

Saltwater desalination by direct solar energy in Madinah, Saudi Arabia

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ABSTRACT

The process of desalination is considered to be an expensive yet powerful solution for providing fresh water. This work aimed to introduce and examine a new and low cost process for seawater desalination using the direct heating power of the sun via a glass dome. The main disadvantage of this process is the potential for low productivity under sub-optimal winter weather conditions. Thus, this research aimed to study all the affected parameters, paying particular attention to the feasibility of this process and recommended design features under the sub-optimal winter weather conditions of Saudi Arabia. An optimal design was subsequently constructed for a practical treatment unit yielding adequate amounts of freshwater. Numerous trials were adopted to design and implement the desalination unit. Results showed that a high productivity rate for desalination unit in Madinah weather was seen between the hours of 11:30 a.m. and 3:30 p.m. and the peak productivity was between 2:30 p.m. and 3:30 p.m. Results also showed that using improvement facilities such as the heating collector and lenses increased the unit productivity and efficiency. The final design of the desalination unit suggests adopting a hybrid system in winter conditions including direct solar heating in addition to other technologies such as concentrated solar thermal and photovoltaic technology to compensate for the low heating efficiency of the sun.

Keywords: Freshwater; Solar desalination evaporation process; Glass dome

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