

CASE STUDY

Tier 1 US operator expands facility as rack heat density increases 5X

- Hybrid cooling design with air-cooling for base load and liquid-cooled rear door heat exchangers (RDHx) for higher density racks
- Consultative partnership rapidly resolved design and implementation challenges to complete project on-time and on-budget
- 480kW saved – power allocated back to servers
- OptiCool's Delta4T™ technology enables capacity expansion on-demand to quickly serve new customers

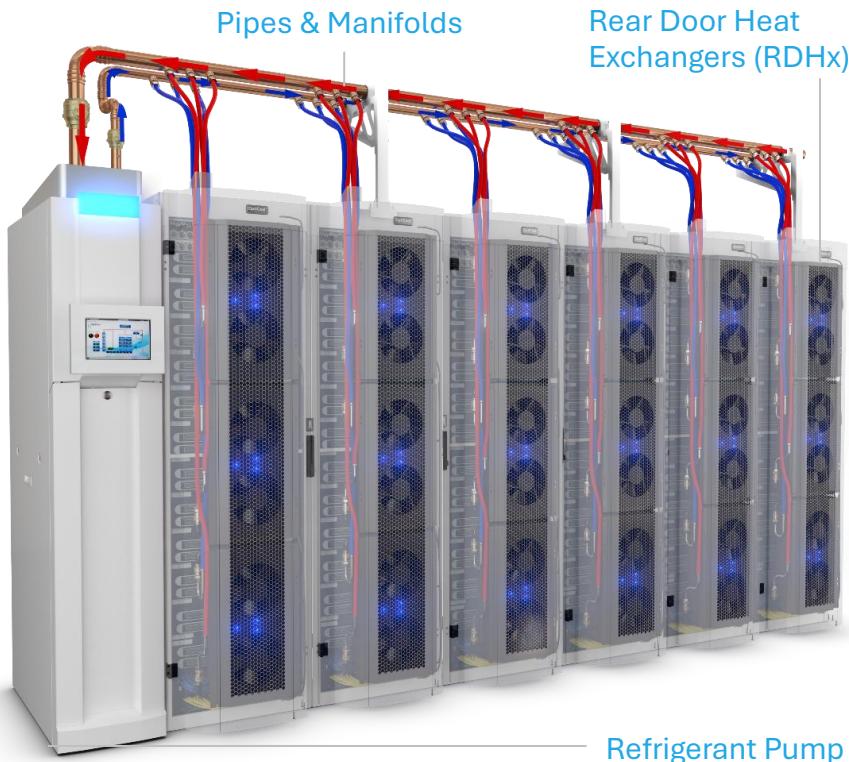


RAPID GROWTH & EXPANSION

A Tier 1 US operator decided to expand an existing data center facility due to strong market demand. Not only was additional rack capacity needed, but also the ability to support higher density racks running high-powered workloads. In less than 2 years, the operator saw average heat densities increase **5X** from 5-10 kW per rack to 30-50 kW at this facility. Rapid increases in rack density had turned cooling into a binding constraint on sellable capacity.

The expansion consisted of three new mixed-use data halls with 120 high-density racks plus medium and low-density racks. OptiCool's Delta4T™ cooling technology was selected due to:

- Support for a wide range of rack densities with 30kW, 60kW, and 120kW rear door options
- Cost savings on electrical bills due to high-efficiency operation (PUE as low as 1.02 in the secondary loop)



At the heart of the OptiCool solution are liquid-cooled rear door heat exchangers (RDHx) that extract heat directly at the rack. Using a two-phase refrigerant process, heat is extracted at the rack level and transferred to the pump, where it is rejected externally through OptiCool's direct expansion (DX) system.

Unlike single-phase approaches that rely on injecting colder air into the space, OptiCool removes heat from the rack entirely, preventing it from re-entering the data hall.

OptiCool's Delta4T™ cooling technology features:

- Rack-level modularity
- Non-invasive to IT equipment
- Scalability to any size of data hall
- Easy to retrofit

DESIGN & IMPLEMENTATION

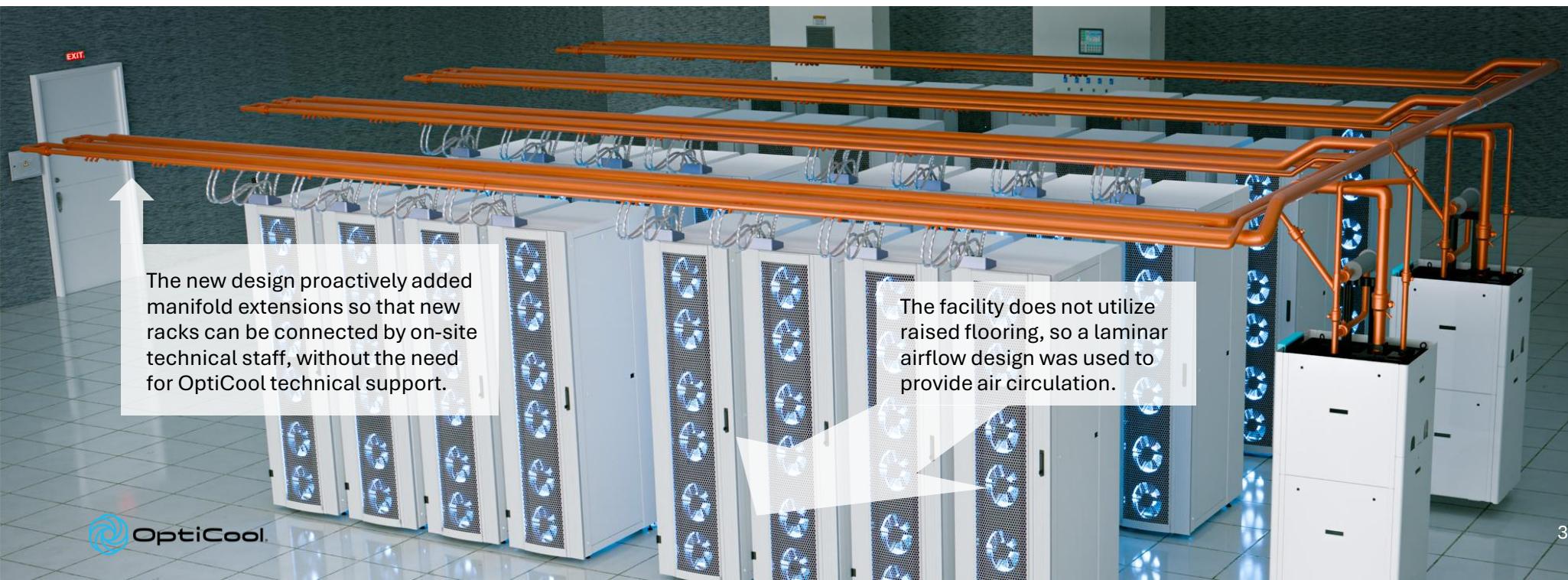
The initial design needed major modifications. OptiCool's **consultative** sales & support teams helped complete the project on budget and on time.

The cooling system was designed before construction began, but the as-built data halls introduced real-world constraints. Column spacing, rack layouts, and service clearances shifted enough that what was planned as a clean greenfield deployment behaved more like a retrofit. At the same time, rack heat density was increasing faster than traditional air-cooling economics could support, turning cooling into a capacity constraint rather than an HVAC detail.

Re-engineering refrigerant distribution

OptiCool worked directly with the installation team to re-engineer refrigerant distribution in the field. Manifolds were strategically extended beyond the initial rack population so the system could support mixed rack densities and future expansion zones without rework or downtime.

This approach allowed the operator to avoid overbuilding mechanical infrastructure up front while preserving the ability to unlock higher rack densities as customer demand materialized. By designing around thermal constraints rather than fixed rack assumptions, the project avoided a redesign cycle, eliminated the risk of stranded infrastructure, and enabled expansion without downtime or schedule impact—allowing capacity to scale in step with demand.



This facility does not utilize raised floors so instead of hot/cold aisle containment, a **laminar airflow** design was implemented.

Aisles are laid out front-to-back. Ambient air is drawn from the front, absorbing heat as it passes through the IT equipment. The rear doors extract the heat, returning room-neutral air back into the room.

As part of OptiCool's Delta4T™ cooling architecture, this approach provides stable, predictable inlet conditions as rack densities increase, eliminating the need for airflow rebalancing, containment retrofits, or operational disruption.

LAMINAR AIRFLOW



Building an agile cooling infrastructure

As part of the redesign, OptiCool recommended that the manifolds be extended so that new racks could be added on-demand. Within six months of completing Phase I, market demand materialized much quicker than anticipated and the operator was able to quickly bring new customers online – without a redesign, downtime, or construction delays. Because the refrigerant manifolds and cooling architecture had been designed around thermal constraints rather than fixed rack assumptions, capacity was already available.

OptiCool's high-efficiency system also consumes far less power than traditional air-cooling, so an upgrade to the power infrastructure was not needed despite the addition of new high-density racks – again saving time, costs, and strengthening the operator's agility and time-to-market.

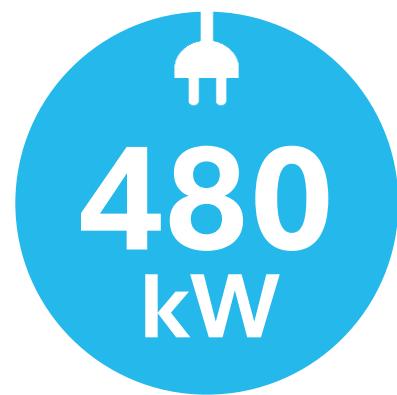
SYSTEM TURN-ON

Upon activation of OptiCool's Delta4T™ system, the impact was immediate and measurable across each data hall. The facility initially operated in a limited mode with cooling supplied by 60-ton CRAC units intended to support the base load prior to Delta4T activation.

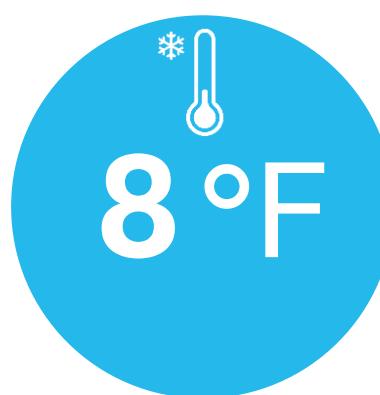
Once the OptiCool system was turned on, each data hall saw an approximate 250-amp reduction in power consumption, totaling roughly 750 amps (approximately 480 kW) across the facility, while ambient temperatures dropped from approximately 79°F to 71°F. Power previously consumed by cooling was returned to the IT load envelope, directly increasing sellable rack capacity without requiring power or mechanical infrastructure upgrades.



RESULTS



Returned to powering compute instead of cooling



Lower ambient temperature than traditional air-cooling



- Turned existing space and power into sellable high-density capacity
- Drove higher revenue per square foot on demand
- Scaled without new capex



OptiCool®

2-Phase liquid-cooled RDHx | Pumps | ODX | CDU | Aisle Containment

