Performance comparison of solar stills using two kinds of solar collectors

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Abstract

This study presents a practical investigation of the effect of two different solar collectors (parabolic concentrator collector and evacuated cylindrical collector) on the solar distiller performance. The experiments were carried out under the climatic conditions of the Iraqi city of Kirkuk (35.46°N, 44.39°E). The results of the testing showed that adding solar collectors raised the temperature of the basin water for the solar distiller. The water in the distiller basin connected to the parabolic concentrator collector reached a maximum temperature of about 71°C. In contrast, the water temperature of the traditional distiller was 67°C. Also, the findings exposed that connecting the conventional solar distiller with different kinds of solar collectors has no significant benefit in enhancing the output of solar distillers. The maximum water production of the solar distiller connected with a parabolic concentrator collector was 1.38 E-04 L/s at 3 p.m. It was also noted that the hybrid solar distillers have higher productivity than the traditional distillers after 3:00 p.m. At a volume flow rate of 1.4 L/min, the daily thermal efficiency of the distiller integrated with the parabolic concentrator collector, the distiller integrated with the evacuated cylindrical collector, and the classical distiller was 27%, 23.64%, and 34.44%, respectively. The results also showed that the solar distiller coupled to an evacuated solar collector operates more efficiently with a higher cooling water flow rate.

Keywords: Solar distiller; Performance; Integrated; Solar collectors