

Are solar and waste heat-powered humidification-dehumidification systems effective?

The solar and waste heat-powered humidification-dehumidification (HDH) desalination systems are gaining much significance owing to the alarming effects of global warming and water scarcity. Their performance depends on the efficiency of the individual humidification and dehumidification processes.

Can humidifiers and dehumidifiers improve the efficiency of solar-powered HDH systems?

Therefore, this study highlights the potential of various humidifiers and dehumidifiers in improving the efficiency of solar-powered and low-grade waste heat (HVAC system and PV panel)-powered HDH systems that effectively utilize sustainable energy sources (solar and waste heat) to enable cleaner production of decentralized freshwater.

Do solar-powered water-preheated HDH systems need a humidifier or a dehumidifier?

(a) Humidifiers and (b) dehumidifiers in solar-powered water-preheated HDH systems. Systems analyzed on air preheating were limited compared to water, owing to the constraint imposed by the inherent lower heat capacity of air.

Can a dehumidifier power a waste heat energy-powered HDH system?

Humidifier and dehumidifier characteristics in waste heat energy-powered HDH systems Similar to water, the increasing demand for electrical energy has resulted in finding innovative/alternative solutions for powering desalination systems (Ahmad and Zhang, 2020).

Can metal humidifiers be used in HDH desalination systems?

It is noteworthy that the HDH process involves a continuous water supply, and because of their inherent corrosive property, metal humidifiers find limited application in HDH desalination systems. Mahmoud et al. (2013) evaluated the HDH system with galvanized steel humidifier and copper condenser with CAOW and OAOW cycles.

Can a cellulose humidifier be used in a solar and waste heat powered system?

Cellulose (experimental investigation) Xu et al. (2018) performed an investigation on a solar and waste heat powered HDH system with the utilization of a cellulose humidifier and FTHE. A maximum yield of 12.75 kg/h was attained for optimal air and water mass flow rates of 450 and 0.3 m³/h.

Water is essential for life on Earth. Desalination may reduce water shortages by turning salty water into drinkable water. We study a solar desalination process that combines a humidifier ...

Therefore, the energy consumption of dehumidification and refrigeration is much less than a conventional Mechanical Vapor Compression Refrigeration (MVCR) system. The heat ...

The hybrid solar-thermal multi-chamber dryer (HSTMC) comprises two subsystems; the solar-thermal dehumidifier and the hybrid solar-thermal dryer. Fig. 1 illustrates the parts of the ...

Theoretical modelling and optimization of bubble column dehumidifier for a solar driven humidification-dehumidification system, Raj Ranjitha, P, Ratheesh, R, Jayakumar, J S, Balakrishnan, Shankar

To obtain the required thermal performance of an air-heated HDD, a detailed system-scale thermal-optical model for a solar air collector and a transport model based on heat and mass ...

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A solar-driven hollow fiber membrane dehumidification experimental rig was designed to investigate its performance from July to September in Guilin, China. The dehumidification, ...

Abstract A mixed-mode solar thermal dryer, with a capacity of 25 kg per batch, was developed and installed in north-eastern India (26° 18' N, 91° 74' E) for drying local agricultural ...

Abstract ... hybrid solar desalination studies is presented besides their thermal efficiency and gain output ratio. Results showed that maximum energy efficiency was 72%. It was achieved with compact flat ...

Recent years have witnessed an upsurge in interest in desalination techniques that employ solar energy as a heat source for the evaporation of salt water. A typical solar reflector of this ...

A mixed-mode solar thermal dryer, with a capacity of 25 kg per batch, was developed and installed in north-eastern India (26° 18' N, 91° 74' E) for drying local agricultural products. This ...

This work presents the theoretical and experimental investigation of a solar-powered humidification dehumidification desalination (HDD) system with different humidifier packing materials ...

The regeneration process, using parabolic solar heating on a polymer-based solid desiccant dehumidifier, effectively removes moisture. Desiccants adsorb moisture, and airflow and ...

The dehumidifier is a key component in liquid desiccant air-conditioning systems. Analytical solutions have more advantages than numerical solutions in studying the dehumidifier ...

What is Solar Powered Dehumidifier? The solar powered dehumidifier is a device that uses solar energy to convert it into electricity and ...

In Hong Kong, a hybrid configuration of solar-assisted liquid desiccant dehumidifier (LDD) along with indirect evaporative cooler was carried ...

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The air solar heater was further improved by the incorporation of copper chips as thermal energy-storing materials for extending the desalination process during the sun's hours.

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Photovoltaic energy storage container A photovoltaic energy storage container is a rechargeable battery system that stores large amounts of energy generated from renewable sources like wind or solar ...

This paper proposes a compact solar driven two-stage humidification-dehumidification desalination system with shared dehumidifier. It contains two humidifiers and a dehumidifier, wherein ...

Experimental investigation of a humidifier-dehumidifier desalination system with a hybrid air heater (solar-electric) and vapor absorption refrigeration (VAR) system in the dehumidifier

Non-uniform solar drying has been deemed a drawback of solar dryer commercialization due to low-quality products influenced by the sun's off hours. Drying uniformity may ...

Lastly, based on obtained optimal operating conditions, a case study on a dehumidifier-integrated solar dryer is proposed for food/agriculture products drying applications using AI-based ...

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