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Solar Energy Collected Using Parabolic Arrangements

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Abstract: *Solar energy can be utilized in different ways to meet various energy requirements. A parabolic dish collector is a device designed to collect solar energy from sunlight. This paper presents the outcomes of a project conducted at BMS College of Engineering. The principal aim of the project is to concentrate solar energy received from sunlight, on a parabolic dish convertor, to a receiver arrangement. The dish surface is made highly reflective which ensures effective concentration of energy to the receiver.*
Most of the power generated currently is from fossil fuels which also have the side effect of polluting the atmosphere. Fossil fuel reserves in the world are also depleting at a rapid rate. In order to make the development of our civilization sustainable and cause less harmful effects to our environment solar energy has developed as a suitable substitute. Because of the ever increasing need for clean energy solar energy is one of the fastest growing sources in today's world.

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I. Introduction

The sun is the most plentiful energy source for the earth. All wind, fossil fuel, hydro and biomass energy have their origins in sunlight. In today's world we are able to calculate the potential for each and every source of energy based on modern technology. We must also bear in mind that the demand for energy is growing at a rapid rate every year. Hence solar energy is the only source that can satisfy such a huge and steadily increasing demand.

There are several applications or solar energy like energy generation, photochemical, solar propulsion, solar desalination and room temperature control. In particular the collection of solar energy and its transfer to electrical energy has wide applications and a deep impact on society, hence has attracted keen and widespread research. This is mainly because electricity is high grade energy. It can be easily transformed into other forms of energy like mechanical energy or heat. If we are able to generate economical and plentiful electrical energy with easy transportation of the same, then electric power will increase its share in the demand sectors .

Methodology Of Study

This project is a demonstration of generrating electricity using sunlight and a parabolic shaped transmitter. Solar energy works on the principle of absorbing sunlight through a solar panel and converting it to electrical energy. The energy is stored in a battery and can be used for many purposes.

II. Components And Materials Used For Experimental Setup

ALUMINIUM PARABOLIC DISH

A parabolic dish or many of the same shape concentrate solar energy at a single focal point similar to the way a reflecting telescope focuses starlight or a dish antenna focuses radio waves. The parabolic shape means that incoming rays of light will be reflected towards the focus no matter where they arrive on the dish.

Light from the sun arrives at the earth's surface in almost completely parallel rays. So when the dish is aligned with its axis pointing at the sun, all incoming radiation is reflected to the focal point of the dish. Most losses in solar collectors are caused by the imperfect parabolic shape and imperfect reflection. Also on a hazy or foggy day, light is diffused in all directions thereby, reducing the efficiency of the dish.

SOLAR PANEL

A solar panel refers to either a photovoltaic module, a solar thermal energy panel or a set of photovoltaic modules electrically connected and mounted on a supporting structure. A PV module is a packaged, connected assembly of solar cells. Solar panels can be used as a component o a larger photovoltaic system to generate electricity. Each module is rated by its DC output power under standard test conditions and this power typically ranges between 100 and 320 Watts. Common photovoltaic panels are made of CRYSTALLINE SILICON, THIN FILMS AND II-VI SEMICONDUCTOR THIN FILMS.

BATTERY

A 12 V battery is a portable device capable of storing up to 12 volts of electricity. Most 12volt batteries, such as those used in cars can be recharged. To understand batteries a basic knowledge of voltage is required. A battery is basically a tank capable of storing electrons. In high voltage batteries more pressure is imparted to the electrons , allowing a greater volume of electrons to pass through a given point at a given time. Eventually the battery runs out of pressure and requires recharging.

STEPPER MOTOR

A stepper motor is an electromechanical device which converts discrete electrical pulse into discrete mechanical movements. The shaft or spindle of a stepper motor rotates with an equal angle of increment called a step when electrical pulses are applied to it, in proper sequence which determines the direction of rotation of the motor shaft.

SUPPORT STAND

This is made of mild steel and consists of an L and rectangular shaped cross bars welded together and two ball bearings fixed with the inner race with a rod. The outer race is rotary and mounted in the housing of an absorber supporting plate.

MICROCONTROLLER ARRANGEMENT

A P89V51RD2 microcontroller was also used. Its key feature is its X2 mode operation. A flash program memory supports both parallel programming and in series fashion to be reprogrammed in the end product under software control.

A BRIEF OVERVIEW OF THE EXPERIMENTAL PROCEDURE

- Sunrays are incident on the parabolic dish
- The incident light is reflected on the solar panel
- The solar panel converts solar energy into electrical energy by the principle of electron shift.
- A buck booster converts low voltage to high voltage thereby enhancing performance
- A connected battery stores the current
- The battery is connected to a switch to supply and run the DC motor.

Thus a successful conversion of solar energy to electrical energy is achieved.
Repeated trials confirm the stability and conclusive results.

III. Conclusion

This paper focuses on a method for converting solar to electrical energy. Conversion was successful with good efficiency. Scale up of the process will ensure higher voltages and currents required to run simple devices especially on clear sunny days. The process is economical as maintenance costs are kept to a minimum, operating and labour costs are low.
Repeated experimental runs confirm the stability and generation capacity of the device.

References

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