

Power Consumption Comparison of Immersion Liquid Cooling in Modular Data Centers



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 Institutional TCO comparison of liquid immersion vs air cooling for data centers: single-phase and two-phase immersion technology, PUE benchmarks (1.6), CAPEX/OPEX modeling across 100kW-50MW deployments, and AI/HPC deployment case studies through 2030. The explosive growth of AI. Evaluating Internal Cooling Approaches: Immersion vs. Other In-Rack Technologies For data center leaders, cooling strategy is no longer just about keeping servers online. As energy prices rise and water scarcity. According to International Energy Agency (IEA), data centers consumed an estimated 200 TWh of electricity in 2022 and are expected to grow to 400 TWh by 2030.

Article Content

Single-Phase vs. Two-Phase Immersion Cooling in Data

Discover the two primary types of immersion cooling, their mechanisms, benefits, and ideal

Single-Phase and Two-Phase Liquid Immersion Cooling of Data

In this work, we redesign and modify the PSU cooling infrastructure and adopt quiescent immersion cooling. This design removes all

Simulation Study of Influencing Factors of Immersion Phase ...

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

Experimental study on the immersion liquid cooling performance of

To overcome these challenges, this study experimentally investigated the flow and heat transfer characteristics of

Natural and forced convection heat transfer characteristics of single ...

Improving power usage effectiveness (PUE) in data centers becomes a key challenge for carbon neutrality and carbon

The immersion cooling technology: Current and future development in ...

Liquid cooling technology improves the efficiency of data centers and enables heat to be reused , . It is possible

Performance improvement of high-density data center via two-phase ...

The present study aims to eliminate the huge power consumption and cost associated with data center cooling

Energy consumption in data centers: air versus liquid cooling

By implementing innovative cooling technologies, such as liquid cooling, hot and cold aisle containment or optimized airflow

Liquid Cooling vs Immersion Cooling: What's the

Discover the key differences between liquid and immersion cooling and choose the most efficient data

System design and experimental study of single-phase immersion liquid ...

The circulation mass flow rate, fluid pressure, liquid height, and power consumption were monitored and utilized to control and reflect

Liquid and Immersion Cooling Options for Data Centers

Data center operators are evaluating liquid cooling options, as processing-intensive computing applications grow. The market for

Evaluation and Optimization of a Two-Phase Liquid-Immersion

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

Comparative Study on Heat Dissipation Performance of Pure Immersion

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

Enough hot air: the role of immersion cooling

A direct comparison shows a reduction of about 50% in energy consumption and a reduction of about two-thirds of the

Investigation of Single-Phase Immersion Cooling for Modern Data Centers

In this study, three distinct dielectric liquids were used with variable circulation rates to examine the effectiveness of

Immersion or Direct-to-Chip: A Comparison of the Most Common Liquid ...

Immersion cooling provides the best performance outcomes of any liquid cooling technology. It enables the greatest

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

Immersion Cooling Revolution: Building Next

When choosing a power supply for immersion cooling systems, priority must be given to

Comparative energy performance evaluation of high-density data

However, the immersion-cooling system with a WSE demonstrated superior performance to the air-cooling system

Cooling Strategies for Data Centres ⇒ Liquid vs

Liquid & Immersion Cooling compared ⇒ Efficient cooling Lower energy consumption Future

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

Abstract As data centers increasingly become the backbone of the digital age, managing their substantial energy

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

In the context of global digital transformation, the rapid expansion of data centers has intensified the challenge of high

Immersion Cooling for Data Centers: A Comprehensive

Discover how immersion cooling is transforming data centers with better efficiency, space

Energy consumption in data centers: air versus liquid cooling

McKinsey and Company estimates that cooling accounts for nearly 40% of the total energy consumed by data centers, emphasizing

Direct Liquid Cooling vs. Immersion Cooling for Data Centers

Direct liquid cooling (DLC) is more efficient, scalable, and sustainable than immersion cooling for data centers housing

Immersion liquid cooling for electronics: Materials, systems ...

Hnayno et al. performed experiments to compare the server power consumption of data centers using forced air

Energy and Water Efficiency Metrics in Data Center Cooling

Learn essential energy and water efficiency metrics for data center cooling systems. Compare traditional towers vs immersion

Immersion cooling technology development status of data center

In order to solve the data center cooling system of high energy consumption and high heat ow fl density needs, immersion cooling

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