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EFFECT OF AUTOMATED COOLING SYSTEM ON EFFICIENCY OF PV SOLAR POWER GENERATION SYSTEM

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Abstract - In day today life because of lack energy resources man move towards renewable energy source. When we go towards solar system it can use the sun energy to boil water or to generate electricity. Our aim is to develop a system which uses solar energy in both form thermal and solar form. The Hybrid Solar Solution is able to produce more electricity than PV, more reliable hot water than solar thermal, and heating at a better CoP than most conventional heat pumps - all with little or no CO_2 emissions. Current projections suggest that a PV-T will produce sufficient electricity over the course of the year to cover the demand of the heat pump, which will meet a reasonably insulated building's total annual heating and hot water requirements. Further to this the incorporation of a solar thermally charged. The efficiency of the system to a point that it outperforms any thermal system or solar system.

Keyword- RENEWABLE ENERGY, HYBRID SOLAR THERMAL, CoP

I. INTRODUCTION

Photovoltaic cells, also called Solar cells, are electronic devices that convert sunlight directly into electricity. The modern form of the Solar cell was invented in 1954 at Bell Telephone Laboratories. Today, PV is one of the fastest growing renewable energy technologies and it is expected that it will play a major role in the future global electricity generation mix. There is a wide range of PV cell technologies on the market today which is classified into three generations, depending on the basic material used and the level of commercial maturity.(IRENA Working paper 2012)

1.1 First-generation PV systems use the wafer-based crystalline silicon (c-Si) technology. This type of PV cell is also called the bulk material cell. This type of cell is mostly used for terrestrial application.

1.2 Second-generation PV systems are based on thin-film PV technologies. These are also called the thin film cells. These include

1) Amorphous (a-Si) and micro morph silicon (a-Si/μc-Si);

2) Cadmium Telluride (CdTe); and 3) Copper-Indium-

Selenide (CIS) and Copper-Indium-Gallium-Di Selenide (CIGS). Thin film PV cells are under early market deployment.

1.3 Third-generation PV systems include technologies such as Concentrating Photovoltaic (CPV) and Organic PV cells that are still under demonstration or have not yet been widely commercialized. The current market share of wafer-based crystalline silicon(c-Si) is 85%-90% of global PV module sales, whereas the market share of PV modules based on thin film technologies is 10%-15%. Global Thin film module production capacity has increased significantly since 2007 although the price of wafer-based crystalline silicon(c-Si) has sharply decreased.

Crystalline silicon currently offers a yield of 15-16% and some studies consider that its limits would be reached approximately 25% under laboratory conditions [2].

Although other materials such as Ga, offering a yield of 30%, prohibitive price makes them suitable only for space applications. Recently, researchers of U.S. universities have announced that was obtained a photocell with a yield of 60%.

It's a big step towards the upper limits of efficiency photovoltaic cells [5]. Very complex technology and materials used do remain only the state of the laboratory. Therefore, in the next decade, nothing seems to threaten the supremacy of silicon. Recently more and more companies have been able to increase the yield offered by solar cells based on silicon.

In March 2003, BP Solar announced an efficiency of 18.3%, while Sanyo has already put on the market a cell with an efficiency of 19.5% [4]. Overheating of a PV module decreases performance of output power by 0.4-0.5% per 1°C over its rated temperature (which in most cases is 25 degrees C). This is why the concept of "cooling off PV" has become so important [1].

To reduce this phenomenon can be applied to the back to panel a cooling water system, which can provide hot water for domestic applications [1].

II. LITERATURE SURVEY

PV modules generate electricity, but the electrical output is only one component of the total energy produced by a photovoltaic array. A typical photovoltaic (PV) module has ideal conversion efficiency in the range of 15%. The remaining energy produced is heat, which is neither captured nor utilized. This heat increases the operating temperature of the PV modules, which actually decreases their overall performance.

Recent scientific testing done in conjunction with the International Energy Agency Task 35 Project at Canada's National Solar Test Facility has shown that it is possible to capture almost two to three times more thermal energy than electricity from a PV array.

Panels from various manufacturers were tested under NOCT conditions, and the results showed that when PV modules were mounted on top of Solar Wall® transpired collector panels [7], the total solar efficiency increased to over 50%, compared to the typical 10 to 15% for PV modules alone By removing the excess heat generated by the PV modules, the electrical output is increased.

Modules can commonly operate at temperatures over 50 degrees C above ambient temperature, resulting in a performance reduction of more than 25%. By dissipating the heat from the module and lowering the operating temperature, significant gains can be made in system performance and the heat can be utilized for practical heating purposes [8]. As a result of these effects, the testing showed that the payback on a PV system that incorporates a thermal component could be reduced by between one third and one half.

This paper will present the test results, and the practical and scientific implications of using a transpired solar collector with conventional PV to create a solar co-generation system [9].

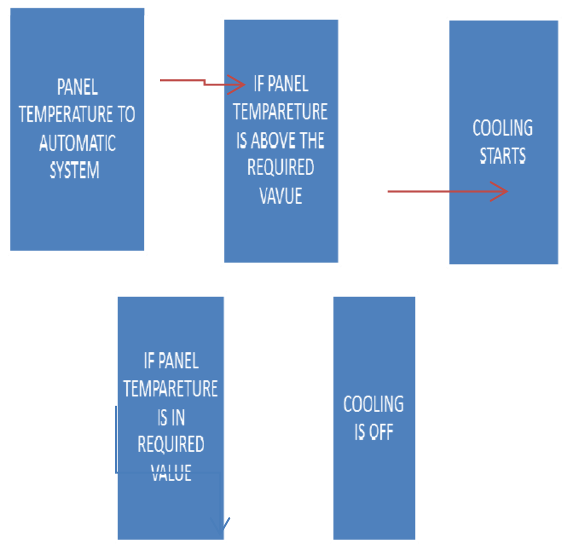
III. WORKING

Basically in all solar panel its efficiency is majoring affected by the heat produce at the back and front part of panel, if it work in ambient temperature, means between 20°C to 35°C its efficiency is perfect but this will never happen, after 30 min of use of solar panel its efficiency decrease due to increase in the panel temperature, hence there is need of research in that field ,what we do in our project we put a sensor in the panel which latch up with the temperature.

In our project if the temperature go beyond the desired value, system senses the danger temperature value and give the signal to microprocessor and then micro controller send the signal to the cooling system to change its status and the system will start, and cooling is starts. When the temperature of panel come in between the desired value cooling stops.

By applying this system we are able to optimize the efficiency of panel.

Systematic diagram of working of project



IV. CONCLUSION

- PV panel temperature values evolve around the prescribed values;
- PV panel is hotter in the center than in the extremities;
- PV panel temperature values are similar to the extremities;
- The power absorbed by pump is insignificant compared with the advantages of cooling system. In conclusion, the experimental emphasize the good side of a PV system operation and on the other hand, accuracy and efficiency of the cooling system designed for photovoltaic panel that can be apply successfully in domestic solar applications. Domestic solar applications.

REFERENCES

[1] Alboteanu, L., Increase efficiency of standalone photovoltaic systems by reducing temperature of cells, Annals of the "Constantin Brancusi" University of Targu Jiu, Engineering series, issue 3/ 2011, ISSN 1842-4856, pp. 15-25, "Academica Brancusi" Publisher.

[2] Alboteanu, L., Monitoring temperature of photovoltaic modules, Annals of the "Constantin Brancusi" University of Targu Jiu, Engineering series, issue 3/ 2010, ISSN 1842-4856, pp. 15-24, "Academica Brancusi" Publisher.

[3] Alboteanu, L, Ocoleanu, F., Novac, Al., Manolea, Gh., Remote monitoring system of the temperature of detachable contacts from electric cells in revista Analele Universitatii din Craiova, seria Inginerie Electrică, Nr. 34, 2010, vol. I, ISSN 1842-4805, pp. 184-189. Editura Universitaria.

[4] Gonzalo C., G., Heat transfer in a photovoltaic panel, Project Report 2009 MVK160 Heat and Mass Transport May 11, 2009, Lund, Sweden

[5] Huang B. J., Lin T. H., Hung W. C., Sun S., Performance evaluation of solar photovoltaic/thermal systems, Solar Energy Vol. 70, No. 5, pp. 443–448, 2001.

[6] Lates, R., Optimization of the solar collectors' design for implementation in the built environment in Romania, Doctorat Thesis, "Transilvania" University of Brasov, 2010, Brasov, Romania.

[7] Lates, M., Lates, R., Hansen, P., U., Hybrid Systems Implementation for Domestic Users, Proceedings of The 2nd Conference of Sustainable Energy, 3-5th of July, Brasov, Romania, ISBN 978-973-598-316-1. Pp.457-462.

[8] Manolea, Gh. Nedelcut, C., Novac, Al., Ravigan, F., Alboteanu, L., The automation and supervision of the cultivation environment for horticulture products, Annals of the University of Craiova, seria horticulture, vol. XI, Ed. Universitaria, 2006, ISSN 1334-1274, pp. 131-133.