Numerical models of solar distillation device: present and previous

ABSTRACT

In this paper, a detailed comparison of a few numerical models (with and without considering humid air properties) for the estimation of water production from a solar water distillation device is investigated. An extensive laboratory production experiments were executed under fifteen sets of external conditions to find the properties of evaporation and condensation coefficients to incorporate with the present evaporation and condensation models (two unique and independent theoretical models), respectively. The calculation accuracy of the evaporation flux computed by two evaporation models (present and previous), Dunkle's and Ueda's model, and of the hourly condensation flux estimated by two condensation models (present and previous) was examined using the field experimental results. It was found that the previous evaporation and condensation models using empirical relationships extremely overestimated and underestimated the observed production flux, respectively. The evaporation flux calculated by the conventional models of Dunkle and Ueda notably underestimated and overestimated the observed values, respectively. Finally, it is revealed that the present models have the smallest deviation between the calculated and the observed values among these six models and can predict the daily production flux.