Phase change energy storage heat exchanger calculation

Are phase change materials suitable for thermal energy storage?
Volume 2,Issue 8,18 August 2021,100540 Phase change materials (PCMs) having a large latent heat during solid-liquid phase transition are promisingfor thermal energy storage applications. However,the relatively low thermal conductivity of the majority of promising PCMs (<10 W/(m ? K)) limits the power density and overall storage efficiency.

Can phase change thermal storage heat exchangers improve thermal efficiency?
Therefore,researchers have focused on improving the thermal efficiencyof phase change thermal storage heat exchangers,reducing heat loss,and increasing the utilization rate of heat sources.

Why should thermal storage heat exchangers be optimized?
Thermal storage technology has received increasing attention under the policy of encouraging the development of renewable energy and new clean energy. Optimizing the heat exchange system of phase change thermal storage heat exchangers to obtain better performancehas become increasingly urgent.

How to optimize the performance of a heat exchanger system?
To optimize the overall performance of the heat exchanger system, it was necessary not only to study the rigid structure of the heat exchanger but also to control and compare the variable factors in the heat exchanger. Therefore, based on the control group, the cooling fluid flow rates are 0.1 and 0.3 m/s, respectively.

How does a PCM control the temperature of phase transition?
By controlling the temperature of phase transition,thermal energycan be stored in or released from the PCM efficiently. Figure 1 B is a schematic of a PCM storing heat from a heat source and transferring heat to a heat sink.

How is phase change addressed in the model?
To address phase change using Eq. (12.1),a 'effective-heat capacity approach'is used,where the latent heat is substituted using an equivalent sensible heat capacity that includes the latent capacity as well.

A numerical investigation of the melting heat transfer characteristics of phase change materials in different plate heat exchanger (latent heat thermal energy storage) ...

Ghoreishi-Madiseh et al. [3] first proposed the idea of using BFHE to extract the hot-rock mine geothermal and analyzed the influence of the natural convection, the thermal conductivity of ...

Depending on the heat-storing mechanism, the TES type in CSP could either be sensible heat storage, latent heat storage, or thermochemical storage [41, 43, 44]. Literature ...

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The main methods of heat transfer analysis are introduced, and the main methods of multi-dimensional numerical simulation are discussed. Several examples, invoking ...

The (dis)charging of an LTES heat exchanger typically has four phases: HTF displacement, sensible energy change, latent energy change and finally sensible energy ...

Latent heat TES utilizing phase-change materials (PCMs) is particularly advantageous because of its high energy-storage capacity with minimal changes in ...

The phase change heat transfer process has a time-dependent solid-liquid interface during melting and solidification, where heat can be absorbed or released in the form ...

Abstract. Recently, there has been a renewed interest in solid-to-liquid phase-change materials (PCMs) for thermal energy storage (TES) solutions in response to ambitious ...

The expression "energy crisis" refers to ever-increasing energy demand and the depletion of traditional resources. Conventional resources are commonly used around the ...

Buonomo et al. (2020) numerically studied a latent heat thermal energy storage system with a highly conductive metal foam phase change material called Nano-PCM to ...

Phase change materials (PCMs) with larger latent heat capacities and wider melting temperatures are clearly superior choices for the heat storage medium in a storage heat exchanger. The ...

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