CONNECT AND PROTECT

Technological improvement in enclosure design for Data Centers

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Originally, servers were application-specific machines, where each server was dedicated to a specific application or client. This resulted in a lot of wasted servers, low performance, excessive power consumption and high heat production.

To improve efficiency, servers have become virtual servers. This means that instead of having separate units dedicated to a particular process, they are connected to each other.

However, while fewer servers are required, overall power usage and thermal densities increase, therefore requiring servers in a modern data center to do all of the work of data processing, which generates more power and creates thermal operating challenges.

Therefore, improvements in server technology and industrial enclosure design have become a necessity for their protection and operation.

TECHNOLOGICAL INNOVATIONS FOR SERVERS AND THE NEED FOR AN EFFICIENT AIR CONDITIONING

The technological improvements in servers have had certain contradictions. The greater the amount of processing, the higher the power requirement, which results in the production of more heat that must be dissipated.

However, servers are getting smaller, have higher performance requirements and are being installed in small spaces.

Therefore, dissipating heat is becoming a challenge considering that the production of more energy in a reduced space, does not allow air flow.

WHAT IS LEED TECHNOLOGY?

LEED or Leadership in Energy and Environmental Design is a rating system created by the United States Green Building Council that is responsible for rating a building's environmental performance based on the market's transformation to more sustainable designs.

LEED was initiated as an effort to develop a "consensus-based rating system" that seeks to accelerate the processes of developing and implementing green building practices.

This program includes the design of enclosures and configuration of data center site plans that can provide significant energy savings and can be used with other attributes to achieve certification.

Data centers are not specifically mentioned within the LEED Certification category, but it does apply to the "Energy Optimized Performance" category where it is listed as a new technology option to dissipate energy within servers.

AFFECTING ASPECTS IN SERVER PERFORMANCE

Industrial enclosures have some features in their configuration and design that can affect the performance of your servers. These are:

Perforated doors: Server manufacturers have guidelines regarding the amount of open space required in the front doors. The open space is the door opening through which the airflow passes, so the doors must have at least 50% open space to supply the airflow.

Perforated or mesh doors promote proper airflow to the equipment to prevent overheating and should be used to provide sufficient airflow, preventing overheating, and should be used on the front and rear of all server enclosures.

However, sometimes front doors are made of Plexiglas® and are used mostly for aesthetic reasons. Therefore, they limit airflow and should be avoided unless the server does not produce heat, such as patch panels.

Similarly, it is important to ensure that rear doors have perforations or are made of mesh to allow hot air emissions to exit the enclosure into the heat chamber and return to the cooling unit. All servers should be installed 10 -15 cm from the front and rear enclosure doors to ensure clearance for accessories, handles and cables while allowing the flow of air.

Rear fans: With the installation of rear door fans, it is possible to increase the amount of heat removed from the enclosure.

When the fans provide greater GWP (airflow) than the server fans, these can be used in conjunction with each other to increase airflow and remove hot air emitted from the enclosure. In addition to this, the fans prevent the formation of hot spots, and can be monitored and controlled for maximum efficiency or turned off at any time.

Enclosure Covers and Fans: In some data center distribution models, the best way to remove heat from the top of the enclosure is by installing a perforated cover or top-mounted fan.

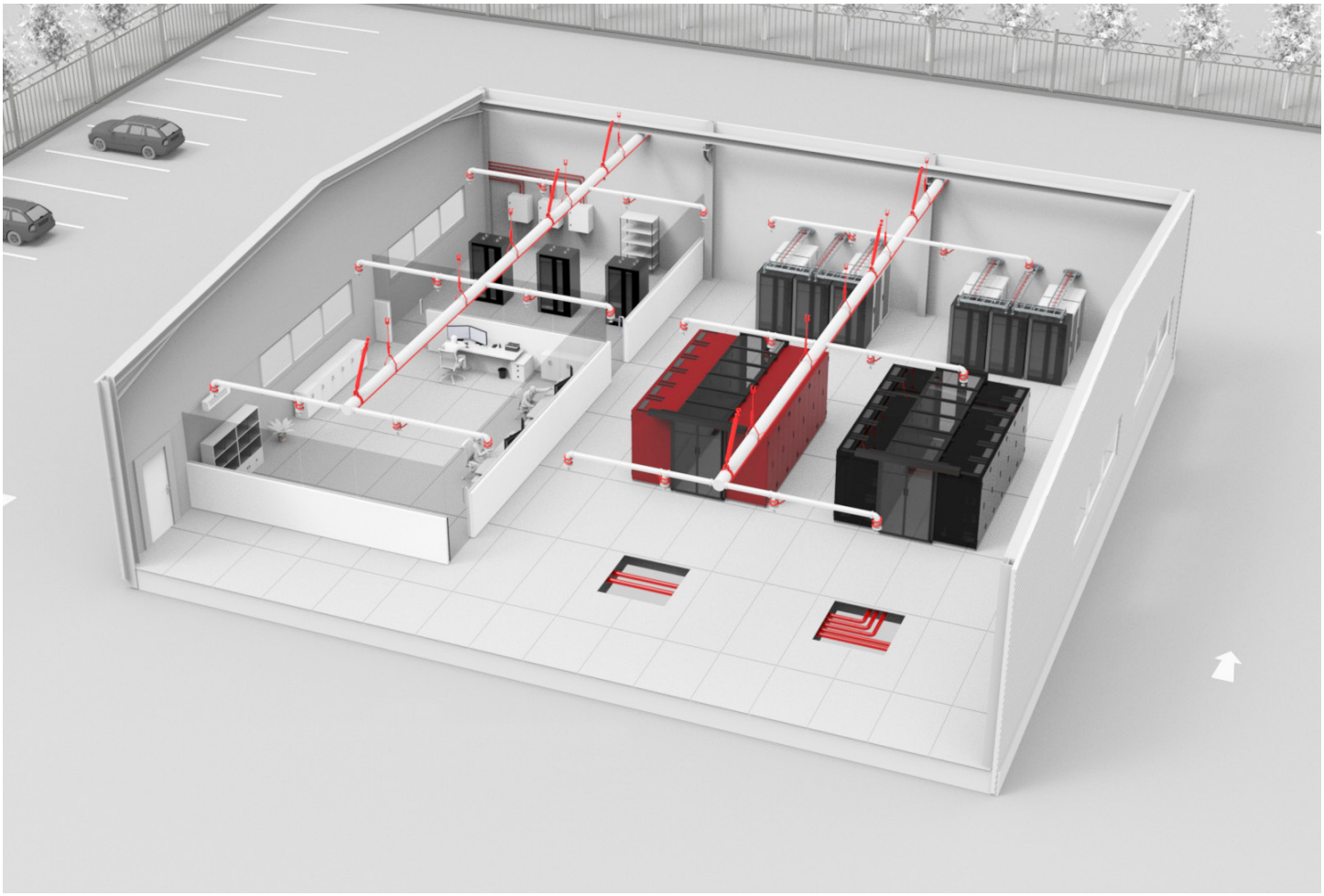
However, the use of fans in the cover may prevent full heat dissipation.

In addition, top-mounted fan could deprive the server enclosures of cool air or suffocate the fans. An efficient way to cool raised-floor systems is to include enclosures with solid parts that force hot air emissions out the back of the cabinet as well as the use of blanking plates to keep cool air inside the equipment.

Cabinet base: When the cooled air is supplied directly to the base of the cabinets, some drawbacks may occur.

First, servers located close to the bases can block airflow, and the cooled air that is directed to the rear of the cabinet can spread in all directions and mix the cold air with hot air, causing a waste of energy.

These are problems that are prevented if cold air is brought to the front of the enclosure through doors or perforated tiles. In some cases, manufacturers use enclosures with ducts in the floors that ensure the supply of cold air to equipment at a regular temperature, creating a full chamber of cold air in front of the equipment. This ensures that the equipment located in the highest part of the enclosure receives the same cold air that is found at the bottom of it.



ACCESSORIES TO IMPROVE AIR FLOW INSIDE THE ENCLOSURE

There are accessories that can improve the air flow inside the enclosure, helping to avoid the accumulation of hot air inside the servers and enclosures, including:

Blind panels: blind panels are used to cover empty spaces in the rack. They prevent cold air from entering the enclosure by deflecting it away from the equipment and preventing it from mixing with hot air emissions.

A solid wall of other equipment, or blanking panels, ensure that cold air only passes through the equipment to dissipate heat. In addition, they provide a simple and economical means to help direct the air.

Blind panels are the most used means of assisting cabinet airflow, avoiding recirculation and can be coupled with planum grade plastic panels and traditional blind panels.

Barrier panels (located between cabinets): Barrier panels are installed between servers to isolate each cabinet for better airflow control. This prevents improper recirculation.

Brushes: It is very important that the cold air does not leak out through cable inlets or the floor and mix with hot air. This would result in a negative effect on the equipment. In order to prevent this, data centers use floor brushes or other products that are applied to the cables to block the flow of cold air.

It is very important that the accessories used to control the airflow are certified to prevent them from generating particles that can permeate the servers. Materials such as cardboard or insulation can easily break down.

Energy saving table

Activity	Energy Effective Usage	Annual Energy Cost USD	Annual Savings USD
Data Center (hot/cold room)	2.40	$1,055,600	-
Blind panels (in all open areas of the shelf)	2.38	$1,040,000	$15,600
Floor brushes (Perforated tiles)	2.35	$1,025,000	$15,000
Perforated tile placement	2.30	$1,007,000	$18,000
CRAC/CRAH Unit – Ducts installation	2.27	$994,000	$13,000
Ceiling panels for ducts return	2.23	$976,000	$18,000
Enclosure composition optimization	2.20	$964,000	$12,000
Floor elevation optimization	2.15	$938,000	$26,000
Containment – cold room	2.10	$920,000	$18,000
Containment heat chamber /Chimney	2.00	$880,000	$40,000
Coolant* (Closed enclosure system)	1.75	$770.000	$286,600

CONCLUSION

Knowing additional measures for industrial enclosure design for your data center is crucial for the protection of your servers.

Based on the inclusion of new technologies and accessories, the improvement in enclosure design allows for adequate airflow that allows for efficient data processing.

Avoids excessive thermal load, system failures, overloads, equipment damage and increased maintenance costs with intelligent and planned enclosure design.

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