

Comparison of High Temperature Resistance and Power Consumption in Data Center Hot Aisles



Article Overview

Hot aisle containment (HAC) offers superior high-temperature resistance and lower power consumption compared to cold aisle containment (CAC) due to improved airflow management and reduced recirculation.

Thermal Performance and High-Temperature Resistance

Hot aisle containment encloses the hot aisles where servers exhaust heated air, preventing mixing with cold supply air. This separation ensures stable inlet temperatures for IT equipment, reduces hot spots, and allows higher chilled water supply temperatures, which increases economizer mode hours and improves overall thermal resilience . CFD studies indicate that HAC with a raised floor can improve air distribution efficiency by 28%, reducing recirculation ratios by 40% under normal cooling conditions . This results in more uniform temperature distribution and enhanced high-temperature resistance, even under partial cooling system failures .

Power Consumption and Energy Efficiency

By directing hot exhaust air directly to cooling units, HAC reduces the need for high fan speeds and excessive cooling, leading to lower energy consumption. Studies show that HAC can achieve up to 43% savings in annual cooling system energy costs and a 15% reduction in annualized PUE compared to CAC . Properly implemented H...

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The fundamental difference between Hot Aisle Containment and Cold Aisle Containment is their respective abilities to increase

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Designing efficient data center cooling systems requires a deep understanding of thermodynamics, energy metrics,

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