

# Design and Fabrication Waterless Solar Panel Cleaning System for Vehicle

Anikesh kalal<sup>1</sup>, Harshit shah<sup>2</sup>, Nihar Adani<sup>3</sup>, Tushar Bhavsar<sup>4</sup>, Rohan Gokhale<sup>5</sup>, Priyanka sharma<sup>6</sup>

<sup>1,2,3,4,5</sup>UG Student of Automobile Engineering, Indus University, Gujarat, India

<sup>6</sup>Asst. Prof., Department of AUTOMOBILE Engineering, Indus university, Gujarat, India

\*\*\*

**Abstract** - Energy is one of the world's key difficulties, and in India, energy supply has been a big issue for both urban and rural populations. Fuelwood and agricultural leftovers meet 60 to 70 percent of the country's energy demand. Solar energy is a renewable source of energy that is radiated by the sun and has a large potential. Renewable energy is critical in replacing petroleum-based electric energy. Solar power has emerged as a renewable energy source, and its use should be expanded. Solar PV modules are typically used in dusty settings, such as those found in tropical countries such as India. The dust collects on the module's front surface, blocking the incident light from the sun. It lowers the module's power generating capacity. If the module is not cleaned for a month, the power output drops by as much as 50%. An automatic cleaning system has been devised to clean the dust on the solar panel on a regular basis. The system detects dust on the solar panel and cleans the module automatically. The provided automatic cleaning equipment is more expensive and cumbersome than our approach in terms of daily energy generation.

## 1. INTRODUCTION

A vehicle with solar panels for usage on public roads and race circuits. Solar vehicles are electric vehicles that run on sunlight and are powered by self-contained solar cells. A rechargeable battery is usually used in a solar vehicle to help manage and store the energy generated by solar cells.

With the rising demand for solar energy, solar panel efficiency is more critical than ever. Solar panels, on the other hand, are inefficient; the typical peak efficiency for converting solar energy to usable energy is 11 to 15% [1]. PV panel contamination reduces panel efficiency even more. This buildup of dirt on the panels is a well-known consequence that can result in a loss of efficiency of up to 27% each year [2]. It's an automatic solar panel cleaner that seeks to cut down on existing solar panel array efficiency losses. To boost energy generation, the system cleans the surface of each panel. When used to commercial solar panel arrays, the method seeks to boost each panel's energy production by 10% on average. The technology is intended for use on solar vehicle, although it can be scaled up to all types of solar 2 systems. This technology will lessen the demand for fossil fuels, reduce the nation's impact on global

warming, and eliminate the possible dangers for human cleaners, in addition to lowering maintenance costs and enhancing electricity generation.

### 1.1 Problem Statement

We all know that the expense of fuel is rising every day, thus many are turning to electric and solar energy. Solar panels are installed on the roofs of many vehicles. For greater power generation efficiency, solar panels should be cleaned every couple of days or twice a week. It takes up to 2 liters of water to clean one solar panel plate, and they want to clean it manually on the roof, which is time-consuming and exhausting.

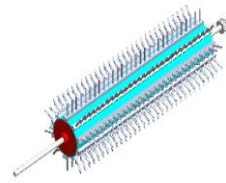
The impact of progressive water stains (scaling) on PV performance degradation must be researched, as well as relevant mitigation methods. Because the water used to clean the panels contains a highly soluble salt that damages the panels, the kind of salt depositing/adhering to the glass surface is determined by PV modules. Bird droppings and the cleaning that follows are particularly prone to discoloration. The enormous solar potential, averaging approximately 6 kWh/m<sup>2</sup>/day in these places, along with the sensitivity to a desert climate (and frequent dust storms), has been attributed to the impact of dust on the performance of solar collectors (including PV). Many studies show that solar panels reduce the efficiency with which they produce energy. As a result, periodic panel cleaning is required in order to produce and send the greatest amount of energy to the grid. Dirt and dust have a significant impact on solar panel performance, which is dependent on a variety of parameters and must always be estimated or analyzed for unique scenarios.

### 1.2 Objective

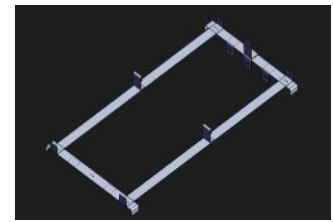
- To clean solar panels waterless and effectively.
- To reduce men's power.
- To increase solar panel energy output in remote places, on utility-grade sites, at a cheap cost, and without the use of physical labor.
- To implement the efficiency of solar panels.

## 2. LITERATURE SURVEY

Sr. no	Paper Title	Author	Published Year	Remarks
1.	Project Space solar panel automated cleaning environment.	Matt burke	2016	3.5% improvement in efficiency.
2.	Design and Implementation of a microcontroller-based automatic dust cleaning system for solar panels.	Satish Patil	2016	1.6-2.2% Improvement by regular cleaning.
3.	Microcontroller-based automatic cleaning of solar panels.	S.B. Halbhav	2015	25% losses due to tilt angle of 35' and furthermore due to dust.
4.	An integrated design of an auto clean and cooling smart PV panel.	Sumit das	2014	Titanium monoxide PV panels have 32% Conversion rate.
5.	Electrostatic cleaning system for removal of sand from solar panels.	Hiroyuki Kawamoto	2014	Use of electrostatic force to remove sand from the surface of solar panels.



ROLER BRUSH

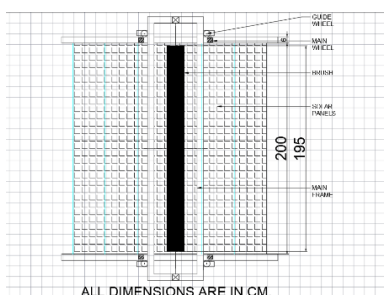


FRAME

## 4. WORKING

The solar panel cleaning system is made up of brushes that are controlled by a remote and are driven by DC motors to match the dimensions of the flat plate panel. The cleaning brush is moved along the length of the solar panel in a horizontal direction and vice versa, resulting in a mopping action on the solar panels that cleans them. This frame also has DC motors that generate rotational motion that is then transformed to linear motion. This is also a remote-controlled action. The frame is manually moved from one solar panel row to the next solar panel row. The frame is shifted horizontally until the solar panel row is complete. All of these cleaning activities will take an average of 80 seconds to complete for a single solar panel with a dimension of 1956-990-40. (mm). Once one row of the solar panel has been cleaned, the cleaning procedure moves on to the next row, and so on. The Moving Assembly and Cleaning Assembly make up the majority of the system.

## 3. DESIGN



TOP VIEW



SIDE VIEW



Moving Assembly



WATERLESS SOLAR PANEL CLEANING SYSTEM FOR VEHICLE

## 5. CONCLUSION

The project's purpose is to develop an automated solar panel cleaning to combat the negative effects of soiling on commercial photovoltaic cells. We aimed to develop a technology that would improve the efficiency of a dirty panel by 10% while costing less than \$10,000 and lasting up to seven years. A successful design should also run without the usage of water and only need to be maintained once a year. The current system makes use of a brush cleaning mechanism that cleans in predetermined cycles. It cleans using a rolling brush as it moves horizontally across a series of panels. The device is mounted atop a set of motorized wheels that are driven by batteries. There would be a docking station at the end of the panel for charging it. We anticipate that, in addition to enhancing efficiency, our design will help to accelerate the global expansion of solar energy. An efficient cleaner would not only assist communities in making the shift to cleaner alternative fuel sources, but it would also assist society is moving closer to giving everyone access to reliable energy.

## 6. REFERENCES

- 1) Heiman MK, Solomon BD (2004) Power to the people: Electric utility restructuring and the commitment to renewable energy. *Annal Assoc Am Geographers* 94: 94-116.
- 2) Elminir HK, Ghitas AE, Hamid RH, El-Hussainy F, Beheary MM, et al. (2006) (effect of dust on the transparent cover of solar collectors. *Energy Convers Manage* 47: 3192-3203.
- 3) Ashish Saini and Abhishek Nahar .Solar Panel Cleaning System. *ijir*.2017; 3(5):1222-1226.
- 4) Masuda S, Aoyoma M. Characteristics of electric dust collector based on electric curtain. *Proceedings of the General Conference of the Institute of Electronic Engineers. Japan, 1971, No. 821 Proc. of Albany Conference on Electrostatics (1971).*
- 5) Park Y B, Im H, Im M, et al. Self-cleaning effect of highly water-repellent microshell structures for solar cell applications. *Journal of Materials Chemistry*, 2011; 21:633-636.
- 6) Zhu Jia, Hsu Ching Mei, Yu Zongfu, et al. Nanodome solar cells with efficient light management and selfcleaning. *Nano Letter*, 2010; 10:1979-1984.
- 7) El-Shobokshy MS, Hussein FM. Degradation of photovoltaic cell performance due to dust deposition on to its surface. *J Renew Energy* 1993.