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Automatic Solar Panel Cleaning using Arduino

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ABSTRACT: Solar panel is vulnerable to accumulated dust on its surface. The efficiency of the solar panel gradually decreases because of dust accumulation. In this paper, an Arduino based solar panel cleaning system is designed and implemented for dust removal. The proposed solar panel cleaner is waterless, economical, and automatic. The two-step mechanism used in this system consists of an exhaust fan which works as an air blower and a wiper to swipe the dust from the panel surface. A dc motor is used to power the wiper. Since the system does not need water to clean solar panel, it avoids the wastage of water and is effective in desert areas. Experimental results show that the proposed cleaning system can operate with an efficiency of 87-96% for different types of sand.

KEYWORDS: Arduino, Dust removal, Sand removal, Solar panel cleaner, Air blower.

I. INTRODUCTION

The Solar energy is the most abundant source of energy for all the forms of life on the planet earth. The technology of photovoltaic (PV) is developing continuously in many applications, so it generates electricity with no harmful effect on environment. Nowadays, energy-related aspects are becoming extremely important. They involve, for instance, a rational use of resources, the environmental impact related to the pollutant's emission and the consumption of non-renewable resources. Various source of energy like coal, gas, hydro, nuclear, diesel and some of them are going to get exhausted within few years. For these reasons there is an increasing worldwide interest in sustainable energy production and energy saving. But the solar technology has not matured to the extent of the conventional sources of energy. It is facing lots of challenges such as cost, unpredictability of nature and low efficiency of the panel. The main factor that affects a PV panel's efficiency is dust, which can reduce its efficiency by up to 50%, depending on the environment. The solar PV modules are generally employed in dusty environments which is the case in tropical countries like India. The cleaning system designed cleans the module by Arduino programming control. The main objective is to remove the dust in the photo-voltaic modules to improve the power generating efficiency of the solar power generation system. Automatic solar panel cleaning system based on Arduino for dust removal. In this paper, an Arduino based solar panel cleaning system is designed and implemented for dust removal. The proposed solar panel cleaner is waterless, economical and automatic.

II. RELATED WORK

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 is 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. a solar panel is placed in the top left corner which produces dc electrical power. A microcontroller is seen just under the solar panel. A buck boost converter is shown in the right side of solar panel which takes input from the solar panel and maintains constant voltage supply.

III. PROPOSED ALGORITHM

The technology of photovoltaic (PV) is developing continuously in many applications, so it generates electricity with no harmful effect on environment. Nowadays, energy-related aspects are becoming extremely important. They involve, for instance, a rational use of resources, the environmental impact related to the pollutant's emission and the consumption of non-renewable resources. Various source of energy like coal, gas, hydro, nuclear, diesel and some of them are going to get exhausted within few years. For these reasons there is an increasing worldwide interest in sustainable energy production and energy saving. But the solar technology has not matured to the extent of the conventional sources of energy. It is facing lots of challenges such as cost, unpredictability of nature and low efficiency of the panel. The solar PV modules are generally employed in dusty environments which are the case tropical countries like India. The dust gets accumulated on the front surface of the module and blocks the incident light from the sun. It reduces the power generation capacity of the module. The power output reduces as much as by 50% if the module is not cleaned for a month. The cleaning system has been designed cleans the module by controlling the Arduino programming. To remove the dust in the PV modules to improving the power efficiency. 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.

IV. ALGORITHM FLOWCHART

- 1) Start.
- 2) Initiate all Ports.
- 3) Get sensor data.
- 4) Check timer threshold time if time exceed turn on motor.
- 5) Display sensor data on LCD.
- 6) Stop.

V. CONCLUSION

Economic benefit, where there is no more money will be paid to a cleaning agency. 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. 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. The performance analysis of the experimental setup is purely based on the amount of power generated on the dusty panel and a cleaned panel. The output power may reduce considerably by the large amount of dust accumulation on the panel. Dry cleaning can eliminate the dust particles on the surface. The assembly is found to be lightweight. In comparison of costs in manual operation cleaning and automatic cleaning, the cost for automatic cleaning is demonstrated to be more economic and significantly less burden particularly in the system having large number of solar panels. The power output is varying for the different weather conditions. A regular periodic cleaning ensures the variation of power measured in both before and after cleaning conditions by showing the significant performance of the cleaning technology.



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