



## Performance evaluation and economic analysis of solar desalination device made of building materials for hot arid climate of India

A.K. Singh, Surendra Poonia\*, Dilip Jain, Dinesh Mishra

ICAR-Central Arid Zone Research Institute, Jodhpur – 342003, India, Tel. +91 9414700864, email: akcazri@yahoo.co.in (A.K. Singh), poonia.surendra@gmail.com (S. Poonia), jaindilip25@gmail.com (D. Jain), ps.dineshmishra@gmail.com (D. Mishra)

Received 27 June 2018; Accepted 16 November 2018

---

### ABSTRACT

Solar desalination devices made of cement concrete hollow block, stone masonry, cement-concrete, brick masonry and vermiculite-cement have been designed, developed and constructed. These are basin type solar stills with absorber area 4.2 m<sup>2</sup> of each device and the bottom is painted with epoxy paint. The longer dimension of the device is in the east west direction so that it collects more solar radiation. One 3.5 mm thick clear window glass is provided over it having 20° tilt from the horizontal and two distillate channels are fixed for collection of distilled water. The performance evaluation of the devices made of cement concrete hollow block, stone masonry, cement-concrete, brick masonry and vermiculite-cement during winter and summer month were carried out by measuring distilled water obtained per day. The average output of the device during summer month (May 2017) was 8065, 8117, 8230, 8340 and 8540 ml d<sup>-1</sup> and in winter month (December 2017) was 7029, 7173, 7285, 7395 and 7595 ml d<sup>-1</sup>. The unit made of vermiculite-cement gave the higher yield due to better insulation and reduced heat loss. The average efficiency was 24.61%, 28.21%, 28.55%, 29.54% and 30.25% respectively. The distillate output of solar desalination device is to be mixed with the available saline water in appropriate proportion to make it drinkable. In fact as much as 20 L/d of potable water (150 ppm TDS) can be made available in a day from raw water containing 300 ppm TDS by a solar desalination device. The economic evaluation of the vermiculite-cement type solar desalination device revealed that high value of IRR (151 per cent) and low value of payback period (0.65y) make the unit very cost efficient. The economic attributes of the system revealed its economic viability. Therefore this solar desalination device can be successfully used for desalination of saline water in rural arid areas for meeting requirement of potable water.

*Keywords:* Basin type solar desalination device; Building materials; Economic analysis

---

\*Corresponding author.