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Desalination and hot water production using solar still enhanced by external solar collector

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Abstract: A unit consisting of a solar still enhanced by an external solar collector to desalinate and produce hot water was designed and tested. The unit consists of three main parts: water basin, external solar collector, and heat exchanger. The water in the basin is heated by direct solar irradiation and by hot water flowing in the heat exchanger heated by the external collector. This enhances water evaporation from the basin. The produced vapor condenses on the lower part of the double glass cover through which cooling water flows. The condensate is withdrawn as desalinated (fresh) water. The effect of cooling water flow rate, ambient temperature, solar intensity, and hot water production rate on the amount of desalinated water produced was investigated. The results showed that the production rate is proportional to the solar irradiation, ambient temperature, and cooling water flow rate. On average the unit was capable of producing 0.4 l/h desalinated water of low salinity (276 ppm) and hot water of temperature up to 87°C.