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Automatic Solar Panel Cleaning System Based on IOT

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Abstract: This paper contains waterless cleaning system method for solar panels. The solar panel system available for studying this work is inclined from top to bottom which provide a degree of slope to solar panels. The cleaning mechanism is placed on the main support frame to clean the surface of the solar panels which move upwards and downwards according to width of the solar panel and main frame. This operation is controlled by a control unit for the cleaning system of solar panels. The cleaning system removes the dust, dirt, sand and mass from the solar panel surface which results in improving efficiency.

Keywords: Solar cleaning mechanism, DC Geared motor, ESP 8266, Limit switch, Proximity sensor.

I. INTRODUCTION

Solar power is the cleanest, most reliable form of renewable energy available, and it can be used in several forms to help power your home or business. Most of the electricity generation methods produce pollution. There is a demand of improving efficiency of solar power generation in industries today. The maximum efficiency of a large solar panel suffers from the major problem of power loss. For this problem we are proposing an automatic solar panel cleaning system. The microcontroller device is used in this system, which is used for the control of the system this makes cleaning process easy and it does not require manual assistance. The impact of fossil fuel on the environment and increasing cost of electricity, therefore eco-friendly energy source of solar power is increase. Currently solar panel cleaning is done manually using water which is costly and not acceptable. There is a demand of improving the efficiency of solar power generation in industries today. The maximum efficiency of a large solar panel is up to 32%. This efficiency drops down drastically due to dust accumulation, unwanted materials, atmospheric conditions etc. Current solar panels setups suffer a major power loss when unwanted obstruction covers the surface of the plane. The obstruction turns the shaded cell into a resistor, causing it to heat up and consume extra power. To address this issue, we will engineer an automatic cleaning of the solar panel. Our mechanism to combat the power loss indirectly resulting into efficiency loss is unique, self-reliant and easy to use. The microcontroller kit is involved which once programmed makes the cleaning process easy, duration wise and need not require any manual assistance towards it.

II. FACTORS AFFECTING SOLAR PANEL

A. Effect of Dust on Solar Panel

As accumulation of dust on solar panels reduces the efficiency and reduction of power output, thus resulting in loss of power generation. This particular problem is responsible for the short life span of solar panels[3]. Most widely used method of cleaning the solar panels is through manual labour. Apart from large time taking, there is risk of damage to the expensive solar panels by the unskilled labour which is involved in this method

B. Effect of Ambient Temperature

There are various ambient condition that affect the output of solar panel. This factor should be taken in consideration Temperature has an effect on efficiency and maximum PV output of a solar panel. The hot panel generate minimum power.

C. Effect of PV Technology Type

However, another way to increase the efficiency is to concentrate sunlight on PV cells using inexpensive reflective material such as lenses and mirrors[2]. There are various ambient conditions such as irradiance, temperature and dirt/dust that affect the output of a PV power system.

III. METHODOLOGY

A methodology for automatic solar panel cleaning system based on IOT. The cleaning system includes a supportive frame that enable bi-directional movement of cleaning assembly. A supportive frame has a left and right moment as well the main frame has up-down moment. The whole assembly is made up of aluminum constructive profile. The supporting elements are connected to main frame, each have a different functions depends on wheel arrangements. The wheels enable the main frame which moves along the solar rows. A cleaning frame is configured for moving along with the main frame. Different type of sensors are used in cleaning system. Two sensor are used for leftward and rightward movement of main frame on rail as well as other two sensor are used for upward and downward motion of cleaning frame.



Fig1: Wheel Arrangement



Fig 2: Wheel Assembly



Fig 3: Cleaning Frame



Fig 4: Solar Cleaning Model

IV. CONCLUSION

With rising implementation of photovoltaic arrays, a new method of cleaning and inspection is necessary. Complete cleaning is especially important since the obstruction of a single panel with debris affects the energy generation for the entire array. It is extremely important that all cells operate at peak efficiency since they are connected in series. On comparing the cost of cleaning with manual method, our smart cleaning mechanism is more efficient.

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