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AUTOMATIC SOLAR PANEL CLEANING MECHANISM

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Abstract - *Energy is one of the major issues that the world is facing in India, the supply of energy has been one of the major problems for both urban and rural households. About 60% to 70% of the energy demand of the country is met by fuel wood and agriculture residues. Solar energy is a renewable source of energy, which has a great potential and it is radiated by the sun. Renewable energy is important to replace the using of electric energy generated by petroleum. Solar power has become a source of renewable energy and solar energy application should be enhanced. The solar PV modules are generally employed in dusty environments which are the case tropical countries like India. The dust gets accumulated on the front surface of the module and blocks the incident light from the sun. It reduces the power generation capacity of the module. The power output reduces as much as by 50% if the module is not cleaned for a month. The cleaning mechanism has been designed to clean the panel by controlling the R-F Circuits. To remove the dust in the PV Panels to improving the power efficiency.*

Key Words**: Rolling brush, R-F Circuit board, DC Gear motor, Design, Wheels.**

1. INTRODUCTION

The increasing demand for solar energy, the efficiency of solar panels is more important than ever. However, solar panels are very inefficient; typical peak efficiency for converting solar energy to useable energy is 11% to 15% [1]. Soiling of PV panels drops the panel efficiency even farther. This accumulation of dirt on the panels is a well-documented effect that can cause a loss of efficiency as high as 27% annually [2]. It is an automated solar panel cleaner that aims to reduce the efficiency losses of existing solar panel arrays. The system cleans the surface of each panel to increase the energy generation. Once implemented on commercial solar panel arrays, the system aims to improve each panels' energy production by an average of 10 percent. The system is designed to be implemented on large commercial arrays, but the design is scalable to all manners of solar 2 installations. Besides reducing maintenance costs and improving power production, this system will reduce the need for fossil fuels and reduce the nation's impact on global warming, as well as, eliminate the potential dangers for human cleaners.

1.1 PROBLEM STATEMENT

Impact of progressive water-stains (scaling) on degrading the PV performance needs to be investigated including appropriate mitigation measures. PV modules determine the nature of salt depositing/adhering to the glass surface, as the water used for cleaning the panels contains a highly soluble salt which damages the panels. Such staining is particularly evident with bird dropping and their subsequent cleaning. The impact of dust on the performance of solar collectors (including PV) has been attributed to the immense solar potential, averaging nearly 6 kWh/m2/day in these regions combined with the susceptibility to a desert environment (and frequent dust storms). There are many studies that confirm reduction of performance of producing energy by solar panels. Consequently in order to produce and deliver the maximum amount of energy to the grid periodic cleaning of panels is necessary. The dirt & dust cause highly effect on the performance of solar panels depends on various factors and always needs to be estimated or evaluated for individual situations.

1.2 OBJECTIVES

A. The Main Aim of the Project is:

1) To maximize the energy production by solar panels in remote areas, in utility grade sites, in low expense and without impact of manual.

2) While cutting cost, the performance of photovoltaic panel in solar farms should be optimize.

B. The Major Factors Consider while Developing the System are:

1) Robot should be compact in size; also it should be maintenance free.

2) It should clean the panels automatically.

3) The material used for cleaning the solar farms should not damage the panels.

C. In Order to overcome on above Problems following steps has been taken:

1) The design should be easy to manufacture, low cost.

2) Design has been drawn in CATIA for better understanding.

3) After analyzing all the calculations and design manufacturing has been done.

2. LITERATURE SURVEY

Some of the researcher had done work to increase the efficiency of work solar plate. They used the different techniques for cleaning the solar panel; some of the researcher has used different acid to clean panels. Some of the research work is conclude in table below.

Table -1: Survey of some research paper

Sr. No.	Paper title	Author	Published Year	Remarks
1	Project SPACE solar panel automated cleaning environment.	Matt burke	2016	3.5% improvement in the efficiency.
2	Design and implementation of microcontroller based automatic dust cleaning system for solar panel.	Satish patil	2016	1.6-2.2% improvement by regular cleaning.
3	Microcontroller based automatic cleaning of solar panel.	S.B. Halbhavi	2015	25% losses due to tilt angle of 35' and further more due to dust.
4	An integrated design of an auto clean and cooling smart PV panel.	Sumit das	2014	Titanium-oxide PV panels have 32% conversion rate.
5	Electrostatic cleaning system for removal of sand from solar panels.	Hiroyuki kawamoto	2014	Us of electrostatic force to remove sand from the surface of solar panels.

3. WORKING PRINCIPLE

In accordance with the dimensions of the flat plate panel the solar panel cleaning system consists of brush driven by DC motors and actions of brushes is controlled by remote. The frame carrying this cleaning brush is moved along the length of the solar panel in horizontal direction and vice-versa, which results in mopping action on the solar panel cleaning the panels. This frame is also consists of DC motors which will produced the rotational motion which is converted into linear motion. This action is also controlled by remote. The shifting of frame from one solar panel row to another solar panel row is done manually. The frame is moved in horizontal direction until the solar panel row ends. All this cleaning actions will consume a time of 80sec for mopping action for cleaning the one solar panel of dimension 1956-990-40(mm). Once one row of the solar panel is cleaned, it moves to another row and hence the cleaning process gets repeats.

4. CONCLUSIONS

The goal of Project is to create an automated solar panel cleaner that will address the adverse impact of soiling on commercial photovoltaic cells. Specifically, we hoped to create a device that will increase the efficiency of a soiled panel by 10% while still costing under ₹10,000 and operating for up to 7 years. Furthermore, a successful design should operate without the use of water and require only yearly maintenance. The current apparatus utilizes a brush cleaning system that cleans on set cleaning cycles. It uses a rolling brush to clean as it horizontally translates across an array of panels. The device is mounted on a set of battery powered-motorized wheels. At the end of the panel, there would be a docking station for it to recharge. Beyond improving the efficiency, we hope that our design will continue to expand the growth of solar energy globally. An efficient cleaner would not only help communities' transition into using cleaner alternative fuel sources, but help society, as a whole, move closer toward providing everyone the opportunity to harness reliable energy.

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