

Performance characteristics of a once-through multi-stage flash distillation process

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Received 30 April 2009; Accepted 20 October 2009

ABSTRACT

Many process variables are involved in the design and operation of a multi-stage flash (MSF) distillation process. An estimation of the effect of these parameters on the plant performance is important to improve the optimum operating conditions. Both analytical solutions and experimental/field analysis are required to identify the most influential parameters that affect the performance and set proper plans for performance optimization. The accurate estimate of the variables related to the brine heater, selecting proper number of stages and the stage-to-stage temperature drop are of crucial importance. In addition, the thermal properties dependent on the operating conditions may affect the accuracy of numerical results. Moreover, the salinity of the feed seawater has a significant effect on the plant characteristics. In this study, the effect of various operating conditions on the performance ratio, brine temperature and salinity as it leaves the last flash stage are investigated in a once-through system. The up-to-date reliable correlations for calculating brine properties that vary with both temperature and salinity are used. The numerical results obtained by the present investigation are compared with the published data on similar plants. A sensitivity analysis to identify the key parameters that significantly influence the desalination plant performance is carried out in an attempt to contribute a better understanding on modeling and optimum operation of MSF desalination processes.

Keywords: Multi-stage flash distillation; Once-through; Sensitivity analysis

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