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Experimental parametric study of solar still coupled with humidification–dehumidification desalination system

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ABSTRACT

Drinking water consumption rises increasingly in our planet given the dense use in industrial and agricultural sector and increase of the world population. For this reason, desalination presents the best solution to fight against this problem. A review of the vast literature available on solar distillation systems has revealed many observations about the design, performance, and the limitation of fresh-water production of solar distillation systems. Solar stills are used for solar distillation plants due to its simplicity in construction and operation, low cost, and however the yield is low. A lot of research work is undertaken to improve the productivity of the conventional still. This paper tackles an experimental parametric study of solar still coupled with humidification–dehumidification desalination system which is located at Sfax engineering national school in Tunisia. The humidification–dehumidification desalination system is made of four elements: the inner condenser, the humidifier, the water solar heater, and the air solar heater. The results clearly indicated that the performance of the solar distiller increases proportionally with the solar irradiation and outlet water temperature of solar collector. The performance of the solar distiller is experimentally studied, to find out the best factors enhancing still productivity. The results show that decreasing of water depth increases the yield product. The experiment is carried out during the summer climatic conditions of Tunisia. The economic analysis of the solar still was studied, and the lifetime for a solar still unit is about 20 years.

Keywords: Solar still; Desalination; Air and water solar heater; Condenser; Humidifier

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