DESIGN AND DEVLOPMENT OF CLEANING AND COOLING SYSTEM

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ABSTRACT

The sun offers the most abundant, reliable and pollution-free power in the world. However, problems with solar energy, namely the expensive cost and inconsistent availability, have prevented it from becoming a more utilized energy source. It is well known that a decrease in the panel temperature will lead to an increase in electrical efficiency, so in recent years different cooling techniques have been proposed and tested experimentally.The solar panel is used to produce electricity by using the solar energy. In case of more light that impact on a panel, the result more power will be generate. Due to the upwards angle of solar panels, they are more liable to a build up the dust and bird dropping. The dirt which is not clean with just water or wiper brush. This is reducing the same amount of light impact on the panel and reducing panel output. The solar panel manufacturers and installers are claimed about the projected energy figures that based on the optimum performance of clean solar panel. Due to build up the dirt on solar panel, that can adversely affect the panel's ability to meet that projected figures. So it is necessary and important to clean the solar panel in order to protect and get more power output. So we are design and develop the automatic machine which is cleaning & cooling the solar panel and improve the panel efficiency. This project presents a solution focused on increasing efficiency of photovoltaic module by reducing losses due to warming photovoltaic cells.

Keyword : - *PV solar panel, cleaning, cooling, efficiency improvement.*

1. INTRODUCTION

Green technologies are becoming more and more common. Thousands of photovoltaic (PV) panels and solar collectors have been installed all over the world. In 2013, 39 GW of solar PV system installations were completed, with REN21's reporting growth of 139% in solar PV installation on a year-to-year basis. The desire to increase the effectiveness of PV panels led to the development of socalled photovoltaic thermal hybrid solar collectors, sometimes known as PVT systems. These systems combine photovoltaic cells, converting electromagnetic radiation into electricity, with a solar thermal collector, capturing the remaining energy and removing waste heat from the PV module. The main advantage of this design is that coupling these two devices (PV system and solar collector) decreases the temperature of PV cells, thus increasing their electrical efficiency and operational life.

1.1 OBJECTIVE

To design a mechanism to detect obstructions on solar panels causing significant loss of power. To design a cleaning mechanism that runs across the length of the panels. To improve overall solar panel efficiency. To reduce cleaning cost of the cleaning process. To increase the life of plate reducing the labour cost.

1.2 SCOPE

The scope of this project is to enhance the efficiency of solar panel using a cooling & cleaning system. This project is that it will help in use of effective solar energy with higher efficiency for the solar panel output.

2. DESIGN

Design consists of application of scientific principles, technical information and imagination for development of new or improvised machine or mechanism to perform a specific function with maximum economy and efficiency. Hence a careful design approach has to be adopted. The total design work has been split up into two parts.

SYSTEM DESIGN : System design mainly concerns with various physical constrains, deciding basic working principle, space requirements, arrangements of various components etc. Following parameters are looked upon in system design. Selection of system based on physical constraints. The mechanical design has direct norms with the system design hence system is designed such that distinctions and dimensions thus obtained in mechanical design can be well fitted in to it. Arrangement of various components made simple to utilize every possible space. Ease of maintenance and servicing achieved by means of simplified layout that enables quick decision assembly of components Scope of future improvement.

MECHANICAL DESIGN : In mechanical design the components are listed down and stored on the basis of their procurement in two categories.

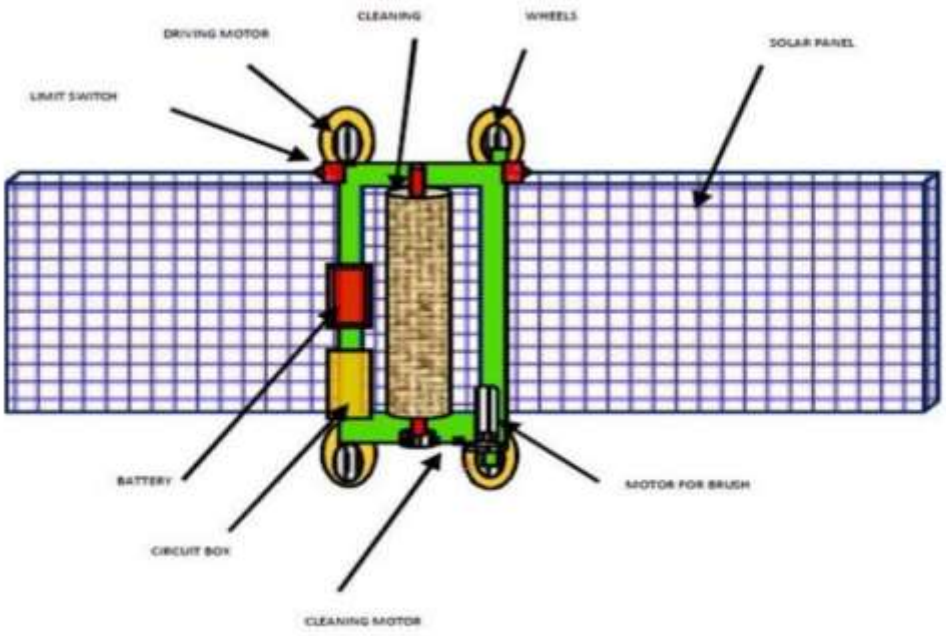

Fig -1: Concept of device

2.1 COST

Overall device cost us approx 10000 rs (market price) including the transport , welding , labour and components expenses. The list of components and quantity is given below.

Table -1: Components list

SR.NO	Component	Quantity
1	Solar panel	2
2	Solar charger unit	2
3	12 volt battery	1
4	DC motors	4
5	Ball bearings	2
6	Shaft	1
7	Fasteners	10
8	Supporting frames	2
9	Electronics controller	1
10	Water tank	1
11	Water pipes	2
12	DC pump	1
13	Cleaning liquid	1
14	Wheels	4

2.2 COMPONENTS LIST

The following components we use in our project.

- Motors
- Frames
- Tubes and hoses
- Pumps and electronic controllers

3. PROCESS OF WORKING

The cleaning unit moves on the central part of the panel in a back-and-forth motion. The wiper roller bundle is mounted on the fixture that unit reciprocates in the forward and backward direction to clean the solar panel. The cleaning unit along with the wiper moves along the central panel spraying the water droplets towards the other end of the panel. It forces the dust to move in the direction of the motion of the cleaning unit and finally flows it away at the edge of the panel. Once the cleaning unit reaches the other end, the water spraying stops and it again returns back. Once it reaches the home position, it sends the signals to the controller for feedback motion. The cleaning unit stops when solar panel temperature is reaches set optimum level. shows conceptual model of solar panel cleaning & cooling machine.

The main component of our machine.We have to clean the solar panel by dry cleaning process, for that we are using foam bundle brush of soft working on surface, so that it should not affect the transparency of solar panel in long term use. Now this brush will rotate at high speed for throwing of the dust from the panel. The rotating motion for brush is given to it by motor mounted beside it, the motor is of high rpm and low torque, so for balancing that two bearing supports are provided between then. This whole assembly is mounted on the frame; the ball bearing is used for mounting rotary roller brush. The frame with this assembly is mounted on four rollers wheel motor; all four rollers are having individual motors of high torque and low rpm. Below frame four rollers' wheels are given for travelling smoothly on solar panel frame. We have used electronics circuit in our machine by which we can set ON when solar panel temperature is increases & OFF after cooling of solar panel surface at set temperature value by cooling water pump operation which will shower water on panel. Our circuit is having two different modules, first is to operate the pump & second is to operate the panel cleaning system motor. On both the ends of the machine limit switch is mounted which will stop the machine as it will go on the one end of the solar panel row

3.1 ADVANTAGES

1) Portable. Autonomous self-cleaning & cooling mechanism that can be attached to solar panels and operated without human operation.

2) It is easy to construct, low cost and low maintenance. The surface of PV panel remains clean regularly to gives better efficiency of PV system comparing with old systems.

3) Cost of system modification is low & No need to purchase heavy machine components.

4) Working principle is quiet easy & Manual assistance is not required.

5) By using adjustable timer, user can clean & cool the panel as per convenience changes.

3.2 APPLICATION

This system work as an autonomous self-cleaning & cooling mechanism that can be attached to solar panels and operated without human operation to increases solar panel efficiency.

4. CONCLUSIONS

The main goal of the device is to make the solar panel more efficient and provide more output by detecting obstructions and cleaning and cooling the dust on the panels.

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