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Solar Plate Cleaning Device: A Review

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Abstract: Accumulation of dust from the outdoor environment on the panels of solar photovoltaic (PV) system is natural. There were studies that showed that the accumulated dust can reduce the performance of solar panels, but the results were not clearly quantified.

The objective of this research was to study the effects of dust accumulation on the performance of solar PV panels. Experiments were conducted using dust particles on solar panels with a constant-power light source, to determine the resulting electrical power generated and efficiency. It was found from the resulting electrical power generated and efficiency.

It was found from the study that the accumulated dust on the surface of photovoltaic solar panel can reduce the system's efficiency by up to 30%.

So it is very important to remove dust from the solar plate. With the help of a wiper on the basis of a water pump, we can remove dust from solar panels and increase the efficiency of the solar plate.

I. INTRODUCTION

Cleaning of the solar plate by the wiper system.

Solar Energy Used Now Days Every Where. It is most Economical now a days.

The Solar Energy directly available in the atmosphere without Any cost. There are 300 sunny day every year in the India. Its generation is 10 times higher than a thermal power plant. So project definition is to be cleaning the solar plate by the Wiper system.

Recently, there was been an increasing interest in the degradation of the performance of solar, photo voltaic and thermal panels due to Environmental conditions. Many collectors show reduction on its performance after a short time, electrical and thermal performance. Most of these panels designated to operate properly for more than twenty years, but it doesn't work that long because of the natural conditions affecting its performance. For this reason, it's important to study the degradation of the collectors leading to invent improvable techniques that might stop the efficient degradation due to natural conditions.

The performance of the solar collectors, thermal and photovoltaic collectors, is defined as the ability of the cover glass to allow the radiation to penetrate the surface.

The performance varies due to the density of solar radiation at that area, the tilt angle of the panels, the properties of the materials, and the gradual degradation of collectors that depends on the accumulation of dust particulates (Eliminir, Ghitas et al. 2006).

The primary source of the natural degradation is hail, chemical weathering process, natural airborne particulates (sand and soil) and industrial carbon and other dirt, (Bethea et al., 1983).

The presence of the air borne in the atmosphere affects the performance of the collectors in a different way, the density of dust on the atmosphere affecting the photovoltaic and dropping the performance of the panels.

Moreover, it might cover the tracking sensor of the outdoor panels, therefore, it will not trace the sun anymore, (Khoshaim et al., 1983). Or it might penetrate the collectors under the glass layer and reduce the mirror reflectance, (Thomas et al., 1985).

The other possibility, it might degrade the collectors due to its presence on the atmosphere with a high density because of the nearby industrial zones or sand storms that effect the amount of radiation to reach the panels finally (Gossens and Van Kerschaver 1999). For record, this study doesn't deal with the issue of the particulates on the sphere or inside the concentrator. It is going to focus on the effect of dust particulates on the performance of the surface of the collectors.

Here we introduce the method of wiper on the basis of water pump to cleaning the dust and other partials from the solarplate.

A. Problems

Dirty panels will not allow energy from the sun to charge the solar cells. In NJ this contamination can come from many different sources such as bird droppings, salt and sand blown in from the beach, pollen, dust, dirt and grime stirred up when vehicles drive by, hard water stains from rinsing with a garden hose, just to name a few.

This can reduce output and efficiency of the system completely if left untreated for years. A typical cleaning will result in a 10%-60% increase in readings.

Even a little bit of dust, for example one-seventh of an ounce per Square yard (=4 grams / square meter) can weaken a panel's Power conversion by 40%. To put this in perspective, dust deposition in Arizona is about 17 Grams per square meter per month, and the situation is worse in Many other solar-friendly sites, including the Middle East, Australia and India. Mazumder, who led the study, presented the Results at the 240th National Meeting of the American Chemical Society.

Large-scale solar PV installations, such as those found in the United States, Spain, Germany, the Middle East, Australia and India are almost ideally located in sunny desert areas. But dry Weather and winds sweep dust into the air and deposit it on the Surfaces of the PV panels. Using self-cleaning solar panels, especially in areas where water is Scarce could overcome one of the significant challenges to Achieving optimum results from the solar installation

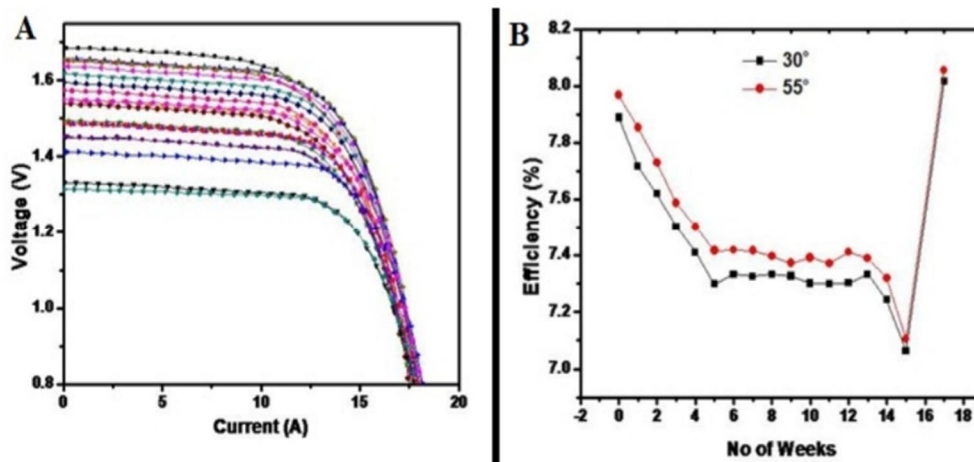
B. Dust Affects Solar-Cell Efficiency

Over the past two decades governmental agencies have played an Integral role in the advancement of renewable energy education by Providing useful information for educators and students. This effect Of such efforts has encouraged primary and secondary educational Institutions to introduce the subject of renewable energy within Their science curricula.

Countries such as the United Arab Emirates(UAE), which heavily Rely on oil and gas exports, have taken initiatives to educate the Local population and invest heavily in developing renewable energy Solutions. For example, taking advantage of the abundance of solar Radiation and vast undeveloped desert land, the UAE government Through its ambitious Masdar initiative is developing large-scale Solar plants using photovoltaic cells.

Interestingly, while there is plenty of solar radiation in the UAE, it Also has plenty of sand and dust. Considering the fact that Photovoltaic cells already have low conversion efficiencies (typically up to 20%), the accumulation of sand and dust particles On their surface further reduces their output efficiency

Using self-cleaning solar panels, especially in areas where water is Scarce could overcome one of the significant challenges to Achieving optimum results from the solar installation.



Effect of dust on solar cell efficiency

C. Operation

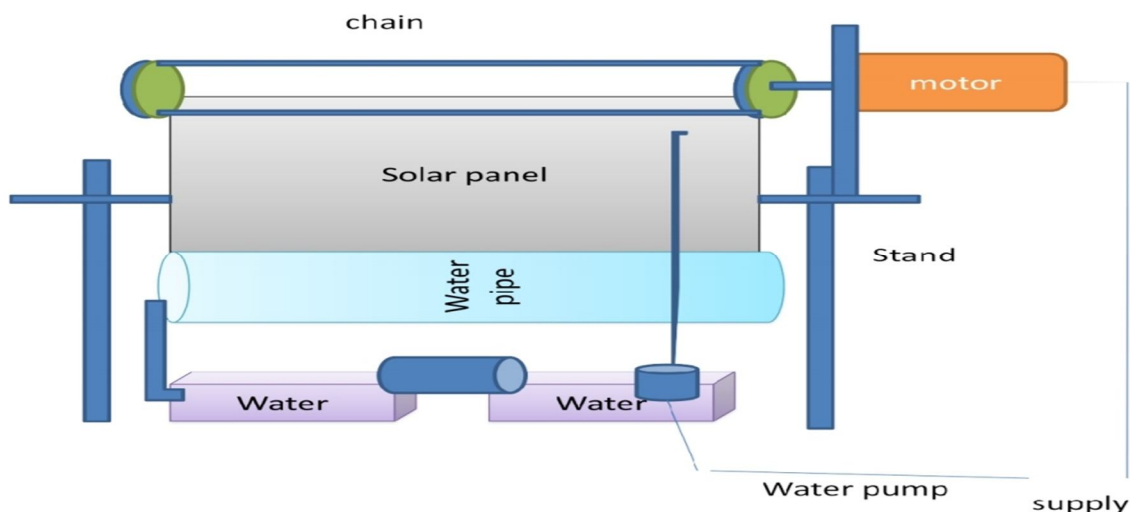
SOLAR CELL CLEANING SYSTEM WITH WATER REUSING.

This system is more effective in efficiency, water reusing etc. Compared with above mentioned options of the solar cell cleaning Panels. In this system, water is conserved and this conserved water is Used to clean the solar panels.

In this project we used automatic wiper for cleaning of solar plate. In this system when dust or other particles placed on solar plate the sensors starts to work. Sensor senses the particles and sends feedback to the wiper and wipers are start and completely clean the plate. We also used this system manually. Here we clean the panels with forcedly thrown water on it by water pump. Here the water cleaned by sedimentation process then takes cleaned water in another water tank.

The arrangements of components have been seen in the block diagram. Power supply give to the pump and motor. Transformer used to convert AC to DC for DC motor.

The arrangements of the components used in this system are Shown in block diagram as below:



Block diagram of solar plate cleaning device

D. Advantages

- 1) Increase efficiency of solar plate.
- 2) Sometimes dust or other particles long time placed on solar plate so it damages the aluminium strip of solar plate. So we avoid this damage by this system.
- 3) By this system we make the life of this plate longer than other plates.

E. Disadvantages

- 1) Normally Installation Cost of this system is higher than other System.

II. CONCLUSION

The main conclusions drawn from this research project include the Following: Dust can cause a 5 to 6% decrease in the solar panel Efficiency in one week. If panels are cleaned at least weekly, there is Potential gain of 150,000 NIS/year. Further research is necessary for More affirmative results. Water also preserved for reusing.

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