



SOLAR ENERGY COLLECTION USING SPHERICAL SUN POWER GENERATOR

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Abstract: This paper proposes another idea of sunlight based assortment that prints the sun oriented cells straightforwardly onto a round surface, or an inflatable. It tends to be utilized for replacement of the draining of non-renewable energy sources in warm applications and power age through warm course. Generally the concentrated sun oriented force implies centering the sun's energy from a huge region into a more modest region, which creates a ton of warmth that can be utilized to deliver power. Sun based force is the change of daylight into power, either straightforwardly utilizing photovoltaic (PV), or by implication utilizing concentrated sun based force (CSP). Concentrated sun based force frameworks use focal points or mirrors and global positioning frameworks to center an enormous space of daylight into a little bar. Photovoltaic effect converts the energy of light directly into electricity.

Keywords: Spherical surface; electricity; photovoltaic; concentrated solar power.

INTRODUCTION

The Sun is the main energy source of the Earth. All fossil fuels used today are indirect forms of solar energy. Most of the renewable energy sources, such as winds and ocean waves, also exist because of the sun. Therefore, collecting energy directly from the sun is an intuitive approach. Currently, photovoltaic (PV) based solar module development started with rigid silicon solar cells. Therefore, flat-panel type solar energy collectors have their technology advantages in manufacturing and installation.

However, in city or residential areas, the flat-panel solar collector has its limitations. For examples, the solar panels should always face true south if they are in the northern hemisphere. But the space for an ideal installation may not always be available. Even if they can face the right direction, nearby higher buildings may block the sunrays from that direction. Additionally, the sun's angles in the sky vary according to the days in the year and the inclination of the panel can only be made optimal in certain times during the year. To most solar collectors, the sun-tracking system is too expensive and impractical, and some cannot even adjust their inclinations manually.

A new idea can solve the above problems: forming the solar cells onto a spherical thin shell and enveloping it around a balloon. When the balloon is raised to a certain height, it will not be blocked by the surrounding buildings and can receive the sunrays from all directions in all seasons. The term—solar balloon has two different meanings. One is a balloon that absorbs solar energy to heat the air inside the balloon and increase its buoyancy. It is just one type of the hot-air balloons and it has a long history. Recently, its usage has been expanded to space missions.

The second definition of solar balloon refers to a balloon that is used to collect solar energy for other applications. This type of balloon is also called a solar collector.

One example of a solar collector is the solar turbine suggested by Papageorgiou using a floating solar chimney to generate hot air and drive a turbine. Another concept has been developed by Cool Earth Solar that uses a large balloon with one side clear so that the sunray can enter the shiny inside of the balloon serving as a mirror that focuses the solar energy to a photovoltaic cell, thus generating electric power.

An Overview of Renewable Energy

Sustainable power is energy created from regular assets like daylight, wind, downpour, tides and geothermal warmth which are inexhaustible (normally recharged). Environmentally friendly power advances range from sun based force, wind power, hydroelectricity/miniature hydro, biomass and biofuels for transportation.

Spherical-Surface Solar Collector

The spherical coordinate system (r, θ, ϕ) is used, where the radius r is a constant, θ is the azimuthal angle in the x-y plane, and ϕ is the zenith angle from the positive z-axis, as shown in Fig.1.

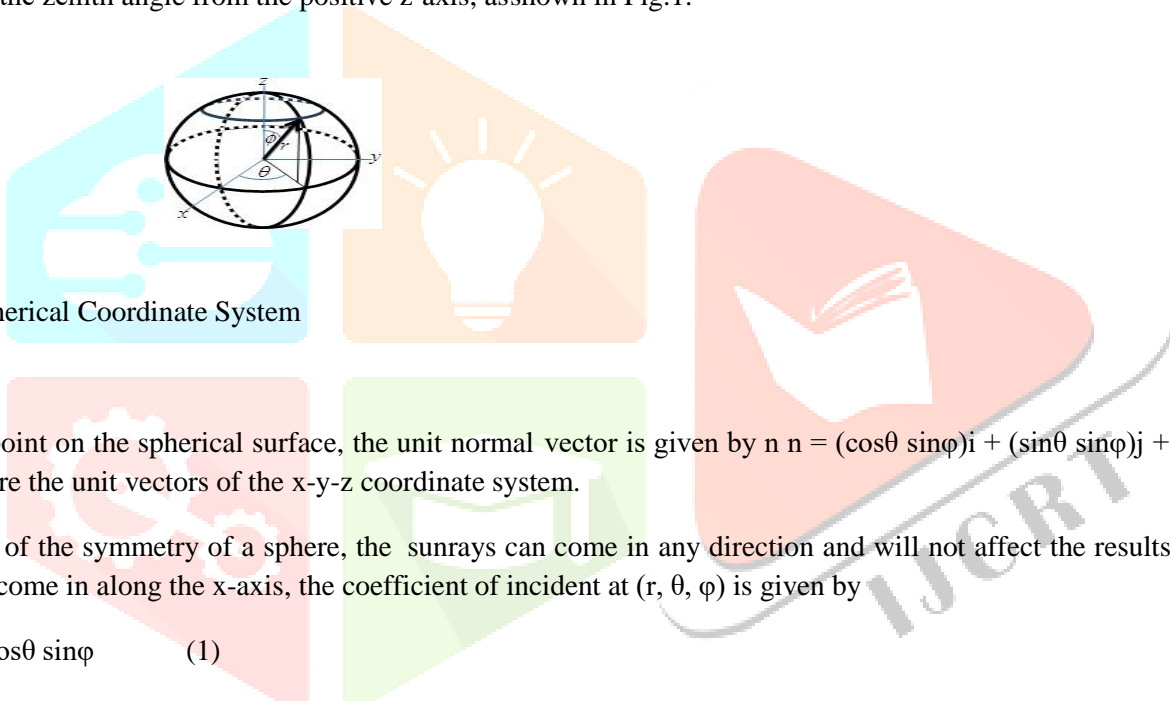


Fig.1 Spherical Coordinate System

At any point on the spherical surface, the unit normal vector is given by $\mathbf{n} = (\cos\theta \sin\phi)\mathbf{i} + (\sin\theta \sin\phi)\mathbf{j} + (\cos\phi)\mathbf{k}$, where $(\mathbf{i}, \mathbf{j}, \mathbf{k})$ are the unit vectors of the x-y-z coordinate system.

Because of the symmetry of a sphere, the sunrays can come in any direction and will not affect the results. Assuming the sunrays come in along the x-axis, the coefficient of incident at (r, θ, ϕ) is given by

$$\cos\lambda = \cos\theta \sin\phi \quad (1)$$

SPHERICAL SUN POWER GENERATOR

Spherical sun power generator is the new strategy utilizing sun based energy. German Architect Andre Broessel accepts that he 'can extract more squeeze from the Sun' in any event, during night hours and in low light districts, by means of this new kind generator.

It consolidates round math rule with double pivot global positioning framework, permitting twice yield than that of ordinary and being completely rotational and appropriate for slanted surfaces and dividers.

Advantages of Spherical Shape

Bigger Exposition to the Sun Rays: As force plant has round shape, its bigger territory is constantly presented to sun beams. Because of this enormous measure of power can be created prompting most extreme utilization of force plant. Likewise this prompts appropriate usage of supplies. Because of this support cost of force plant is decreased as compared to a force plant with some other shape.

Attraction Inside: Due to the constant intermittent turn of sunlight based force plant attractive energy inside it tends to be kept up much viably. The principle advantage for turning of force plant is to make attractive energy inside it.

Structure

The typical structure of Spherical Sun Power Generator is shown in Fig.2.



Fig.2 Structure of Spherical Sun Power Generator

According to the designer the transparent sphere is able to collect and concentrate diffuse where traditional devices cannot, and providing an efficiency boost as well, it can be used in far more locations than their flat, fixed counterparts. It's also claimed that it concentrates the sun's light in one area, which reduces the solar cell surface required to just 1 percent of that required by a traditional panel.

Working

The working of Spherical Sun Power Generator is shown in Fig.3.

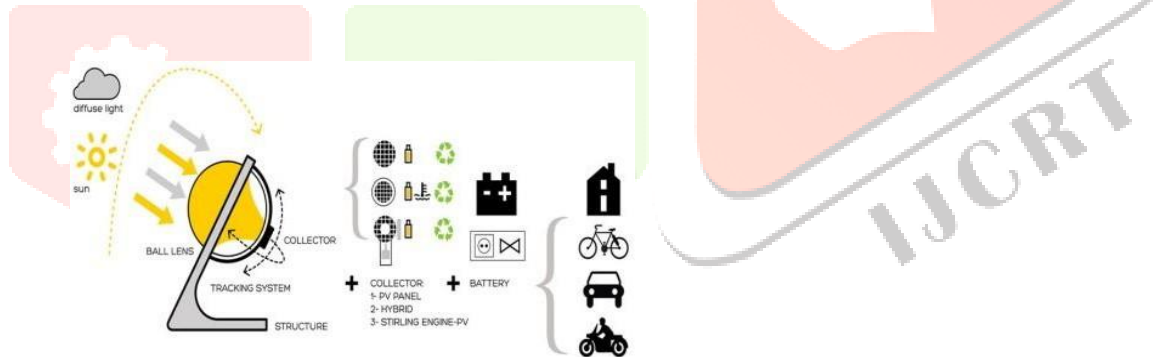


Fig.3 Working of Spherical Sun Power Generator

The beta Ray comes with a hybrid collector to convert daily electricity and thermal energy at the same time. While reducing the silicon cell area to 25% with the equivalent power output by using our ultra-transmission Ball Lens point focusing sun, solar panels tend to be aesthetically inspiring.

The operation of Spherical Sun Power Generator is shown in Fig.4.



Fig.4 Operation of Spherical Sun Power Generator

Solar start-up Raw lemon aims concentrator; it operates at efficiency levels of nearly 57% in hybrid mode. At night time the Ball Lens can transform into a high-power lamp to illuminate your location, simply by using a few LED's. The station is designed for off grid conditions as well as to supplement buildings' consumption of electricity and thermal circuits like hot water.

Special Features

- i) Designed for off-grid conditions as well as to supplement building's consumption of electricity.
- ii) Modular collector system charges and stores energy during daylight hours.
- iii) Can even collect energy from the moon during night hours.
- iv) Suitable anywhere with access to the sky.
- v) Multi Junction Cells are used-making it suitable for different wave lengths.
- vi) Size of Solar Panel is reduced.
- vii) Independent of the position the Sun.

Advantages

- i) Electrical output is twice the conventional .
- ii) Effective use of Solar Energy.
- iii) Efficiency is 57% .
- iv) Less number of LED's are used.
- v) Usage of silicon cells are 25% reduced.

Disadvantages

- i) Cost of Lens is high
- ii) Materials required to design are more.

Applications

- i) Can even be used as an electric car charging station.
- ii) Motors are operated using electrical energy stored in the rechargeable batteries.



Fig.5 Application of Spherical Sun Power Generator

CONCLUSION

Based on the above analysis, we reach at the following conclusions:

Due to the seasonal changes of the sun's position in the sky and only a shorter time in a day that the flat-panel collector can see the sun, the advantage of the flat-panel collector is not that much.

The back-side of the spherical surface can collect significant amount of scattered radiation and reflected solar energy that makes it as efficient as the flat panel without occlusion.

Considering the occlusion factor, the spherical-surface collector can be the better choice in certain situations. Besides the efficiency consideration, the balloons coated with the PV solar collectors have other features that make them attractive. For example:

It is light and portable.

It is easier to be taken in bad weather.

It can be decorated and made a beautiful scene.

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