Development of Waterless Solar Panel Cleaner in Arid Areas

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Abstract: The solar panel is work by allowing the light into solar cells. The lighter that impact on a panel, the result more powers it will be generating. Due to the upwards angle of solar panels, they are more liable to a build up the dust and bird dropping. The dirt which is not clean with just rain. This is reducing the same amount of light impact on the panel and reducing panel output. The solar panel manufacturers and installers are claimed about the projected energy figures that based on the optimum performance of clean solar panel. Due to build up the dirt on solar panel, that can adversely affect the panel's ability to meet that projected figures. So it is necessary and important to clean the solar panel in order to protect and get more power output. So we are design and develop the automatic machine which is clean the solar panel and improve the panel efficiency.

Keywords: Solar panel; motor; Roller Brush; efficiency; dust affect.

1. INTRODUCTION

The accumulation of dust on the surface of a photovoltaic module decreases the radiation reaching the solar cell and produces losses in the generated power. Dust not only reduces the radiation on the solar cell, but also changes the dependence on the angle of incidence of such Radiation. Research show that the mean of the daily energy loss along a year caused by dust deposited on the surface of the PV module is around 4.4%. In long periods without rain, daily energy losses can be higher than 20%. In addition, the irradiance losses are not constant throughout the day and are strongly dependent on the sunlight incident angle and the ratio between diffuse and direct radiations. That's why it becomes important to clean the solar panel modules on a regular basis. So we had developed Solar panel cleaning robot which cleans the solar panels automatically. This results into increase in efficiency of solar panel and hence the Productivity of Solar power plant increases. The use of solar PV modules as the power source is increasing day by day. This increasing demand of the solar PV modules has encouraged people to work in this field, to increase their efficiency and make them more economically viable. There are several hurdles in making their use affordable for the people, for both the off grid as well as the on grid solar power system. The research related to the characteristics of semiconductors used in solar cells has limited the efficiency of PV systems to 15–20%. There are several losses linked with the power generation using solar panel like shading loss, wiring loss, sun tracking loss and soiling loss. Among all these losses the most critical one for the tropical countries is the soiling loss, which is due to the accumulation of the dust, dirt or other particles on the glass of the PV modules. So, in these areas there is no option other than cleaning the PV modules to maintain the high-power output, but as the PV modules are mounted at greater height on the roof for avoiding the shading in the off-grid system, their access is difficult and risky. Also, the panel cleaning is required to be done once or twice a day in the dusty areas, which would be cumbersome if done manually. So, there is a necessity of developing a system to clean the solar panel automatically, to reduce the loss of power due to soiling.

2.1 Literature Survey of Soiling effect on Solar Panel :

Ashish Saini et al [1] Designing & studying the basic prototype. Choosing the proper microcontroller. Improve the efficiency of the pv panel after being washed by almost 15-20%. Rupali Nazar [2] Solar tracker Use of this method can effectively improve the efficiency of solar power generation. V.A Ballal et al [3] This system is simple control implementation and energy gain up to 15%

for a cloudy day. Amit Kumar Mondal et al [4] Efficiency enhancement would have been much better significant value. Priya Shukla et al [5] The main purpose is to reduce risks & limits to workers. K.S.Margaret [6] Tackling the dust accumulation on pv panels and further improvement .Gandhi Mayank et al [7] Easily maintainable & low of cost. Power consumption is also less. S.G.Kulkarani et al [8] No external power are required as a self cleaning system take its power from the battery of the solar panel. Z.H.Bohari et al [9] Efficiency can improve by using ir sensor & also sensor less pv panel needs no sensing ng material but only needs coding. Athira Sivan et al [10] It can improve stability and also with the use of wiper technique it's cost is also reduces. L.Mora-Lopez et al [11] Estimation of energy losses produce by dust have to be calculated in different way. N. Ketjoy et al.[12] Used to find the mathematical relationship between accumulative dust on pv module & also used to predict the energy output. Abhishek Rao et al. [13] A comparative analysis of i-v curves led to understanding of the phenomenon of power loss due to dust accumulation on pv surfaces.

2.2 Literature Survey on waterless cleaning System :

Miqdam T. Chaichan et al. [14] Relative humidity affects efficiency of pv as it affect the current, voltage & power. Kutaiba Sabah et al [15]Frequently cleaning will insure that the solar panel work with good transmittance. M.R.Maghami et al [16] This paper has investigated the partial shading of pv module by soil which has accumulated on the surface of the pv. H.K.Elminir et al [17] Deduction in glass normal transmittance depends strongly on the dust deposition with tilt angle with respect to wind direction. R.Saidur et al.[18] Increases the wind velocity more heat can be removed & higher air velocity, lower the relative humidity in atmosphere. E.Filemon [19] A procedure for determination of variation in time of the moment acting on the shaft for fixing the number & location of pin reverse. H.M.Badran [20] It aim to help to minimize its effect on measurement by applying the cleaning method for longer time for best scientific reason

2.3 Literature Survey on increasing efficiency:

Sue Bloomfied et al.[21] The cost of maintenance battery at least once in a year of solar pv panel. Shyam vekaria [22] The cost of pv panel cleaning system is get reduces. Daniel Shapiro et al [23] This cleaning system services will save money and keep your panel working in optimal condition. Umayal R.M.et al [24] Electrostatic precipitator helps in utilizing the solar energy effectively and efficiently. Terry Green et al [25] System maintained the battery charged when there was no cleaning and sufficient power was available.

Conclusion:

The effects of presence of dust were studied using falling leafs, dust, bird dropping. The dust has a major impact on the efficiency and performance of the solar panel. The reduction in the peak power generates can be up to 10% to 20%. By the observation, it is observed that power reduction due to dust accumulated on the panel and it can be improved by using the cleaning method, there is increase in power and efficiency of solar panel. This is easily maintainable and low of cost. Power consumption is also less for this process. Finally results showed that reduction in the peak power generated.

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