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ASSESSMENT OF THERMAL ENERGY FOR NaCl PRODUCTION BY SOLAR ASSISTED EVAPORATION OF CONCENTRATED SALTWATER

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Abstract

Vacuum-tube thermal collectors are used to collect heat radiated by the sun. This heat is then used to drive the forced evaporation of concentrated seawater (saltwater) released by reverse osmosis and the extraction of NaCl. This paper reports heat consumption during evaporation. About 78.90% of seawater has to be evaporated in advance through insolation to initiate forced evaporation. This step is conducted to precipitate the NaCl because only $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ are initially precipitated. Every ton of NaCl produced needs 9260.51 MJ energy and the output of NaCl can increase linearly with an increase in the evaporation ratio. An increase in the evaporating temperature will result in more energy consumption and reduction in the efficiency of the heat utilization. The added heat consumption is mainly used to heat the concentrated seawater. The selected temperature of forced evaporation is 55 °C and the water discharge of the vacuum-tube collectors is about 235 m³/h. This study proved that salt production from the seawater by utilizing solar assisted forced evaporation is technically feasible.

Key words: concentrated saltwater, forced evaporation, solar collector, thermal energy

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