Enclosed Cold Aisle Computer Room



Overview

After arranging the enclosed hot aisle, the remaining space in the computer room is in a cold air area.

Key Takeaways

An enclosed cold aisle system isolates cold supply air to server inlets, improving cooling efficiency, reducing energy consumption, and enhancing equipment reliability.

Overview

An enclosed cold aisle system creates a dedicated corridor in front of server racks where cold air from precision air conditioners is directed exclusively to equipment intakes. By physically separating the cold aisle from the hot exhaust air, the system prevents mixing of hot and cold air, ensuring uniform and predictable temperatures across all racks. This containment approach is a key component of modern data center airflow management.

Benefits1. Improved Cooling Efficiency: By sealing the cold aisle, the system ensures that only cold supply air reaches server inlets, reducing wasted cooling and allowing air conditioning units to operate more efficiently. This focused airflow can significantly lower energy consumption and operating costs.

2. Enhanced Equipment Reliability: Maintaining consistent temperatures prevents hotspots and thermal stress on servers. This controlled environment reduces the risk of overheating, improving reliability and extending the lifespan of IT equipment.

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3. Energy Savings and Environmental Impact: Cold aisle containment can enable higher supply air temperatures while maintaining safe operating conditions, which reduces energy usage. For example, some facilities have reported annual energy savings of hundreds of thousands of kWh and measurable reductions in carbon footprint.

4. Flexibility and Scalability: Modern systems are modular, allowing adaptation to various data center sizes and layouts. They can be installed in new facilities or retrofitted into existing aisles, supporting different rack heights and widths.

Components typically include ceiling panels, doors, and structural frames to create a fully enclosed zone.

Design Considerations

Aisle Width and Height: Optimal cold aisle width (e.g., 1200 mm) ensures sufficient airflow and pressure for effective cooling, while excessive width can reduce air velocity and cooling efficiency. Access and Security: Sliding doors with locks and clear panels allow controlled access and monitoring without compromising airflow. Compatibility: Systems are designed to work with standard rack sizes (42U, 45U, 48U) and widths (600 mm or 750 mm), making them versatile for different equipment configurations.

Comparison with Hot Aisle ContainmentWhile both hot and cold aisle containment aim to separate hot and cold air, enclosed cold aisle systems are generally preferred in data centers with moderate heat loads (e.g., racks dissipating less than 4 kVA). Cold aisle containment requires less air volume from cooling units compared to hot aisle containment, reducing energy consumption and improving overall efficiency.

Conclusion

Enclosed cold aisle systems are a critical strategy for modern data centers, providing efficient cooling, energy savings, and improved equipment reliability. Their modular design, compatibility with existing racks, and ability to reduce hotspots make them a practical and scalable solution for both new and retrofitted computer rooms.

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Article Content

Hot Aisle vs Cold Aisle Containment Explained (Data

In cold aisle containment, the cold aisle is enclosed. This traps the cold air directly in front of the racks, ensuring that servers always receive

How to Make the Right Choice? Comparison between the Enclosed

After arranging the enclosed hot aisle, the remaining space in the computer room is in a cold air area. People who often enter and exit the computer room will feel that the computer room is

Cold Aisle Containment | Legrand

By isolating the cold aisle, containment reduces unintended mixing of cold supply air with hot exhaust air, maintaining uniform, predictable temperatures across all racks.

Cold Aisle Containment in Data Centers | Subzero

Cold aisle containment systems use doors at aisle ends, ceiling panels or lids above racks, and structural frames to create enclosed zones where cold supply air

FOCUSED COOLING USING COLD AISLE CONTAINMENT

Cold aisle containment can be used with or without conventional raised floor cooling. It is easily retrofitted into existing raised floor data centers and works in tandem with the raised floor as well as

What are hot and cold aisles in the data center?

Hot and cold aisles in the data center are part of an energy-efficient layout for server racks and other computing equipment. The goal of a hot/cold

Enclosed aisle effect on cooling efficiency in small scale data center ...

In order to improve the cooling effect, two types of aisle enclosure can be adopted: one is full enclosed cold aisle, another is semi-enclosed cold aisle which is only enclosed from two sides

Data Center Aisle Containment Systems | Profile IT

Specify complete aisle containment systems for data centers, edge facilities and high-density compute rooms. Compare configurations, build a shortlist and send

Design of Cold and Hot Aisle Isolation in Enclosed Computer Room of ...

The airflow organization in the equipment room completes the isolation of cold and hot aisles, which maximizes energy efficiency and achieves the purpose of energy conservation and emission reduction.

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Data Center HVAC Systems

Learn how Data Center HVAC Systems work using cold and hot aisle strategies and air cooled versus liquid cooled IT equipment racks.

Data Center Aisle Containment

Traditional open aisle data centers use perimeter PAC (precision air conditioning) or CRAC (computer room air conditioning) units to channel cold air up through a raised floor void via grilles positioned in

Hot Aisle Containment vs. Cold Aisle Containment:

Implementation of both hot and cold aisle containment does not reduce the volumetric flow rate of bypass airflow in a computer room. When cold

Move to a Hot Aisle/Cold Aisle Layout

A Time-tested Technique The hot aisle /cold aisle data center layout was originated by IBM in 1992 and it is one of the oldest ways to save energy in the data center. 1 Hot aisle/cold aisle layout involves

Aisle Containment Systems for Hot & Cold Aisle Solutions

Cool Shield Aisle containment solutions reduces server row temperatures in active data centers. Learn more about the benefits of hot and cold containment.

Hot and Cold Aisle | Effective Aisle Containment

Hot Aisle Containment The objective of the hot aisle containment data center is to enclose hot air masses and redirect them further to cooling systems. By entering an enclosed hot

Data Center Containment: Types, Benefits & Challenges

The air from the enclosed hot aisle is returned to cooling equipment via a ceiling plenum or duct work, and then the conditioned air enters the data center via raised floor, computer room air

Hot And Cold Aisle Containment For Data Center

Design Features of Typical Containment System A typical Cold Aisle Containment system features enclosed cold aisles with doors at each end, a

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