The conceptual proposal of a hybrid solar photovoltaic module with water coil cooling

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Abstract

The Solar Photovoltaic (PV) modules present loss of generation potential because of the solar cells heating by solar irradiation. This loss occurs due to the increase of the layer between the P and N junction of the cell, instigating that for the same quantity of solar irradiation, the cooled cell has a greater potential in relation to the heated cell. The aim of this research is to propose a conceptual model of a cooling system for a Solar PV Module in order to achieve a generation potential superior to the same solar irradiation power. The development of the conceptual model used the 15 meters of copper tube in order to make the coil cooling, which it will be in contact with the superior part of the solar photovoltaic module. Aluminium plates were used to expand the thermal contact between Solar PV Module and Cool Fluid. The tests with the hybrid solar PV module in a real application show a temperature reduction of 14,6 ºC in relation to the original Solar PV Module. This temperature reduction increases in 21.1 W of the power rating in the peak of energy generation as well as leads to a gain of 1,16% of electrical efficiency. The conceptual proposal implementation shows a better use of solar energy, since the hybrid system increases the absorption of solar irradiation and heats the water that can be stored in a suitable container for future use. Finally, the calculus of the hybrid efficiency of the module presents a utilization of the irradiation in 36.93%, that is, a gain of 222.25% in relation to the original system, which reached an efficiency of 11.46% during the peak of energy generation.

Keywords: *Solar Energy, Efficiency, Solar PV Hybrid System, Water Coil Cooling, Heat Transfer*