



Practical and sustainable household seawater desalination using an improved solar still

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ABSTRACT

Conventional seawater desalination plants have so far not been scaled down to household level, at least not in a practical or affordable manner. Solar still technology can fill this void. Studies were conducted with five step-solar stills (1.01 m² top glass area) operated (i) conventionally, (ii) after fitting with North–South reflectors in V-trough alignment to raise the incident solar radiation on the still and (iii) after additionally fitting metallic condensers on the sides. Comparative data generated for (i) and (ii) gave an output (day + night) of 2.95 and 5.95 L, respectively, on a typical sunny day in April 2012, and 2.54 and 5.11 L during a typical day in November 2012. Similarly, comparative data of (ii) and (iii) gave values of 4.72, 4.42 and 5.44 L for (ii); 7.06, 5.31 and 6.27 L for (iii), for experiments conducted during typical days in March, June and December 2012, respectively. Output thus followed the trend (iii) > (ii) > (i). The maximum production of potable water with (iii) was 7.27 L m⁻² d⁻¹ on 22 March 2012 with recovery of 40.4% with respect to concentrated (55,000 ppm) seawater charged. The average output of (iii) over 258 d of operation spread over the year was 5.07 L m⁻² d⁻¹, and the average efficiency with respect to incident radiation on top glass cover was 32.86%. Such a still, which was not only more productive but also easy to operate, clean and maintain, would be an ideal sustainable solution for individual households in the proximity of the sea if the unit can be made affordable. A scaled-up version of the unit at (ii), having 3.02 m² top glass area, and with some modifications in aspect ratio, material of construction and number of steps, gave ca. 3.5 times the output of (ii) with 35,000 ppm seawater feed, indicating the scalability of the still in V-trough design.

Keywords: Household seawater desalination; Solar still; V-trough reflectors; Condenser assembly; Enhanced production & recovery; Easy maintenance

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