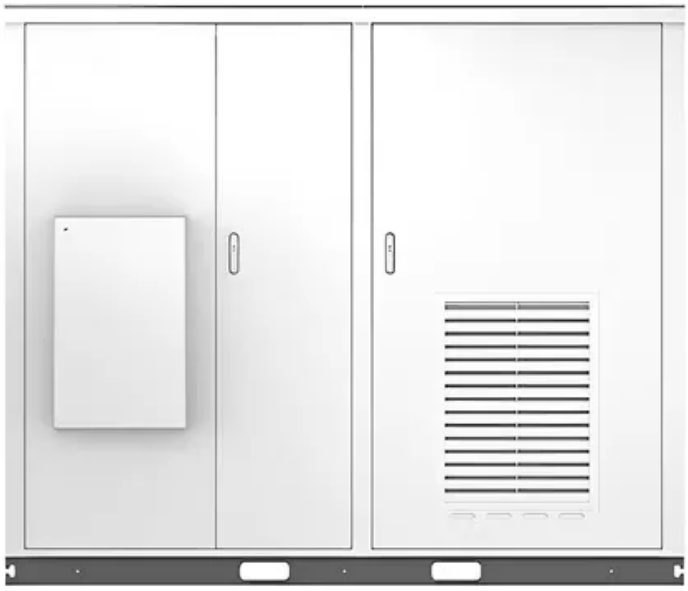
Solar360 Mobile Energy

Latent heat storage for solar steam systems



Overview

This paper deals with a latent heat storage system using Phase Change Materials (PCM) as an effective way of storing thermal energy (solar energy, off-peak electricity, industrial waste heat). It has the advantages of high storage density and the isothermal nature of the storage.

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Solar thermal systems, including direct steam generation in the absorbers, require isothermal energy storage systems. One option to fulfil this requirement is the application of phase change materials (PCMs) to absorb or release energy. The implementation of cost-effective storage systems demands.

Solar steam generation for power plants requires latent heat storage systems for a saturation temperature range between 200°C and 320°C. This paper describes the basic concepts investigated and first results of research activities aiming at the demonstration of a storage system using steam provided.

Latent heat storages are based on the shift in internal energy that occurs whenever the storage material undergoes a phase change within a narrow temperature interval. Usually, the transition between the solid and liquid state is used. One of the main applications for high- temperature latent heat.

Thermal energy storage (TES) is indispensable for solar thermal power plant applications. It makes it possible to meet the intermediate load profile with dispatchable power, a benefit that has a high value to power utilities and that gives concentrating solar power (CSP) technology an edge over.

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storage density and the isothermal nature of the storage process. This.

Solar thermal systems using absorber evaporating steam directly require isothermal energy storage. The application of latent heat storage systems is an option to fulfill this demand. This concept has been demonstrated mainly for low temperature heating and refrigeration applications, the experience. Which latent heat storage material is used?

The latent heat storage material used wasstearic acid. After the tests, the authors concluded that the system with a combined storage system has higher overall than the system with just sensible storage. Images of the experimental set-up are shown in Fig. 20. Fig. 20. Experimental set-up of the system presented by Bhale et al. (2015).

Can a latent heat thermal storage system be used for solar cooling?

Starting with publications of PCMs for solar cooling systems, Gil et al. (2013) presented a pilot plant totest a latent heat thermal storage system for solar cooling applicationswith a storage temperature range between 140 and 200 °C (Fig. 14).

What are the applications of latent heat storage units?

The application of these storage units is industrial process steam recovery (Steinmann 2009, Johnson 2011a). Solar industrial process steam applications could also utilize such storage systems. Tab. 2: Overview of latent heat storage units and PCMs tested by DLR (Steinmann 2009, Laing 2010a, Bauer 2010, Johnson 2011).

What is latent heat thermal storage (lhts)?

According to the authors, latent heat thermal storage (LHTS)increases the initial cost of a thermal system, but saves energy in the long-range and allows to run the system continually in spite of the discontinuity of the heat source.

Can a combined latent and sensible heat storage system be integrated?

The integration of a combined latent and sensible heat storage system in a DSG solar power plant was analyzed by Birnbaum (2010). The combined system consists of the preheating, evaporation/condensation and the superheating module. Figure 8 shows the integration of such combined system in a DSG power plant and the T-s diagram of the process.

What are latent heat storage materials (PCM)?

Regarding the material, latent heat storage orphase change materials(PCM) were selected for this study because they are a very promising type of storage to be integrated in thermal industrial processes, although the state of the art of latent heat thermal energy storage (LHTES) systems is still far from broad commercialization.

Latent heat storage for solar steam systems

Thermal energy storage concepts for direct steam generation (DSG) solar

This chapter summarizes recent research in TES for DSG solar plants that covers from the use of the existing TES configuration in commercial systems but with optimized power ...

Harnessing the Future: Solar Steam Storage Explained Rajendra ...

? Harnessing the Future: Solar Steam Storage Explained Rajendra Parekh Kalanidhi "Steam: The Restless Traveler of Energy" copyright by Kalanidhivapinews Steam may seem like a perfect energy carrier, but in reality, it behaves like a restless traveler -- always eager to escape ...

Solar Thermal Energy Storage Systems

Latent heat systems usually have high energy storage densities when compared to sensible heat storage devices. This is because the enthalpy change associated with phase changes is large compared to the sensible heat stored in a material ...

Latent Heat and Cold Storage in a Solar-Driven Steam Jet Ejector

This paper presents a plant concept of a solar-driven steam jet ejector chiller with latent heat

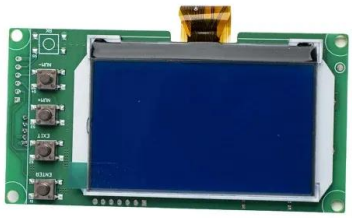
and cold storage. The concept will be realized in a first demonstration plant. The solar cooling plant ...

Analysis of the experimental behaviour of a 100 kW th latent heat

A latent heat thermal storage prototype was tested under real working conditions with steam produced by a parabolic-trough collector test facility at the Plataforma Solar de Almería. The ...

Heat transfer efficient thermal energy storage for steam ...

In consideration of solar irradiation as an essentially intermit-tent source of energy, all those solar power technologies need to be integrated with adequate thermal storage capacities in order to: ...



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