Enhance performance of solar plate with the help of cleaning mechanism

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ABSTRACT

Effective shooting of solar energy is of great importance as phase of discovering a answer for the ever-increasing demand for energy coupled with the depletion of resources of fossil fuels. The area of Bhopal city in the india is related with distinctly high levels of atmospheric dust concentrations. This causes high costs of dirt accumulation on photo voltaic collectors, which decreases the whole energy yields. Therefore, minimizing the quantity of dust that accumulates on pinnacle of the solar collectors is of outstanding importance for photo voltaic electricity utilization in widespread and for the Masdar The objective of this lookup used to be to advance a mannequin that describes dust accumulation in order to understand the elements that affect the utilization of PVs in an area with high dirt concentrations. Subsequently, we moved on to address the hassle of dirt accumulation through trying to relate the rate of dust accumulation to special climate conditions. The cleaning system consists of a frame, a cleansing device, and an working device. The frame includes a first sidewall and a opposite 2d sidewall facing away from the first sidewall. The cleansing system is affixed on the transparent protection panel. The operating system consists of a motor, a pulley and a belt. The motor is affixed on one cease of the first sidewall. The pulley is affixed on the different stop of the first sidewall. The belt is wrapped around the rotating shaft of the motor and the pulley. The cleaning gadget includes an axle linked to the running device and a washer supplied on the axle. The cleaning gadget is pushed by way of the running gadget to easy the Solar panel.

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Keyword: - *Solar Panel, Cleaning Mechanism.*

1. INTRODUCTION

Effective shooting of photo voltaic strength is of Understanding the factors that have an effect on dust accumulation, namely, weather conditions, is the first step to obtain three necessary targets: 1- creating correct electricity output predictive models through incorporating the drop in power due to dirt when modeling the PV's electricity output, 2- Optimizing the cleansing value of the photo voltaic collectors and 3- Developing coating with self-cleaning homes (summarized in Figure 1).:significant importance, as part of discovering a answer for the ever-increasing demand for electricity that is coupled with the depletion of resources of fossil fuels. The format is to have a hundred percent of the electricity used in Bhopal City generated via renewable resources. Figure 1 suggests the proportion share of the specific planned sources of strength technology at Bhopal City. Three out of four of these sources count number on photo voltaic energy, namely: evacuated tube collectors, targeted solar energy and photovoltaics, comprising ninety two percent of the whole share. The vicinity of Bhopal City in the India is associated with tremendously excessive levels of atmospheric dust concentrations. This reasons excessive quotes of dirt accumulation on photo voltaic collectors. A quantity of problems are related with dirt accumulation on photo voltaic collectors and can be summarized in the following points.

The location of Bhopal City in the MP is associated with relatively high levels of atmospheric dust concentrations. This causes high rates of dust accumulation on solar collectors. A number of problems are associated with dust accumulation on solar collectors and can be summarized in the following points:

1. A drop in the total energy yield, which reflects on the energy supply of the city.
2. Difficulty in predicting the power output due to dust accumulation losses.
3. Time and cost associated with cleaning solar collectors.

Therefore, minimizing the amount of dust that accumulates on top of the solar collectors is of great importance for the Bhopal Initiative and in particular for Bhopal City.

.In order to be able to resolve the problem of dust accumulation, we first need to understand the dynamics and various factors that affect dust accumulation.

1.1 BACKGROUND

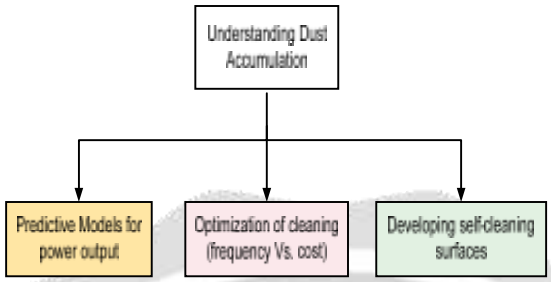

Figure 1 dust accumulation

Previously mentioned, the contemporary lookup addresses three major areas, namely:
1- Grasp dirt accumulation and correlating dirt accumulation with weather conditions,
2- Creating a regression model that describes the most energy output of a PV module as a characteristic of climate conditions,
3- Testing a functionalized coating and its capability to limit dust accumulation. The following offers a historical past about the modern-day and preceding lookup in these areas.

1.2 .HISTORY

A cleansing device for Solar panels includes a quantity of photo voltaic cells and a obvious protection pane masking the Solar cells. The cleaning gadget includes a frame, a cleansing device, and an operating device. The body includes a first sidewall and a opposite 2nd sidewall facing away from the first sidewall. The cleaning device is affixed on the transparent safety panel. The working gadget includes a motor, a pulley and a belt. The motor is affixed on one give up of the first sidewall. The pulley is affixed on the different stop of the first sidewall. The belt is wrapped round the rotating shaft of the motor and the pulley. The cleaning machine includes an axle connected to the operating machine and a washer provided on the axle. The cleaning device is driven by means of the operating gadget to clean the Solar panel

2. EXPERIMENTAL SETUP

As discussed in chapter 1, in order to make the best use of the solar resource available, PV panels (and any other solar collector) needs constant cleaning. We also discussed several ways that can be used to clean the solar collectors. Using passive methods of cleaning such as using the so called self-cleaning surfaces translates into less maintenance, less time consumption and more ease. Any self-cleaning coating should be suitable for the specific region to be utilized in.

Site information

The effectiveness of clean surface its ability to reduce dust accumulation or reduce the amount of water necessary to clean the PV modules. For this reason, we compared the daily energy output of a clean and unclean module at the solar PV test field located at Bhopal City.

Site Name	LNCT BHOPAL INDIA
Coordinates	23° 12' 45.29"N, 77° 24' 32.62" E
Elevation	532m
Slope inclination	1°
Slope azimuth	340° north
Annual global in plane irradiation	2067 kWh/m²
Annual air temperature at 2m	24.8° C

System description

Installed power	120.0 kWp

Type of modules	c-Si
Mounting system	Fixed mounting, free standing
Inclination	180° (south)/23°
Inverter euro eff.	96.0%
DC/AC losses	5.0% / 2.0%
Availability	95.0%

Experimental analysis

Model No.	Jakson 24×315
Max. Power	315Wp
Max. Power voltage	37.8 V
Max. Power current	8.34 A
Short circuit current	8.85 A
Open circuit voltage	45.6 V
Max. System voltage	1000 V
Weight	22 Kgs

3. RESULTS AND CONCLUSIONS

It was found from the study that the accumulated dust on the surface of the photo voltaic solar panel can reduce the system efficiency by up to 24.3%. The solar wiper will increase the efficiency of the panel while cleaning the dust particle to me .

In the Figure we see the power and Efficiency more compare to the dust solar panel so it is necessary to remove dust from panel to improve efficiency of solar plate.

The fully assembled system was able to detect a shaded cell from debris. Furthermore, it initiated the wiper motion down and up the panel to clear the debris. Also, the system maintained the battery charged when there was no cleaning and sufficient power was available.

More importantly, the project decreased the daily energy lost compared to the case where the PV panel was left shaded for an entire day. In order to determine energy savings, the PV Panel was placed under a solar test bed under identical conditions to test the energy loss from one half shaded g a cell. The losses due to shading alone was determined by taking the difference between the maximum power of the unshaded PV Panel and the maximum power of with one PV cell half shaded. The power losses of the entire Automated Self-Cleaning Solar Panel were also measured. Energy loss was normalized for one day of operation with one cleaning cycle.

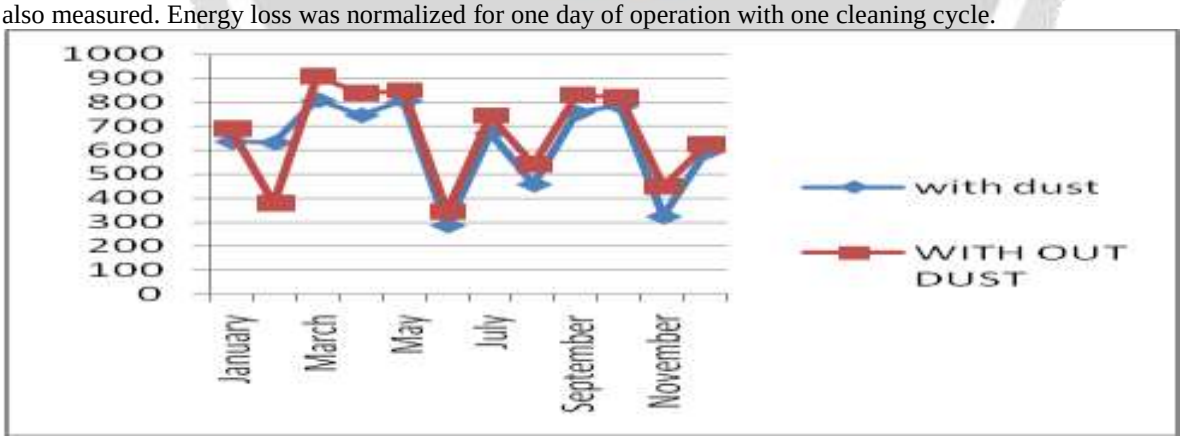

Figure2 comparison of power through one

On the basis of Efficiency [%]

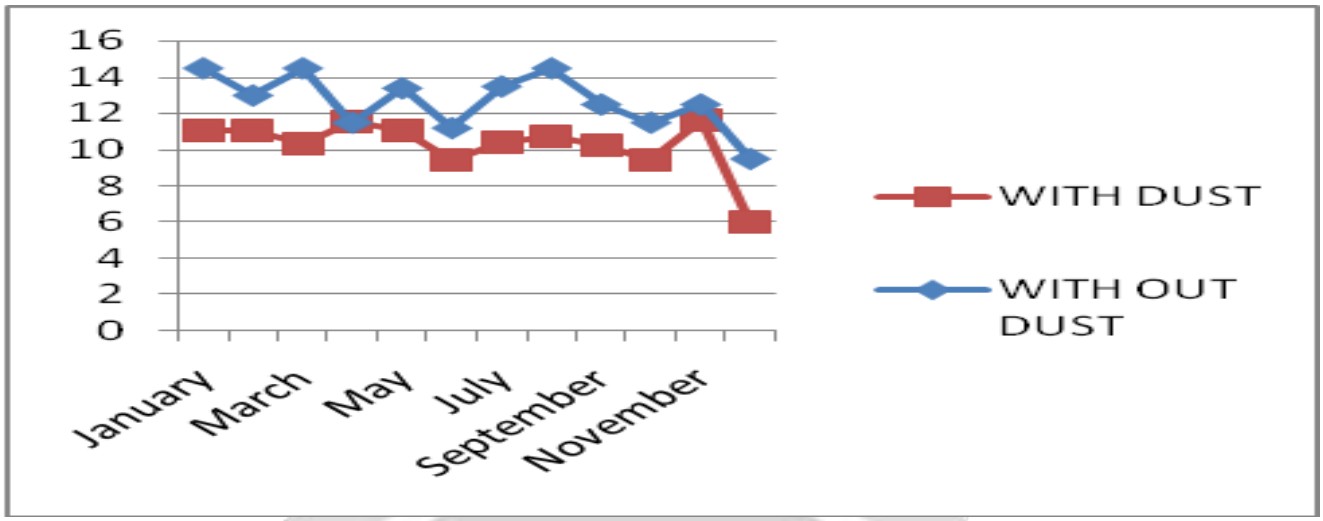

Figure3 Comparison of Efficiency through one year

4. FUTURE SCOPE

Even though our project worked perfectly and was functioning as initially planned, there are still a lot of improvements that can be made to make it more marketable and efficient.

First of all, we would like to deal with reducing the friction losses in our project. It is something we did not account for since our panel was prepared by the ECE Machine Shop. We could use a better, and more lubricated ball-screw which would significantly reduce our friction losses.

We would also work on making our project more marketable by designing and ordering a PCB. This would make our circuit look neat, and would also reduce its size considerably.

We would like to make our DMU more universal. We could make our DMU wireless, which would allow us to relay data back to a central monitoring system.

Research public opinion and determine whether people would be willing to pay for the long-term savings that our project promises.

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