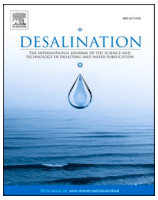
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Experimental investigation of double slope solar still integrated with PCM nanoadditives microencapsulated thermal energy storage

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HIGHLIGHTS

- Design configuration of integrating solar still with storage unit has been studied.
- Efficacy of PCM nanoparticle with epoxy resin polymer mould-filled has been tested.
- Heat transfer, productivity and cost of still collector with TES have been valued.
- Thermal energy storage assisted solar still system has extended operation period.

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ABSTRACT

Transparent covered slope solar stills are trending but characterised with low productivity, heat losses and high energy consumption, which are setbacks in practice. In this study, double slope solar still (DSSS) integrated with PCM-TES is presented. PCM was microencapsulated with epoxy resin composite using vacuum mould-filled techniques. Conventional DSSS and DSSS-TES data collected have been compared to establish the influence of TES on productivity. Daily average temperature of the glass cover, humid air, saline water, still basin absorber and TES cavity for the DSSS-TES attained are 65.2 °C, 77.5 °C, 82.4 °C, 79.5 °C and 68.4 °C, respectively. DSSS-TES has yielded higher production, with 7.5 *Litres* of potable water daily and extension in operation period by 3 h has been achieved. In addition, condensation and evaporation rates increased with increase in production by 105%. Integration of TES with the system has reduced the heat losses while leakages from PCM nanocomposite have been prevented by microencapsulated insulator. No trace of metals, bacteria and organic contaminants has been found in desalinated water. A payback period of 0.8 year has been recorded based on all-year-round operations. Findings are in good agreement with existing models. Moreover, sensorial characteristics obtained conform to WHO standards.

Abbreviations

BOD	biological oxygen demand
COD	chemical oxygen demand
CRF	capital recovery factor
DO	dissolved oxygen

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