To Fill, or not to Fill
Get the Most out of Data Center Cooling with Thermal Blanking Panels

The use of a hot aisle/cold aisle configuration in the data center has long been considered a best practice for energy efficiency in a raised-floor environment, allowing the intake side of network equipment to pull in cold air from the cold aisle and expel hot exhaust air into the hot aisle. As density continues to increase, reaching upwards of 15 kW per rack, and the need to ensure energy savings becomes a top concern among data center managers, a simple hot aisle/cold aisle configuration is often no longer adequate as it allows some mixing of hot air and cold air.

In response, containment has become the latest trend for thoroughly separating hot and cold air to maximize energy efficiency. However a well-designed containment system and related energy savings simply cannot be realized without using blanking panels to fill empty rack spaces.

FOR BOTH HAC AND CAC
Whether using hot-aisle containment (HAC) that isolates hot air exhaust and returns it directly to computer room air conditioner (CRAC) units via close coupled in-row cooling or vertical ducts (i.e., chimneys), or cold-aisle containment (CAC) that completely closes off the cold aisle to isolate cold air to the intake side of equipment, the purpose of any containment strategy is to prevent the mixing of the cold air and hot air.

Preventing the mixing of cold and hot air in the data center not only ensures that the equipment is taking in the coldest air possible to keep server fan speed at a minimum and prevent overheating, but it also ensures that the hottest air is returned to the CRAC units. Raising the temperature of the return air provides a greater Delta T (i.e., difference between intake out output air), which allows the units to operate more efficiently.

Containment can also increase the pressure difference between the hot and cold sides of a rack or cabinet. In today’s data center environment, it is rare to find every rack-mount space filled with equipment. When rack-mount spaces are left vacant to allow room for growth or reduced power consumption within the rack, pressure drives air through those gaps, which causes mixing of hot and cold air and potential overheating and hot spots. Covering any open rack-mount spaces is therefore more imperative than ever with today’s containment and hot aisle/cold aisle strategies. When spaces are left open, the potential energy savings associated with hot and cold air isolation are significantly reduced.
The only way to truly reap the benefits of hot and cold air isolation is to eliminate the mixture of hot and cold air not only within the rows but also within the cabinets themselves by using thermal blanking panels to block vacant rack-mount spaces.

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**THERMAL MODELING**

The most obvious justification for using thermal blanking panels is seen through the use of computational fluid dynamics (CFD) analysis. Using this technology, it is easy to see the increased heat and hot spots within the data center where blanking panels are not used. Despite the validation, there are still many who do not deploy blanking panels due to lack of knowledge, misconceptions and cost.

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**CFD Analysis for Blanked vs. Unblanked Cabinets**

![CFD Analysis Image]

**With Blanking Panels**
Average Inlet Temperature: 66.35°F

**Without Blanking Panels**
Average Inlet Temperature: 76.07°F

While knowledge surrounding airflow in the data center has improved dramatically over the past decade, there are still some that simply do not understand the impact that leaving open rack spaces can have on equipment and overall energy efficiency within the data center. One study by Upsite Technologies demonstrated that servers in a cabinet without blanking panels drew in 40% of their required airflow volume from the hot exhaust air originating in the back of the cabinet, while the use of blanking panels with no gaps eliminated hot exhaust air recirculation for a 100% improvement.

Some believe that the use of HAC or CAC is enough to keep the cold aisle cold and the hot aisle hot. Every data center is different, but all can benefit from using blanking panels to fill open positions within each cabinet. It is important to note that a single open rack-mount space can leak temperatures that are as hot and as detrimental as several open rack-mount spaces.
One significant misconception is that blanking panels are for aesthetic purposes only. While blanking panels are ideal for aesthetically concealing openings and reserving rack unit positions for future use, this is certainly not their primary function. Aesthetics is simply an added bonus.

Many also do not deploy blanking panels because it is yet another component that adds cost and labor. However, inexpensive blanking panels are just a fraction of the cost of other infrastructure and cable management components within the data center, and they quickly get their return on investment through energy savings and longer equipment life.

Installation of blanking panels is simple with newer toolless and lightweight options. Siemon’s durable, lightweight SnapFit™ Thermal Blanking Panels easily snap into the square holes of vacant rack spaces with no tools required. And when the vacant rack spaces are needed, the blanking panels can be just as easily removed.

Siemon also offers its 1U SnapFit Thermal Blanking Panels in bulk packaging of 10 to further reduce cost. Several varieties and sizes of flat and angled blanking panels are offered, including Brush Guard Panels that allow cables to pass through while still maintaining isolation for thermal protection and efficiency.

In today’s higher density data centers that generate more heat and need to maintain cooling system efficiency and reduced energy costs, to fill or not to fill vacant rack-mount spaces should not be a question. Toolless blanking panels are the fastest, easiest and most cost-effective way to ensure that recirculated air through unused rack spaces is kept to a minimum. This simple practice can help data center managers get the most out of their data center cooling strategies.

1Two-Dimensional Computation Fluid dynamics Analysis of Blanking Panel Solutions, Strong, Lars P.E., Karki Kailash, PhD, Merchant Berkeley, Copyright 2008 Upsite Technologies, Inc.
SIEMON AIRFLOW MANAGEMENT ACCESSORIES FOR RACKS AND CABINETS

Blanking panels and brush guard panels help to improve thermal efficiency by preventing airflow through vacant rack-mount spaces within enclosures. By isolating the front of the cabinet, these panels keep the cold air directed at the equipment where it is needed. Thermal blanking panels help to prevent recirculation of hot air to improve a facility’s cooling effectiveness. These panels also fill empty rack-mount space to conceal openings or reserve the positions for future use. Brush guard panels provide the added benefit of allowing cables to pass through the front and rear of a rack or cabinet while still providing thermal protection to maintain isolation.

**SnapFit™ Thermal Blanking Panels**
- Durable, lightweight panels
- Cost effective solution for data centers
- Snaps quickly into place without requiring tools
- Fits cabinets and racks with square mounting rail holes
- Easy to remove when space is ready to be used
- 1U height for maximum flexibility

**Standard Filler Panels**
- Metal panels screw into racks or cabinets
- Blank on one side and Siemon logo on the other
- 1U, 2U, 3U, 4U flat panels
- 1U and 2U angled panels

**Brush Guard Panels**
- 1U height
- Internal brush to allow cable pass-through

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TECH BRIEF

ORDERING INFORMATION

SnapFit™ Thermal Blanking Panels
PNL-TBLNK010-1S .......... Toolless blank filler panel, 1U, square holes, black, pkg of 10

Flat Blank Filler Panels
PNL-BLNK-(X) ................. Flat blank filler panel, black
Use (X) to specify height of panel:
1 = 1U, 2 = 2U, 3 = 3U, 4 = 4U

Angled Blank Filler Panels
PNL-BLNKA-(X) ............... Angled blank filler panel, black
Use (X) to specify rack mount space height of panel:
1 = 1U, 2 = 2U
PNLA-CVR-01 .................. Angled panel cover, black

Brush Guard Panel
PNL-BRSH-1................... Brush guard panel, 1U, black

Note: U=44.5mm (1.75 in.)