

Effects of water and basin depths in single basin solar stills: an experimental and theoretical study

ABSTRACT

The effects of water depth in solar stills were studied in many earlier works. It was revealed that in the previous experimental works, the water surface-cover distance (WCD) was altered with the change of the water depth. However, in this research, the effects of water depth and WCD were investigated separately, and effects of water depth on the performance of solar stills with the same WCD were examined for the first time. In this way at first, some experiments were conducted in the summer and winter seasons using the stills with the same water depths, but different basin depths (i.e. different WCDs). It was found that WCD can affect the amount of distillate yield up to 26%. Thus, it was concluded that to study the effect of water depth accurately, different stills should be employed at the same time (to keep WCD constant). In the second step, some experiments were conducted using four stills in the summer, fall and winter seasons to examine the effects of water depth, while the WCD was constant. In addition, the stills with different water depths were modeled analytically and their performance was investigated. Moreover, an empirical relationship was obtained between the distillate yield and the water depth. By comparing the results of this empirical relation with previous studies, it was revealed that the past researches reported a lower dependency (in the average 15%) of the distillate yield on the water depth, since in their experimental works, WCD was changed along with the water depth.

Keyword: Water surface-cover distance; Water depth; Basin depth; Seasonal investigation; Distillate yield