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REDUCING THE IMPACT OF SOILING ON SOLAR PANEL USING AUTOMATED WATER FREE SPLIT MICROFIBER CLEANING SYSTEM

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Abstract— The objective of this project is to clean the solar panel from soiling without use of water to prevent wastage of water as it is a life giving liquid. It will maintain the efficiency of the solar panel up to a greater extent. Through this maximum power will be gained and backup power will be higher. Due to this pressure from the power grids for meeting energy demand will be decreased.As solar panel efficiency depends upon intensity of sunlight falling on it but as the solar panel gets covered with dust particles, bird drops etc. required amount of sunlight is unable to strike the solar panel so it is very necessary to clean it at regular interval of time. Basically it is experimentally tested that if a solar panel is installed in harsh and arid region then if it is not cleaned at all then there will be a 35% loss in energy. If it is cleaned weekly then there will be an energy loss of 12% and if solar panel is cleaned daily then there will be 0% loss. As lot many ways exist to clean the system through water and other methods which are not cost effective and much wastage of water and manpower is required but all these demerits are sorted in our project in which we have used split fibre to clean the panel from dust and dirt.

Keywords— DC motors, microcontroller, Arduino IDE software,1298 H-bridge module, split microfiber , bush bearing wheels, pulley belt arrangement, IR sensors, solar panel .

I. INTRODUCTION

The peaking of most industries and impending climate change are critically driving the adoption of solar photovoltaic (PV) as a sustainable renewable and eco-friendly alternative. The solar systems and large-scale solar power plants are planned by precise engineering methods. The structure of wiring for minimum loss, the inverters efficiency and the modules orientation are carefully determined. All these will help to design the most powerful operating PV systems under the given site conditions with smallest losses.

In contrast, the solar facilities operation hardly gets appropriate attention to reduce the losses in a long time. There are vulnerable to, often overlooked, on-site omnipresent practicalities such as deposition of dust, bird droppings, sand, tree leaves and salted water-stains can significantly degrade the efficiency of solar thermal installations. This project is basically focussing on maintenance of solar panel installed in harsh and aired region (desert areas). To get the optimum output from the solar panel the solar panel has to be clean periodically depending upon to what limit the solar panel gets dusty in a day, week or month. Generally solar panel required little maintenance depending upon area where it is installed. Traditional solar cleaning system is water and labour intensives and not cost effective. So our project deals with all those problems and have uses an automated system which will clean the solar panels through their splited microfibers. There is no any extra power is required to run the cleaning system as we will install a separate solar panel which will drive the solar cleaning system throughout the day when required.

II. BLOCK DIAGRAM AND CIRCUIT DIAGRAM DESCRIPTION

Figure- 1 and figure-2 shows the proposed blocks and the circuit diagram of the total project. The project needs microcontroller (ATMEGA328P-PU), IR Sensors, motor driver L293D and is

designed for DC motors 12V- 100RPM and 500 RPM as shown in figure-1 and along with it split microfiber, bush bearing wheels, pulley belt arrangement and solar panel. Here, the arduino reads the input from the IR modules through the analog pins. Depending on the values received from the IR module, the arduino controls the two motors separately.

The L293 motor driver has a set of 2 inputs and 2 outputs for each motor. To control the motors, the 4 control points are connected to the arduino and the 4 output points to the motors, the 9V battery can be connected to the driver using the input power pins. IR sensors are used where when an object gets in front of it then the surface of the object reflects a part of the IR light back to the receiver, the receiver then outputs a LOW signal notifying that an object is in front of the sensor. Two DC motors- left and right are used of 100 and 500 RPM respectively.

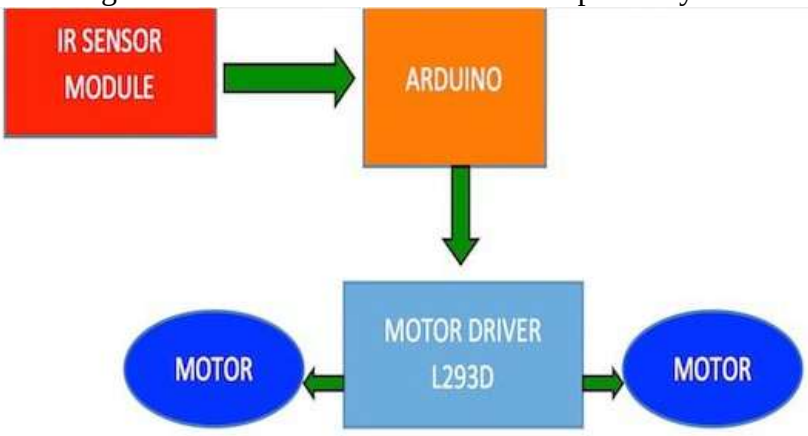


Figure 1:-Block diagram of the entire project

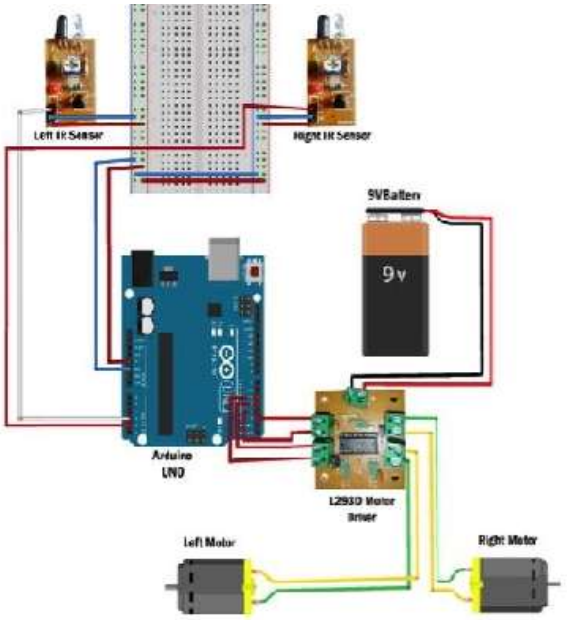


Figure:-2 Circuit diagram of the project

III. METHODOLOGY

Firstly, solar panel is installed in an inclined plane. It depends on the area where it is installed that how much dust particle are covering the solar panel within certain duration. On the side of solar frame the rail arrangement is made on which the cleaning system moves freely through their bearing wheels. Again on the cleaning system itself rail arrangement is made in which brushes made of split fiber are rotated with certain speed from which air coming out will swipe out dust and dirt through their split brushes and continuously move the swipe arrangement in back and forth motion and also the frame to the next place of the solar panels. This entire motion is done by only two gear motors

which will get power through separate solar panel installed on the moving system itself. Here the control over the motors and moving split fiber is done through microcontroller and relay arrangement made for the reversal of the motor. So, in this way no separate power arrangement is required just to run the cleaning system and also the system is totally automated so, avoids man power and damages made by them. The figure 1 below shows the split micrefiber used in the project and figure 2 shows the belt pulley arrangement with motor.

Figure 3

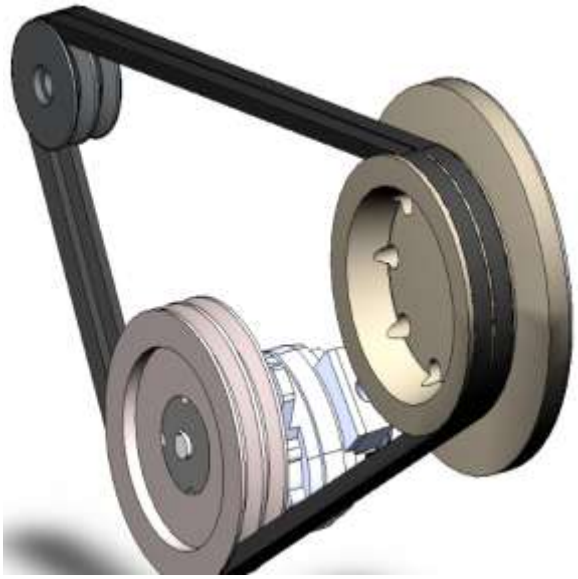
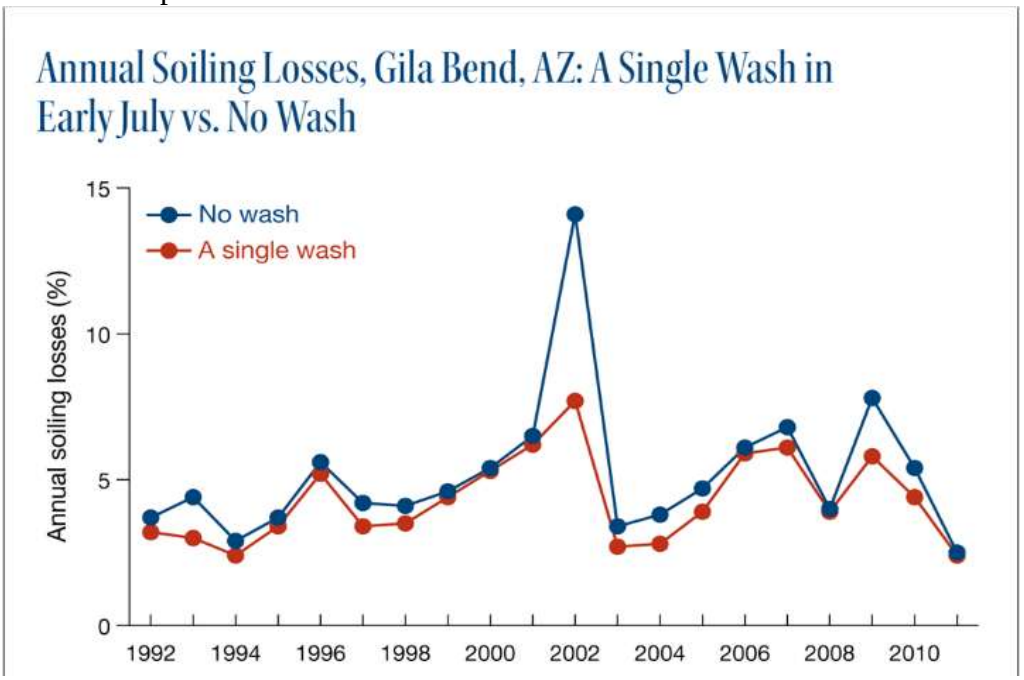


Figure 4

IV. RESULTS AND DISCUSSIONS

This project will meet the energy demands of the public sector and reduce the pressure from power grids for meeting the energy demand which shall help extensively in solving the energy crisis. With the solar panel being free from the impact of soiling the quality of power generation will improve. The figure below denotes the annual soiling losses when a single wash is provided in the early july season in comparison to no wash at all. Through the project we will get maximum output so there the investment does not go in vain. Moreover, the project is too environment friendly and does not need manual operation i.e. it is automated.



V. CONCLUSION AND FUTURE APPLICATIONS

The basic goal of this project is to reduce the impact of soiling by bringing into use cost effective and environmental friendly split microfiber which assures no wastage of water as water is no where being used as well as no separate power source is required to run the system because separate solar panels have been installed for them to operate. The system is totally automated therefore less operational as well as maintenance cost will be required. In future the this project holds application in rural areas, highways where supply of power from grids is difficult, it can be installed in harsh and arid regions where water facilities are not available. It can also be extensively used in railway stations, hospitals, institutions and remote areas.

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