

## SolarInnovate Energy Solutions

# Comparison of energy storage liquid cooling and air cooling



## Overview

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Air cooling relies on fans to dissipate heat through airflow, whereas liquid cooling uses a coolant that directly absorbs and transfers heat away from battery modules. Since liquids have a heat transfer capacity more over than air, liquid cooling significantly enhances cooling efficiency and ensures uniform temperature distribution, reducing the risk of localized overheating. Are air cooling systems better than liquid cooling systems?

Air cooling systems, with their simpler design, are generally easier to maintain and have a lower risk of failure. Liquid cooling systems, while more efficient, require more maintenance and have a higher risk of leaks or other issues. Consider the available resources and expertise when choosing between these systems.

Which cooling method is best for battery energy storage systems?

When it comes to managing the thermal regulation of Battery Energy Storage Systems (BESS), the debate often centers around two primary cooling methods: air cooling and liquid cooling. Each method has its own strengths and weaknesses, making the choice between the two a critical decision for anyone involved in energy storage solutions.

What is the difference between air cooling and liquid cooling?

The temperature difference of the hottest cell between air cooling and liquid cooling reduces with an increase in power consumption. For the power consumption of 0.5 W, the average temperature of the hottest cell with the liquid cooling system is around 3 °C lower than the air cooling system.

Does the temperature difference between air cooling and liquid cooling affect power consumption?

However, the temperature of the hottest cell in the liquid-cooled module is lower than the air-cooled module within the investigated range of power consumption. The temperature difference of the hottest cell between air cooling and liquid cooling reduces with an increase in power consumption.

How to evaluate the performance of a cooling system?

The parasitic energy consumption of the fan in the air cooling system and the pump in the liquid cooling system are crucial factors to evaluate the performance of the cooling systems.

How much power does a liquid cooling system consume?

For the power consumption of 0.5 W, the average temperature of the hottest cell with the liquid cooling system is around 3 °C lower than the air cooling system. For 13.5 °C increase in the average temperature of the hottest cell, the ratio of power consumption is around  $PR = 860$ .

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### A review of battery thermal management systems using liquid cooling ...

Jan 15, 2024 · Moreover, the research status and advantages of the combination of PCM and liquid cooling BTMS are introduced. In addition to PCM and liquid cooling, the BTMS operation ...

### Two-phase immersion liquid cooling system for 4680 Li-ion ...

Sep 10, 2024 · Zhao et al. [12] proposed a novel thermal management system for lithium-ion battery modules that combines direct liquid-cooling with forced air-cooling, utilizing transformer ...



### Thermodynamic and economic analyses of liquid air energy storage

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## Air-Cooled vs. Liquid-Cooled Energy Storage Systems: Which Cooling

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### A comparative study between air cooling and liquid cooling

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Nov 5, 2021 · In this paper, a comparative analysis is conducted between air type and liquid type thermal management systems for a high-energy lithium-ion battery module. The parasitic ...

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Feb 5, 2016 · In order to compare the advantages and disadvantages of different cooling methods and provide usable flow rate range under a specific control target, this paper analyzes the ...



## Thermal performance analysis

## of 18,650 battery thermal ...



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