A REVIEW PAPER ON IMPROVING THE EFFICIENCY & THE PERFORMANCE OF SOLAR PANEL BY THE USE OF SILICON PHOTOVOLTAIC PHASE-CHANGE MATERIALS.

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ABSTRACT -. The present research is done in some extent and going on to maintain high photovoltaic (PV) efficiency & increased operating PV life by maintaining them at a lower temperature. Solid-liquid phase change materials (PCM) are integrated into PV panels to absorb extra heat by latent heat absorption mechanism & maintain PV temperature. Electrical & thermal energy efficiency analysis of PV-PCM systems is conducted to calculate their effectiveness in two different climates and conditions. Finally costs incurred due to inclusion of PCM into PV system & the resulting changes are discussed in this paper. The results show that such systems are financially viable in higher temperature & higher solar radiation environment. An operating temperature is important parameter of solar panel. As temperature of solar panel is increased ,efficiency of solar panel decreases. That means that the operating temperature of PV panel is minimum then maximum efficiency of solar panel maximum is obtained. Different methods are used for solar panel first we have used to Cooling Technique.

Keywords: PCM; PV Cell; energy savings; cost reduction; temperature regulation; performance enhancement

1. Introduction

In present years, the cost of fossil fuels has considerably increased because people are getting to alternative fuels. In the alternatives, solar energy is becoming more popular & reliable source of heat energy because of its unlimited supply of energy. Substantial work is undertaken to harness solar energy for heating needs in an economical way. However, the irregular availability of sunlight is a serious issue in the development of solar technology. Silicon photo voltaics (PV) show a power drop above 25 °C panel temperature with a temperature coefficient ranging from −0.3%/K up to −0.65%/K [4,5] depending on type of PV cell & manufacturing technology [6]. Various mathematical correlations have been developed to describe the dependence of PV operating temperature on climatic conditions & PV materials [7]. The operating temperature reached by PV panels & associated power drop largely depends on the climate of the site. In Germany 50% of the solar radiation incident on a PV panel is above 600 W/m2 , while in Sudan this value reach upto 80%, resulting in different operating temperatures & related power drop [8,9]. A maximum PV operating temperature of 125 °C has been reported in southern Libya (27.6°N & 14.2°E) resulting in a 69% reduction in the nominal power [10]. The preferable operating temperature limit for PV ranges from −40 °C to 85 °C [8] however in hot & arid climates, PV temperature frequently rises above upper limit of temperature range [11], which results in temperature induced power failure as well as PV cell delimitation & rapid degradation [12] urging a strong need for PV temperature regulation to increase both panel power output & life.

OBJECTIVE:

1. Non conventional resources like solar energy, wind energy, hydroelectricity, geothermal energy and tidal energy.
2. Petro-cropping and petro-plantation.
3. Energy crisis and its solution by using non conventional sources to maximum extent.
4. Tropical countries like India must use solar energy to increase extent as it is available in large amount
5.To increase percentage of potable water through a suitable PCM;
6.To introduce new type of organic PCM for energy storage medium;
7.This study will also help to understand & to store maximum thermal energy that reduce the requirement of conventional fuels like coal, oil etc
8.it will help in reducing greenhouse gasses & climatic changes

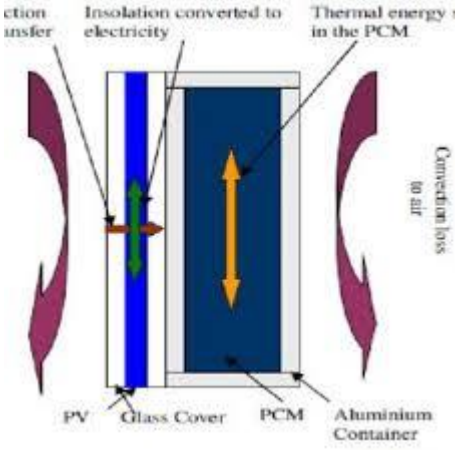

fig.1 pv/pcm system

Heat transfer in a photovoltaic panel

The temperature at which a PV module works is equilibrium between the heat produced by the PV module and the heat lost to the surrounding environment. The different kind of mechanisms for heat loss are conduction, convection and radiation. Conductive heat losses are mainly due to different temperatures between the PV module and other materials with which the PV module is in contact. The ability of the PV module to transfer heat to its surroundings is given by the thermal resistance. Convective heat transfer arises due to the transport of heat away from a surface as the result of which one material moving across the surface of another. In PV modules, convective heat transfer is due to wind blowing along the surface of the module. The last way in which the PV module can transfer heat to the surrounding environment is through radiation.

MATERIALS AND METHODS PAPER PRINTED PHOTOVOLTAIC CELL

Paper pv cell is having very simple mechanism, in this solar cell can be printed on the simple paper of any kind like printing paper, notebook page or news paper as shown in fig. 3. A designed solar cell printer can be used to print solar cell and when printing paper is passed through solar printer, different layers of solar cell get deposited on the surface of printer and by spraying pv material on the paper in vacuum. All five layers of the PV cells get deposited one by one on the surface of paper and from the other end a solar cell will come out of the printer. If any kind of conductors are attached to the connection points at paper a electricity can be produced from the solar paper. These solar papers provide simple, cost effective and flexible production of solar cells. These paper cells is used for providing energy in small scale devices or the places where carrying conventional solar cells is difficult as solar papers gives excellent weight reduction as there is no electrodes, backing material or supporting structure in paper cells which gives it a edge in transportation also paper pv cell has importance that it can be printed at the place of application itself. Due to all these characteristics solar papers has tonnes of importance over conventional process of pv cell manufacturing process. But most importance of paper printed pv cell is that the cost of these cells is very much low as compare to conventional cells as conventional PV cells require strong supporting and backing materials

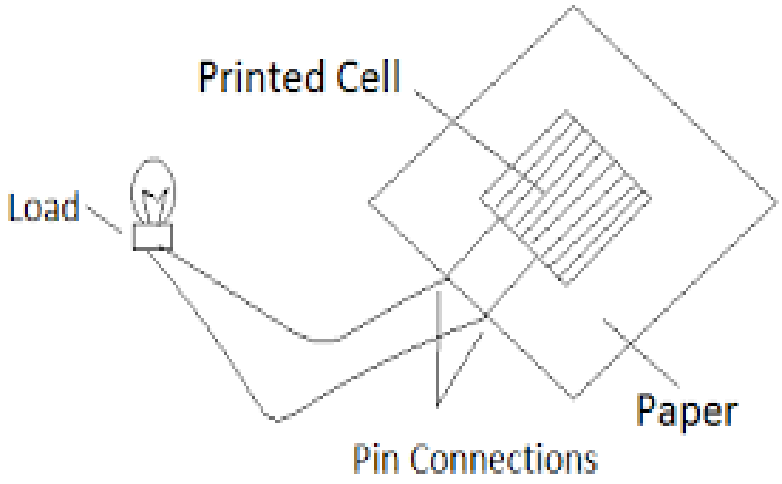

Fig. 3 Working of Paper printed Photovoltaic Cell

2. LITRATURE REVIEW

[1] V. jafari fesharaki Majid Dehghani, J.Jafari Fesharaki, Humed Tarasoli, "The effect of temperature of pv cellefficiency", first international conference on emerging trend in energy conservation-ETEC Tehran, Tehran, Iran. Represented PV characteristics for various Temperatures from these characteristics it can be seen that as the change in Temperature increased it will affect the power output from the cells. Also explained relation formula that gives the effect of temperature of electrical efficiency of PV cell/Module. From this paper we can able to investigate ambient temperature for desired efficiency.

[2]Anna Machniewics, Dominika knera,Dariusz Heim, "Effect of transition temperature on efficiency of PV/PCM", Sixth international building physics conference IBPC 2015 energy procedia 78(2015)1684-1689In this paper the application of Phase Change Material on the back side PV panel helps maintain temperature below the melting point of material. Temperature of PV Panel is every sensitive to climate conditions. The aim of this paper is to investigate & Determine Transition temperature of PCM layer that allows avoiding rapid temperature fluctuation on the PV back surface.

[3] K.A. Moharram M.S. Abd –Elhaldy, H.a. K&il, H. EISherif,"Enhancing the performance of PV PANELS by water cooling",Ain Shams Engineering Journal(2013)4,869-877. In this paper,an experimental setup has been developed to study the effect of cooling by water On the performance of PV panel.In this paper a Non-pressurised cooling system has been developed which includes spraying the PV Panel by waer.cooling has been developed to find how long it will take to cool the PV Panel by water spray.

[13] Catain George Popovici, Sebastian Veleriu Hudisteanu, Theodor Dorin Mateescu, Nelucristian Chereches,"Efficiency improvement of photovoltaic panels by usimg air cooled heat simks",sustainable solution for enrgy & enviroment, EENVIR_YRC 2015,Bucharest,Romana, energy procedia 85(2016)425-432. They represented Dependence between the conversion of efficiency & temperature of PV cell the average reduction of efficiency is about 0.45% for each Degree over the 25 degree Celsius. The efficiency of panel is high,if the oprating temperature of PV panel is in between the range of 18-25 Degree Celsius & above 25 the large impact on efficiency /power output to take place.

[14] Mr. Dinesh S. Borkar,Dr.Sunil V prayagi, Ms. Jayashree Golmare,"Performance Evaluation of Photovoltaic solar panel using Thrmaoelectric cooling,International Journal ofEngineering research volume No.3,Issue No.9,pp:536-539. They represented by a effect of solar panel from thermoelectric cooling & without thermoelectric cooling .they said how to avoid the panels heat?how to apply thermoelectric cooling ,it controlled damages efficiency of solar panel .maximum heat is gone to 80 degree Celsius, then not possible to remove heat , the they applied thermoelectric method. Thjen remove heat .life span is increases. ng spelling & grammar:

2. METHODS USED TO AVOID OVERHEATING EFFECT: -

The Presence of PCM at the back side of PV panel [2], -Using a setup for water cooling [3], -Using setup for air cooling [4], -By use of setup for thermoelectric cooling [5], By the use of above methods we can able maintain temperature PV panel at a certain level to achieve required efficiency.

3. CONCLUSIONS

From various papers we concluded that the various aspects are governing the efficiency of solar panel in which temperature of PV panel is one the important aspect. To increase the efficiency of PV cell the PV panel temperature should be maintained at particular level. It is the standard temperature at which photovoltaic cells are designed, & it is different for different PV technologies used. In the present study, parameters affecting the temperature in the solar cell are the physical properties of each layer of the PV module, like diffusivity, thickness or density, the junction between theirs, contact resistance, and parameters dependence of the ambient characteristics, as the irradiation or heat transfer coefficient of radiation in the glass surface.

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2.Anna Machniewics,Dominika knera,Dariusz Heim, "Effect of transition temprature on eficiency of PV/PCM",Sixth international building physics conference IBPC 2015 energy procedia 78(2015)1684-1689.

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