



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 5, Issue 3)

Available online at: www.ijariit.com

Fabrication of model of solar panel cleaning machine

Meet Prajapati P.

prajapatimeet663@gmail.com

Government Polytechnic, Dahod,
Gujarat

Tanuja Mishra P.

2tanujamishra9@gmail.com

Government Polytechnic, Dahod,
Gujarat

Manisha Prajapati M.

prajapatimanisha663@gmail.com

Government Polytechnic, Dahod,
Gujarat

ABSTRACT

The cleaning of dust particles on the solar panel is a huge job and time taking the process and requires a lot of manpower and money. To remove this limitation automatic system is a good choice for no man operations, it also economical and autonomous as it requires no man to monitor. This project implements a solar panel cleaning automatic systems which can self-charge it's a battery and clean the dust on the solar panel only during the night time.

Keywords— Chain mechanism, Cotton roller, Water pump, Water sprinkling

1. METHODOLOGY

For panel cleaning system a mechanical structure is developed .The arm is fitted on the solar panel connected with the DC motor. This arm rotates in both directions. The rotation of the arm is depends on the switch. For proper cleaning system, small piece of the cushion is attached to the cleaning arm which covers the entire area of the panel.

In accordance with the dimensions of the flat plate panel, the system consists of brushes driven by DC-motors. The movement of the brushes is controlled by switch. Photovoltaic front panel glass is getting dirty from dust, seeds, chemical rain etc. This dirty is expressed in percentage of the surface covered by spots. Current technology disadvantage is photovoltaic panel electricity generation efficiency decreases with dust, chemical or other spot on the cover panel glass. We convert it into an advantage with our invention Cleaning while water spraying with roll brush. The panel cleaning arm which cleans the panel by rotating the cleaning arm which is mounted on the top of the panel and the DC motor is connected to the cleaning arm.

1.1 Required components

1.1.1 Stand: It is used to support the whole panel cleaning system.

1.1.2 Solar panel: Photovoltaic solar panels absorb sunlight as a source of energy to generate electricity. A Photovoltaic (PV) module is a packaged, connected assembly of typically photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications.

A photovoltaic system typically includes an array of photovoltaic modules, an inverter, a battery pack for storage, interconnection wiring, and optionally a solar tracking mechanism.



Fig. 1: Solar panel

1.1.3 DC motor: A DC Motor is a class of electrical machine that convert direct current electrical power into mechanical power. The most common type rely on the forces produced by the magnetic field. DC motors speed can be controlled over a wide range by using a variable supply voltage or by changing the strength of current in the field winding.

Specification: Voltage: 12 V, Speed: 200 rpm, Current: 0.5- 1 A



Fig. 2: DC Motor

1.1.4 Brush: A brush is a type of wide brush with a long shaft used for cleaning surfaces. Unlike a broom, which has soft bristles to sweep dirt away, a scrubber has hard bristles for brushing. It may therefore be used wet, with water or cleaning fluids. Around the brush head there may also be a removable floor cloth or mop, either soaked in water for cleaning or dry for wiping dry. However, these days other cleaning implements tend to be used for such purposes.



Fig. 3: Brush

1.1.5 Battery: An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smart phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. It is used to drives the motor



Fig. 4: Battery

1.1.6 Shaft: A drive shaft is a mechanical component for transmitting torque and rotation, usually used to connect other components of a drive train that cannot be connected directly because of distance or the need to allow for relative movement between them. To allow for variations in the alignment and distance between the driving and driven components, drive shafts frequently incorporate one or more universal joints.



Fig. 5: Shaft

1.1.7 Bearing: A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; many bearings also FACILITATE the desired motion as much as possible, such as by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.



Fig. 6: Bearing

1.1.8 Water Sprayer: It is used to spray the water on the solar panel for cleaning purpose.



Fig. 7: Water Sprayer

2. WORKING OF SOLAR PANEL CLEANING SYSTEM

The solar panel cleaning setup was assembled and experimented for 1 week in campus of Government polytechnic Dahod. The setup is placed in open ground where full solar coverage is achieved from 10:00 am to 5:00 pm and power generated at different times was recorded. The battery was discharged before readings were taken with the help of digital multi-meter as shown in the figure below (discharged battery)



Fig. 8: Discharged battery

The following table shows the reading at different time in a single day.

Table 1: Power generated from solar panel during day time

S no.	Date	Time	Reading (V)
1	05-04-2019	10:00 AM	00.00
2		10:40 AM	00.34
3		12:00 PM	05.88
4		01:15 PM	08.52
5		03:00 PM	10.51
6		05:00 PM	19.96



Fig. 9: Solar panel cleaning machine

In the above figure the solar panel cleaning system is shown in its working mode, the cleaning is enhanced by with the water sprinkling system. This water sprinkling is carried out using small pump as shown in the figure. The water is sprayed directly on the solar panel during cleaning. Pressurized water is sprinkled with the help of rotary pump installed this can also be accompanied with compressed air flow through the surface of solar panel which will further improve the cleaning. Figure 10 to 13 shows the reading at different time.



Fig. 10: 12:00 PM



Fig. 11: 1:15 P M



Fig. 12: 3:00 PM



Fig. 13: 5 PM

Similarly readings were taken on subsequent days with the following minimum and maximum readings as shown in column D in the table below:

Table 2: Power generated from solar panel on subsequent days

S no.	Date	Time	Battery charging (V)
1	05-04-2019	10:00 AM to 05:00 PM	00.00 - 19.96
2	08-04-2019	10:00 AM to 05:00 PM	00.00 - 19.29
3	09-04-2019	10:00 AM to 05:00 PM	00.00 - 19.00
4	10-04-2019	10:00 AM to 05:00 PM	00.00 - 18.33
5	11-04-2019	10:00 AM to 05:00 PM	00.00 - 18.00
6	12-04-2019	10:00 AM to 05:00 PM	00.00 - 19.01

From the above readings, it is clear that the power generated from the solar panel is used for the installed application of solar panel as well as the cleaning setup. As the size of the solar panel is increased the power generated also increases with the increase in efficiency of the cleaning system

3. CONCLUSION

The solar panel cleaning machine is fabricated using chain roller mechanism. The solar power is used to run the cleaning mechanism. In addition to roller, water sprinkling is also setup which adds up to the cleaning mechanism. The cleaning of solar panel is very sensitive and plays important role in power generation and overall efficiency of the solar panel.

4. REFERENCES

- [1] Shaum's Outline of Theory and Problems of Machine Design. Published by McGraw Hill
- [2] Yadav, D. (2009). Garbage disposal plant mired in controversy.
- [3] Dr .K. Kumaresan M.E, Ph.D., Automatic sewage cleaning equipment
- [4] M. D. Pawar , Pranjali Lokhande1., Garbage Collection Management System
- [5] Norfadzlia Mohd Yusuf., Smart Garbage Monitoring System for Waste Management
- [6] Mr. Jobin Francis., Solar Power Smart Waste Bin