

A Theoretical Model for a Humidification Dehumidification (HD) Solar Desalination Unit

Authors : Yasser El-Henawy, M. Abd El-Kader, Gamal H. Moustafa

Abstract : A theoretical study of a humidification dehumidification solar desalination unit has been carried out to increase understanding the effect of weather conditions on the unit productivity. A humidification-dehumidification (HD) solar desalination unit has been designed to provide fresh water for population in remote arid areas. It consists of solar water collector and air collector; to provide the hot water and air to the desalination chamber. The desalination chamber is divided into humidification and dehumidification towers. The circulation of air between the two towers is maintained by the forced convection. A mathematical model has been formulated, in which the thermodynamic relations were used to study the flow, heat and mass transfer inside the humidifier and dehumidifier. The present technique is performed in order to increase the unit performance. Heat and mass balance has been done and a set of governing equations has been solved using the finite difference technique. The unit productivity has been calculated along the working day during the summer and winter sessions and has compared with the available experimental results. The average accumulative productivity of the system in winter has been ranged between 2.5 to 4 kg/m².day, while the average summer productivity has been found between 8 to 12 kg/m² day.

Keywords : solar desalination, solar collector, humidification and dehumidification, simulation, finite difference, water productivity

Conference Title : ICDRE 2015 : International Conference on Desalination and Renewable Energy

Conference Location : Copenhagen, Denmark

Conference Dates : June 11-12, 2015