

# AUTOMATIC DUST DETECTION MECHANISM FOR SOLAR PANEL CLEANING SYSTEM

Rahul B. Ingle<sup>1</sup>, Ravindra S. Chavan<sup>2</sup>, Rameshwar R. Kondke<sup>3</sup>, Nishant V. Mahadane<sup>4</sup>, Vishnu D. Phuke<sup>5</sup>, Prof. K. V. Nemade<sup>6</sup>

*1 UG. Rahul B. Ingle, Mechanical, S.Y.C.E.T. A'Bad, Maharashtra, India*

*2 UG. Ravindra S. Chavan, Mechanical, S.Y.C.E.T. A'Bad, Maharashtra, India*

*3 UG. Rameshwar R. Kondke, Mechanical, S.Y.C.E.T. A'Bad, Maharashtra, India*

*4 UG. Nishant V. Mahadane, Mechanical, S.Y.C.E.T. A'Bad, Maharashtra, India*

*5 UG. Vishnu D. Phuke, Mechanical, S.Y.C.E.T. A'Bad, Maharashtra, India*

*6 Assistant Prof. K. V. Nemade Mechanical, S.Y.C.E.T. A'Bad, Maharashtra, India*

## ABSTRACT

*In modern days, all area of industries are going to like automated, economically and environment freely to reduce the global warming problem. But, in production of metal by molding process no any wide change. Our main concept for this project is cleans the solar plate by automation system itself. Construct the automation system which clean the solar plate in few time we and lowest cost. So, project background is clean the solar plate by automation. The solar plate cleaning is done by different methods like manual workers, either help of the mop, spraying water on the solar plate etc..but our system is clean the solar plate by automation system. so solar plate efficiency is increase and the life of the solar plate is increase.*

*We designed and built an automated self-cleaning solar panel. The panel detect the presence of an obstruction shading a cell and actuate a cleaning mechanism that clean off the obstruction and therefore, restore the panel to normal capacity. To power the cleaning mechanism, we built our own power supplies which are supplied by a 12v battery.*

**Keyword :** -Arduino-Uno Microcontroller, Driver, IR Sensor, Arduino Programming.

## 1. INTRODUCTION

Now a day, energy-related aspects are becoming extremely important. They involve, for instance, a rational use of resources, the environmental impact related to the pollutants emission and the consumption of non-renewable resources. For these reasons there is an increasing worldwide interest in sustainable energy production and energy saving. Among the technologies that could play a role in the generation of sustainable and widespread energy, interesting solutions are represented by photovoltaic (PV) cells, wind generators, biomass plants and fuel cells. In particular, photovoltaic systems can be considered one of the most widespread solution with significant margins of improvement while ensuring the generation of energy with low environmental impact.

Solar energy is one of the main promising clean energy sources in future of the world. The technology of Photovoltaic PV is always on continuous developing in many applications, so it is generate electricity without dangerous effect on environment. It can utilize in pipelines catholic protection. Furthermore, Photovoltaic systems are today largely used in rural electrification, and grid connected systems, also in a water pumping irrigation and

remote check point etc. Because of their versatility, low maintenance, and long lifetime, photovoltaic (PV) modules are an alternative for small, off the grid energy projects. In recent years, the use of these devices in the greater Sonoran Desert region has increased considerably.

## 2.OPERATION

First IR sensor detects the dust on panel. If the sensor gives 1 signal to microcontroller means no dust accumulated or its density does not affect solar panel performance. When it gives 0 to controller means need to remove dust by cleaning mechanism. Microcontroller take action as per programmed in uploaded in it. It drives the drive mechanism within control of limit sensors and make one complete cycle for cleaning After further check IR module check for dust on panel if it is clean then wait for dust to be accumulated as on cycle is going on.



Fig -1: System Development

### 2.1 System Components

- **IR Sensor:-** used for detecting dust on solar panel
- **Aurduno uno:-** Open source low cost micro controller
- **Driver:-** 12volt dc motor driver
- **Limiting switch :-** used for limit the path

### 3. Arduino Programming

We are using an Arduino Uno, ArduinoDuemilanove, Nano, Arduino Mega 2560 , or Decimal. Aurdino programmed on aurdino open source software available on aurdino web site.The Programed use as below;

```
// automatic solar panel cleaning robot system
int SENSOR=3;
int LIMITSWITCH1=4;
int LIMITSWITCH2=5;
int MOTORD1A=6;
int MOTORD1B=7;
```

```

int MOTORD2A=8;
int MOTORD2B=9;
int BRUSHMOTORD3A=10;
int BRUSHMOTORD3B=11;
void setup()
{
pinMode (SENSOR,INPUT);
pinMode (LIMITSWITCH1,INPUT);
pinMode (LIMITSWITCH2,INPUT);
pinMode (MOTORD1A,OUTPUT);
pinMode (MOTORD1B,OUTPUT);
pinMode (MOTORD2A,OUTPUT);
pinMode (MOTORD2B,OUTPUT);
pinMode (BRUSHMOTORD3A,OUTPUT);
pinMode (BRUSHMOTORD3B,OUTPUT);

}

void loop()
{
if (digitalRead(SENSOR)==LOW)
move();
}

void move()
{
boolean STOP=false;
// FORWARD
digitalWrite(MOTORD1A,HIGH);
digitalWrite(MOTORD1B,LOW);
digitalWrite(MOTORD2A,HIGH);
digitalWrite(MOTORD2B,LOW);
digitalWrite(BRUSHMOTORD3A,HIGH);
digitalWrite(BRUSHMOTORD3B,LOW);
while(!STOP)
{
if (digitalRead(LIMITSWITCH1)==HIGH)
{
//REVERSE
digitalWrite(MOTORD1A,LOW);
digitalWrite(MOTORD1B,HIGH);
digitalWrite(MOTORD2A,LOW);
digitalWrite(MOTORD2B,HIGH);
digitalWrite(BRUSHMOTORD3A,LOW);
digitalWrite(BRUSHMOTORD3B,HIGH);
}
}
if (digitalRead(LIMITSWITCH2)==HIGH)
{
STOP=true;
//STOP
digitalWrite(MOTORD1A,LOW);
digitalWrite(MOTORD1B,LOW);
digitalWrite(MOTORD2A,LOW);
digitalWrite(MOTORD2B,LOW);
digitalWrite(BRUSHMOTORD3A,LOW);
digitalWrite(BRUSHMOTORD3B,LOW);
}
}

```



}  
 }  
 }

#### 4. CONCLUSIONS

There are many benefits from such a project. First, economical benefit, where there is no more money will be paid to a cleaning agency. Second, it is time saving, where there is no time will be spent to clean those solar panels. Besides that, frequently cleaning will ensure that the solar panel works with a good transmittance. Finally, safety and health of workers in sites. Since robots are capable of working in hazardous environments, more dangerous operations are being handled by robots. Thus the safety and health of workers is ensured, thereby reducing expenditures on health and medicines.

#### 5. REFERENCES

- [1]. Effect of dust accumulation on performance of photovoltaic solar modules in Sahara Environment, J. Bsic. Appl.Sci.Rec, Volume 2, 2012, Pages 11030-11036
- [2]. Fundamental studies on dust fouling effects on PV module performance, Syed A.M. Said, Husam M. Walwil, Solar Energy, Volume 107, September 2014, Pages 328-337
- [3]. Review of self-cleaning method for solar cell array, Gaofa He, Chuande Zhou, Zelum Li, Procedia Engineering, Volume 16, 2011, pages 640-645.
- [4]. Effect of dust on performance of PV panels, Shaharin Anwar Sulaima, Haizatual H. Hussain, Nik Siti H. Nik Leh, Mohd S. I. Razali, International science index, Volume 5, 2011.
- [5]. Effect of dust on performance of solar PV panel, International journals of chemtech research, Volume 5, June 2013, Pages 1083-1086.
- [6]. Effect of dust deposition on the performance of multi-crystalline photovoltaic based on experimental measurements, Hussein A. Kazem, Tamer Khatib, International journals of renewable energy research, Volume 3, No - 4, 2013
- [7]. Influence of dirt accumulation on performance of PV panels, Shaharin Anwar Sulaiman, Atul Kumar Singh, Mior Maarof Mior Mokhtar, Mohammed A. Bou-Rabee, Energy Procedia, Volume 50, 2014, Pages 50-56
- [8]. Energy yield losses caused by dust deposition on photovoltaic panels, Arash Sayyad, Mark N. Horensten, Malay K. Mazurmdar, Solar Energy, Volume 107, September 2014, Pages 576-604.