Click www.researchjournal.co.in/online/subdetail.html to purchase.

RESEARCH PAPER | International Journal of Agricultural Engineering | Volume 6 | Issue 1 | April, 2013 | 71–74

Performance evaluation of fresnel lens concentrated solar water heater cum distillation unit

P. M. KAPURKAR AND A. K. KURCHANIA

Received : 30.06.2012; **Revised :** 05.12.2012; **Accepted :** 30.01.2013

See end of the Paper for authors' affiliation

Correspondence to:

P.M. KAPURKAR
Department of Renewable Energy Sources, College of Technology and Engineering, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA

ABSTRACT : A composite unit of Fresnel lens concentrated solar water cum distillation unit, having a capacity of 70 liters was developed to perform the functions of water heating and distillation. In this system two insulated tanks with glass cover were fabricated where one was used for water heating and the second tank was for condensation of water vapour. Solar energy concentrated by Fresnel lens was absorbed by the plate and surrounding water contained in water heating tank was heated by this absorber plate's heat through conduction. Water vapour from hot water was condensed in dehumidification tank by the comparatively colder surfaces of copper tube used to feed fresh water and top slanting glass surface. Condensed water was collected in a collection trough. Overall efficiency of solar water heater was found to be 42.38 per cent and 27.48 per cent for distillation unit. The final hot water outlet temperature was 65.12 and the yield of distilled water was 4.72 kg/m^2/day. The total cost of the composite unit was Rs. 7524.

KEY WORDS : Solar water heater, Solar distillation, Dehumidification, Composite unit

HOW TO CITE THIS PAPER : Kapurkar, P.M. and Kurchania, A.K. (2013). Performance evaluation of fresnel lens concentrated solar water heater cum distillation unit. *Internat. J. Agric. Engg.*, **6**(1) : 71-74.

Many scientists have worked on various aspects of solar water heating and distillation technology throughout the world. The solar energy is capable to harness directly or indirectly for water heating, space heating, distillation, drying cooking etc. Conversion of solar energy into the thermal energy can be achieved by employing collectors. The efficiency of solar appliances can be increased by incorporating solar concentrators. Xie *et al*. (2011) studied about the recent development of the concentrated solar energy applications using Fresnel lenses. Nahar (2002) studied that many companies in India manufacture solar water heaters but these were not becoming popular in the domestic sector because of their high cost. Umamaheswaran (2005) studied details of the construction, testing and analysis of parabolic trough collector/reflector configuration for small scale domestic purpose water distillation application. Singh (2011) carried out experimental study was conducted in a single slope solar still integrated with solar water heater.

Distillation is one of many processes that can be used for water purification. Access to safe drinking water may be more difficult in the future, due to various reasons such as population growth, environmental pollution and climate change. Significantly elevated levels of arsenic and fluorides in the groundwater have been detected, which can cause diseases like the fluorosis in the exposed population. A solution which meets up all the proposed requirements and offers adequate water quality at an affordable price is the technology of solar distillation. By adding raw water in distilled water it can be converted in to consumable water. The composite unit of solar water heater and distillation unit can add advantages like reducing the overall cost of system making it more versatile

Ahmed *et al.* (2010) designed a solar still system and built to utilize solar energy in the Gulf States environment to produce drinking water from the sea. The result found that the efficiency of the solar still with a cooling tube was about 4 per cent lower than that of the solar still without a cooling tube. Sengar and Kurchania (2008) developed and evaluated solar geyser cum distiller device, having a capacity of 100 l. Overall efficiency of SGD for winter and summer was found to be 36.70 and 27.48 per cent, respectively. The yields of distilled water were 5007 ml/m^2 day in winter and 5275 ml/m^2 day in summer, respectively. Badran *et al.* (2010) designed, built and tested a portable solar water heater. A normal satellite dish of 150 cm diameter was used as a concentrator for solar radiation. The highest efficiency obtained for this mode was 77 per cent. Galvez *et al*. (2009) developed a solar multi-stage membrane distillation concept in order to develop a high-efficiency and cost-effective system for seawater desalination.