

Abstract

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Experimental Study on Water Distillation Based On Humidification-Dehumidification Process Integrated With a Heat Pump

In this work an experimental investigation was performed on a multi-stage dehumidifier water desalination system using Humidification-Dehumidification process based on the operating principle of the heat pump cycle. The cycle was open air open water (OAOW) air heated. In this water desalination system it has been taken the effect of the heating and cooling effects in the heat pump (Condenser and Evaporator). Air is heated using the heat rejected by the heat pump through the condenser after that air passes through the humidifier section. The water needed to be desalinated have been sprayed in 3 different techniques at a constant flow rate of 2.2 L/min includes Cross, Counter and Parallel flow spraying systems according to the direction of air flow. The evaporator is used to condensate water vapor in the humid air after the humidification process. The mass flow ratio between water and air was varied from 0.091 to 0.14. Results of the experiments showed that the parallel flow spraying system was of the highest productivity for the two stages as it was 2.34 L/h in single stage dehumidifier and 4.44 L/h in two stages dehumidifier, with a percentage of increase 89.75% due to the water cooled heat exchanger. The maximum specific productivity was 2 L/kWh.