



## Study of falling film evaporation process in a vapor compression desalination system

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### ABSTRACT

An analysis of falling film evaporation of saltwater has been carried out for a vapor compression desalination pilot plant. Detailed modeling and simulation have been used to find the temperature and concentration variation inside the film on a vertical tube evaporator. The heat and mass transfer phenomenon were analyzed using basic conservation equations. To evaluate the performance of the rig, three operating variables were considered, which included the top brine temperature (TBT), compressor speed and brine concentration. Performance of the rig was dominated by compressor speed and top brine temperature. The highest distillate production rate experimentally obtained was 20 kg/h for the compressor speed of 2400 rpm at a TBT of 102°C. From the simulation, it was found that the feed concentration rapidly increased near the falling film-vapor interface. The numerical results have been compared with the experimental values in terms of distillate produced, and good agreement was found.

*Keywords:* Vapor compression desalination; Falling film evaporation; Concentration profile; Temperature profile; Vertical tube evaporator

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