

# AUTOMATICALLY SOLAR PANEL CLEANER

Subhash Chaurasiya<sup>1</sup>, Anuj Singh<sup>2</sup>, Harsh Srivastava<sup>3</sup>, Harshit Mishra<sup>4</sup>, Vipin Kumar<sup>5</sup>, ER.  
Avadhesh Pratap Patel<sup>6</sup>

<sup>1,2,3,4,5</sup> Student of B. Tech fourth year, Dept. of Mechanical Engineering, Rameswaram Institute of Technology and Management, Lucknow

<sup>6</sup> Assistant Professor Dept. Mechanical Engineering, Rameswaram Institute of Technology and Management, Lucknow

## ABSTRACT

*In the modern age the need of energy consumption is increasing day by day. In India approx. 70% energy is generated by coal which produces various ill effect on environment such as global warming, atmosphere pollution, water pollution etc. To tackle this problem, we are moving renewable energy resources such as solar energy, wind energy.*

*We are looking towards renewable energy solar energy is most prominent source of energy source. These are various factor such as location of India and maximum sun light hours. We are using solar panel after some time on this plate dust, dirt and other substance are stick on the panel.*

*That creates a lot of problem, which gradually decrease the efficiency of the system. However, manually cleaning solar panels is hazardous and time consuming and suitable for small plant.*

*For this purpose, we create the automatically solar panel cleaner which is operate by the remote and wirelessly.*

*Maintains efficiency of solar panel by keeping them clean and roller brush clean all dust, dirt, grime and debris.*

*The solar panel cleaner robot makes use of a water tank with motorized pump along with 4x dc motor to achieve vehicle motion using caterpillar. Wheel motion and rolling brush operated by gear motor. The robotic vehicle is built over a metal chassis with a controller circuitry operated over R.F wireless remote.*

**Keyword:** - rolling brush, dust solar panel, DC motors.

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## INTRODUCTION

Sun is abundance source of energy. The earth gets energy from the sun in the form of radiation. Most of the solar energy is waste and hence to utilize the maximum use of solar energy. We developed solar panel which it converts solar energy into electrical energy with the help of solar panel. As the time passes, the efficiency of plant decreases when dirt, dust or other contaminants accumulates on the surface, resulting in a decrease in power output. You can clean small plant by manual method. But this is not feasible for the medium and large plants. Manual Cleaning of solar panels is a time -consuming and costly process, particularly in remote or inaccessible areas. An automatic solar panel cleaner that can keep the panels clean without human intervention would be a significant advancement. This project aims to design and develop an automatic solar panel cleaner that can remove dust and dirt from the solar panel surfaces regularly.

## OBJECTIVE

- To clean the solar panel effectively.
- To make the system automated using Arduino.
- To avoid the manual work.
- To avoid dust associated problems on solar panels.

## COMPONENTS USED

- Robotic Chassis
- DC Motors
- Wheels
- Rubber tracks
- Pump Motors
- Water Tank
- Piping, Screw & Bolts
- Controller Circuitry
- Bluetooth
- Motor Shafts,
- Mounts & Coupling
- Battery
- Solar panel

## DC MOTORS

Any member of the group of rotating electric motors known as dc motors transforms direct current electric energy into mechanical energy. The most prevalent types depend on the forces generated by induced magnetic field as a result of current flowing through the coil. Almost all kinds of dc motors have an internal electrical or electronic mechanism to sporadically change the direction of current in a specific area of the motor.



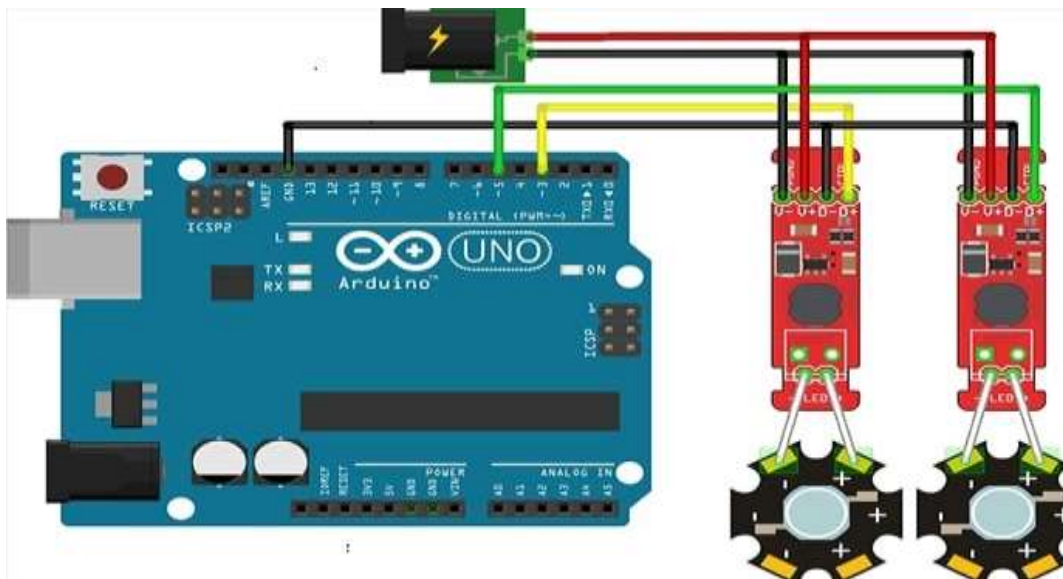
## BLUETOOTH

Linking a phone to a Bluetooth module (HC-05) Open Bluetooth setting on your phone and connect to 'HC-05' Using pin '1234' to pair the module with your phone. Try '0000' if '1234' does not work. You can use the app once the Bluetooth module and your phone have been paired.



## CONTROLLER CIRCUITRY

To ensure that the motor is started and halted in a way that is secure user and the machinery, a control circuit utilised. The thermostat for a home's air conditioner serves as an illustration of a typical control circuit.



## WHEELS

Robots with wheels moves across the ground by employing power wheels as their means propulsion. Using wheels instead of treads or legs makes this design simpler to design, manufacture, and programme for mobility on flat, moderately difficult terrain.



## Working Principle of Automatic Solar Panel Cleaner

The automatic solar panel cleaner design uses a robot that moves along a track installed on the solar panels' surface. The robot two sets of brushes and a water jet system to remove dust and debris. The brushes are made of soft materials to avoid damaging the panels' surface during cleaning. The robot is powered by solar panels installed on it. The robot's movement and cleaning operation are controlled by a microcontroller system that receives data from sensors to detect the level of dirt and dust accumulation on the panels' surface.



### **EFFECT OF DUST ON SOLAR PANEL**

The dust on the PV panel also increases the temp. at which PV panel operates. Dust thickness of  $500\mu\text{m}$  by virtue of this increasing the panel temp. by  $2^\circ\text{C}$  resulting in a reduction photocurrent and drop in the panel conversion efficiency by 30%.

### **Construction**

Design of Automatic Solar Panel Cleaner comprises several components, including control unit, cleaning mechanism, and power supply. The control unit contains the program that manages the entire cleaning process, while cleaning mechanisms can vary depending on the system design. For instance, some systems use brushes, while others use rotating wipers, soft absorbent materials, or even robots for cleaning the solar panels. The power supply can vary from solar to electric power process, along with backup power sources for uninterrupted solar panel system.





### Advantages of Automatic Solar Panel Cleaner

There are several advantages to using automatic solar panel cleaners.

1. Increase efficiency: Automatic solar panel cleaners can increase the panel efficiency by removing the dirt and debris that block the sunlight.
2. Save Time and Labour: It can Save time and money spent on labours and its result in more consistent in cleaning.
3. Reduce water use: Many automatic solar panel cleaners use less water than traditional method, preventing water wastage.
4. Ensure Safety: Automatic solar panel cleaners eliminate the requirement for manual labour and ensure the safety of workers on the job.

### Applications

- Large scale solar power producing plants.
- Rooftop solar panels at homes and offices.

### COST ANALYSIS

Robotics chasis	1500
Motors assembly	1800
Wheels	1000
Rubber track	300
Water tank	100
Pipe, screw & bolt, mounting & coupling	350
Controller circuitry	1500
bluetooth	400
battery	1200
Solar Panel	4000
<b>Total cost</b>	<b>12150 (INR)</b>

### Results

The automatic solar panel cleaner design was successfully developed and tested in a laboratory environment. The robot moved smoothly along the track, and the brushes and water jet effectively cleaned the panels' surface.

The microcontroller accurately detected the level of dust on the panels, and the cleaning operation was triggered when the threshold was reached. The power consumption of the robot was minimal, making it an energy-efficient solution for solar panel cleaning.

### Discussion

The automatic solar panel cleaner is a promising solution to the problem of solar panel efficiency loss due to dirt and dust accumulation. It provides an automated and efficient way to keep solar panels clean without manual intervention. The proposed design is relatively simple and uses readily available materials, making it cost-effective. The use of renewable energy source to power the robot makes it a sustainable solution.

### Conclusion

The design and development of an automatic solar panel cleaner has been successfully completed. The robot's movements and cleaning operation are controlled by a microcontroller system, which detects the level of dirt and dust accumulation on the panels' surface. The proposed design is energy-efficient and cost-effective, making it a viable solution. Further testing and refinement of the design would be necessary before deploying it on a larger scale.

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### BIOLOGRAPHY



He is currently student of B. Tech final year Dept. of Mechanical Engineering at Rameshwaram Institute of Technology and Management Lucknow.



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He is currently student of B. Tech final year Dept. of Mechanical Engineering at Rameshwaram Institute of Technology and Management Lucknow.



Er. Avadhesh Pratap Patel is an Assistant Professor of Mechanical Engineering Dept. at Rameshwaram Institute of Technology & Management, Lucknow. He has 15 Years Teaching Experience.



He is currently student of B. Tech final year Dept. of Mechanical Engineering at Rameshwaram Institute of Technology and Management Lucknow.

