Factors affecting latent heat storage

For a deeper understanding of the factors affecting roundtrip efficiency, McTigue et al. [32] carried out a sensitivity analysis of compressor/expander losses, pressure losses, ... Latent heat storage (LHS) systems utilize phase change materials which absorb or release heat at a constant temperature while undergoing phase change [52, 53].

The research progress on HP-enhanced latent heat storage systems is summarized from three aspects: HP and PCM coupling applications, HP heat transfer models, and simulation studies. ... PCM and hot HTF, cold HTF and hot HTF are the major factors affecting the system mode. The relationship between heat storage of PCM and the heat ...

As a key component of latent heat thermal energy storage system, heat exchangers that complete the energy storage process directly affect the operation efficiency of the system [11], [12], [13]. In order to improve the heat storage rate of the LHTES heat exchanger, scholars made extensive research on the structure of heat exchangers and the ...

where m is the mass of the substance and DT is the change in its temperature, in units of Celsius or Kelvin.The symbol c stands for specific heat, and depends on the material and phase.The specific heat is the amount of heat necessary to change the temperature of 1.00 kg of mass by 1.00 ºC. The specific heat c is a property of the substance; its SI unit is J/(kg ? ? K) or J/(kg ? ? ...

The factors that affect the specific latent heat of fusion of a substance include the type of material, its molecular structure, and intermolecular forces. The purity of the substance and any ...

These factors affect the density and porosity of the concrete, which, in turn, impact its thermal conductivity. ... Latent heat storage, on the other hand, involves incorporating PCMs within the concrete, which absorb or release heat energy during phase transitions. By leveraging the thermal storage capacity of the concrete matrix, this ...

Second, the paper discusses the factors affecting the occurrence and the degree of supercooling, such as cooling rate, PCM container characteristics, PCM thermal history, use of additives, etc. ... However, if supercooling is not desired like in latent heat thermal energy storage systems, some parameters should be modified in a way to eliminate ...

Qarnia [6] developed a theoretical model to predict the thermal performance of a solar latent heat storage unit and three kinds of PCM (n-octadecane, Paraffin wax and Stearic acid) ... it also can be seen that the density, melting enthalpy and specific heat are the key factors affecting the heat and exergy storage capacities. The heat and ...

and also electric storage heaters. Latent heat storage uses different types of phase change materials (PCM), while thermochemical heat storage (THS) refers to the use of reversible chemical reactions to store large quantities of heat in a compact volume. 3. There are two primary applications for TES - intra-day and interseasonal storage of heat.

From Fig. 8 (b), It can be calculated that the sum of weights of the density (42.2 %) and latent heat (35.2 %) can attain 77.4 %, which means the other three factors including melting temperature (9.1 %), specific heat (7.2 %) and thermal conductivity (6.4 %) have very minor effects on the air storage capacity compared to the density and latent ...

The article presents different methods of thermal energy storage including sensible heat storage, latent heat storage and thermochemical energy storage, focusing mainly on phase change materials (PCMs) as a form of suitable solution for energy utilisation to fill the gap between demand and supply to improve the energy efficiency of a system.

The latent heat of vaporization, Lh, for a grain depends on its moisture content and temperature and is appreciably greater than the latent heat of evaporation of water. ... There are three groups of factors affecting drying efficiency: * those related to the environment, in particular, ambient air conditions; ... It is essential that the grain ...

The energy involved in a phase change depends on two major factors: the number and strength of bonds or force pairs. ... (100^oC) reflect the large latent heat of melting and vaporization, respectively. Water can evaporate at temperatures below the boiling point. More energy is required than at the boiling point, because the kinetic energy of ...

Latent heat energy storage (LHES) offers high storage density and an isothermal condition for a low- to medium-temperature range compared to sensible heat storage. The ...

In latent heat storage (LHS) TES systems, the outlet temperature of the HTF is steady during discharge. However the main drawback of latent heat storage materials is poor thermal conductivity. ... The main influencing factors that affect the performance of a solar water heater are optical transmittance of glass cover, ...

Comparison study between a naturally cooled and a storage-based latent heat cooled PV solar panels conducted by Tana et al. was found that the panel temperature of the latent heat cooled shell reduced by 15 °C in comparison with a naturally cooled PV panel. It is observed from the above literatures that most of the studies were either ...

Process of Freezing. Freezing is a physical process by which the temperature of a material is reduced below its freezing point temperature. Two heat energy principles are involved: sensible heat and latent heat.When the

material is at a temperature above its freezing point, first the sensible heat is removed until the material reaches its freezing point; second, ...

As the water and heat storage term, soil moisture has long-term memory on time scales ranging from several weeks to months. ... With the initial wet soil moisture anomalies, the main factors affecting latent heat flux anomalies are ground evaporation and transpiration anomalies at the beginning and later, respectively. The anomalies of latent ...

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 conditions. ... [15] analyzed the factors affecting the thermal performance of cascaded PLTES system and optimized ...

The ratio of the heat stored to the temperature rise is the heat capacity of the storage medium [32:p.257]. SHS substances can be classified into liquid SHS such as water and oil or solid SHS such as rocks, metals, and masonry materials. Since gases have a very low heat capacity, they are not usually suitable for cold or heat storage [33:p.257].

1. Introduction. Latent heat thermal energy storage (LHTES) has become a widely adopted approach in medium and high temperature solar thermal utilization due to its high energy storage density and minimal temperature change during heat storage and release [1].The selection of phase change material (PCM) in the LHTES system is a crucial step in the design ...

Latent heat storage is a popular research area with industrial and domestic applications, ... It relies on the absorption and release of heat during phase change, the efficiency of which is determined by factors like storage material and temperature [102]. While boasting high energy density and efficiency, LHS is hampered by costs and ...

The article presents different methods of thermal energy storage including sensible heat storage, latent heat storage and thermochemical energy storage, focusing mainly on phase change materials ...

Latent heat is associated with processes other than changes among the solid, liquid, and vapour phases of a single substance. Many solids exist in different crystalline modifications, and the transitions between these generally involve absorption or evolution of latent heat. The process of dissolving one substance in another often involves heat; if the solution ...

The energy involved in a phase change depends on two major factors: the number and strength of bonds or force pairs. The number of bonds is proportional to the number of molecules and thus to the mass of the sample. ... Latent heat is an intensive property measured in units of J/kg. Both L f and L v depend on the substance, particularly on the ...

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LATENT HEAT STORAGE: In this type of heat storage, energy is stored as latent heat in suitable substances during a phase change, usually, from a solid to a liquid phase at a desired temperature. 1,4 The energy that is absorbed during the melting (solid --> liquid) process is stored as "latent heat of fusion" and is released during the freezing

Section 6 discusses the major factors affecting the performance of free cooling systems and the suitable enhancements that can be applied for the required purpose. This paper concludes by summarising the key achievements of application of PCM energy storage in free cooling, based on the reviewed research work. ... The proposed latent heat ...

Scholars have come up with various factors that affect the outcome of these battles ... The principles behind a latent heat storage system are pretty similar to that of a sensible heat storage. The main difference originates from the fact that in these systems a change of phase occurs (e.g. from solid to liquid or the other way around). ...

A thermodynamic model of cascaded latent-heat stores is developed, and the effects of the heat store arrangement (i.e., total stage number and stage area) and fluid velocity in the thermal store tubes as key parameters that affect the heat storage and release rates, as well as the roundtrip efficiency, are evaluated.

Latent heat is also released into the environment when a liquid freezes, and can be calculated from Q = m L f Q = m L f. Fun In Physics. Making Ice Cream. Figure 11.11 With the proper ingredients, some ice and a couple of plastic bags, you could make your own ice cream in five minutes. (ElinorD, Wikimedia Commons)

The heat loads and pressures are two key factors to affect the transient temperature-control performance. ... Schematics of three typical melting means for latent heat storage; (b) Heat flow evolutions corresponding to three melting means where the condition is the constant superheat degree or constant heating plate temperature. Compared with ...

The technology for storing thermal energy as sensible heat, latent heat, or thermochemical energy has greatly evolved in recent years, and it is expected to grow up to about 10.1 billion US dollars by 2027. A thermal energy storage (TES) system can significantly improve industrial energy efficiency and eliminate the need for additional energy supply in commercial ...