

What is a thermocline storage tank?

In conventional design practice, a well-mixed storage tank is considered for storing the heat. A thermocline tank offers benefits like the uniformity of the output temperature and reduction in thermal losses from the solar collector, through the establishment of thermal stratification.

Do design parameters influence thermal performance of a packed bed thermocline thermal energy storage system?

The influence of design parameters on the thermal performance of a packed bed thermocline thermal energy storage (TES) system was analyzed. Both one-dimensional (1D) and two-dimensional (2D) in-house codes were developed in MATLAB environment. The diameter of solid filler, height of storage tank, and fluid velocity were varied.

Is thermocline storage a good solution?

Thermocline storage on a solid bed is a promising solution but requires an adequate choice of the solid material used. In this literature review, it was found that vegetable oils have the same orders of magnitude in terms of thermal properties but their thermal stabilities allow them to be differentiated.

What are the three concepts of thermocline packed-bed storage tanks?

Ahmed et al. (2019) [166] developed and compared three concepts of thermocline packed-bed storage tanks: sensible rod structure (Fig. 10.18A), and spherical PCM capsules (Fig. 10.18B) and combined sensible-latent in radial direction (Fig. 10.18C).

What is the difference between a thermosiphon based and thermocline tank?

In a thermosiphon-based well-mixed tank, the entire storage medium is assumed to be at a single temperature. On the other hand, a thermocline tank maintains a temperature stratification inside and offers various system-level advantages over a well-mixed ST (Lavan and Thompson 1977).

To date, TES systems have been prohibitively expensive except in certain markets. Two of the most significant capital costs in a TES system are the storage medium (typically molten salt) and the storage tanks. Thermocline storage is a relatively unproven TES method that has the potential to significantly reduce these costs.

To provide more knowledge for designing and operating of such a thermocline storage system, this paper firstly presents the application of method of characteristics for numerically predicting the heat charging and discharging process in a packed bed thermocline storage tank. Nondimensional analysis of governing equations and numerical solution ...

The single-medium thermocline TES system has been investigated by several numerical and experimental

studies. Gajbhiye et al. [9] conducted an experimental analysis of a direct single-medium thermocline tank equipped with a flow distributor, using water as a working fluid. The flow distributor used in the experiment was an annular vertical porous type with ...

Xu et al. (2012b) presented a two-dimensional, two-phase model for heat transfer and fluid dynamics within the thermocline storage system. The authors used the model to evaluate different correlations for the interstitial heat transfer coefficient, effective thermal conductivity and the effect of the thermal conductivity of solid fillers. ...

Thermocline storage system is experimentally reported in recent years. Pacheco et al. [3] proposed 2.3 MWh molten salt thermocline system, and studied the temperature distribution with thermocline layer, and this experimental results have been used by most researchers. Hoffmann et al. [4] built a laboratory-scale experiment of thermocline storage ...

Presents optimum design of the thermal energy storage system. article info Article history: Received 17 May 2013 Received in revised form 2 August 2013 Accepted 19 August 2013 Keywords: Thermal energy storage Thermocline system Latent thermal energy storage Encapsulated phase change materials Concentrating solar power abstract

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A numerical comparison between two-tank and thermocline storage systems was carried out in Rodr guez et al 32 to evaluate the best system to integrate with a CSP-ORC system. The results revealed the superior global attractiveness of the thermocline solutions, since they exhibited similar thermal performance but at a much lower cost of about 30 ...

This work presents an optimized thermal energy storage (TES) system based on thermocline technology. A prototype of a single-medium (molten salt) thermocline storage system was built and tested at the ENEA Casaccia Research Center, which consists of a single tank equipped with an internal vertical channel to drive the salt motion by natural convection.

In this paper, an overview on thermal energy storage using thermocline tank for CSP plant is presented, with more attention to the thermocline technique, the principle concept of thermocline storage system is well presented, as well as a summary of different correlations applied to describe the charging and discharging phases are analyzed.

A thermocline thermal energy storage system with filler materials for concentrated solar power plants: experimental data and numerical model sensitivity to different experimental tank scales. Appl Therm Eng, 100 (2016), pp. 753-761, 10.1016/j.applthermaleng.2016.01.110.

One such thermal storage system, a thermocline, uses a single tank containing a fluid with a thermal gradient running vertically through the tank, where hotter fluid (lower density) is at the top ...

Thermal storage improves the dispatchability and marketability of parabolic trough power plants allowing them to produce electricity on demand independent of solar collection. One such thermal storage system, a thermocline, uses a single tank containing a fluid with a thermal gradient running vertically through the tank, where hotter fluid (lower density) is ...

indirect thermal storage system by assessing the feasibility of using molten salt in a thermocline. We chose to study a thermocline system because it has the potential to reduce the cost of the thermal storage system and it can dispatch thermal energy at nearly a constant temperature over most of its discharge cycle. Both labo-

This study aims to quantify the environmental benefits of the optimised thermocline storage system. First, the environmental impacts of a reference case, is assessed. Then the influence of varying the optimisation variables is investigated. In this study, the reference tank is the industrial thermocline tank named Eco-Stock¹⁷⁴; (ES) [33].

Hence, to understand the stability of the thermocline, it is pertinent to prudently design a thermal energy storage system. The thin thermocline is desirable for thermal energy storage systems concluded (Gil et al., 2010, Medrano et al., 2010). For a clear understanding, this novel study discusses the size and stability of the thermocline along ...

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