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Design and Analysis of Solar Panel CleaningMachine

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Abstract - *With growing value of energy and challenge for the environmental effect of fossil fuels, implementation of eco-friendly strength resources like solar energy growing. For Solar energy electricity technology machine government additionally offer subsidy on their installation so that everywhere solar energy strength generation device is implemented but the cleaning of dirt from the solar panel is the foremost hassle so that we made Automatic solar panel cleaning device that cleans automatically. The purpose of project is to create an automated solar panel cleaner so as to deal with the impact of dust on solar panel. Specifically, we've was hoping to create a tool that increases the maximum strength output of solar panel by means of 10% (improving the amount of electricity lost). The main purpose of running is to clean solar panel with water spiral brush and rubber wiper. This project (solar panel cleaning machine) can clean dirt on the solar panels. Current labour based cleaning methods for photovoltaic are highly-priced, time ingesting and shortage monitoring skills. The packages for this layout can be prolonged for a Solar Farm, solar, Solar Rooftop and Floating Solar panels.*

Key Words: *Photovoltaic, Spiral brush, Rubber wiper*

1. INTRODUCTION

The increasing use of solar PV panels is pushed by using growing electricity desires, pricey electricity prices, and unreliable energy supply. Various solar-powered appliances have become famous, along with lanterns, warmers, fanatics, and networking devices. The obvious glass pane on solar panels collects daylight, but if it becomes grimy, it reduces absorption and conversion performance. Cleaning sun panels manually is tough and time-consuming, main to reduced strength manufacturing. Solar panel cleansing robots offer an alternative answer by lowering water wastage and human effort. However, they can nevertheless be labor-extensive and much less environmentally friendly. Maintaining smooth solar panels turns into greater crucial as sun energy initiatives make bigger globally. Using water for cleaning stays a cost-effective alternative for solar power plant owners. To deal with those demanding situations, a robotic with a solar-powered layout has been evolved, providing brushes and cars to clean panels frequently, saving water and time. This automated device pursuits to reduce dust and beautify energy manufacturing performance.

1.1 Objectives

1. Maximizing electricity output: The number one objective of an automated solar panel purifier is to make certain most energy manufacturing from the solar panels. By retaining the solar panels easy and unfastened from dust, and other debris, the cleanser enables optimize their efficiency and basic power output.

2. Increasing gadget overall performance: Solar panels can revel in a lower in performance due to the buildup of dust and particles on their surfaces. An automated cleanser goals to enhance the performance of the solar panel machine by means of often casting off any obstructions that may avert daylight absorption and conversion into power.

3. Enhancing device reliability: Clean sun panels are less probably to come upon problems together with hot spots or shading, that may negatively effect the reliability and toughness of the panel. By effectively cleansing the panels, an automated cleanser facilitates keep their reliability and guarantees the system operates optimally over an extended period.

4. Reducing water intake: Traditional techniques of cleansing solar panels often contain the usage of water, which can be a scarce useful resource in some regions. An automated purifier can include progressive cleaning strategies that minimize water consumption whilst nevertheless successfully eliminating dust and debris from the panels.

2. Literature Survey

• **Reeka Narang, Varsha Sharma (Issue: 11 | Nov 2019)** Sun power is a standout among the most productive yet easy wellsprings of power we approach. There are no multiplied fuel fees or situations, no connections to pollution, and it is both dependable and reasonable. Obviously, maintaining in thoughts the quit intention to bridle solar orientated strength you require get admission to to specific innovation. This tech relies upon on either little scale sun oriented photovoltaic (PV) systems but in foremost hassle of photovoltaic (PV) gadget soil and dirt particles collecting on photovoltaic (PV) panels reduce the sun electricity getting the cells, thereby falling normal energy overall performance.

• **Ram Jatan Yadav, Lakshay Saini, Devashish, Rishabh Tomar, Vipul Rana ISSN: 2277 -3878 (Online), Volume-nine Issue-2, July 2020**

In this studies paper, various studies revolving around how dirt and dust affect the overall performance of solar panels depending upon specific areas, as distinct regions have exceptional soil compositions and the way they are exceptional from each other. A new manner of technique to the domestic sun panel cleansing gadget, researchers have proposed many approaches to improve and classify the item and present it in an photograph within the beyond. However, there have few initiatives related to home cleansing of solar panels.

• **Akhil Mishra, Ajay Sarathe JETIR (ISSN-2349-5162)** In this paper we evaluation the diverse concepts to address electricity call for round the arena. The use of unconventional resources is growing hastily for plenty applications. Some unconventional assets of power are solar, wind and geothermal that are inexhaustible. Solar strength is considerable in nature and is being used for lots packages like road lights , residence maintain home equipment(cooking), water heating, agricultural and industrial purposes. One of the methods to harness sun power is accomplished through the use of solar photovoltaic panels.

• **Sambhaji S. Shankar, Mayur B. Bande , Swapnil A. Gore , Prof. Manmohan O. Sharma , Prof. A.V.Harkut**

Energy is one of the foremost problems that the arena is facing in India, the supply of strength has been one of the essential problems for both urban and rural families. About 60% to 70% of the power call for of the usa is met by way of gas timber and agriculture residues. Solar electricity is a renewable source of power, which has a great capability and it is radiated by means of the solar

3. Methodology

Automatic solar panel cleaning machine is very much beneficial in cleansing solar panel of sun rooftop machine or sun farms or ground Mounted solar machine, and many others. Many of solar panel cleaning machines are available however we evolved machine is a very simple in production and clean to function. Anybody can operate this machine effortlessly. Hence it's far very useful in solar farms, Rooftop solar machine. The time taken for cleaning could be very less and value is also very much less. Maintenance fee is less. Automatic solar panel cleansing robot is used for solar panel cleansing functions via the usage of brush, spray of water and wiper. Here we used nylon brush for putting off sticky dust in conjunction with brush rotation water is sprayed via nozzles on the panel's and after Brush one wiper is hooked up so that once water is spread on panel sticky dust is eliminated by brush and if dust at the panel then it's far cleaned by using the wiper. For powerful cleansing we attached a wiper at the cease. During the cleaning and shifting operation of machine a propulsion mechanism including pushed wheels and guide wheels. Scrubbing movement is carried out by the comb directing water closer to rear end. Preferably, a sweeper mechanism is established at the frame forwarded by way of propulsion mechanism and operated with such manipulate device for develop sweeping of a debris on solar panel floor. SPDT and DPDT relay are used to control the movement of device which takes the enter from restrict switches and offers upward push to the simulation of wheel in a synchronized way

4. .Calculation

Specification of solar Panel

Maximum Power	Pmax	10
Voltage at maximum Power	Vmp.	17.20V
Current at maximum Power	Imp.	0.58A
Open circuit Voltage	Voc.	20.20V
Shortcircuit current	Isc	0.66A
Tolerance		+ or – 5%
Normal Operating Cell Temperature		45 Degree Celcius

Before cleaning Output of Panel
Voltage = 12 volt
Current = 0.40 Ampere
Output in Watt = 12 X 0.40 = 4.8 Watt
After cleaning Output of Panel
Voltage = 18 volt
Current = 0.46 Ampere
After Cleaning Output = 8.28 Watt
Percentage increase in Output = 42.02 %

5. 3D Printing

3D printing or additive manufacturing is a method of creating 3 dimensional stable items from a virtual record. We used 3-D pinting for Designing of body for light weight and durability as in modern-day era Adoption of 3-d printing has reached essential mass as the ones who've but to integrate additive manufacturing someplace of their supply chain are now a part of an ever-shrinking minority. Where 3D printing turned into handiest suitable for prototyping and one-off production inside the early stages, it's miles now unexpectedly remodeling right into a production era. And we used 'POLYLACTIC ACID' as a cloth of 3-D printing of our version.

Fig: 3D frame

Model Design

1. **Design of Frame**

Actual Model

6. Expected Outcome

The dust and bird drop make a hotspot inside the panel, and it can maketemporary fail in the panel. Dry cleansing can' no longer do away with all the dirt on the floor of the solar panel, but it could dispose of the outer layers of the dust. Cleaning solar panel with water increases the cleansing performance by putting off majority of the dust deposited on the panel. This device is made up of lightweight material (Polylactic Acid PLA), so the power ate up is low. Comparing the costs of cleaning by means of Manual operation and Automatic operation the value for automatic cleaning is proved to be extra monetary and considerably much less bulky especially in structures having huge range of sun panels. Also common periodic cleaning guarantees that the sun panel works with a suitable transmittance always at all times.

Due to Air Pollution Exposure to outdoor Dust for 2 months Loss of 6.5% in energy output of PV For 1 year = 6.5 X 6 = 39%Loss of power 39 %.In Desert Loss of power out put in one year 40%

7. Acknowledgment

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