

Comparison of performance of Czech micro-module data center immersion liquid cooling



Overview

Liquid immersion cooling achieves PUE of 1.80 for air cooling — a 40-50% energy efficiency gain at high densities TCO breakeven for immersion happens above 50 kW/rack and \$0.10/kWh electricity — payback as low as 1.6 years at 80+ kW/rack. The immersion phase-change cooling technology utilizes the latent heat of the cooling liquid to dissipate heat by directly contacting the cooling liquid with the heat-generating electronic chip, which can meet the cooling requirements of current high heat flux density data centers. In this paper, by constructing a single-server liquid cooling test bench, this study compares the heat dissipation efficiencies of pure immersion and immersion jet liquid cooling systems and examines the impact of inlet water temperature, jet distance, and inlet water flow rate on system performance. The air cooling, which supports up to approximately 70kW per rack, has long been the de facto standard for data centres. However, this approach is now falling out of favour. 6), CAPEX/OPEX modeling across 100kW-50MW deployments, and AI/HPC deployment case studies through 2030.



Article Content

(PDF) AI-driven cooling technologies for high

AI-driven cooling technologies for high-performance data centres: state-of-the-art review and future directions ☆

Simulation Study of Influencing Factors of Immersion

The immersion phase-change cooling technology utilizes the latent heat of the cooling liquid to dissipate heat by directly contacting the cooling liquid

A comprehensive review of cold plate liquid cooling technology for data ...

This study provides a comprehensive review of cold plate liquid cooling technology for data centers, covering aspects such as cold plate materials, coolant properties, inlet and outlet

Experimental investigation of a data-centre cooling system using a

The energy performance of the proposed technique and the liquid-cooling system previously used by OVHcloud was compared at a 600 kW data centre (DC). The proposed technique

Disrupting Data Centre Design

This report examines the transformative potential of liquid cooling, an emerging technology that is poised to become a cornerstone of modern data centre design. We will explore the diverse approaches to

Performance evaluation and optimization of data center servers using ...

Abstract This paper conducts a comprehensive performance evaluation and optimization of single-phase immersion cooling (SPIC) systems to address challenges in data center server cooling.

A review of the immersion liquid cooling technology for high ...

In summary, immersion cooling has emerged as a pivotal solution for supporting the development of high-performance data centers. Driven by the dual forces of the intelligent digital

Evaluation and Optimization of a Two-Phase Liquid-Immersion Cooling ...

Abstract: An efficient cooling system for data centers can boost the working efficiency of servers and promote energy savings. In this study, a laboratory experiment and computational fluid dynamics

Optimization of heat sinks for data center server CPUs cooled via ...

Abstract As modern data centers increasingly support high-performance computing and AI-driven applications, advanced thermal management becomes ever more critical. Single-phase

Enhancing data center cooling efficiency and ability: A comprehensive ...

Recommendations for future research directions to improve the efficiency and ability of direct liquid cooling applications in data centers were concluded, emphasizing the need for user

Two-phase liquid-immersion data center cooling system: Experimental ...

Two-phase liquid-immersion cooling is one of the promising direct liquid-cooled DC systems, but its system-scale thermal management performance has not been investigated in detail yet.

Comparative Study on Heat Dissipation Performance of

Heat dissipation has emerged as a critical challenge in server cooling due to the escalating number of servers within data centers. The

Liquid vs Air Cooling for Data Centers 2026: Cost & Efficiency Analysis

At Energy Solutions Intelligence, we analyze operational data from hyperscale operators, colocation providers, and enterprise deployments to benchmark liquid immersion cooling economics against

Experimental study on the immersion liquid cooling performance of

Highly dense and integrated data centers face key challenges of realizing efficient cooling and improved energy efficiency. To overcome these challenges, this study experimentally

Immersion cooling technology development status of data center ...

Submerged liquid cooling technology is favored by the data center cooling system, mainly because of the outstanding performance of this technology in data center cooling, which can solve

(PDF) AI-driven cooling technologies for high-performance data

A detailed comparative framework synthesises thermal efficiency, scalability, and water usage across air, liquid, and hybrid systems.

Thermal Performance of Single-Phase and Two-Phase Immersion Cooling

Thermal management is a key bottleneck of technology development in data center systems. Immersion cooling eliminates the thermal interface material and packaging limitations of conventional cooling

Current Status and Challenges for Liquid-Cooled Data

Because it is a targeted cooling technology, compared with immersion liquid cooling, the required dose of coolant is lower, and the implementation is

Thermal Management for Data Centers 2025-2035:

This report provides an analysis of different liquid cooling vendors, coolant fluid suppliers, and data center end-users, offering insights into the opportunities and

Comparative Study on Heat Dissipation Performance of

By constructing a single-server liquid cooling test bench, this study compares the heat dissipation efficiencies of pure immersion and immersion jet

Immersion cooling fluid comparison using a single-phase immersion ...

Abstract This paper analyses the cooling performance of different immersion fluids for a single-phase immersion/liquid-cooling technique, which integrates a direct-to-chip water-cooling

Enhancing data center cooling efficiency and ability: A comprehensive ...

Comparative analysis of these systems reveals their potential to substantially lower thermal resistances and improve energy utilization. Despite these advancements, the research

Performance Enhancement of Single-Phase Immersion

To address this, a steady-state three-dimensional numerical model is constructed herein to analyze flow and thermal transport capacities in servers

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Evaluation and Optimization of a Two-Phase Liquid

An efficient cooling system for data centers can boost the working efficiency of servers and promote energy savings. In this study, a laboratory

Data centers cooling: A critical review of techniques, challenges, and ...

Abstract In order to increase data centers' efficiency and performance, a proper cooling system should be applied. This article provides a comprehensive assessment which explores current

Simulation Study of Influencing Factors of Immersion Phase ...

In this paper, the effect of different factors on the heat dissipation performance of immersion phase-change cooling technology was explored through numerical simulation.

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