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SEALED-SYSTEM PERFORMANCE OF A COMPACT STEPPED SOLAR-STILL

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Abstract

This paper comprises an in-depth study into the sealed-system performance of a stepped solar-still. Solar-stills generate clean water by evaporating saline/polluted water using solar energy and collecting clean water as condensate. To reduce the risk of external contamination, most experiments, have been under conditions of being sealed or non-interactive with external atmospheric conditions. One of the critical limitations in the extensive adoption of solar-stills as a viable safe-water devise is its generally low yield, which is directly proportional to the available solar insolation and the solar-still design. Among the critical design parameters, the air-volume and water-depth inside the solar-still needs to be kept to a minimum to increase system-yield. A stepped solar-still design was evolved to reduce the air-volume and water-depth inside the solar-still. A study into its performance, under sealed conditions, included its experimental and theoretic evaluation. A multiple-regression analysis has also been carried out to predict the yield of the solar-still for varying ambient weather conditions. The average efficiency of the sealed-system was found to be 35%. The experiment was carried out at the Centre for Sustainable Technologies, Indian Institute of Science, Bangalore. Details of the design, experimental setup, evaluation, results and conclusion is presented in this paper.

Key words: ambient parameters, efficiency, sealed-system, stepped solar-still

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