

Bionics provides a positive and beneficial impact on the development of various materials and systems, which has been widely used in energy storage, heat transfer enhancement, and solar thermochemical reactions. In this paper, the idea of heat storage unit with biomimetic alveoli structure is proposed and introduced to increase the heat transfer area ...

For packed bed energy storage tanks, we can change the height-to-diameter ratio of the energy storage tanks for a fixed volume, e.g., a large height would result in a smaller diameter, and vice versa. ... Molten-salt thermal energy storage in thermocline under different environmental boundary conditions. Appl. Energy, 87 (11) (2010), pp. 3322-3329.

The cryogenic energy storage packed bed (CESPB) is widely employed as a cold recovery device to enhance the round-trip efficiency of cryogenic energy storage systems. Nonetheless, the cycle efficiencies of CESPB remain relatively low, with limited research investigating efficient methods for determining the design parameters.

DOI: 10.1016/j.applthermaleng.2023.120247 Corpus ID: 257068325; Dynamic creep and stress performances of the packed-bed thermal energy storage tank with molten salt EPCM particles @article{Du2023DynamicCA, title={Dynamic creep and stress performances of the packed-bed thermal energy storage tank with molten salt EPCM particles}, ...

In the present study, a two-dimensional CFD approach has been chosen to investigate heat transfer in a packed bed filled with phase change materials (PCM) capsules. In this research, four different geometries, circular, hexagonal, elliptical, and square, are considered PCM packages made of KNO₃ covered with a copper layer and NaK as heat transfer fluid ...

Renewable energy from the sun is increasingly recognized as a viable replacement for fossil fuels, offering reduced carbon emissions and sustainable energy solutions. Thermal energy storage (TES) technology addresses the inherent intermittency of solar energy source. While molten salt technology with two tanks is commonly used in concentrated solar ...

The instability of the renewable energy significantly impacts the thermal performance of solar thermoelectric systems. In this paper, a coupling system consisting of solar trough collector and double-layer cascaded packed-bed latent heat storage system (PLTES) is constructed to investigate thermal performance and operating parameters under dynamic ...

To achieve sustainable development goals and meet the demand for clean and efficient energy utilization, it is imperative to advance the penetration of renewable energy in various sectors. Energy storage systems can

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mitigate the intermittent issues of renewable energy and enhance the efficiency and economic viability of existing energy facilities. Among various ...

With the goal of utilizing the PCMs in the storage tank to produce high storage volumetric capacity, Khor et al. [28] examined multilayer energy storage tank's thermal characteristics. According to numerical analysis by Mao et al. [29], the tank's charge time decreases as the temperature of the inlet HTF rises, and the rate at which heat is ...

The packed-bed thermal energy storage (PBTES) technology exhibits significant potential for utilization in various energy sectors, including concentrating solar power, city heating systems and power peaking. This paper uses a genetic algorithm (GA) to optimize the phase change material (PCM) layer height arrangement of cascaded two-layered PBTES with ...

Semantic Scholar extracted view of "Optimization of capsule diameters in cascade packed-bed thermal energy storage tank with radial porosity oscillations based on genetic algorithm" by Jiuyang Zhang et al. ... Optimization of the packed-bed thermal energy storage with cascaded PCM capsules under the constraint of outlet threshold temperature ...

Thermal-mechanical coupling characteristics of large-scale molten salt storage tanks under stable operating conditions with varying liquid levels. 2024, Journal of Energy Storage ... Optimization of PCM layer height of cascaded two-layered packed-bed thermal energy storage tank with capsules of varying diameters based on genetic algorithm.

Packed-bed thermocline tank with sensible fillers is a cost-effective option for thermal energy storage (TES). In real charging and discharging, the thermocline stability is disturbed and thermocline expansion occurs due to various factors, leading to the decreased global performances of storage tank. The purpose of this work is to experimentally and ...

Semantic Scholar extracted view of "Optimization of the packed-bed thermal energy storage with cascaded PCM capsules under the constraint of outlet threshold temperature" by Meng Li et al. ... Thermal-mechanical coupling characteristics of large-scale molten salt storage tanks under stable operating conditions with varying liquid levels. Bo Ren ...

The design, in which the capsules are packed in the bed at different sections based on the Phase Change Material (PCM) melting temperature, is an effective method to improve the heat-storage performance of the latent heat energy storage system. A latent heat storage system was established in the present study in order to optimize the arrangement of ...

Seasonal thermal energy storage. Ali Pourahmadiyan, ... Ahmad Arabkoohsar, in Future Grid-Scale Energy Storage Solutions, 2023. Tank thermal energy storage. Tank thermal energy storage (TTES) is a vertical thermal energy container using water as the storage medium. The container is generally made of reinforced

concrete, plastic, or stainless steel (McKenna et al., ...

A packed-bed system consists of an insulated tank, an aggregate storage material (particles/pellets/chunks), and a fluid pathway for heat exchange. In this study, we consider PCM pellets as a means for increasing energy storage density and for removing the risk of thermal ratcheting (e.g. often observed in sensible DMT systems).

The packed bed tank with multiple phase change materials (PCMs) is one of the most efficient latent heat energy storage techniques. This study presents insight into the influence of the latent heat arrangements on the cascaded packed bed tank, providing a new idea for designing multi-PCM packed bed tank, which concerns the screening of PCMs.

1 INTRODUCTION. Thermal energy storage (TES) can be used to ensure the continuity of many thermal processes due to the temporal difference between energy supply and utilization in energy systems. 1, 2 TES has been widely used to achieve dispatchable and steady thermal energy output in industrial processes, such as concentrating solar power, 3, 4 adiabatic compressed ...

Thermal energy storage (TES) is applied to overcome the intrinsic deficiency of solar energy by migrating the dispatching between the energy supply and demand. ... pressure drop under high porosity bed, and stability under various operational parameters. Therefore, investigations on the physical phenomena influencing the thermocline thickness ...

Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License ... Comparative study of different storage bed designs of a solid-state hydrogen tank. Journal of Energy Storage, 2019, 26, pp.101024. ?10.1016/j.est.2019.101024?. ?hal-02459251? ... the metal hydride storage bed. The tank wall is 8 mm thick and ...

Model a packed-bed storage tank unit integrated with solar water heating system, containing encapsulated PCM in spherical capsules, surrounded by SHS material. ... under various inlet operating conditions for various arrangements of PCM modules with different air flow channels. The proposed TES unit had 16 modules, which were arranged in eight ...

Therefore, the design of the storage tank in a packed bed system must consider the temperature field within the tank's flow field [11]. ... Parametric study on melting process of a shell-and-tube latent thermal energy storage under fluctuating thermal conditions. Appl. Therm. Eng., 180 (2020), p. 115898, 10.1016/j.applthermaleng.2020.115898.

Hydrogen can be stored as a gas, liquid, or as a part of a solid metal, polymer, or liquid hydride. Studies have indicated that large-scale storage could take place with gaseous hydrogen underground in aquifers, depleted petroleum or natural gas reservoirs, or man-made caverns from mining operations.

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According to Li et al. [10], the charging and discharging efficiency of a packed bed thermal energy storage system (PBTES) is 1.9-2.4 times that of the shell-and-tube thermal energy storage system. The thermal performance and the dynamic response characteristics of the EPCMs PBTES under various working conditions are the keys to the system ...

Thermal energy can be stored as thermochemical, sensible and latent [7]. Researchers extensively studied the sensible thermal system as a thermal energy storage (TES) system of A-CAES [8]. Razmi et al. [9] studied these applications but found that the heat recovery in TES is low, thus leading to a lower roundtrip efficiency (RTE). Wang et al. [10] ...

Thermal energy storage (TES) systems are central elements of various types of power plants operated using renewable energy sources. Packed bed TES can be considered as a cost-effective solution in concentrated solar power plants. Such a device is made up of a tank filled with a granular bed through which a heat-transfer fluid circulates. However, in such ...

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