

Infomart Partners with DPR for Industry-Leading Innovation

Hillsboro data center pioneers unprecedented amount of Active Rear Door coolers for energy efficiency

Nestled amid the green hills and tall firs of Hillsboro, Oregon, are the Infomart Data Centers, a DPR design-build project that has quietly captured the attention of the industry.

What makes this project so unique is its unusually high quantity of Motivair active rear doors (ARD), hinged doors that replace the rear door of any standard or Original Equipment Manufacturer (OEM) server rack. Not only is this project the single largest deployment of ARDs to date in North America, it also represents a uniquely innovative approach to ARD design at DPR's second major deployment of chilled doors in North America. Many other projects use ARDs for supplemental cooling, but at Infomart, they are the primary source of cooling for the entire space, enabling the customer to move into a hyperscale data center deployment.

DPR's expertise working with ARDs was a major selling point for this long-standing customer and data center wholesaler that leases space to many high-profile tech companies across the country.

While other DPR data center projects have used about 70-75 ARDs for supplemental cooling, once the Infomart project is complete, the Hillsboro site will have an unprecedented 556 ARDs between two data halls to accommodate the rapid growth and the fluctuating needs of Infomart's tenant.

Through insight into the online behaviors of its user groups, Infomart's tenant knows what time of day activity tends to spike across the globe, and correspondingly, when peak loads of data transmit across its servers. Because of these insights, the company is able to accurately predict the server loads necessary for each individual rack.

While servers in a traditional data center environment with traditional cooling systems typically operate at 0-8 KW, the ARDs in Infomart's environment are designed to support server racks operating at 0-25 KW or even 0-45 KW. This additional power is needed to accommodate the uniquely heavy loads of data moving back and



forth. For example, photos, videos, links that open on the company's server, and long form writing require significantly more power to transmit than a quick ATM transaction would. The ability of the ARD cooling to fluctuate, adjusting to the server load demand, allows the servers to handle spikes in data transmission that may occur in a dynamic web environment.

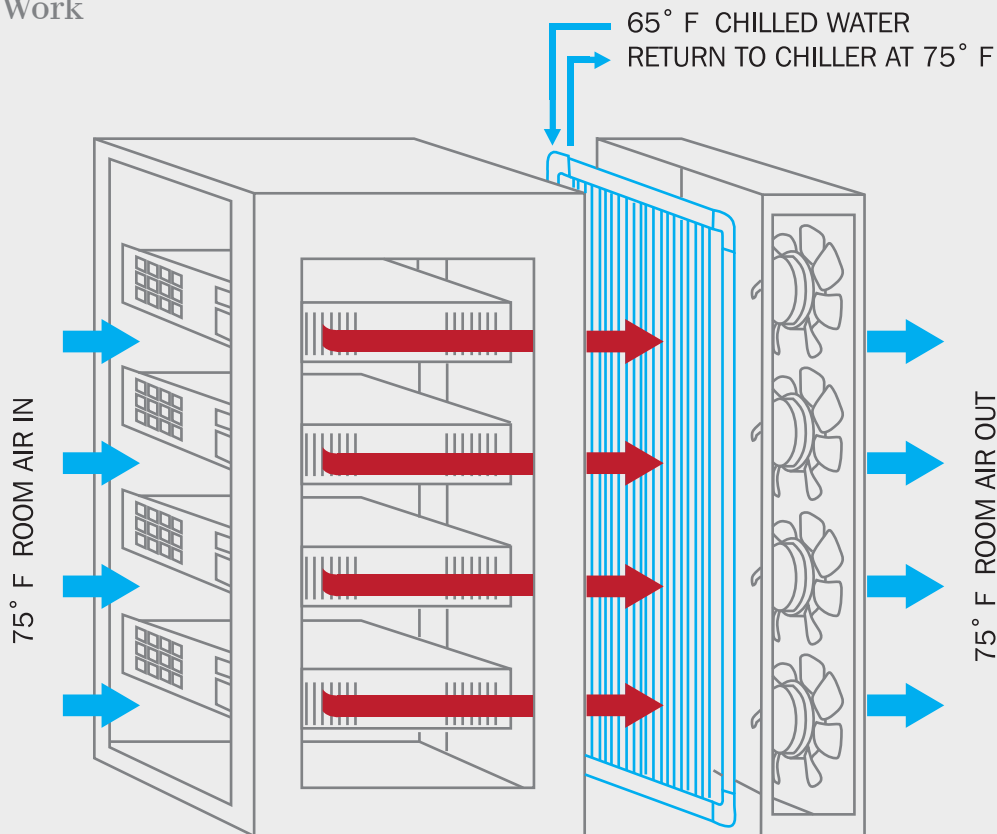
The intricate design and mechanics of the ARDs make this project more technically complex than typical data centers. Because the performance of the ARDs varies based on response to the server rack power demand and heat load, ARDs need specific input for water temperatures, air flows, air pressure and air temperature. The load capacity of the ARD had to be taken into account when designing the data center. The team was challenged to strategically break the condenser water supply and turn the racks into small clusters to ensure that the business would still be able to operate if one ARD or combination of ARDs experienced technical difficulties.

Since the amount of ARDs and the cooling design used at this project is unprecedented, the industry will look to Infomart and DPR as a case study for how ARDs affect total cost of ownership (TCO) in data centers over time. Although a typical data center averages a 1.4 annualized PUE (Power Usage Effectiveness), the Infomart project design committed to a goal of 1.2 annualized PUE, which will be determined in the next year. At Level 5 commissioning, Data Hall A achieved an instantaneous 1.08 PUE, meaning the total amount of energy used by the facility computing equipment and the total amount of energy delivered to the computing equipment, lighting and cooling are nearly equal.

"We are leading the industry into the next generation of cooling technology. This is the wave in which data centers will be starting to focus the cooling source directly to the heat source," said DPR's Travis Bright. "To the best of our knowledge, we don't know anyone else that has done it in this magnitude. This project is a real diving board into data center expansions, the growing Northwest market and what active rear door coolers can do."

DIAGRAM

How ARDs Work



Benefits of using ARDs:

- By actively removing 100% of the heat load at its source, ARD systems create a heat-neutral white space that requires little or no additional air conditioning systems.
- Because ARDs sit directly on the server rack, focusing cooling directly onto the heat source, they can achieve a high degree of efficiency over a wide set of utilization levels. The ability to adjust to the server load demand allows the servers to handle spikes in data transmission that may occur in a dynamic web environment.
- Hot aisle/cold aisle configurations are eliminated, data center square footage is reduced, raised floors are optional and energy efficiency can be increased.
- ARDs require less architectural or structural changes to existing buildings, which can make projects more cost-effective. For example, unique to the Infomart project is the lack of a redundant rooftop cooling unit, as all the cooling resources are channeled through the ARDs. ARDs are backed up by an additional fan within the ARD unit itself.

The technology of an ARD allows the use of “warmer” cooling water. High density cooling no longer requires low temperature chilled water and extended chiller operations, resulting in energy and cost savings. In addition, warmer water in the conditioned space means minimized risk of condensation, eliminating the need for insulation and saving more money for the client.

Due to Infomart’s rapid growth and need for quick deployments, fast-track delivery was crucial for this design-build project, which included two phases: a 15,000-sq.-ft. data hall tenant fit-out (Data Hall A) and a 100,000-sq.-ft. greenfield building footprint (Infomart’s Portland Expansion), which includes a second 15,000-sq.-ft. data hall build (Data Hall B). The second data hall is connected to Data Hall A by structured cabling, as well as joined mechanical and electrical systems.

Data Hall A was Level 5 commissioned and turned over to Infomart and its tenant on schedule in April. Even when faced with a record-breaking amount of rainfall this past winter, which affected exterior excavations and overall project progress, the team was able to complete Data Hall B ahead of schedule in August. Flexibility was key with shifting mechanical plans and project designs, as DPR ensured that the design of the data center fit the client’s and tenant’s long-term and short-term needs.

The project, which has taken a little over a year to build, is located about 20 minutes west of Portland. Hillsboro, in particular, has become a popular spot for data centers, with tax and utility incentives paving the way for new construction in the booming Northwest.

Pushing the envelope of industry boundaries is one of Bright’s favorite aspects of the project. “I enjoy solving these types of problems that no one has really solved before. Maybe there’s a little bit of ego—you don’t think we can do it? We’ll show you we can. And we definitely have the team to do that.”





Photos by Haley Hirai



CUSTOMER: Infomart Data Centers, formerly Fortune Data Centers, is an award-winning, industry leader in building, owning and operating highly efficient, cost-effective wholesale data centers. Each of its national facilities meet or exceed the toughest industry standards for data centers in all operational categories of availability, security, connectivity, and physical resilience.

DESIGN-BUILD TEAM LED BY DPR:

- Architect: Jackson-Main Architecture
- Structural Engineer: KPFF
- Mechanical Engineer: McKinstry
- Electrical Engineer: Rosendin Electric

CHALLENGES:

- **Aggressive schedule for tenant space to be fully commissioned.** Committed dates were determined between Infomart and its tenant as part of securing the lease, before any system design requirements, scope or project GMP was determined.
- **Design-Build.** DPR led a design team to meet the predetermined dates for both the delivery of tenant ARDs and move-in. The team designed systems to support the unprecedented approach of using the ARDs to provide cooling of the entire space, not just for supplemental cooling.
- **Unprecedented amount of ARDs.** While other DPR data center projects have used about 70-75 ARDs, the Infomart site has an unprecedented 556 ARDs. This is the single largest deployment to date in North America.
- **Mechanical design to support ARDs.** The Infomart project is unique because of the intricate design and mechanics of the ARDs. Because the performance of the ARDs varies based on responding to the server rack power demand and heat load, the ARD had to be taken into account when designing the data center. The team was also challenged to strategically break the condenser water supply and turn the racks into small clusters to ensure that the business would still be able to operate if one ARD or combination of ARDs experienced technical difficulties.
- **Fast-track delivery.** Even when faced with a record-breaking amount of rainfall this past winter, which affected exterior excavations and overall project progress, the team was able to complete Data Hall B ahead of schedule in August. The team topped out the 100,000-sq.-ft. structure in six weeks, and built a weathertight electrical room in two months.