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SOLAR TRACKER IS A UNIQUE INVENTION FOR NEXT SOLAR POWER GENERATION

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ABSTRACT

Solar tracker is a unique invention for next solar power generation. It is device which is the integration of smaller mechanical components specifically designed to generate higher efficiency in solar energy with respect to other solar energy devices such as solar panels , dry cells etc. It approximately tracks 30 to 40% solar energy more than the devices mentioned above. The solar tracker will increase the energy output of PV array 30% - 50% compared to the fixed PV array with the same rated output power.

Currently solar cells are becoming extremely popular for utilizing solar energy to use different ways such as producing electricity, transportation etc. So many solar panels have been installed all over world and most of them are stable. They are installed in the direction of maximum radiation on sun light. But now the problem arises that the sun is moving. So we cannot use maximum radiation receiving position only comes once in 24 hours. Solar tracker is the best solution for maximum radiation. By moving the solar panel to the movement of sun, we can always receive the maximum radiation. So we have come up with an innovative idea for tracking, we have used the principle of dynamic balancing of weights (attached on both ends of solar panel) in order to track the sun. This makes our project quite simple, cost effective and practical one and has much scope in future for further development.

I. INTRODUCTION

One of the most promising renewable energy sources characterized by an huge potential of conversion into electrical power is the solar energy. The conversion of solar radiation a direct electrical energy by Photo-Voltaic (PV) effect is a very promising technology, being clean, silent and reliable, with very low maintenance cost and small ecological impact. The interest in the Photo Voltaic conversion systems is visible reflected by the exponential increase of sales in this market segment with a strong growth projection for next decades. According to recent market research reports carried out by European Photovoltaic Industry Association (EPIA), the total installed power PV conversion equipment increased from about 1GW in 2001 up to nearly 23 GW in 2009.

The continuous evaluation of the technology determined a sustained increase of the conversion efficiency of PV panels, but none the less the most part of the commercial panels have efficiency no more than 20%. A constant research preoccupation of the technical community involved in to the solar energy harnessing technology refers to various solutions it increase the PV panel's conversion efficiency. Among PV efficiency improving solutions we can mention: solar tracking, optimization of an solar cells geometry, enhancement of light trapping capability, use of new materials etc. The output power produced by the PV panels depends upon the incident light radiation.

II. PRINCIPLE

The energy output of PV panel changes based on the angle between the panel and the sun. The angle at which the sun hits a PV panel determine its efficiency and what engineers use in the design of an efficient PV array for a specific location.

Tracking systems continually adjust the angle and direction of their solar panels to achieve the greatest potential harvest at all times by literally tracking the sun's movement across the sky. This inherent advantage can net a 40% greater efficiency than traditional static systems, resulting in fewer panels (and in some cases arrays) needed to meet a particular energy requirement.



Fig.1 Principle of operation.

Figure 1 shows the basic principle of the project, the water tanks are attached at the both end of the frame/ panel mounting which tilts for weight displacement of this water tank. The one of the water tank act as a dead weight and other is as a variable weight from which we are going to adjust the flow rate in such a manner that panel rotates with 15 degrees per hour (as sun moves with 15deg./hour).

As by Lambert’s co-sine rule for total incident radiations on particular surface area, the intensity of that radiations is given by following equation,

$$I_n = I \times \cos \Theta$$

Where, I_n = normal intensity of incidence radiations,

I = average intensity of radiations,

Θ = angle of incidence

III. WORKING

Figure 2 gives the details about the working of the project, also below are few simple steps that could explains the working of the project.



Fig.2 Working

- Collect 20liters of Water.

- Setup water tanks into a drip mechanism.
- Adjust the flow rate.
- Attach counterweight to other side.
- As the water drips from the can and gets filtered, the mechanism tracks the sun.
- At the end of the day you have 40% more power and filtered water.

3.1. FRAME:-

The frame is designed so as to provide provision for mounting of solar panels. It also serves the need of carrying the load of water tanks and transferring the same to the shaft. A C- channel at the center of frame is provided with a number of equidistant holes so as to provide freedom for adjusting the position of water tanks from the center of shaft.

3.2.SHAFT:-

Shaft is a common and important machine element. It is a rotating member, in general ,has a circular cross-section area and is used to transmit power. The shaft may be hollow or solid. The shaft is supported on bearings and it rotated a set of gears or pulleys for the purpose of power transmission. The shaft is generally acted upon the bending moment, torsion and axial force. The ferrous, non-ferrous materials and non-metals are used as shaft material depending upon the application.

3.3.BEARING:-

Bearing is mechanical element which locates two machines parts relative to each other an permits the relative motion between them.

IV. ADVANTAGES& APPLICATIONS

4.1 ADVANTAGES:-

- Produces 40%more electricity per day.
- Powered by water displacement.
- Filter's at least four liters of water per day.
- Easy assembly and maintenance.
- Inexpensive.
- helps to earn **carbon credits**.

4.2 APPLICATIONS:-

- The Solar Tracking System has the following applications:-
- The Solar Tracking system can be utilized it tracking the sun and thus pointing the solar panel at the point of higher solar intensity.
- Off-grid areas can be effectively electrified.
- Most efficient for pumping water and other agricultural applications.

V. CONCLUSION

The Sun Follower supports impoverished communities in meeting their need for both electricity and clean water. Using the weight displacement of water passing through the filter, a Sun Follower rotates solar panels throughout the day, to optimize energy collection by up to 40 percentage. Now, a family thatan struggled with limited electricity an insufficient clean water has both.

From the design of experimental setup with Solar tracking system using dead weight. If we compare tracking by the use of mass imbalance with fixed solar panel system we predicted that the efficiency of solar tracking system is improved by 30-40% and it was found that all the parts of the experimental setup are give the good results. Moreover this tracking system does track the sun in the continues manner. And this system is more efficient and low cost effective in long run. From the result it is found that, by automatic tracking system, there is 30% gain in increase efficiency when compared with non-tracking system. Even purification of water can be achieved

VI. FUTURE SCOPE

The goals of this project were a purposely kept within what was believed to be attainable within the allotted timeline. As such, many advance improvements can be made up of initial design of solar tracker. That being said, it is felt an this design represents a functioning scale model which could be replicated for a much larger scale. following recommendation are provided as ideas for future expansion for this project.

- We can use wood and other locally available materials instead of Mild steel and thus reduce the cost further.
- A spring of appropriate stiffness could be designed to avoid sudden jerks.
- Provisions for safety of solar panels from rain.
- More accuracy can be achieved by providing measures against wind vibrations

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