

Design, development and simulation of Multi-Effect Humidification (MEH) solar desalination system

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The demand for potable water is increasing day by day and remains a crisis for the whole world, especially in remote areas and in islands, where there is a huge demand for drinking water. Renewable energy technologies prove to be the best partners for powering desalination projects around the world. Nature uses solar energy to desalinate sea water by means of natural water cycle, called the rain cycle. This principle has led to the development of a desalination technique called the “Multi-Effect Humidification (MEH)” technology. This process is based on humidifying air, circulated in a closed loop by natural draft circulation, using hot water obtained from a solar collector. The hot humidified air is partially condensed in a condenser, thereby producing low salinity potable water. The major successful feature of this process is the ability to utilize the latent heat of condensation by preheating the saline feed water fed to the condenser. In this project, a MEH desalination system, based on the thermal energy derived from a flat plate collector is designed, to distill and deliver a capacity of 1000 litres of potable water per day. The collector area required for the MEH unit was found out to be 48 m² (approx.), by considering the collector efficiency to be 70% and the varying solar insolation from 600 W/m² to 800 W/m², followed by the thermal performance analysis of the tube-fin condenser and the gasketed plate fin heat exchanger. Also, the heat and mass balance equations were formulated by doing a comprehensive study of both the humidifier (evaporator) as well the dehumidifier (condenser) separately. MatLab simulation is performed to show the dynamic behaviour of the varying parameters in the humidifier as well as in the dehumidifier, with respect to the varying inlet temperature from the flat plate collector to the humidifier, and the obtained results were discussed.

Biography

I Lovelyn Theresa has done her bachelor degree in Electrical Engineering and currently, pursuing her Post Graduation in Solar Energy in Institute for Energy Studies (IES), Anna University, Chennai. Her objective is to play an active role in the development of the academic research hierarchy and to progress in pace along with the research institution's school of thought. Her areas of interest include renewable energy systems, solar photovoltaic devices, LEDs / eco-lighting technologies and green buildings.

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