

Does liquid air energy storage improve data-center immersion cooling?

A mathematical model of data-center immersion cooling using liquid air energy storage is developed to investigate its thermodynamic and economic performance. Furthermore, the genetic algorithm is utilized to maximize the cost effectiveness of a liquid air-based cooling system taking the time-varying cooling demand into account.

Can a data center cooling system use liquid air energy storage?

By using liquid air energy storage, the system eliminates the data center's reliance on the continuous power supply. Develop a thermodynamic and economic model for the liquid-air-based data center cooling system, and carry out a sensitivity analysis on operating parameters for the cooling system.

Can liquid cooling system reduce peak temperature and temperature inconsistency?

The simulation results show that the liquid cooling system can significantly reduce the peak temperature and temperature inconsistency in the ESS; the ambient temperature and coolant flow rate of the liquid cooling system are found to have important influence on the ESS thermal behavior.

How much power does a liquid air cooling system use?

For an optimized liquid air-based cooling system with an average IT power of 6.97MWh, power consumptions of liquid-air pump and immersion-coolant pump are 0.03 MWh and 0.01 MWh, respectively. According to Eq. (26), the pPUE can be determined as 1.006.

What is the maximum temperature rise of a liquid cooling system?

With the liquid-cooling system on, from the initial temperature, the maximum temperature rise of the LIBs is 2 K at the end of the charging process and 2.2 K at the end of the discharging process compared with the initial temperature.

Can a liquid cooling structure effectively manage the heat generated by a battery?

Discussion: The proposed liquid cooling structure design can effectively manage and disperse the heat generated by the battery. This method provides a new idea for the optimization of the energy efficiency of the hybrid power system. This paper provides a new way for the efficient thermal management of the automotive power battery.

IT cooling challenges continue escalating as new server-accelerated compute technologies, machine learning, artificial intelligence, and high-performance computing drive higher heat ...

In conclusion, chilled water at 10 °C with a flow rate of 105.32 kg/s (7.15 MW of cooling), N 2 with 99.9 % purity and a flow rate of 55.78 kg/s, and O 2 with a flow rate of 17.67 kg/s are produced ...

In this paper, a novel liquid air energy storage system with a subcooling subsystem that can replenish liquefaction capacity and ensure complete liquefaction of air ...

A study by Shahi et al., 2021 showed that pumping power can be saved by dynamically varying the flow rate across the system and thereby decreasing the energy ...

The increasing global demand for reliable and sustainable energy sources has fueled an intensive search for innovative energy storage solutions [1]. Among these, liquid air energy storage ...

Wang et al. [45] introduced a cryogenic distillation method air separation unit with liquid air energy storage, storing waste nitrogen to store cold energy with a payback period of ...

Liquid air energy storage (LAES) uses air as both the storage medium and working fluid, and it falls into the broad category of thermo-mechanical energy storage ...

A comparative study between air cooling and liquid cooling ... The liquid cooling method is more energy efficient than air cooling. Abstract. ... As the flow rate in the cooling channels 11 and 12 ...

Energy, exergy, and economic analyses of a novel liquid air energy storage system with cooling, heating, power, hot water, and hydrogen cogeneration ... utilizing heat ...

The liquid yield, defined as the ratio of liquid energy storage nitrogen to total energy storage nitrogen in ESR, is 58.6 % in this work. The maximum allowable flow rate of ...

Modelling a packed-bed latent heat thermal energy storage unit and studying its performance using different paraffins. ... Solar energy offers immense potential for building ...

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