

Modeling of the heat transfer of a solar multi-effect distillation plant at the Plataforma Solar de Almería

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ABSTRACT

Potable water supply by desalination systems has a significant role in today's developing world. Multi-effect distillation (MED) is a progressing, low cost and easy operating system to produce drinking and pure water for both social and industrial applications. It is very important to understand in detail the process elements in order to determine the effects of the important design and operating variables on the parameters controlling the performance of the plant. A model is developed for the MED plant located at the Plataforma Solar de Almería (PSA), in the southeast of Spain. It is a vertical-arrangement forward-feed MED plant with pre-heaters, which uses hot water as the thermal energy source. The model has been developed dividing the MED plant into four blocks: the heater (consisting of the first effect), the evaporators (consisting of effects 2 to N), the pre-heaters (for effects 1 to N – 1) and the condenser (after effect N). To solve the model, a parameterization of the overall heat transfer coefficient of the four blocks has been carried out with experimental data for a wide range of operation, based on correlations found by other authors for similar plants. The adjustments were good for all the components with the exception of the condenser, which seems to behave differently than in other cases reported in the literature.

Keywords: Solar desalination; Multi-effect distillation; Modeling

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