

## Solar desalination of water using evaporation condensation and heat recovery method

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### ABSTRACT

Desalination is a long term and reliable solution for increasing the fresh water supply but this process is consuming huge amount of primary energy. Fossil fuel reserves are diminishing and increasing fossil fuels combustion has also resulted severe climatic and environmental issues. In the meanwhile, the enormous amount of solar energy 5–5.5 kWh/m<sup>2</sup> in most parts of the Pakistan offers an excellent opportunity to use it effectively for desalination processes. This study has been carried out for the development and evaluation of solar desalination system using evaporation condensation and heat recovery method. The effect of key parameters on fresh water production have been studied and it was found that the fresh water productivity and system efficiency is a function of solar radiation, mass flow rates (MFR), tilt angle of flat plate collector (FPC) and inlet hot water temperature. The result shows that the daily specific fresh water productivity was found to be 4.5 l/m<sup>2</sup> with an overall system efficiency of 52%. The result also shows that the heat recovery of vapors in condensation chamber (CC) increases the system efficiency by 6% and the gain output ratio (GOR) of the system was found in the range of 1.7–2.2. The water quality tests show that the quality parameters are in line with WHO water quality standards and the concentration of arsenic, *E. coli* and faecal coliform remained undetectable in the distillate. The cost per liter of water from the system was found to be \$0.021 which is lower than the cost of the available bottled fresh water in the country.

*Keywords:* Solar collector; Desalination; Evaporation chamber; Condensation chamber; Distillate

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