International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 08 | Aug 2022 www.irjet.net p-ISSN: 2395-0072

Automatic Solar Panel Cleaner using Arduino

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Abstract - *-Solar energy is the most abundant source of energy on the earth for all forms of life. With the use of solar panels, we can convert solar energy into electrical energy. However, keeping the solar panels clean presents numerous issues, since it necessitates the use of labour and results in lower efficiency. Our country's solar installed capacity is around 30.709 GW, and the Indian government has set a target of 100 GW by 2022.Nearly 42 solar parks have been built in India to provide land to solar plant developers. Solar panels' effectiveness decreases as a result of dust, grime, and moisture, and they become less efficient as well as less useful. Our project is a solution to these issues.*

Key Words **- Solar Cleaner, Arduino Solar Cleaner, Automatic Solar Cleaner, Arduino based, dust cleaner, panel efficiency**

1. INTRODUCTION

This project is about a cleaning system for solar panels. When dust collects on PV panels, these systems move around the length of the panels and lean the surface using various techniques such as brushing, watering, and mopping. This project was chosen because of the working circumstances that occur when dust collects on the panels. Cleaning is done with the assistance of motors positioned on the sloped panels. A mechanical system that combines brushes and sponges with water sprinklers to effectively clean dust and stains caused by water droplets. The Mulshi solar power plant, a 3 MW solar

power plant planned and built by Tata Power Solar in March 2011, supplies energy to over 2 million houses and has created jobs in the surrounding area.

2. OVERVIEW

In March 2011, Tata Power Solar completed a 3 MW solar power facility for the company, using cells and modules developed in-house. The project was developed on 13 acres of land, with the site's natural landscape intact. This solar PV project in Mulshi, India, was completed in a record-breaking nine months and put into service in two phases – 1 MW and 2 MW, respectively, in January and March 2011. Carbon Project Power: 3 Mwproject Type: Power Producer Footprint Reduced: 12 Tones Per Yeartime to Complete Project: 16 Months Land Approximately 13 Acres module Count: 16,000 Modules Crystalline Technology 230 Wp Si

3. CELL TEMPRETURE

As stated previously, expensive hazard: increased possibilities of an accident Problems with the lungs and respiratory organs are among the health issues that people face. Unavailability of labors for these jobs: workers are hesitant to take over work / jobs since they are not interested in doing them. Factors impacting solar power plant efficiency the state of the air According to new research, a combination of airborne pollutants and dust buildup can cause solar arrays to fail. Solar panels can only absorb a small percentage of the sunlight that strikes them, even in ideal conditions. The effectiveness of the solar panels was monitored over time as they became dirtier. They discovered that just a few weeks of build-up was enough to block out most of the sunlight.

4. SOLUTION

You should make sure that the solar panels are installed in such a way that they receive adequate airflow even as the temperature rises. When the temperature changes, the I-V and P-V properties at constant light are shown in the diagram [4]. Temperature effects are a byproduct of crystalline silicon cell-based modules' inherent characteristics. When the temperature drops, they produce more voltage, and when the temperature rises, they lose voltage. This temperature effect must be factored into any solar panel or system de-rating calculations.

5. SOLAR PITCH AND ORIENTATION

In the Northern Hemisphere, a non-tracking PV system should face true south. If you live in Flagstaff, Arizona, which is 35.2 degrees north of the equator, your panel should face directly south at a 35.2-degree angle. If the solar panels are to be mounted on a roof, remember to account for the roof's pitch. Adjust your solar panels twice a year for optimal performance. When the sun is high overhead in the summer, tilt the solar panel at a lower angle to catch more sunlight. Because the sun moves across

the sky at a lower angle in the winter, solar panels should be angled higher during this time. Solar tracking systems in large commercial systems follow the sun automatically.

Fig.1 Solar Panel with Assembly of Cleaner.

Fig.2 L293D motor driver

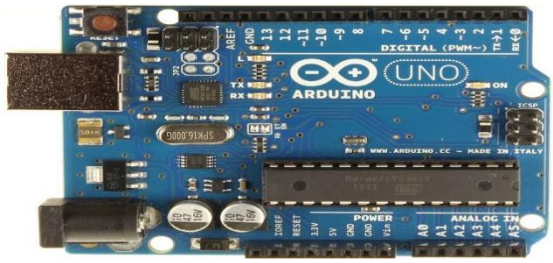

Fig.3 Arduino Uno R3

6. FRONT SURFACE SOILING& MAINTENANCE

When the surface of solar panels is covered with dirt or pigeon droppings that is not rinsed away by rain, solar cells cannot absorb light as effectively. Physical inspections and watering your modules on a regular basis can assist to alleviate the problem. Are you perplexed by solar technology? The best approach to choose solar equipment in Northern Arizona is to contact for solar. We can look at your location and determine the exact design and items that will work best for your needs. Solar cells require minimum annual maintenance, especially if the system is grid-tied; however, it is advised that cells be washed on a regular basis because dirt and dust reduce the effectiveness of solar panels. Rain can do the job in some regions, but if it doesn't rain or only rains once or twice a year, you'll need to wash solar panels or cells with soapy water. The best answer is whenever your panels produce less output.

6.Programming Of the Arduino

Programming of the system is according to the component used like LCD display of 16*2, L298N motor driver having two motors connected with it and controlled by the Arduino. The programing used in the system is as follows:

```
#include "LiquidCrystal.h"

const int voltageSensor = A0;

float vOUT = 0.0;

float vIN = 0.0;

float R1 = 30000.0;

float R2 = 7500.0;

int value = 0;

int In1 = 10;

int In2 = 8;

int In4 = 12;

int ENA = 9;

int ENB = 11;

int SPEED = 210;

LiquidCrystal lcd(7, 6, 5, 4, 3, 2); // RS, E, D4, D5, D6, D7

void setup()

{

//Serial.begin(9600);

lcd.begin(16,2);

lcd.print(" Measure < 12");

delay(2000);

}

void loop()

{

 value = analogRead(voltageSensor);

 vOUT = (value * 5.0) / 1024.0;

 vIN = vOUT / (R2/(R1+R2));
```

```
 //Serial.print("Input = ");
 //Serial.println(vIN);
 lcd.setCursor(0,0);
 lcd.print("VOLTAGE =        ");
 lcd.setCursor(9,0);
 lcd.print(vIN);
 delay(500);
{
 if(vIN < 1 )
 { pinMode(In1,OUTPUT);
 pinMode(In2,OUTPUT);
 pinMode(In4,OUTPUT);
 pinMode(ENA,OUTPUT);
 pinMode(ENB,OUTPUT);
 digitalWrite(In4,HIGH);
 analogWrite(ENB,250);
 delay(1500);
 digitalWrite(In4,LOW);
 delay(200);
 digitalWrite(In1,HIGH);
 digitalWrite(In2,LOW);
 analogWrite(ENA,250);
 delay(450);
 digitalWrite(In1,LOW);
 digitalWrite(In2,LOW);
 delay(200);
 digitalWrite(In1,LOW);
 digitalWrite(In2,HIGH);
 delay(450);
 }
 }
```

7.WORKING SEQUIENCE OF THE SYSTEM

Our project is related to cleaning of the solar panel the efficiency of the solar plant get reduced due to accumulation of the dust on the panel, Due to the dusty atmosphere the dust Gathered on the panel resist and create the barrier to the sunlight falling the surface of the panel. So as a remedy the automatic cleaning system is used for the panel . by using the cleaning system, we can increase the efficiency as well as increase the life of the panel. So, if the dust accumulates on it the output voltage of the panel can be reduced.

so, we connect the voltage sensor to the system to sense the voltage level if the voltage level is reduced the Arduino take signal from voltage sensor and activate the motor and start, he sprays motor to make panel somewhat wet and then activate another motor if the wiper to clen the all the dust on the panel this process will activate till the panel get clear and till recovery of the reduced voltage level.

8. CONCLUSION

Existing automatic cleaners are primarily designed for big arrays and are therefore unsuited for use on smaller arrays, such as residential rooftops. For individuals with limited space, this means that a smaller array can be installed, which is a significant benefit for those with smaller sites. Our technology can be used to connect solar panels to the roof. The solar panel cleaning system was originally built with the design requirements in mind. The following observations were observed once our working model was put to the test. The brush has a superb cleaning function, scrubbing the dust that was sticky in nature. It is less expensive to install and has a short payback period

ACKNOWLEDGMENT

It gives me great pleasure to deliver this project dissertation, but we would be remiss if we did not thank the contributions of a few individuals without whom this work would not have been possible. We would want to convey my heartfelt gratitude to our project guide and the esteemed HOD of the electrical department

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