

# Abstract

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## **Enhancement of the productivity for single solar still with ultrasonic humidifier combined with evacuated solar collector: An experimental study**

Desalination of brackish and sea water with renewable energy source is an important economical solution for obtaining potable water. There are different techniques were used to improve the solar still productivity. So, this research deals with improving the solar still productivity by using ultrasonic waves, reflectors and phase change material. A single solar still was designed, fabricated and tested under the climate conditions of Alexandria, Egypt. The solar still has base dimensions of 1 m × 1 m and integrated with an evacuated solar collector of 200 l capacity. Six ultrasonic humidifiers were installed to strengthen the evaporation frequency of the water basin. A photovoltaic solar panel of 280 W was used to provide the power for ultrasonic humidifiers. An evacuated solar collector was used to provide solar still with hot sprayed water inside the solar still after 13:00 local time. Experimental tests have constructed to powerfully assess the daily productivity of fresh water during the three summer months under the same climate conditions. Four cases were studied to investigate the daily fresh water productivity at different embedded components with the solar still: phase change material ultrasonic humidifiers and phase change material evacuated solar collector and phase change material and the forth case is phase change material and ultrasonic humidifiers combined with evacuated solar collector. The results showed that the maximum daily productivity are 5.34 and 7.4 kg per day for 25 and 35 mm water depths respectively in case of using solar still with phase change material and ultrasonic humidifiers integrated with an evacuated solar still. The ultrasonic humidifier was influential in case of integrating evacuated solar collector and improved the daily productivity by 25 and 44% at water depths of 25 and 35 mm respectively.