

## Effects of concentrator type and encapsulated phase change material on the performance of different solar stills: an experimental approach

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### ABSTRACT

An experiment has been performed to study the effect of system integration by two different concentrator assisted de-salting systems. The compound parabolic concentrator (CPC) and compound conical concentrator (CCC) are used in this research work. Two solar desalination systems, the single slope solar still (SSSS), and pyramid solar still (PSS), have been integrated with a CCC and compound parabolic concentrator-concentric circular tubular solar still (CPC-CCTSS). To study the effect of system integration, a thick cloth prevents the entry of sunlight into the solar still top. Additionally the concentrator assisted de-salting systems are equipped with phase change material (PCM) for enhancement. In CCC-SSSS, the PCM fills the inside of hollow copper balls and the balls are placed in the SSSS basin. In the CPC-CCTSS, the PCM is loaded in the specially designed circular trough. Two methodologies are followed here to produce the fresh water even while the distillers are blocked from the sunlight. They are (1) thermosyphon effect in CCC-SSSS and (2) waste heat recovery from CPC-CCTSS. The results showed that the productivity of CCC-SSSS, CCC-SSSS with PCM, and CCC-SSSS (PCM) top cover shaded were found as 2680 mL/m<sup>2</sup>/d, 3240 mL/m<sup>2</sup>/d and 1646 mL/m<sup>2</sup>/d, respectively. Similarly the productivity of the CPC-CCTSS-PSS, CPC-CCTSS (PCM)-PSS and CPC-CCTSS (PCM)-PSS top cover shaded were found as 7160 mL/m<sup>2</sup>/d, 7346 mL/m<sup>2</sup>/d, and 5120 mL/m<sup>2</sup>/d. The productivity of the CCC-SSSS and CPC-CCTSS-PSS is examined and conclusions are drawn such as the solar radiation blocked distillers productivity did not drop to zero.

**Keywords:** Compound conical concentrator; Compound parabolic concentrator; Desalination; Pyramid solar still; System integration

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