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Solar desalination unit with falling film

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ABSTRACT

Desalination of water by a solar unit with falling film was investigated. Even distribution of the water film on the collector plays an important role on the amount of desalinated water that can be produced. Several distribution systems were designed and tested. A combination of water distributor and a wick on the plate surface were needed to achieve uniform film on the plate surface. The effect of various parameters such as feed water flow rate, ambient temperature, water salinity and cooling the outer glass surface on the unit productivity was investigated. A linear relationship between the amount of fresh water produced and time is exhibited. On average about 0.6 L/h.m^2 of water was produced by the unit during the hot months. Reducing the feed water flow rate and cooling the outer glass surface improved the unit productivity. Cooling the outer glass surface improved the unit productivity by 30%. On the other hand, water salinity adversely affected the unit productivity. The productivity is reduced by 40% upon increasing the salt concentration in feed water to 20,000 mg/L. The quality of the produced water was assessed by measuring its conductivity and it was found to be about 23 μS/cm. An equation to estimate the amount of desalinated water produced from the falling film was derived based on mass and energy balances. The agreement between the theoretical predictions and the experimental results is good.

Keywords: Desalination; Solar collector; Falling film; Inclined plate; Water

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