

Can simultaneous charging and discharging process be used in heat exchangers?

However, the work on the cases of simultaneous charging and discharging (SCD) process receives attention in just recent 15 years and is still inadequate. To the authors' best knowledge, Liu et al. studied an SCD process in a heat pipe heat exchanger with PCM in 2006.

Does a latent TES system perform a simultaneous charging/discharging performance?

Simultaneous charging/discharging performance for a latent TES system is studied. Heat transfer rate is sensitive to flow rate combinations of cooling/heating water. Direct heat transfer between cooling/heating water is found in the stable state. System reaches stable states in 7500 s for initially solid phase change material.

Does a latent thermal energy storage system have thermal performance?

Conclusion The thermal performance of a latent thermal energy storage system is experimentally investigated during the simultaneous charging and discharging process.

Do TES systems need to be charged and discharged simultaneously?

To avoid frequent switches between the charging/discharging mode and to keep a continuous operation, TES systems need to be charged and discharged simultaneously. However, the work on the cases of simultaneous charging and discharging (SCD) process receives attention in just recent 15 years and is still inadequate.

What is the balanced charging/discharging power?

The balanced charging/discharging power is approximately 52 W. By comparison of Fig. 6 and Fig. 8 (b), it can be seen that the balanced power is still lower than that under the equal flow rate. It is noted that the initial charging power decreases to approximately 130 W, owing to the reduction of the charging flow rate.

Why is the ESU charged and discharged simultaneously?

Unequal charging/discharging flow rates Different flow rate combinations of the heating water and cooling water can affect the thermal behavior of the ESU. Accordingly, the ESU is charged and discharged simultaneously under two unequal flow combinations of heating and cooling water.

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This study proposes a cold and hot simultaneous energy storage tank (CAHSEST) for the first time, although its heat transfer characteristics are not yet clear. ... Khurana et al. [23] conducted experimental research on the simultaneous charging and discharging modes of a vertical cylindrical thermal energy storage tank equipped

with a helical ...

Various techniques like application of fins, metal foams etc. have been explored to solve the problem but focus has been mainly on energy storage and recovery separately, but in real life, the systems operate mostly through simultaneous storage and recovery or charging and discharging (SCD).

This paper mainly studies the operating characteristics of the heat storage system based on solar energy in simultaneous charging, the influence in the change in solar radiation intensity...

Investigating and modeling of simultaneous charging and discharging of a PCM heat exchanger; R.E. Murray et al. Experimental study of the phase change and energy characteristics inside a cylindrical latent heat energy storage system: Part 2 ...

Simultaneous charging/discharging performance for a latent TES system is studied. Heat transfer rate is sensitive to flow rate combinations of cooling/heating water. Direct heat ...

Simultaneous charging and discharging operations of thermal energy storages render effective energy-harnessing features. However, it leads to thermocline formation due to the dynamic interplay between energy input, energy extraction, and losses. Reliable retention of good thermodynamic quality of energy is realized by minimizing the energy degradation and ...

PCMs can store up to 14 times more energy than water per unit volume [15]. Therefore, depending on the temperature difference considered for the LHTES systems, PCM can reduce the weight and required space of the LHTES system by providing higher storage capacity [16]. LHTESs can provide high energy storage capacities to adjust the mismatch ...

In the dynamic environment of energy storage, the battery management system (BMS) has become a basic tool to control the charge and discharge conversion within the battery system. These systems not only ...

Energy storage and efficiency profile for the simultaneous and non-simultaneous modes with heat flux of 934 W/m²; Furthermore, the Stable-Transient-Region can be used to characterize this operation process for different practical applications apart from energy storage. ... Part II: Simultaneous charging/discharging modes. Energy Conversion and ...

As a renewable energy power generation method, concentrating solar power generation has a broad application prospect. Weather and fluctuation significantly affect the output power of concentrating solar power generation. A ...

This study has been broken into two stages: part 1) the experimental study of a LHESS during separate charging/discharging, and part 2) the experimental study of a LHESS during simultaneous

charging/discharging. This paper presents the first stage of this research in which a vertical cylindrical LHESS is consecutively charged and discharged.

In modern photovoltaic (PV) systems, the simultaneous charging and discharging of energy--commonly referred to as "simultaneous charge-discharge"--is a groundbreaking feature. This capability plays a vital role in improving energy efficiency, ensuring uninterrupted power supply, and maximizing energy utilization in both residential and ...

The simultaneous charging and discharging (SCD) process is carried out when the initial condition of PCM is solid (i.e. $27\text{ }^{\circ}\text{C}$). Numerical analysis is recorded with the hot and cold HTFs inlet temperatures of $80\text{ }^{\circ}\text{C}$ and $27\text{ }^{\circ}\text{C}$ Simultaneous energy storage and recovery in the triplex-tube heat exchanger with PCM, copper fins and Al_2O_3 ...

Abstract. In this study, the effect of inclination on the thermal performance of a shell and tube latent heat storage system (LHSS) is investigated. Due to its practical applicability, a simultaneous charging and discharging (SCD) condition is considered. The SCD process for the LHSS involves the circulation of the hot fluid from one side and at the same time cold fluid ...

In this paper we provide non-simultaneous charging and discharging guarantees for a linear energy storage system (ESS) model for a model predictive control (MPC) based home energy management system (HEMS) algorithm. The HEMS optimally controls the residential load and residentially-owned power sources, such as photovoltaic (PV) power generation and ...

Renewable Energy Storage Systems: In renewable energy systems, simultaneous charging and discharging allow for better energy management. Solar panels can charge the battery when sunlight is available, and the battery can discharge during sunset or cloudy periods, providing a steady power supply.

The performance of simultaneous charging and discharging process of a thermal energy storage system is experimentally investigated in this study. The microencapsulated phase change material (MEPCM) is used as the energy storage medium. The different combinations of the inlet cooling/heating water flow

A review of the latent heat thermal energy storage systems (LHTESS) regarding the shape of the PCM containers by Agyenim et al. [46]. They notice that the shell-and-tube energy storage system is the most widely studied among those systems. ... The simultaneous charging/discharging can solve the problem of the large volume of the storage heaters ...

The performance of simultaneous charging and discharging process of a thermal energy storage system is experimentally investigated in this study. The microencapsulated phase change ...

The second modified model discusses the technique of simultaneous charging and discharging operation

applied in the CHP unit. Two types of operations are analyzing with ...

An experimental setup for simultaneous charging and discharging experiments to be performed on an oil storage tank is presented. The experimental setup enables thermal energy to be stored in the storage tank as well as water to be heated up for a cooking application in a simultaneous charging and discharge cycle.

A new thermal storage system, a heat pipe heat exchanger with latent heat storage, is reported. The new system may operate in three basic different operation modes, the charging only, the discharging only and the simultaneous charging/discharging modes, which makes the system suitable for various time and/or weather dependent energy systems.

This review presents a first state-of-the-art for latent heat thermal energy storage (LHTES) operating with a simultaneous charging-discharging process (SCD). These systems combine the thermal behaviour of a storage with a phase change material (PCM) and the behaviour of a heat exchanger with heat transfer between two heat thermal fluids (HTF).

Latent heat thermal energy storage (LHTES) systems using phase change materials (PCMs) have appeared as promising solutions for energy storage when harnessing renewable energy ...

In this study, the effect of inclination on the thermal performance of a shell and tube latent heat storage system (LHSS) is investigated. Due to its practical applicability, a simultaneous...

The geometrical shapes of the thermal energy storage and the configurations of immersed discharging coils dictate the efficacy of low-to-medium temperature hot water applications. This study uses a three-dimensional numerical model to investigate the thermal characteristics of three storage configurations for simultaneous charging and ...

Murray and Groulx experimentally investigated consecutive charging/discharging [14] as well as simultaneous charging/discharging [15] of a cylindrical storage for DHW heating. The setup used in their studies consisted of a vertical cylindrical storage through which two finned parallel pipes were passed carrying heat transfer fluids (HTFs).

Simultaneous charging and discharging operations of thermal energy storages render effective energy-harnessing features. However, it leads to thermocline formation due to the dynamic interplay between energy input, energy extraction, and losses. ... vertical thermal energy storage tank during the simultaneous charging and discharging operation ...

Thermal energy storage (TES) technology acquired immense attention as it constitutes a reasonable and practical alternative in facing the intermittent and limited availability of solar energy [4]. ... The simultaneous charging and discharging process of a molten-salt packed-bed storage tank needs further investigations. In

Energy storage and simultaneous charging and discharging

order to maximize the ...

Abstract. Thermal energy storage (TES) has become a key component in combined heat and power (CHP) generation, which enhances the load regulation capability and overall thermal performance. In line with that concept, the present work addresses a numerical study that aims at investigating and predicting the transient thermal behavior of a water ...

The performance of simultaneous charging and discharging process of a thermal energy storage system is experimentally investigated in this study. The microencapsulated ...

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