SOLAR VACUUM CLEANER

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Acknowledgements

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Abstract

Engineering is not only a theoretical study but is implementation of all we study for creating something new and making things more easy and useful through practical study.
It is an art which can be gained with systematic study, observation and practice. In the college curriculum we usually get the theoretical knowledge of the industries, and a little bit of implementation knowledge that how it works? But how can we prove our practical knowledge to increase the productivity or efficiency of the industry?
As we all know that our home land Pakistan is suffering from worst energy crisis in the history. Everyday we running out of fuels like petrol, diesel, gasoline and natural gas.
These are not even fulfilling the needs of home users. These sources are very expansive, so electricity produced by these sources is also very expansive. The power generated by water sources like dam is not up to the required need. That's why we should be looking for some other source to meet the needs. The whole world is relying on electrical and electronics technology, Technology requires some power to run. If we don't provide the sources for the development we will be left far behind in the race of development as country. The ideal source for Pakistan is Solar Energy. In Pakistan the daylight in summer is for almost near to twelve –fourteen hours. The summer session remains for six to eight months. There are places that are very dry during the whole year, no or very rare cloudy weather and perfect for the supply of solar energy. Due to this reason we chose to work on this project which can solve the problems. To make this a little better we have included a battery percentage indicator which informs the user about recent battery charge level to avoid over discharging or overcharging. Which act in way for the safety of battery and can perform better in this way. The life of battery is increase by using in a better manner.

DEDICATION

Dedicated to ALLAH who bestowed us with the ability to understand his knowledge to serve this world and our parents, teachers and friends, without their support it would not have been possible to complete this project.

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Chapter 1

Solar Energy

1.1 Solar Energy Overview

- We've used the Sun for drying clothes and food for thousands of years, but only recently have we been able to use it for generating power.
- The Sun is 150 million kilometres away, and amazingly powerful.
- Just the tiny fraction of the Sun's energy that hits the Earth (around a hundredth of a millionth of a percent) is enough to meet all our power needs many times over.
- In fact, every minute, enough energy arrives at the Earth to meet our demands for a whole year - if only we could harness it properly.

1.2 Why Solar Energy is in Your Future

There is three main reasons for this.

- Global Energy Demand
- Sources of Energy
- The Solar Resource

1.3 Types of Solar Energy Technologies

Three main types Of Solar Energy

- Passive
  - Direct Solar Gain
  - Indirect Solar Gain
  - Isolated Solar Gain
- Concentration
  - Power towers
  - Trough Collectors
- Photovoltaic cells

Here in Our project we are using Photovoltaic cells technology.

1.4 What are Photovoltaic Solar Cells?

Photovoltaic cells are devices that produce electricity directly from sunlight. Many photovoltaic cells put together form a solar array or solar panel. These cells convert light into electricity by harnessing the energy created when photons from sunlight knock electrons into a higher state of energy, within the cell itself. Photovoltaic cells are composed of layered materials which include two types of silicon, an anti-reflective coating, and a glass cover. The technology used to produce solar panels continues to advance, and may one day provide essentially free energy to power homes and businesses.

One of the most important parts of a photovoltaic cell is the material used as the semiconductor. Silicon is the most commonly-used semiconductor, but other options are available for certain applications, which can be less expensive than silicon. When light hits the semiconductor, a portion of the light energy is absorbed, causing the release of electrons. The electric current that results is what can be used as electricity, and it is collected by the metal contact grids on the top and bottom of solar cells.

1.5 Types of Solar Cells

Solar cells are usually made from silicon, the same material used for transistors and integrated circuits. The silicon is treated or "doped" so that when light strikes it electrons are released, so generating an electric current. There are three basic types of solar cell. Mono crystalline cells are cut from a silicon ingot grown from a single large crystal of silicon whilst polycrystalline cells are cut from an ingot made up of many smaller crystals. The third type is the amorphous or thin-film solar cell.

o Amorphous Solar Cells

Amorphous technology is most often seen in small solar panels, such as those in calculators or garden lamps, although amorphous panels are increasingly used in larger applications. They are made by depositing a thin film of silicon onto a sheet of another material such as steel. The panel is formed as one piece and the individual cells are not as visible as in other types.

The efficiency of amorphous solar panels is not as high as those made from individual solar cells, although this has improved over recent years to the point where they can be seen as a practical alternative to panels made with crystalline cells. Their great

advantage lies in their relatively low cost per Watt of power generated. This can be offset, however, by their lower power density; more panels are needed for the same power output and therefore more space is taken up

- **Crystalline Solar Cells**

Crystalline solar cells are wired in series to produce solar panels. As each cell produces a voltage of between 0.5 and 0.6 Volts, 36 cells are needed to produce an open-circuit voltage of about 20 Volts. This is sufficient to charge a 12 Volt battery under most conditions.

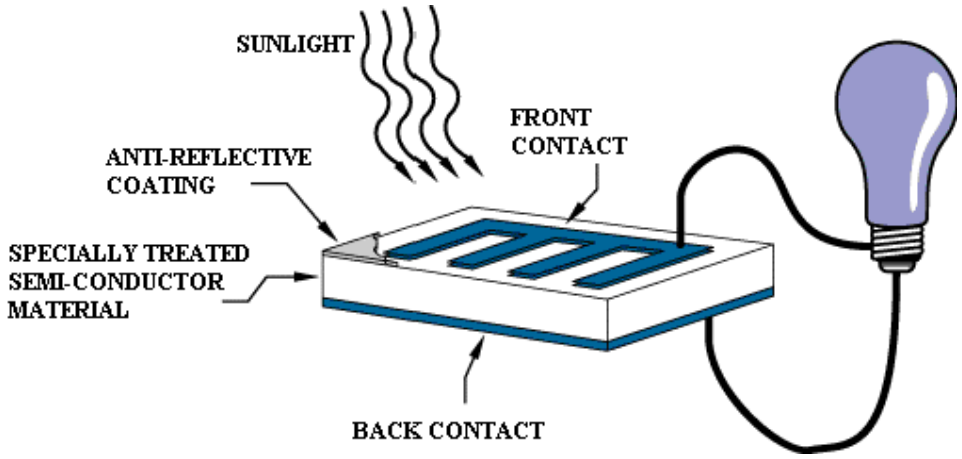
Although the theoretical efficiency of monocrystalline cells is slightly higher than that of polycrystalline cells, there is little practical difference in performance. Crystalline cells generally have a longer lifetime than the amorphous variety.

1.6 **How do Photovoltaics Work?**

Photovoltaic is the direct conversion of light into electricity at the atomic level. Some materials exhibit a property known as the photoelectric effect that causes them to absorb photons of light and release electrons. When these free electrons are captured, electric current results that can be used as electricity.

The photoelectric effect was first noted by a French physicist, Edmund Becquerel, in 1839, who found that certain materials would produce small amounts of electric current when exposed to light. In 1905, Albert Einstein described the nature of light and the photoelectric effect on which photovoltaic technology is based, for which he later won a Nobel Prize in physics. The first photovoltaic module was built by Bell Laboratories in 1954. It was billed as a solar battery and was mostly just a curiosity as it was too expensive to gain widespread use. In the 1960s, the space industry began to make the first serious use of the technology to provide power aboard spacecraft. Through the space programs, the technology advanced, its reliability was established, and the cost began to decline. During the energy crisis in the 1970s, photovoltaic technology gained recognition as a source of power for non-space applications.

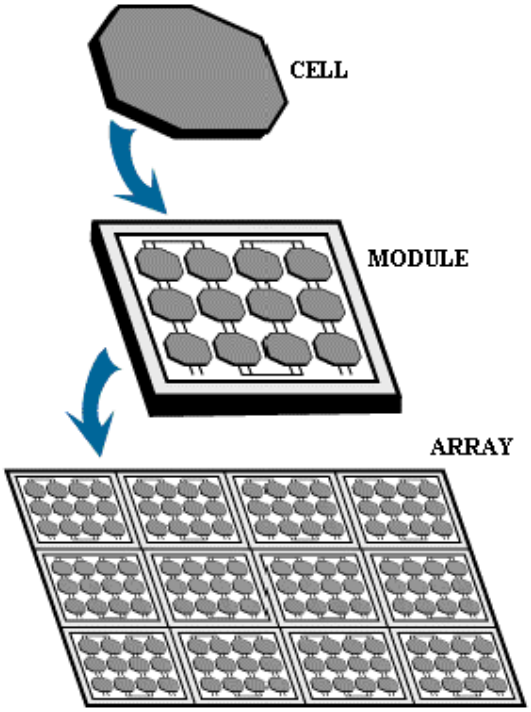
Fig(1.1)



The diagram above illustrates the operation of a basic photovoltaic cell, also called a solar cell. Solar cells are made of the same kinds of semiconductor materials, such as silicon, used in the microelectronics industry. For solar cells, a thin semiconductor wafer is specially treated to form an electric field, positive on one side and negative on the other. When light energy strikes the solar cell, electrons are knocked loose from the atoms in the semiconductor material. If electrical conductors are attached to the positive and negative sides, forming an electrical circuit, the electrons can be captured in the form of an electric current -- that is, electricity. This electricity can then be used to power a load, such as a light or a tool.

A number of solar cells electrically connected to each other and mounted in a support structure or frame is called a photovoltaic module. Modules are designed to supply electricity at a certain voltage, such as a common 12 volts system. The current produced is directly dependent on how much light strikes the module.

Fig(1.2)



1.7 The solar panel we need?

Example we want to power up 2 lights of 15 Watt and we need to use these 5 lights for 3 hours every day. Here first we get a total watt usage. Ptotal = 15 * 2 = 30W. Than we multiply 30 with 3 hours. Pdaily = 30 * 3 = 90W. We are going to use 90 watt daily. Let us say we are going to have complete sunshine 6 hours each day. Now we divide 90W with 6 hours, so we will get hourly power charge that we need Phourly = 90/ 6 = **15W**. So we need a 15 watt solar panel. But it is recommended to always choose a panel some bigger then we need. Because when solar panel charges the battery so it is wasting some power on charging too.

1.8 Quality of solar panels

Normal quality solar panels have about 1% or less yearly loss of energy each year. So it means if you use them for 20 years so they will have a loss percent of 20%. So a 100 Watt panel will produce 20% less then what it produced when it was new. 100 watt minus 20 it is equal 80 watt. After a 20 years usage in direct sunshine a solar panel will produce 80V.If a panel just begins to produce less power just after 1-2 years usage so it is not a good quality. You have just loss your money on bad panels.