



Automatic Solar Cleaning System

¹ Ms. Priyanka S. Patil, ²Aniket Mali, ³Ninad Malekar, ⁴Viraj Etam, ⁵Swastik More

¹Lecturer, ²Student, ³Student, ⁴Student, ⁵Student

¹Electrical Engineering Department,

¹Rajarambapu Institute of Technology, Rajarnnagar, India.

Abstract: Solar photovoltaic plants are generally used as clean energy generation. For the better efficiency and to increase the life of plant we should have to clean it the dust and dirt and accumulated due to environment, which reduce output of the panels 20%. incoming water cause damage the control system then the solar and photovoltaic plants become susceptible to fault a failure Cleaning of Solar caused major difficulties to many solar plant operator/ humans this automatic solar cleaning system allows an easy and fast performance. In this system photovoltaic panels, Differences Measurement unit, Arduino Nano, Brush & spray mechanism. Motor And spray valve this system reduce time, and also increase the efficiency of the panel.

IndexTerms - Arduino, Dust removal, Solar panel cleaner, photovoltaic, LDR.

I. INTRODUCTION

In now days solar panels generally cleaned by people's human but it is risky operation and also time required for cleaning. Hence, we design automatic system for solar panel cleaning microcontroller are used, DC Motor Driver. IC can control the set of two dc motor at any direction. In this system we use new technologies for the better performance, this system provides 32% better energy output also by using this system we reduce man power. dust, Dirt accumulated in solar panel that cause output efficiency, this system observes the dust or dirt on solar panel and it will be Cleared automatically. Arduino will send signal to brush spray mechanism and motor spray valve control Brush and spray mechanism is used to, clean the panel and spray for spraying water on it and motor and spray valve control is used to move the cleaner on the surface of solar panel.

II. PROBLEM STATEMENT:

Solar panels work by allowing light into the solar cells. The more light that hits a panel, the more power it will generate. Due to the upwards angle of solar panels, they are more prone to bird droppings and a build-up of general dust. Sand, moss and dirt that does not wash off with just rain. This reduces the amount of light hitting the panel and reduces its output. As the projected energy figures claimed by solar panel manufacturers and installers are based on the optimum performance of clean solar panels, this build-up of dirt can adversely affect the panel's ability to meet those projections. Therefore, it is important to clean solar panels in order to protect and maintain your investment. Regular solar panel cleaning will also help you to make the most of the government feed-in tariff.

- **OBJECTIVES:**

1. Design a mechanism to detect obstructions on solar panels causing significant loss of power
2. Design a cleaning mechanism that runs across the length of the panels
3. Improve overall solar panel efficiency

- **SOLUTION:**

Due to growing costs of electricity and concern the environmental impact of fossil fuels, eco-friendly energy sources are necessary to implement. The main method for utilize solar power are mostly dependson the Solar panels by absorbing sun rays. Accumulation of dust on even one panel reduces their efficiency in energy generation. That is why we need to keep the panel's surface as clean as possible. Current labor-based cleaning methods for Solar panels are costly in time, water and energy usage and lack automation methods. So, we have to develop automatic cleaning machine which can clean and easilymove on the glass surface of panels which helps in improvement of efficiency using Arduino

III. LITURATURE SURVEY

The solar sector has grown rapidly in recent decades, but solar panel cleaning and contingency planning have received very little attention.

The author Vamsi Krishna et al. have explained the importance of the author Vamsi Krishna et al, the idea of merely cleaning the dust off the solar panel throughout the day It is now night-time. The impact of dust has been explained by M. Mani et al. on the performance of solar photovoltaics [1]. It delivers an evaluation regarding the current state of research into the effects of dust on the performance of PV systems. Kutaiba Sabah and his colleagues have showed how to avoid the influence of self-cleaning solar panels. solar panels transmittance due to accumulated dust this investigation is a hybrid of two concepts. Analysis of dust losses in solar modules has been discussed by J. Zorrilla-Casanova et al. The goal of this study is to estimate the losses caused by dust deposition on the surface of PV modules. To achieve this, irradiance values collected by two mSi cells were recorded every ten minutes over the course of a year [3]. The impact of cleaning with water and surfactants on the performance of photovoltaic panels has been explained by K.A Moharram et al. The goal of this study is to remove dust from PV panels with the least amount of water and energy possible. To that end, the impact of cleaning PV panels with water and a surfactant was explored experimentally using non-pressurized water [5]. Natural dust build-up was avoided since it might not be evenly distributed on the surface of a solar PV panel, since it would be exposed to the environment naturally and the dust settlement could be affected by wind [8]. The influence of soiling on energy output for large-scale solar systems has been explained by A.M. Pavan et al. This can help us study the operation and maintenance responsible in choosing the proper washing schedule and method for their plants and avoid wasting money, and this research aims to evaluate the effect of soiling on energy production for largescale ground mounted PV plants in the southern Italian countryside. The findings of this study reveal that both the soil type and the washing process have an impact on pollution losses. [11]

IV. METHDOLOGY:

In our project we introduce the idea of special robot for PV cleaning, specialized in clean solar cell from dirt accumulation as well as to reduce the power loses. PV cleaning robot can be used without need for human intervention to speed up the work in the large PV farms. The robot moves in the tracks that are mounted on the photovoltaic panel structure.

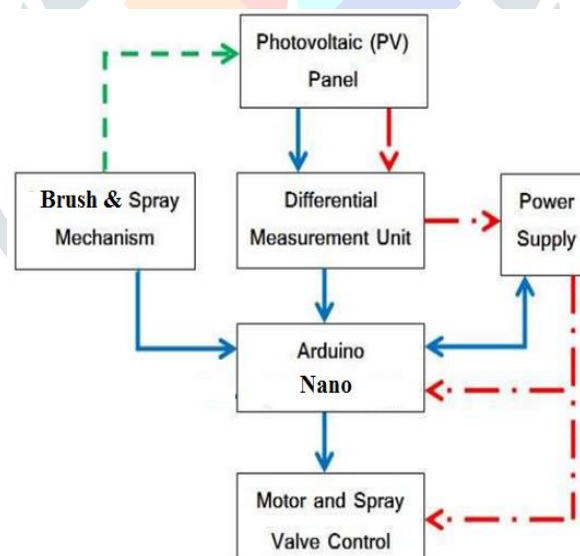


Fig 1. Block diagram of automatic solar cleaning system

The proposed solar panel cleaning system uses two-step cleaning techniques. First, an exhaust fan removes dust from the surface of the panel as much as possible. Four different types of sands are used here as dust. Then a wiper made of soft clothes are used to swipe. Therefore, no water is needed for the system for cleaning. This feature keeps the solar panel safe from scratch. The proposed solar panel cleaning system is fabricated with easily accessible components. The prime units are solar panel, microcontroller (Arduino Uno), metallic dc gear motor, buck boost converter and motor drive module.

1. The trolley is motorized with a DC motor to provide lateral motion to the system. The trolleys canbe controlled by battery.
2. On the top of the trolley, Water sprayer which is used to clean small particle of dirt by spraying water.
3. We attached roller brush with soft material and roller brush is rotates through shaft, followed by wiper which is clean the dust, leaves, etc

V. CONSTRUCTION AND WORKING:

The automatic solar panel cleaner works as follow first, the trolley is motorized with a DC motor to provide lateral motion to the system. Then trolleys can be controlled by battery. Next, On the top of the trolley, Water sprayer is used to which clean small particle of dirt by spraying water. We attached roller brush with then soft material and roller brush is rotates through shaft, followed by wiper which is clean the dust, leaves, etc. On the panel. And last, wiper again clean the water particle which remains on the surface.

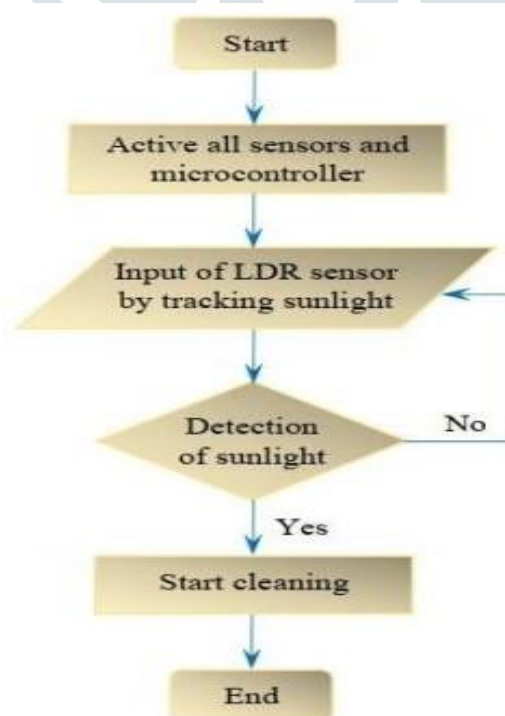


Fig 2. Prototype Model

To ensure sustainable environment, solar energy can play a vital role because it is an enormous, inexhaustible and green source of energy. Solar energy is directly usable for electrical power generation for a variety of applications which includes residential, commercial and industrial uses. It can provide the necessary amount of electricity without any threat to the environmental and health issues because no harmful gasses are emitted at the time of energy conversion. Moreover, the total sunlight that hits the surface of the earth in an hour and a half, according to the US department of energy, is adequate to manage the yearly energy consumption of the whole world. It is estimated that, the total amount of fossil fuel which is stored in the earth is equivalent to the energy produced from the sunshine on earth of around 18 days

Fig 3. Flowchart of proposed system

VI. RESULT



- The project was made with the working hardware model, which utilizes solar power which depends on the Solar panels by absorbing sun rays to keep the panel's surface as clean as possible with water, energy usage and lack automation methods which helps in increasing the efficiency of the solar panels.
- This system is economical, gives fast response, consumes low power, light weight, easy to handle and effective.

VII. CONCLUSION

In this project we design and implement the technology which Clean solar panel with water which increases cleaning efficiency by removing majority of the dirt deposited on the panel. Comparing the costs of cleaning by manual operation and automatic operation the costs of automatic cleaning is provide to be more economic and significantly less difficult particularly in systems having large number of solar panels. Also, frequent periodic cleaning ensures that the solar panel works with a good consistency at all times.

REFERENCES

1. SCCC701 Engineering Development Paper
2. Microcontroller Based Automatic Cleaning of Solar Panel
3. International Journal of Latest Trends in Engineering and Technology (IJLTET)/ Vol. 5 Issue 4 July2015/ ISSN: 2278-621X
4. J. Zorrilla-Casanova, M. Piliougine, J. Carretero, P. Bernaola, P. Carpena, L. Mora-Lopez, M. Sidrachde-Cardona. "Analysis of dust losses in photovoltaic modules" world renewable Energy Congress 2011. Sweden, 8-13 May 2011.
5. Ravi Tejawani, Chetan S Solanki. "360° Sun Tracking with Automated Cleaning System for PV" Department of Energy Science and Engineering, Indian Institute of Technology Bombay.
6. "Effect of Dust on Solar Panels". Katz. G.

