

Study on Solar Water Bulb-a Liter of Light

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Abstract

The solar bottle bulb is made out of a used plastic soda bottle or water bottle, which is filled with water and liquid bleach. The bottle is then fixed into a hole in the roof. While light streaming through just the hole would come in through a single, straight, narrow light beam, the water in the solar bottle bulb refracts the light so that it can illuminate a larger space, 360 degrees around. The bleach keeps the water clean by preventing algae from forming. The solar bottle bulb gives off 55 to 60 watts of clear light, and lasts up to 10 months. This innovative light bulb provides low-income manila households with light - while traditional windows can easily crack or leak during typhoon season or other severe weather, the solar bottle bulb brings even more light in and helps save money and energy. Not only do the bulbs improve the lives of families, but they also improve the future and health of the environment by significantly reducing plastic waste.

Keywords: solar energy, refraction of light, water treatment

I. INTRODUCTION

SOLAR POWER is the conversion of sunlight into electricity.

So, Today, World is facing so many problems such as pollutions, water for drinking purpose, food problems, and electrical. YES, electricity problem is one of the major problem which is increasing rapidly day by day.

In world, 90% people are poor. Comparing with rich category poor category is more. So, the electricity is not lightening the houses of each person because of it is not affordable for every person and someone who can afford it, getting no electricity. And the method we are using for generating electricity is so expensive and costly and creating large pollution which we are not realizing now.

Now, we found out the one day-light solution which is solar bulb to stop the unnecessary use of costly electricity. We can use it in domestic place as well as in industry level and also having positive silent features such as no electric shock, not costly and easy to handle. There are so many houses OR slums that they cannot afford OR not getting electricity, And also slums having no windows so sunrays cannot enter easily in their houses. Then that place our method can easily work also.

Now, our method is totally based on sunrays. So, there is no any high cost and it is manufactured by the help of waste bottles. This is that method, which helps to generate 40-60 Watt light by the help of 1 liter water, and generally we are using 40-60 Watt bulbs for which large electricity requires and it goes expensive. So, our method is perfect for day light.

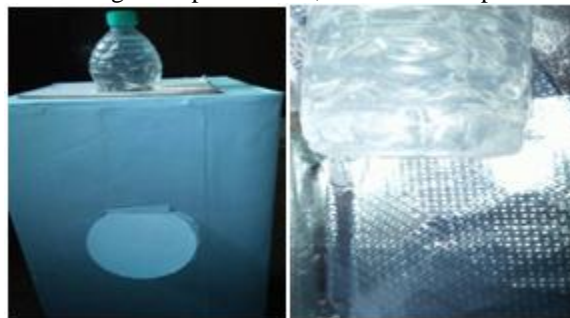


Fig. 1: Solar Power

A. How It Works?

Sunrays are everywhere. So, solar bulb installation is very easy For it requires one solution which is very easy and no costly. Fill one liter bottle with prepared solution and install it on the roof of houses OR slums OR industries. When the sunrays fall on the bottle, it will automatically glow and generate 40-60 Watt electricity and it will last long for maximum 5years.

B. Sunlight:

Sun is the infinite source of light. Sunrays are everywhere. It falls in one direction in air medium. But suppose we take one glass medium and sunrays fall on it then some of it passes through it is called as “ REFRACTION ” and some of it strikes on the glass and goes in opposite direction is called as “ REFLECTION ”.

In this method, our medium is water medium. In that sunrays fall on the water, it slightly changes its direction is refraction. It is just like deck prism.

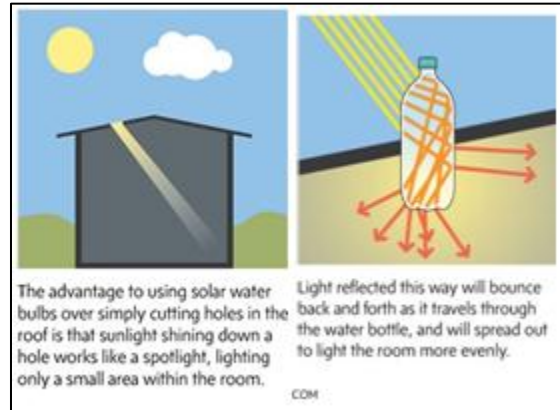


Fig. 2: Sunlight

C. The Law of Refraction:

The actual law of refraction was discovered in the early 1600s by a Dutch mathematician and geodesist, Willebrord Snel van Royen. (Because his name in Latin is “Snellius”, the law is often called “Snell's law” instead of “Snel's law”.)

Snel found that there is a fixed ratio of two lengths in diagrams like those above. Let a ray of sunlight SR is incident on a rectangular tank of water, as shown below, where it is refracted at R. Extend the incident ray to A, on the vertical wall of the tank. Then the length of the actual refracted ray RC bears a fixed ratio to the extrapolated length RA, regardless of the angle of incidence.

This ratio, RC/RA , is called the index of refraction, and denoted by the letter n . It is a property of the two media on either side of the refracting surface. For water and air, the ratio is very nearly $4/3$; for glass and air, it is close to $3/2$. (It's just a coincidence that the refractive indices of these common materials are so close to simple ratios; but it makes them easy to remember.)

It is convenient to assign every material an absolute value of the index of refraction, instead of dealing with a “relative index” that depends on the second material (air, in these examples). If we assign an absolute index of unity to vacuum, the index for air turns out to be nearly 1.0003 under ordinary conditions; then the absolute indices for most materials are very close to their relative indices, measured against air. So the index of refraction of water is about 1.33, and that of glass is about 1.5.

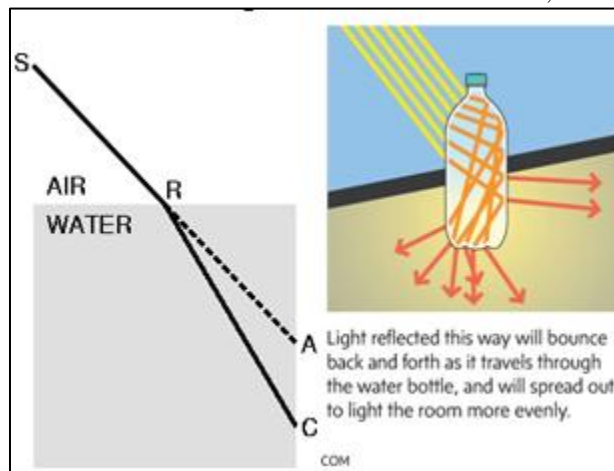


Fig. 3: refraction of light

D. Material:

Plastic soda bottle, bleach (CaOCl_2), sun rays, sealing Material (polyester resin).

E. Prepare Solution:

First upon take 1liter clean water then put 5gm bleaching powder in the water and then stir it for 10 min.



Fig. 4: Prepare Solution

F. Bleaching Work:

Good sunlight refraction and reflection depend upon a clear water medium, just as a diamond's brilliance depends on its clarity. Chlorine bleach plays the role of destroying the microorganisms that could proliferate inside the bottles, reducing the clarity of the water. As for maintenance, water and bleach must be replaced, but only every five years. It is not clear how long the beverage bottles hold up in this role, but replacing them should not be too great a hurdle. Solar bottle bulbs are a wonderfully safe, cheap, energy-efficient lighting technology being supplied to those who need it most.

G. How to Construct?

Construction of this device is quite simple. A clean one liter plastic bottle is filled with water. 5 gram of bleach is added to prevent the growth of bacteria and algae. An empty film container is fitted to protect the cap from sun. Next a hole is cut in the roof and the bottle is pressed half way into the hole. Then, the gap between the hole and the bottle is sealed off with polyester resin and made waterproof, preventing rain from seeping in. The device works on the principal of refraction. Sunlight which falls on the exposed surface of the water bottle gets refracted and illuminates the room below. When measured, its luminosity is equivalent to that of a 40-60 watt incandescent electric bulb, depending upon the amount of solar insolation available on a given day.



Fig. 5: Construct

H. Sustainability:

The Liter of Light is a zero-carbon-emitting alternative to the daytime use of electric or hydrocarbon-burning (kerosene, gas) illumination. The materials used in the technology are readily available, the plastic bottles as scrap, needing no additional manufacturing resources. This inexpensive technology allows most slum households to install it with the assistance of entrepreneurs from their communities. Once installed, the bottle is estimated to last about five years before being replaced. The electrical power consumed, at significant cost in carbon dioxide emission and money, by an electric bulb producing comparable light (say 55W incandescent or 20W CFL) is substantial.

I. Benefits:

This innovation provides free energy without carbon emissions and is environmentally friendly. The carbon footprint of manufacturing one incandescent bulb is 0.45kg CO₂. A 50 watt light bulb running for 14 hours during the daytime has a yearly carbon footprint of 200kg CO₂. Moreover, approximately 90 percent of the power consumed by an incandescent bulb is emitted as heat rather than visible light. As per calculations, 15000 water bulbs at 200kgs will reduce pollution at 3 million kgs for a year of use. Although it has the limitation of only working during the daytime, it has potential for further improvisation — like fitting with solar panels and battery to collect and store energy which can then be utilized during the night.

Even in its basic form it has the potential to transform the lives of millions of poor people. There are 1.5 billion people throughout the world without electricity. They live in shanty houses without proper windows and depend on candles and kerosene lamps to illuminate their homes. Kerosene lamps give poor light and produce noxious gases. Every year two million people die because of indoor air pollution. In such circumstances, these inexpensive and easy to make solar water bottle bulbs

come as a breath of fresh air for these people. There is no air pollution and no possibility for accidental burns or fires. This simple idea which anybody can build and implement, with no expense, solves a lot of problems at once.

J. Result:

We found that strength of light it depends upon intensity of sun rays. We are using lux meter for measuring strength of light.



Fig. 6: Result

II. CONCLUSIONS

The engineering goal was achieved and a new design was constructed that further reflects ambient sunlight. There were no predictions or hypotheses for which design would generate the most light. Because of the construction of an improved design, it is possible that households in developing countries will be using this design instead of the soda bottle solar light that is currently being used.

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