

IMPROVEMENT OF SOLAR ENERGY BY MIRROR REFLECTION TECHNIQUE

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Abstract— The objective of this paper is improving the solar energy by using mirror reflection. By using solar tracking the generation of solar energy is less compare to the mirror reflection. So, we can generate more solar energy by using mirror reflection. The improvement of the output power using plane mirror reflector is even higher than that of sun tracking and secondly these reflectors are very cheap and are easily available in market. The average power output during mid day as increased substantially using mirrors, the solar panels equipped with such mirrors can also be utilized for loads/equipments requiring higher power inputs during that period of the day.

KEYWORDS—SOLAR PLATES, MIRRORS, LEAD ACID BATTERY, CHARGE CONTROLLER, LED'S.

INTRODUCTION

The paper aims at developing more power using mirrors to harvest more of the incident solar irradiance and direct sunlight to qualified PV modules increases the electricity produced from a given area of PV panels. The system consists of 12V (5W) solar panel, 12V 1.3 Ah Re-chargeable battery, DC relay, LEDs. The current flows from solar panel to battery. We have used diode to make current flow for unidirectional. It means current flows only from solar panel to battery. When the battery gets fully charged, circuit is automatically disconnected and charging process stops. We are using mirror arrangement at both sides of solar panel for increasing it's power efficiency.

SOLAR ENERGY

Solar energy is energy derived from the sun's radiation. The sun is an powerful source of energy and provides the earth with as much energy every hour. It is important that we continue to harness and increase our use of solar energy as fossil fuels become depleted, expensive, and fall out of favor with their consumers.

One solution to make solar energy more competitive is to combine reflectors with the PV modules in the system. Using solar mirrors to harvest more of the incident solar irradiance and direct sunlight to qualified PV modules increases the electricity produced from a given area of PV panels.

Block Diagram

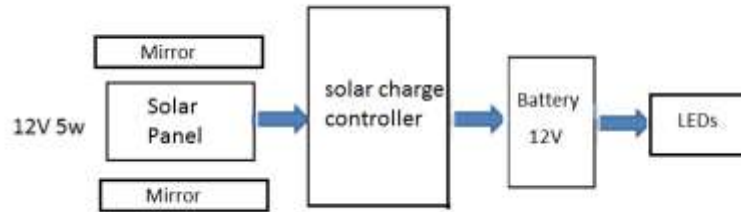


Fig. 1. Block diagram

Solar cell

A solar cell is an electronic device that produces electricity when light falls on it. The light is absorbed and the cell produces dc voltage and current. The device has a positive and a negative contact between which the voltage is generated and through which the current can flow. You connect these contacts to whatever it is you want to power. Solar cells have no moving parts. Effectively they take light energy and convert it into electrical energy in an electrical circuit, exploiting a physical process known as the photovoltaic cell.

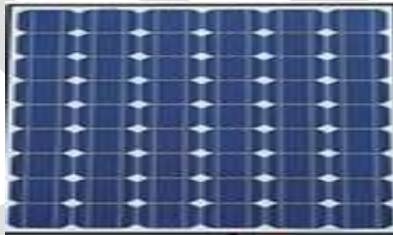


Fig. 2 solar panel

SOLAR CHARGE CONTROLLER

A charge controller is basically a voltage and current regulator to keep batteries from overcharging. It regulates the voltage and current coming from the solar panels going to battery. Most 12 volt panels put out about 16 to 20 volts, so if there is no regulation the batteries will be damaged from overcharging. Most batteries need around 14 to 14.5 volts to get fully charged. The charge controller consist of a relay that opens the charging circuit when a preset high-voltage point is reached and closes the circuit again when a preset low-voltage limit is reached, allowing charging to continue.

Battery power supply

A battery is a type of linear power supply that offers benefits that traditional line-operated power supplies lack: mobility, portability and reliability. A battery consists of multiple electrochemical cells connected to provide the voltage desired.



Fig.3 12v Battery

This battery is rechargeable; it consists of lead and lead/dioxide electrodes which are immersed in sulfuric acid. When fully charged, this type of battery has a 12.06-12.14 V potential. During discharge, the lead is converted to lead sulfate and the sulfuric acid is converted to water. When the battery is charging, the lead sulfate is converted back to lead and lead dioxide. A nickel-cadmium battery has become more popular in recent years. This battery cell is completely sealed and rechargeable. The electrolyte is not involved in the electrode reaction, making the voltage constant over the span of the batteries long service life. During the charging process, nickel oxide is oxidized to its higher oxidation state and cadmium oxide is reduced. The nickel-cadmium batteries have many benefits. They can be stored both charged and uncharged. They have a long service life, high current availabilities, constant voltage, and the ability to be recharged.

LED

LEDs are semiconductor devices. Like transistors, and other diodes, LEDs are made out of silicon. What makes an LED give off light are the small amounts of chemical impurities that are added to the silicon, such as gallium, arsenide, indium, and nitride.



Fig.4 LED

When current passes through the LED, it emits photons as a byproduct. Normal light bulbs produce light by heating a metal filament until it is white hot. LEDs produce photons directly and not via heat, they are far more efficient than incandescent bulbs.

Not long ago LEDs were only bright enough to be used as indicators on dashboards or electronic equipment. But recent advances have made LEDs bright enough to rival traditional lighting technologies. Modern LEDs can replace incandescent bulbs in almost any application.

Result

Snap Shots of Project Kit



The experiments for this project were carried out under bright and sunny weather. The graphical representation of this project results are shown below.

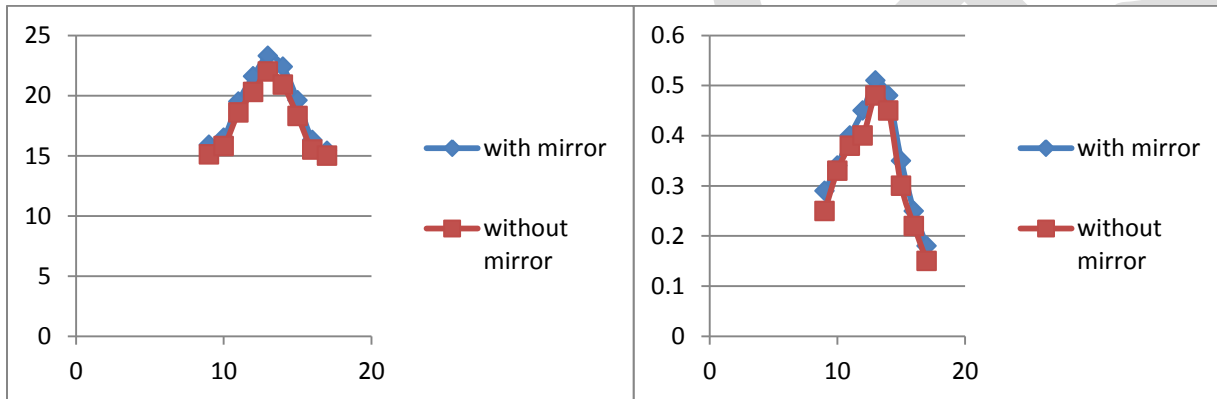


Fig.5 Voltage vs Time

Fig.6 Current vs Time

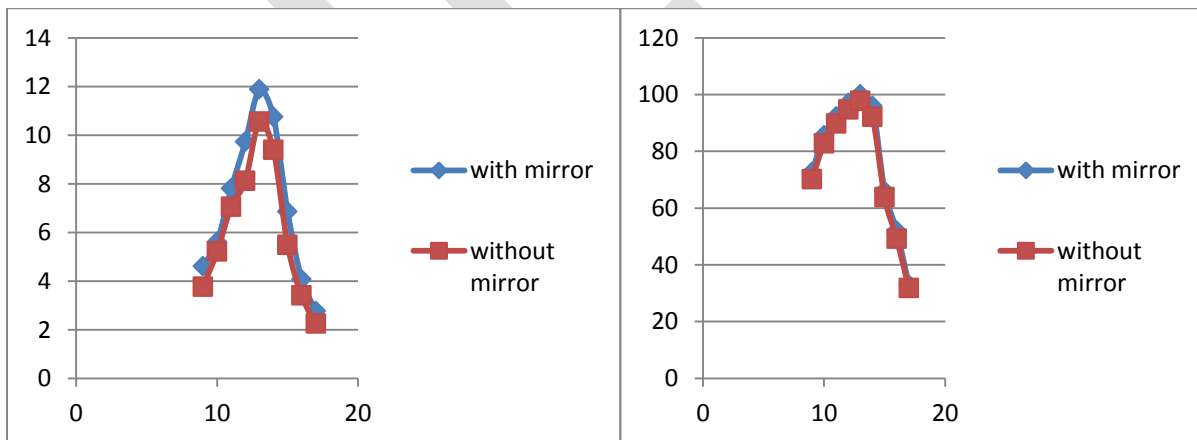


Fig.7 Power vs Time

Fig.8 Intensity vs Time

It can be seen from the graphs the output power obtained by using mirror is higher than the power using without power, during the mid day.

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Conclusion

Photovoltaic electricity has the potential to serve as a competitive and efficient energy source in the future. However, the prime cost of this technology is still higher than nuclear, thermal and wind power. One simple and effective way to drive down the cost of PV electricity is to combine reflectors with PV panels in order to harvest more light from the modules. The optical analysis and experimental current and voltage data both show that the with mirror system has higher power output compared to without mirror system.

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