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AN OVERVIEW OF TRACKING APPROACH FOR THE SOLAR PHOTOVOLTAIC SYSTEM

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ABSTRACT:

A solar panel is consisting of solar cells to generate electricity. The output of the panel relies upon on different factors like semiconductor utilized in manufacturing of solar cell, type of solar cell, tilt angle of the solar collector, environmental factors like wind, dust, shading etc. in this document characterization of the solar panel and its behavior at various tilt angles is studied. For a fixed installed solar panel, it is very essential to mount a panel at an angle in which the collector will receive the maximum radiations. Therefore the tilt angle primarily based overall performance of the panel is checked. While automation is introduced, a solar panel can be made to rotate in direction of the sun called solar tracker. Subsequently a solar tracker usually tries to adjust its position in perpendicular to the sun. A water pumping application is designed for remote place where grid connected supply is not available. This report offers information about characterization and behavior of solar panel at different tilt angles, overall performance of solar tracker to increase the output of the panel and pumping application that can be designed for agriculture or household use.

KEYWORDS: Solar energy, solar cell, angle of tilt, automation, etc.

INTRODUCTION:

The technological development in twenty first century is happening with the extraordinary increasing rate. The generation of the power is performed through various different sources across the world. The main sources of generation of electricity, that's broadly utilized in India, are Hydropower plant, Thermal power plant, and nuclear electricity plant. Although these sources are restricted in nature, human being is still completely or partially dependent in this power sources. This dependency on such restricted power sources of the entire country is increasing the burden on those sources. Ultimately, the increasing rate of using these sources is liable for decrease in storage of the resources. A solar collector consisting of solar cells whilst put in sun light, it offers power output. However it isn't always possible that the solar collector will come in the perpendicular position with the sun. It genuinely states that solar collector will now not provide maximum output at maximum time of the day. In villages, human beings do not recognize anything about the position of the collector. They absolutely mount the solar panel on the rooftop and hence the acquired output energy is decreased by using extremely good amount. This unawareness about the solar collector reduces the system efficiency. A position of the solar collector with recognize to position of the sun is determined through azimuth angle and altitude angle. It becomes very crucial to check the overall performance of the solar collector at different tilt angles to get the maximum output energy. For a selected location, solar radiation data is precise. Therefore by calculating the data regarding the solar isolation and the tilt angle, it allows to enhance up the efficiency of the panel. Characterization of the solar collector deals with the overall performance of the panel at different tilt angles for a defined direction. Consequently by getting the tilt angle corresponding to the most output, efficiency of the solar collector is increased. Numerous applications can be then carried out on the generated energy. In remote places of the country, till this date, electricity is not reached. At these remote areas, solar energy can be used to generate the electricity.

SOLAR CELL:

A solar cell or photovoltaic cell converts the energy of light directly into electrical energy by means of photovoltaic effect. Photoelectric cell is defined as a device in which electrical parameters vary when exposed to light. Solar cells got importance when they had been proposed as an addition to the 1958 vanguard I satellite.

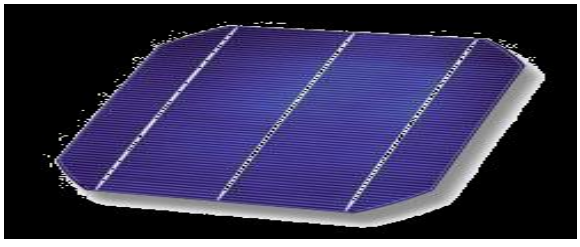

Fig. Solar cell

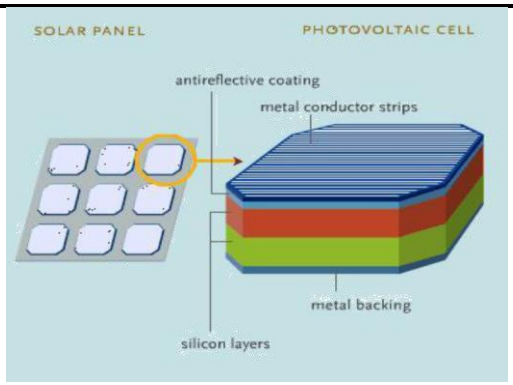

fig. A solar cell and its position in collector

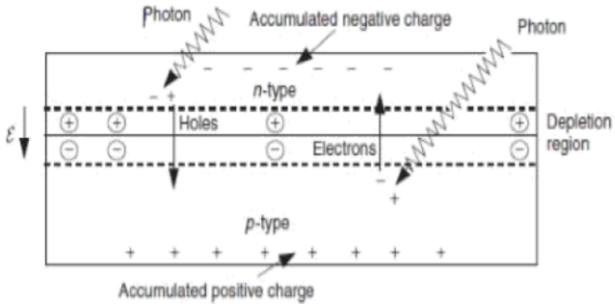

Fig. P-N junction solar cell

It is a p-n junction. Solar cell is made from semiconductor material like Silicon or Germanium. Solar cell is operating on the principle of photoelectric effect. Above diagram explains operating of solar cell. Because of photoelectric effect electrons in p-n junction get extra energy and they jump from valance bond to conduction band. Accumulation of positive and negative charge is shown in above figure. Movement of electron and holes voltage is created at depletion region. This voltage is acts as driving force because of which electron flows from n area to p area through outside circuit. Basically solar cell is current source and not the voltage source. Magnitude of output current from solar cell is directly proportional to solar radiation to which it uncovered. Diode is connected parallel with current source to keep away from reverse drift of current. So final equivalent circuit is as shown in following figure

POLYCRYSTALLINE CELL:

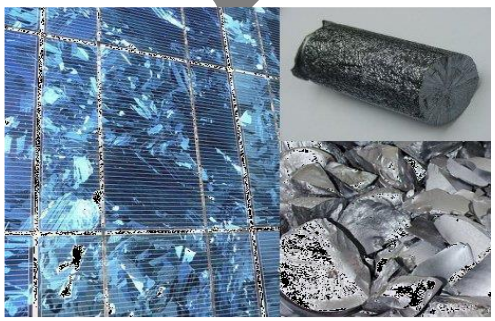

Fig. Left side- solar cells made of multi crystalline silicon, Right side- poly silicon rod (top) and chunks (bottom)

Polysilicon is made out of metallurgical grade silicon by using a chemical purification method, referred to as Siemens process. This method entails distillation of volatile silicon compounds, and their decomposition into silicon at excessive temperatures. The photovoltaic industry additionally produces upgraded metallurgical-grade silicon (UMG-Si), the use of metallurgical instead of chemical purification methods. when produced for the electronics industry, polysilicon includes impurity levels of less than one part per billion (ppb), at the same time as polycrystalline solar grade silicon (SoG-Si) is typically less pure.

MONOCRYSTALLINE CELL:

fig. Mono crystalline solar panel

Monocrystalline silicon is the base material for silicon chips utilized in sincerely all electronic device now days. Mono-Si also serves as photovoltaic material in the manufacture of solar cells. It includes silicon material wherein the crystal lattice of the whole solid is continuous, unbroken to its edges, and freed from any grain limitations. Mono-Si may be prepared intrinsic, consisting simplest of notably pure silicon, or doped, containing very small portions of other elements added to change its semiconducting properties. Most silicon monocrystals are grown by the Czochralski technique into ingots of up to 2 meters in length and weighing several hundred kilogram's. Those cylinders are then sliced into thin wafers of some hundred microns for in addition processing. Single-crystal silicon is possibly the most crucial technological material of the previous few years—the "silicon technology", due to the fact its availability at a cheap price has been crucial for the improvement of the electronic devices on which the present day electronic and informatics revolution is based.

CONCLUSION:

In recent few years the generation of electricity the usage of solar technology has seen an amazing growth, especially because of the financial issues and smooth operation of the solar panels. Even though the preliminary cost are excessive, however operation costs and maintenance expenses are low. Solar energy is easily available and can be directly utilized to generate electricity. When it comes to mount the panel on roof top or on the plane floor, the overall performance of the panel at numerous tilt angles is checked. This overall performance testing offers a tilt angle which generates maximum output for that solar tracker in that specific locality. A solar tracker is advanced technology in vicinity of solar energy generation. With proper sensors and control assembly, a solar collector can automatically regulate its position in perpendicular to the position of solar at any time of the day. Because the panel is in 90° role with the solar, the received output is always maximum output at that time of the day. From the observation table and graph drawn, it very well states that, with using solar tracker, output of the system is increased by 15-20 %. Solar tracker requires much less area than the fixed installed panel system. For this reason, in the metropolitan cities where rate of the land is high, solar tracker offers maximum output in less area, consequently price of the land is saved. Since the growth in rate per increase in unit power output of a photovoltaic system is more than that for a diesel, gasoline, or electric system.

REFERENCES:

1) *'Effects Of Tilt And Azimuth On Annual Incident Solar Radiation For United States Locations*' by Craig B. Christensen and Greg M. Barker.
2) '*Factors Affecting Solar Power Production Efficiency*' by New Mexico Supercomputing Challenge.
3) '*Design, Implementation and Evaluation of a Solar Tracking System Based on a Video Processing Sensor'.*
4) *'Development of Automated Solar Tracker for High Efficiency Solar Panels'* by Benny Cherian, Lakshmi P, Linda Joseph, , Madhu PM, ,Minu John.
5) 'A *Design of Low Power Single Axis Solar Tracking System Regardless of Motor Speed*' by Asmarashid Ponniran, Ammar Hashim, Ariffuddin Joret.
6) *'Selection Of Servo Motors And Drives'* by Dal Y. Ohm, Drivetech, Inc .on www.drivetechinc.com
7) *'Solar Powered Water Pumping Systems'* by B. Eker from Trakya University, Tekirdağ Agriculture Faculty, Agricultural Machinery Department ,Tekirdağ, Turkey.
8) *Renewable and Efficient Electric Power Systems* book by Gilbert.