

Productivity enhancements of compound parabolic concentrator tubular solar stills

ABSTRACT

The performance of compound parabolic concentrator assisted tubular solar still (CPC-TSS) and compound parabolic concentrator-concentric tubular solar still (CPC-CTSS) (to allow cooling water) with different augmentation systems were studied. A rectangular saline water trough of dimension $2\text{ m} \times 0.03\text{ m} \times 0.025\text{ m}$ was designed and fabricated. The effective collector area of the still is $2\text{ m} \times 1\text{ m}$ with five sets of tubular still ó CPC collectors placed horizontally with north-south orientation. Hot water taken from the CPC-CTSS was integrated to a pyramid type and single slope solar still. Diurnal variations of water temperature, air temperature, cover temperature and distillate yield were recorded. The results showed that, the productivity of the un-augmented CPC-TSS and CPC-CTSS were 3710 ml/day and 4960 ml/day, respectively. With the heat extraction technique, the productivity of CPC-CTSS with a single slope solar still and CPC-CTSS with a pyramid solar still were found as 6460 ml/day and 7770 ml/day, respectively. The process integration with different systems cost was found slightly higher but the overall efficiency and the produced distilled water yield was found augmented.

Keyword: Compound parabolic concentrator; Single slope solar still; Pyramid solar still; Cooling water