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Waterless Solar PV Cleaning System

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Abstract: *Traditionally, solar panels were cleaned manually, but this method has some problems, such as the risk of accidents, potential damage to the panels, difficulty moving equipment, and poor maintenance. The automatic dust cleaning system for solar panels solves these issues and offers an effective, water-efficient cleaning method. It also prevents damage to the panels and helps maintain their performance by removing dust. After cleaning, the efficiency of the solar panels will be measured at different time intervals-one day, one week, and one month-and compared to their efficiency before cleaning.In this project,we will develop a waterless cleaning technology for sola panels*
helps maintain their performance by removing dust. After cleaning, the ef ficiency of the solar panels will be measured at different time intervals-one day, one week, and one month-and compared to their ef ficiency before cleaning. In this project, we will develop a waterless cleaning technology for solar panels. This will help improve energy generation while saving water. The cleaning will be done using high-speed brushes and air blasts to remove dust. The quick cleaning process will save time, and we will also make sure that the panels are not damaged and that shading from the cleaning system doesn't affect the panel's performance

Keywords: solar panels

I. INTRODUCTION

The solar energy is the most abundant source of energy for all the forms of life on the planet earth. The technology of photovoltaic (PV) is developing continuously in many applications, so it generates electricity with no harmful effect on environment. Various source of energy like coal, gas, hydro, nuclear, diesel and some of them are going to get exhausted within few years. Due to these there is an increasing wordwide interest in sustainable energy production and energy saving. But the solar technology has not matured to the extent of the conventional sources of energy. It is facing lots of challenges such as cost, unpredictability of nature and low efficiency of the panel. The performance of solar panels depends on various types of factor such as effect of clouds, shadow, snow , high temperature , pollen bird dropping, dust and dirt.

The main factor that affects a PV panel‘s efficiency is dust, dirt which can reduce its efficiency up to 50%. The best way to eliminate the effect of dust accumulated on the solar panels is to clean the panels.

Traditionally cleaning was done manually. The manual cleaning has disadvantages like risk of staff accidents and damages of panels, movements difficulties, poor maintenance etc. The automatic dust cleaning systems of solar panels will overcome the difficulties arose in the traditional cleaning. The main aim of the project is to provide automatic dust cleaning mechanism for solar panels.

Problem Statement

Dust build-up on solar module surface is issue of great worry, particularly in desert provinces where frequen dust storms occurs. The glass cover transmiitance decreases because of dust on the surfaces of (PV) modules, which ultimately decreases the amount of solar radiation reaching the cells.

Accumulation of dust on solar panel reduces their efficiency in energy generation. That is why we need to keep the panel‘s surface as clean as possible. So we designed automatic cleaning machine which can clean and move easily on the surface of solar panels which helps improvement of efficiency.

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II. LITERATURE SURVEY

Some of the researcher had done work on the manufacturing of automatic solar cleaning systems. They used different cleaning techniques; some of the researcher had used different acids to clean panels. Some of the research work was surveyed by us.

Williams R B. et. al, in this paper author has worked on a particular downfall of Electrodynamics Screen (EDS) and tried to resolve it by providing an integrated approach. An EDS based system requires a high-voltage external power source for its operation, but the EDS can be made self-sustainable with the power output from the PV cell itself.

Author incorporates a transparent EDS with a PV array as its power source to make itself sustainable.

Sharma R, Wyatt C A, Zhang Jing, et al., in this paper authors had also worked on EDS technology. The outcome of this research was a modified technique with high dust removal efficiency. It was researched especially for the future space programs.

First studied the effects of dust on solar panel presentation with the aid of analyzing the dust collecting on such panels. A 3 month test becomes done in a business location close by a four-tune railroad 90m away from Boston, Massachusetts. They located a mean of one% loss of occurrence solar radiation changed into caused by dirt that accumulated on the surface of the sun

panel with a slant attitude ofa30°. The very best dilapidation defined for the duration of the check duration becomea4.7%. The researchers found out a corre ction issue , de f in e d as the ratio of the transference

from a polluted or exposed glass plate to clean one, of zero. Ninety nine, with aa45° slant angle; this value changed into general and hooked up in the layout of flat

plate collectors till 1970. Kimber et al. tested the consequences of soiling on large grid-linked PV panels in California, USA in 2011. The goal of the have a look at became to deliver a better model to correctly are expecting soiling patients all through the 12 months barely than presumptuous a continual annual fee.

Every other objective changed into to illustrate the f inal results of soiling on PV arrangement for general area slightly than for a particular area. For that examine, to illustrate soilin g losse s ov e r t h e dr y se a son a l in e a r

III. METHODS OF CLEANSING

Currently PV panels can be cleaned manually and automatically. Over time, manual cleaning is more costly compared to automatic cleaning. This project considered some different cleaning technologies available the market today, such as; the Heliotex rinse, electrostatic cleaning and the Sun Brush robot system. These cleaning methods were chosen to review, as to determine whether the cleaning robot will work on a PV panel's surface. Furthermore, the use of PV panels cleaning robotics has been expanding over the last few years to reduce the need for manual cleaning (Anderson, 2012), The cleaning methods are explained below.

Heliotex Technology

Heliotex is an automatic cleaning system which washes and rinses solar panel surfaces. The cleaning system can be programmed whenever it is necessary, depending on

.

Figure 3 1:- Heliotex cleaning technology

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The advantages and disadvantages of using the Heliotex cleaning system are listed below:
Advantages: Good for areas with ready access to water. being washed by almost 100%.Improves the efficiency of the PV panels after
Disadvantages: Expensive equipment such as the soap, hoses and pumps which are required. Requires ready access to plenty of water. Needs regular checking for the water and soap residue build up.

The Sun Brush Robot
The Sun Brush is a similar fixed cleaning robot primarily designed for cleaning snow from PV panels. It is a automated cleaning system for the PV panels.

Figure 3.2:- Sun Brush full automatic cleaning over solar panels.
The disadvantages of using the Sun Brush robot systems are that they are expensive and dif ficult to install over a large PV area

Manual Cleansing
This method required human operator is to clean manually with the help of mop for any wipers with suitable support structure

Figure 3.3:- Manual cleaning

IV. DESIGN OF SYSTEM

The system consists of different part as shown in figures as follows.

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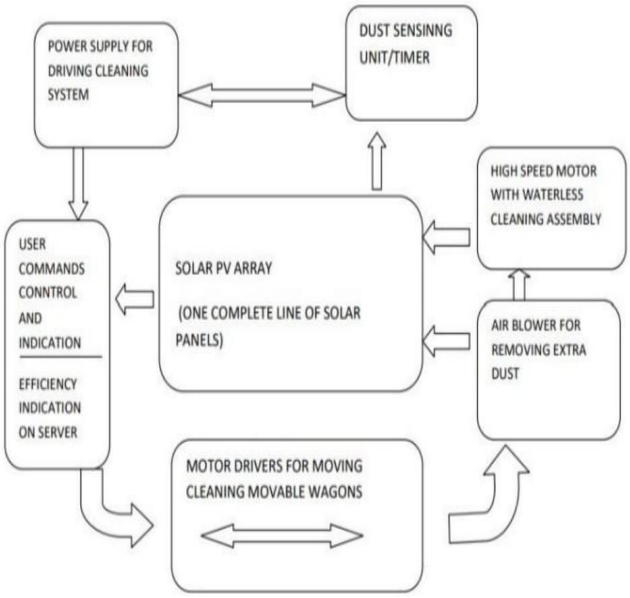

V. CONCLUSION

The performance analysis of the experimental setup is purely based on the amount of power generated on the dusty panel and a cleaned panel. The output power m a y re du ce du e to t h e la rge a m ou n t of du st accumulation on the panel. Dry cleaning can eliminate the dust particles on the surface. The assembly is found to be lightweight. In comparison of costs in manual operation cleaning and automatic cleaning, the cost for automatic cleaning is demonstrated to be more economic and signif icantly less burden particularly in the system having large number of solar panels. The power output is varying for the different weather conditions. A regular periodic cleaning of solar panel shows the signif icant performance of the cleaning technology.It is observed that power reduction takes place because of dust accumulated on the panel and it can be improved by using the cleaning method, there is increase in power up to 35%.

VI. FURTHER SCOPE OF THE PROJECT

The system that we have made is a working prototype which demonstrates our mechanical design along with its durability and feasibility

Further future study in this project might involve using dust sensors which would be calibrated to a certain threshold value such that it will automatically start the system without any manual on and off switch. Further inclusion of Bluetooth module can enable the users to switch on the system from a certain safe distance. The results of the cleaning can be uploaded in a cloud se rve r w he re it can be monitore d and ce r tain commands can be given in order for proper functioning of the system.

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