Heat transfer performance and bundle-depth effect in horizontal-tube falling film evaporators

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Received 1 March 2012; Accepted 10 May 2012

ABSTRACT

A set of experimental facilities were set up to measure overall heat transfer coefficient of horizontal-tube falling film evaporator with square-pitch bundle. Effect of spray density, saturation temperature, total temperature difference, and inlet steam velocity on the overall heat transfer coefficient $K$ is studied. The tubes are made of HAL77-2A aluminum brass with an outer diameter of 25.4 mm. Fluids inside and outside the tubes are steam and fresh water respectively. The results indicate that growth of spray density and saturation temperature helps to increase the $K$. The $K$ could also be increased by reducing the total temperature difference. However, the impact of the inlet steam velocity on the $K$ is less significant. Furthermore tube bundle-depth effect and space distribution of local overall heat transfer coefficient $\dot{K}$ in the evaporator are also presented. Based on this investigation, basic engineering design information will be provided to establish the governing parameters for horizontal-tube falling film evaporator in the field of seawater desalination.

Keywords: Horizontal-tube falling film evaporator; Heat transfer coefficient; Bundle-depth effect; Space distribution; Seawater desalination

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Presented at the International Conference on Desalination for the Environment, Clean Water and Energy, European Desalination Society, 23–26 April 2012, Barcelona, Spain