the fuel. As a result, the limited resources are being quashed by the producers and dealers to satisfy this need which is leading us to an uncertain future with having the scarcity of fuel and minerals .This project is mainly designed to build solar and electrical powered car that is completely eco-friendly as it does not emit any harmful gases. The greater community on alternative energy and its applications, as

2. LITERATURE SURVEY

It is necessary to understand solar energy collection and its conversion into electricity, evaluation of electrical performance, and the current efforts being made to improve conversion efficiency. It was also important to examine the actual effect of the color filters on the light input into the panel.

The primary material used in the modern collection of solar energy is silicon. Even though it takes 100 times more surface area of silicon than that of other solid-state materials to collect the same amount of energy, silicon was already developed and in mass production when solar

energy collection technology was developed, and so it was the practical choice[1]. However, any semiconductor is acceptable. The semiconductor is part of a panel called a photovoltaic, or solar cell. This cell absorbs sunlight and transfers it into electricity, typically with a 15-20% efficiency[2]. The true principle of this study (the factor observed) centers not on the inner processes involved in the energy transfer, but rather on the efficiency of the solar cell.

The purpose of solar panels and solar energy collection is for the output of power, measured in Watts ($P=V \times I$, V =voltage, I =current). However, in order to study how factors affect this output, it is crucial to understand how this performance is evaluated. A study was conducted by the Florida Solar Energy Center (1999) observing the performance of two separate solar setups for homes in Kissimmee, Florida. Analyses were done on the long-term performance and efficiency of the two systems, measuring power over time in Watt-hours. This study examines similar parameters on a smaller scale, but does not look at many of the extra angles examined by this study. For example, the standard requirements of Electrical Codes had to be considered, which does not apply in this study. In essence, the Florida study was designed to incorporate all the elements necessary to practically supply a fully functional family home with all its electrical needs, whereas this study is more concerned with the general principles of solar energy collection. However, the most basic analyses are the same. The Florida study determined photovoltaic to be an adequate and acceptable alternative to standard electrical power[3]. It examined thermal efficiency of solar panels, a factor not being considered in this study, but still presents sound examples of useful graphics, aptly demonstrated analysis equations, and a good explanation of what it all means. A scatter plot with a linear regression was displayed and used to determine the thermal efficiency coefficient, which was then compared to calculated values of the same. These are sound statistical techniques that can be applied to a variety of situations.

Efficiency is the ratio of total energy input into a machine or other system to the total energy output ($e = \text{useful energy output/energy input}$). Solar energy collection efficiency has improved as the general technology has improved, growing from the first passive collection methods (efficiency approx. 1%) to the current applicable methods (efficiency approx. 15-20%)[2]. Studies have been done toward the next advance for increased output and efficiency. The issue has been examined from several

angles, both from that of maximum possible efficiency, and from that of highest possible efficiency while remaining **industrially feasible**. **Kribus's study (2002) delivered an examination of a new process with efficiencies approaching 70%**, although it would be difficult and extremely expensive, probably too much so to be economically feasible. In the conversion within the panel from sunlight to electricity, efficiency will rise if the panel can operate at higher temperatures. Normal panels use a double cycle conversion process; Kribus (2002) introduces a triple cycle, the first of which operates at extremely high temperatures. It is called a magneto-hydrodynamic (MHD) cycle, and can operate at temperatures in the range of 2000° - 2500° , up from the current limit of about 1300° . A panel with increased efficiency, possibly approaching 30%, that is still feasible for mass production[4]. His design uses a different kind of silicon, called Czochralski silicon, with oblique evaporated contacts (OECO). The contact points are metalized using low-cost aluminum and obliquely evaporated using a very simple four-step process that may prove to be feasible for mass production.

These improvements being made in the technology are wonderful, but worthless unless they can be put to good use. Why should scientists bother with all the effort of improving alternative energy collection methods when the world is already quite happy with its current energy supply? Obviously, fossil fuels will only last so long, and solar energy is emerging as the heir-apparent to the oil dynasty, as the best choice economically and ecologically [5]. According to the U.S. Department of Energy's "About Photovoltaics" website: "PV systems are now both generating electricity to pump water, light up the night, activate switches, charge batteries, supply the electric utility grid, and more [6] . Whether you are a homeowner, farmer, planner, architect, or just someone who pays electric utility bills, PV may already touch your life in some way . the possibility of using photovoltaics to provide the energy needs of the 25,000 portable classrooms throughout Florida. Given the tremendous cost of powering these units, even with ventilation below recommended standards, an alternative was needed; but no such switch could be made without verification of its effectiveness. The energy consumption of an average classroom was observed using similar techniques to this study, but on a larger scale, and it was determined that the total energy [7]. Consumption could be significantly reduced with only modest modifications and additions to supply solar power. As the world moves forward to new

technologies and horizons, solar energy stands poised to lead the way into a new era of cleaner, more efficient energy.

Colored filters for light perform a rather simple function: they absorb all wavelengths of light except that of their own colour, thus tinting the light that colour. The colour of light is determined by its wavelength and dictated in the colour spectrum; a shorter wavelength will appear blue, while a longer one will appear red (green is somewhere in the middle). So, essentially what is done when an object is exposed to colour-filtered light is it is exposed to light of a specified wavelength: shorter for blue, medium for green, and longer for red [8].

3. EXISTING METHOD

Solar cars use energy that comes from the sun. Direct exposure to sunlight doesn't move cars or other devices that can use this energy, so the converter of sun rays into usable power is needed. When it comes to solar cars, specially designed batteries serve as converters. Solar energy also needs to be stored since sun is not always available. Silicon-based photovoltaic cells are still most common solar collector and storage space where, due to electron movements and interactions, accumulated sunlight moves electrons around. These movements and interactions of electrons trigger electrical current or energy that eventually runs the car through DC motors.

4. PRAPOSED METHOD

Sunlight is now-a-days considered to be a source of energy which is implemented in various day to day applications. Solar energy is being used to produce electricity through sunlight. With the help of this technology we aim to make solar and electrical energy (using dynamo) powered car. Preliminarily our objective would be to implement our idea on a remote control toy car and afterwards with help of this prototype we can extend our future work on building an actual car powered by the solar and electrical energy which is both cost effective and of course environment friendly.

When sunlight falls on the solar panel then solar energy gets converted into electrical energy and stored in the battery. Mechanical energy is most common renewable source of energy. It can be converted into various forms of energy such as electrical energy. The dynamo converts mechanical energy into electrical energy. It is implemented in our project such that it regenerates the electrical energy which is spent by the batteries to run the motor and it is stored in the battery, and supplement batteries are employed, and solar controller circuit supplies required power to the motor. The change in

batteries in automated using a relay switch, which automatically switches between batteries as shown in the figure4.1.

4.1 FLOW DIAGRAM

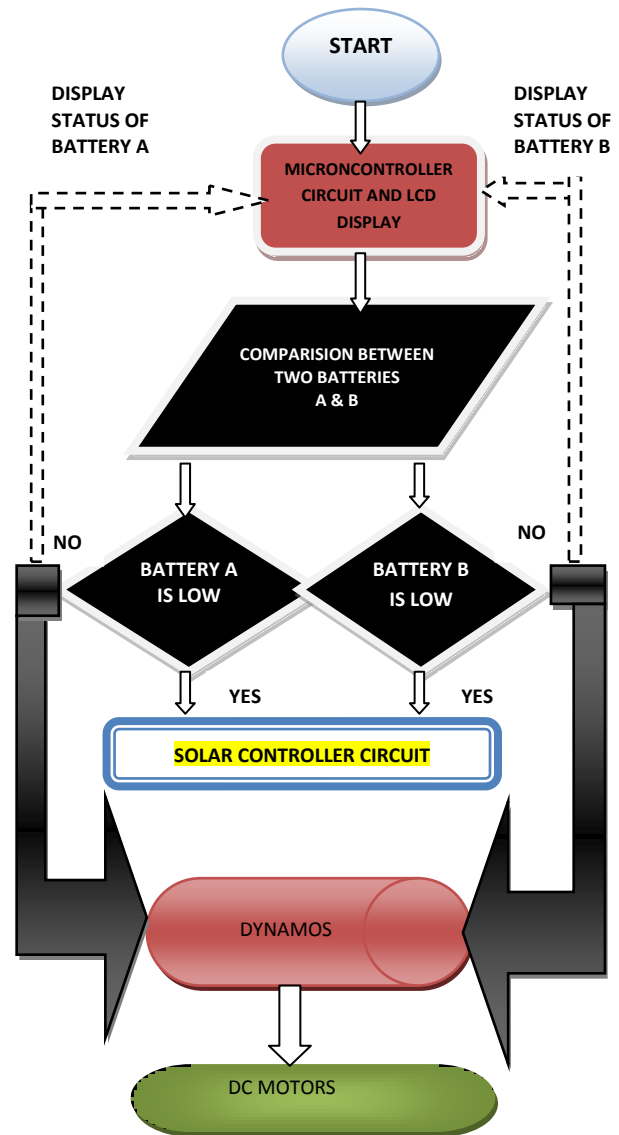


FIGURE 4.1: FLOW CHART OF THE SOFTWARE

5. COMPONENTS USED

- Solar Panel
- Solar controller circuit
- Batteries
- DC Motors
- Pic Microcontroller 16F877
- Interfacing Circuit
- Dynamos
- LCD display

5.1 SOLAR PANEL

Solar panels are actually “boards” that collect the sun’s rays, and host the whole process of transforming energy coming from the sun into electricity and power. Placing the solar panels on the car allows you to direct solar power to the motor or you can store it in a battery, depending on the car make and design. Known a century ago as home water heaters, then going through some periods of oblivion, solar panels experience today their re-birth one more time, thanks to growing popularity of solar powered electric cars. Solar panels basically wrap the whole system of solar principle, since they work as long as electrons freely flow around. They are still a little costly, but you can definitely find affordable ones, if you wish to turn your car to a solar electric car.



FIGURE 5.1: SOLAR PANEL OR PHOTOVOLTAIC CELLS

5.2 SOLAR CONTROLLER CIRCUIT

This charge controller was designed for high efficiency, use of common parts, and operation with common ground circuitry. The charge controller circuit has been used with solar power input. It also functions well as a battery charger when used with any current limited DC power supply such as small “wall wart” transformers or a high current supply with a series resistor.

Purpose of the charge controller circuit is to cutoff the supply from the solar panel when the battery is fully charged to avoid over charging... and to start charging when battery voltage drops off a certain value... in my case the max. allowed voltage is 11.5 volts and min is 12volts.

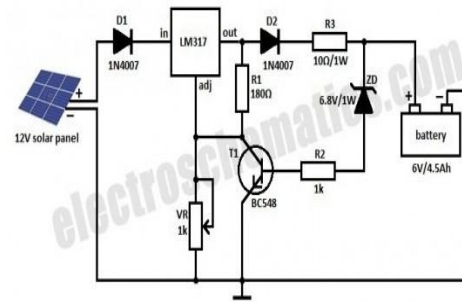


FIGURE 7.2: SCHEMATIC SOLAR CONTROLLER CIRCUIT

The circuit uses a 12 volt solar panel and a variable voltage regulator IC LM 317. The solar panel consists of solar cells each rated at 1.2 volts.12 volt DC is available from the panel to charge the battery. Charging current passes through D1 to the voltage regulator IC LM 317. By adjusting its Adjust pin, output voltage and current can be regulated .VR is placed between the adjust pin and ground to provide an output voltage of 9 volts to the battery. Resistor R3 Restrict the charging current and diode D2 prevents discharge of current from the battery. Transistor T1 and Zener diode ZD act as a cut off switch when the battery is full. Normally T1 is off and battery gets charging current. When the terminal voltage of the battery rises above 6.8 volts, Zener conducts and provides base current to T1. It then turns on grounding the output of LM317 to stop charging.

5.3. BATTERIES:

Lead-acid battery having a very low energy-to-weight ratio and a low energy-to-volume ratio, its ability to supply high surge currents 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.



FIGURE 7.3: IMAGE OF LEAD ACID

5.4. DC MOTORS:

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances.

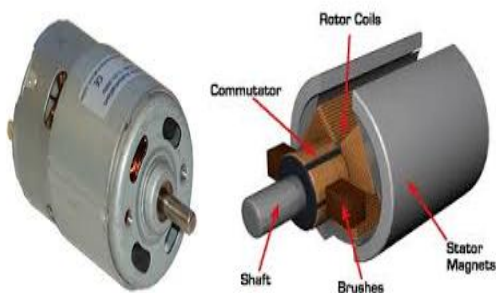


FIGURE 7.4: IMAGE OF DC MOTOR

Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

5.5. DYNAMO

A dynamo is an electrical generator that produces direct current with the use of a commutator. Dynamos were the first electrical generators capable of delivering power for industry, and the foundation upon which many other later electric-power conversion devices were based, including the electric motor, the alternating-current alternator, and the rotary converter. Today, the simpler alternator dominates large scale power generation, for efficiency, reliability and cost reasons. A dynamo has the disadvantages of a mechanical commutator. Also, converting alternating to direct current using power rectification devices (vacuum tube or more recently solid state) is effective and usually economic.



FIGURE 7.5: IMAGE OF DYNAMO.

5.6. PIC MICROCONTROLLER

PIC 16F877 is one of the most advanced microcontroller from Microchip. This controller is widely used for experimental and modern applications because of its low price, wide range of applications, high quality, and ease of availability. It is ideal for applications such as machine control applications, measurement devices, study purpose, and so on. The PIC 16F877 features all the components which modern microcontrollers normally have. The figure of a PIC16F877 chip is shown below.



The PIC16FXX series has more advanced and developed features when compared to its previous series. The important features of PIC16F877 series is given below
 Maximum operating frequency is 20MHz, Flash program memory (14 bit words), 8KB.Data memory (bytes) is

368,EEPROM data memory (bytes) is 256,5 input/output ports,3 timers,2 CCP modules,2serial communication ports (MSSP, USART),PSP parallel communication port 10bit A/D module (8 channels),100000 times erase/write cycle enhanced memory,1000000 times erase/write cycle data EEPROM memory.

Self programmable under software control,In-circuit serial programming and in-circuit debugging capability, Single 5V,DC supply for circuit serial programming, WDT with its own RC oscillator for reliable operation, Programmable code protection, Power saving sleep modes. Selectable oscillator options.

The main reason for their great success and popularity is a skillfully chosen configuration which satisfies different needs of a large number of users allowing at the same time constant expansions (refers to the new types of microcontrollers). Besides, the software has been developed in great extend in the meantime, and it simply was not profitable to change anything in the microcontroller's basic core.. What makes this PICMICROCONTROLLER so special and universal so that almost all manufacturers all over the world manufacture it today under different name.

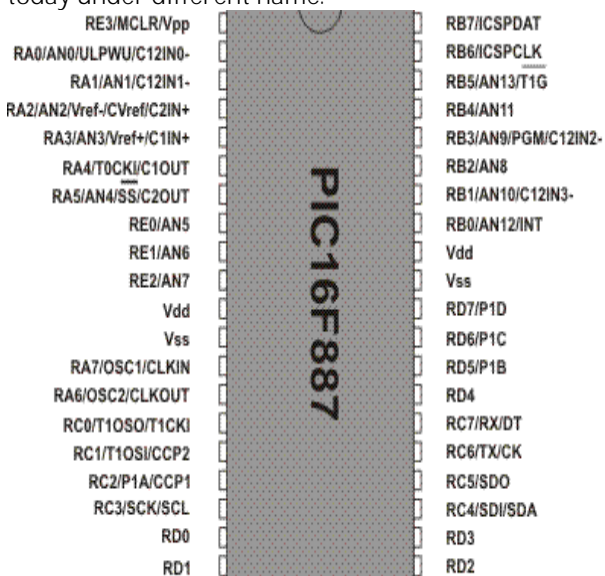


FIGURE 5.6: PIN DESCRIPTION OF PICMICROCONTROLLER 16F877

5.7. LCD

LCDs can add a lot to your application in terms of providing a useful interface for the user, debugging an application or just giving it a "professional" look. The most common type of LCD controller is the Hitachi 44780, which provides a relatively simple interface between a processor and an LCD. Inexperienced designers do often not attempt using this interface and programmers because it is difficult to find good documentation on the interface,

initializing the interface can be a problem and the displays themselves are expensive.

LCD has single line display, Two-line display, four line display. Every line has 16 characters.

6. ADVANTAGES

- Unlike regular cars, solar energy powered cars are able to utilize their full power at any speed.
- Solar powered cars do not require any expense for running.
- Solar cars are quite.
- Solar cars require very low maintenance.
- A solar car produces no harmful emissions.

7. APPLICATIONS

- Solar car which completely uses renewable sources of energy.
- It uses the dynamo which is used to regenerate electric energy.
- This technique using renewable resources which runs completely free of cost can be used for private use.

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