Grundfos Data Center Solutions

Case stories

Inspirational stories of how Grundfos helps keep data flowing around the world

Discover more at
grundfos.us/datacenters

GRUNDFOS

Possibility in every drop

Meet your efficiency and redundancy goals at every step

At Grundfos, we believe it’s possible to cool a data center without warming the planet.

Our high-efficiency, energy-saving water solutions make it possible for you to cool your data center while meeting redundancy requirements and exceeding your sustainability goals.

In new builds, retrofits or modular systems, our reliable products combine to form intelligent cooling systems tailored to any data center, maximising efficiency, cost-effectiveness and redundancy.

This booklet is a collection of cases covering a wide range of data centers and the variety of needs and circumstances unique to them.

We hope you’ll be inspired by the many operators who have implemented high-efficiency, energy saving Grundfos cooling solutions for the next generation of data infrastructure.

High-efficiency solutions

Redundancy meeting up to Tier 4 requirements

End-to-end partnership process

Note: All cases are actual data center projects carried out by Grundfos. While we have respected customers’ wishes to remain anonymous, all details contained within accurately reflect the project status at the time of completion.

Co-location off-site plant room build

Description

A global data center organization needed a cooling system for an extension to one of the co-location data centers they operate in the United Kingdom.

The installed cooling system needed to serve a 100,000 ft², subdividable space to allow clients' racks in either a co-location area or their own suite or data hall with dedicated power and cooling.

The Solution

The facility's twelve data halls were constructed in three phases, with four data halls and support infrastructure in each.

For Phase 1, Grundfos designed one plant room with seven end-suction pumps, variable speed drives, manifolds and headers, and two plant rooms fitted with pressurization units, expansion vessels, side stream filtration units and chemical dosing units. For Phases 2 and 3, (2) seven-pump skids with variable speed drive and weatherproof covers were supplied for outdoor installation.

N+1 redundancy was configured with 6 duty pumps and one standby pump, each supplied with a 30 kw CUE frequency converter and connected with butterfly valves and Y strainers. (2) 211 gallon expansion vessels were installed, as well as chilled water side stream filtration to keep the system clean.

In line with current data center industry trends, the solution was built off-site. All equipment was tested and delivered to the site and commissioned after installation.

Results

The Grundfos solution was tailored to meet all technical and redundancy requirements and saved physical space in the plant room. Grundfos technicians were on hand to provide friendly, specialist service throughout every stage of the process.

Using modular or off-site builds for data center projects has several advantages:

- Safer, healthier, controlled environment with fewer accidents
- Faster, with more control on labor, scheduling and material handling
- Improved quality, fewer defects and tested in a controlled factory environment
- Reduced waste due to controlled factory processes
- Reduced environmental nuisance, noise, dust and litter

Technical Details

Modular plant room and skids	**7x Grundfos NB 80-200/188 ASF2ABQQE pumps connected to 16 in flow and return manifolds**
Capable of serving >40 kw racks	**7x 1.55 MW water-cooled chillers**
68°F flow, 82°F return chilled water	**Pump design duty: 800 gpm @ 50 psi**
Hot aisle containment; air-flooded room principle	**System design duty: 4750 gpm @ 45psi**

Tier

III

IT Load

24 MW

Cooling load

10.85 MW

PUE

1.3

Area

100,000 ft²

Cooling Type

Air-cooled, free cooling chillers

Redundancy

N+1

Mobile flushing systems in a circular economy

Description

Hyperscale data centers depend on efficient and reliable cooling systems, and the commissioning of the systems is critical. In larger data centers, the cooling pipework is extensive and complex, and ensuring it is clean and free of debris is vital to the safety and reliability of all the equipment in the system. Flushing the system during commissioning is a complex but essential task. Due to the volumes and pressures required, large pumps are used which often take up limited space in the plantroom. Yet after the flushing is complete, the pumps are no longer needed. When an end-user or their contractor moves on to projects in other locations, repeating the whole cycle will lead to wasted resources.

A global operator wanted a solution to reduce this wastage, to meet their sustainability goals, contribute to a circular economy, reduce their carbon footprint, and streamline their commissioning process across multiple sites in northern Europe.

The Solution

Grundfos designed and built a mobile flushing system, consisting of a mobile plant room and skid manifold system with a precise fit to the chilled water systems on any site.

The system is designed as a containerized mobile pumping station, easily transported as conventional freight and thus reusable on multiple sites. It consists of six Grundfos NB pumps, valves and manifolds. Six end-suction pumps provide the water pressure and volume required to flush debris from the pipe system.

As the 23 in manifolds cannot fit into shipping container-sized housing, they are mounted on a separate base with a hydraulic leveling system. This enables precision coupling to the pump housing on uneven surfaces.

Results

Designed, manufactured and delivered by Grundfos, the mobile flushing system contributes to the customer's sustainability goals while saving significantly on money and time.

The containerized nature of the highly versatile system makes it suitable for use on multiple projects, while the use of six pumps in parallel allows it to be dimensioned for different systems. Reusing the system in this way contributes to a circular economy, saving resources and manpower, and reducing costs.

The hydraulic leveling system eases the installation process, and the straightforward connection process is made even easier with the hydraulic leveling system, reducing the overall time and cost of the flushing process.

The mobile flushing system is already in use around northern Europe, delivering on time to the customer's critical projects, and backed up by dedicated international aftersales service from Grundfos.

Technical Details

Modular plant room and skids, transportable on 40 ft containers or flat backs	Hydraulic levelling system; hydraulic jacks for precision coupling
6 Grundfos NB pumps, valves and manifolds	Hot aisle containment; heat rejection through cooling towers
Air and dirt separators	Degassing units

Hyperscale off-site plant room build

Description

A multinational data center operator required a cooling infrastructure for 4 MW of IT cooling across a new ~35,000 ft² data hall. Due to the site's urban location, unique planning requirements including durability and weather resistance had to be taken into account.

The operator's criteria also included meeting the Uptime Institute's Tier III requirements, a 40-year performance guarantee, and a system as compact and energy-efficient as possible. All was to be delivered on a tight timescale and within a strict commercial budget, with regular online progress inspections and FAT testing

The Solution

To successfully meet the project requirements, Grundfos designed and built a packaged plant room off-site. The setup included two sets of duty/assist/standby secondary pumps with duplicate intelligent pump control systems and piping topology, consisting of N+1 secondary chilled water pumps, N+N pressurization units, water treatment equipment and N+N pump control panels, all in accordance with Tier III requirements.

A critical part of the solution was to provide two MPC controllers to each pump system with an automatic changeover switch, to switch between the main MPC Controller and the standby controller in the event of a failure on the controller. Each controller had two electrical feeds and redundant differential pressure sensors, ensuring the solution provided N+N redundancy.

Once built, the complete modular package was delivered in a highly durable, weatherproof enclosure of welded construction, with high-density mineral wool insulation compliant to atmospheric corrosivity category C4 (high), with a guaranteed durability performance of at least 40 years.

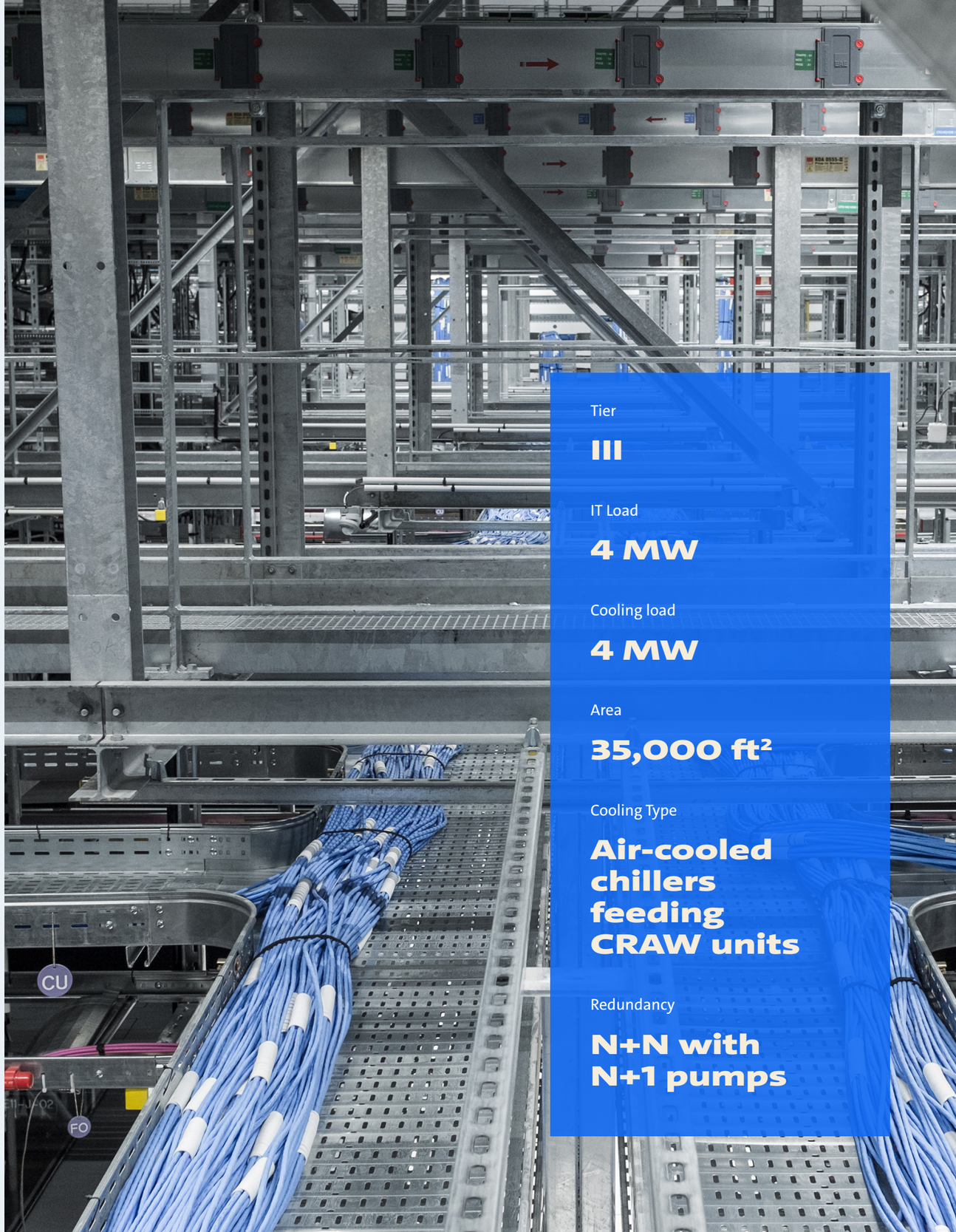
Results

The solution was delivered to the site within the desired budget and agreed timeframe, meeting all the performance, durability and redundancy requirements of the data center operator.

The off-site build and Grundfos intelligent pump solutions also ensured the requirements for saving physical space and maximizing energy efficiency were also successfully met.

Technical Details

Modular plant room and skids	Chilled water: 68°F flow, 80°F return
Airflow: 75°F flow, 96°F return	2x sidestream filtration units (< 5 µm)
4x 1.4 MW air-cooled chillers with free cooling mode	2x spill & fill combined pressurization unit with auto-glycol top-up
Two sets of duty/assist/standby pump skids with Tier III MPC Control solutions	



Tier
III

IT Load
4 MW

Cooling load
4 MW

Area
35,000 ft²

Cooling Type
Air-cooled chillers feeding CRAW units

Redundancy
N+N with N+1 pumps

Design, Build & Delivery time

20 weeks

Modular plant rooms

7

Redundancy

N+1

Modular plant rooms for rapid-build data center

Description

The ever-growing, worldwide demand for data has created a need for rapid deployment of data storage, processing and management.

For their new rapid-build data center in the Netherlands, a leading data center operator, familiar with Grundfos's extensive water treatment application knowledge, commissioned the design and build of plant rooms for the pumping and water treatment equipment.

To meet the very tight construction schedule, it was planned to use modular, off-site builds as far as possible.

The Solution

Grundfos designed, built and supplied seven packaged chilled water and water treatment plant rooms. Regular online meetings were held with the customer's design, construction and installation teams to provide a suitable solution to fit the pre-designed and installed piping and electrical infrastructure.

Each plant room consisted of Grundfos Hydro MPC Boosters piped in an N+1 configuration with intelligent variable-speed controllers and BMS connectivity, and a water treatment system.

They were built in a controlled environment at Grundfos's manufacturing facility in Sunderland, UK, with full quality control and progress updates offered to the customer throughout. As they were unable to visit the site due to the COVID pandemic, FAT testing was carried out by video link. Grundfos then organized shipment and delivery to the Netherlands, where the plant rooms were installed by a contractor and commissioned by Grundfos.

The entire process, from design and build in the UK to delivery in the Netherlands, took place in twenty weeks.

Results

The unique partnership approach and end-to-end support of Grundfos was of considerable benefit to the customer, who received their fully-commissioned plant rooms on time and to schedule, enabling them to continue with their rapid data center rollout.

Using Grundfos's intelligent pump and control solutions also contributes to the site's outstanding energy efficiency.

Technical Details

7x Grundfos Hydro MPC Boosters with variable-speed controllers

Co-location renovation project with BMS integration

Description

A former city warehouse was to be renovated by a global data center operator, refitting the structure and converting it into a four-hall data center. Each data hall was to have a dedicated plant and redundancy to ensure round-the-clock, year-round availability of the critical infrastructure.

The Solution

Grundfos installed the same system of loose pumps and equipment in each of the four data halls. Each system consists of eight chillers (6 duty & 2 standby, N+2) with free cooling mode, assisted with an adiabatic mode to increase efficiency. A Grundfos NB primary pump is dedicated to each chiller, charging eight buffer vessels on a constant primary principle. The buffer vessels help balance the system in a low loss header, and, as the chillers are staged, give 5 minutes extra chilled water capacity when the chillers switch off.

Eight Grundfos CRE secondary pumps (N+2) are connected to the buffer vessels and fitted with Modbus cards to provide real-time data to the BMS. They draw off a low-loss header and regulate the amount of water fed to the CRAH units on a variable volume principle. The CRAH units feed the fan wall's sixteen fans (N+4, 12 duty & 4 standby).

Each data hall has a pressurization unit installed on the primary and secondary circuits to maintain pressure. When it tops up the system with make-up water, it signals the Grundfos dosing system, which doses enough glycol to maintain the desired level of 20%.

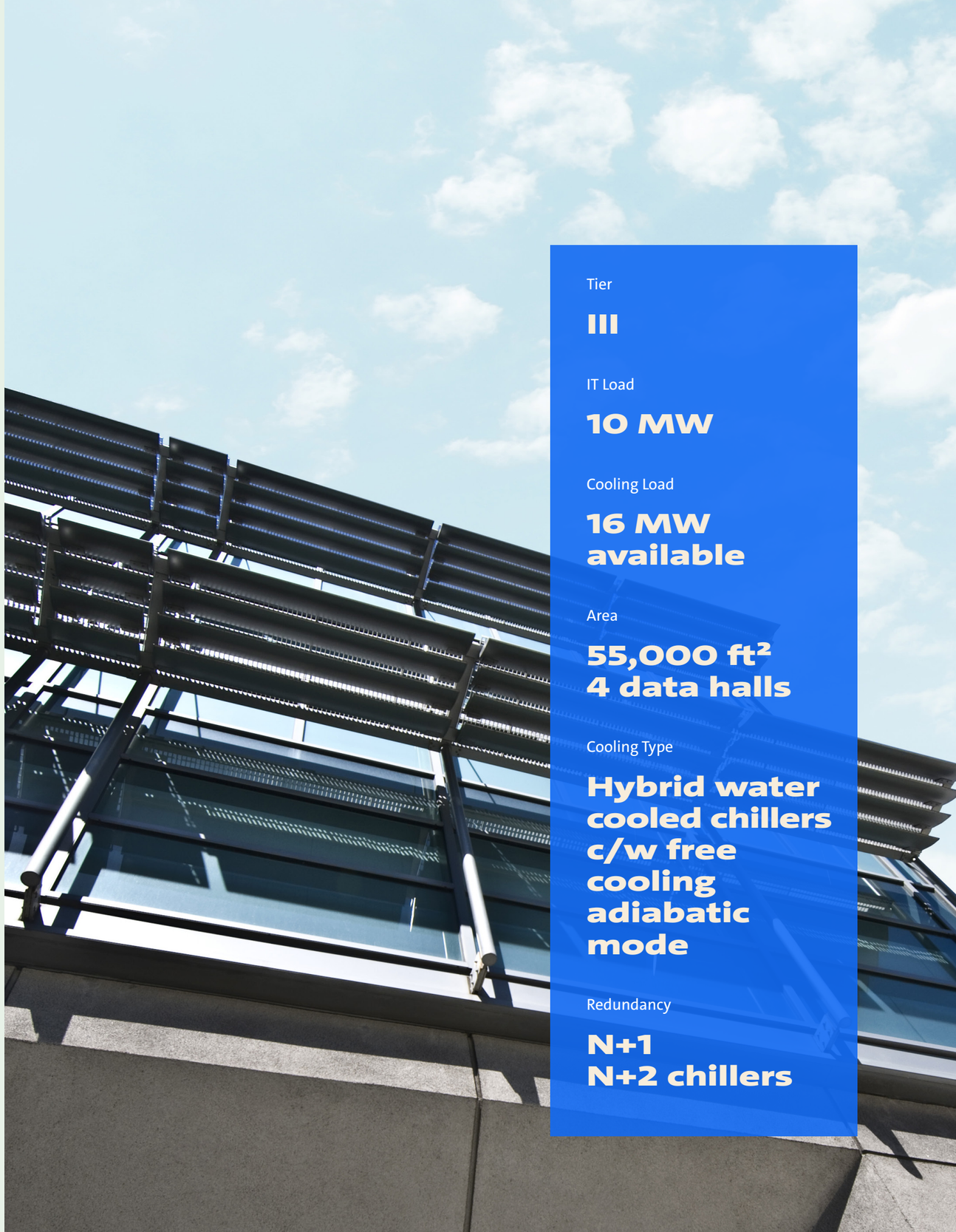
The BMS monitors real-time system information including supply pressure, differential pressure, supply water temperature, pump speed, pump status, fault condition, hours run and the pressurization unit condition. In turn, it controls pump run and pump speed, alongside other equipment, alternating between the duty and redundant plant to optimize the system.

Results

The customer received a chilled water plant that is functional, energy-efficient and offered the desired level of redundancy while benefiting from the ease of dealing with a single supplier for all their pumping and associated equipment. The Grundfos CRE pumps also met the high-efficiency requirements to contribute to the data center's low PUE.

Technical details

4 data halls, each with dedicated plant and redundancy	**68°F flow, 86°F return chilled water**
16 hybrid chillers (N+2), free cooling with adiabatic mode	**Grundfos NB dedicated primary pumps**
Glycol dosing system	**Pressurization unit installed on primary & secondary circuits**
Grundfos CRE secondary pumps supplied with Modbus BMS cards	



Tier

III

IT Load

10 MW

Cooling Load

16 MW available

Area

55,000 ft²
4 data halls

Cooling Type

Hybrid water cooled chillers c/w free cooling adiabatic mode

Redundancy

N+1
N+2 chillers

Tier

III

IT Load

10 MW

Cooling load

13.8 MW

PUE

<1.3

Cooling Type

Free cooling, air-cooled chillers

Redundancy

N+1

Hyperscale, co-location new build

Description

A new 85W co-location data center was subdivided into sections to suit specific customer requirements. This project concerned a 10MW section of the data center divided into 5 data halls, with a requirement for a PUE of 1.3 or less.

The customer preferred to deal with as few suppliers as possible, also stipulating that the equipment should be packaged and assembled off-site where feasible.

The Solution

Each 10MW data center is cooled by twelve air-cooled chillers (N+2) with free cooling mode, each with its own variable speed pump. The chilled water is pumped into a 1,585 gallon buffer vessel dedicated to each chiller, feeding a ring main system supplying chilled water to the CRAH units.

To maintain the pressure and quality of the water in the chilled water system, Grundfos supplied a pressurization set, a 528 gallon pressure vessel, a side stream filtration unit to filter out any debris or organic material, and an automatic degassing unit to remove any air from the system. For the AHU's humidification system, a water treatment package was installed in the packaged plantroom with reverse osmosis and water softening. The treated water is stored in a water storage tank and pumped to the CRAH units as required.

Offsite, Grundfos built a dosing skid with Grundfos dosing pumps, tanks, pipework and valves, injection valves, a flow meter and associated equipment. An MPC booster set was supplied to provide domestic water to the utilities and the services.

Water quality is continually monitored on a closed loop system by a Grundfos DID (Digital Instrumentation Dosing) unit, its three sensors measuring PH level, conductivity and ORP. If the readings deviate from their setpoints, the dosing pumps dose the appropriate amount of biocide, glycol and inhibitor to bring the system back to its set parameters.

In addition, an Oxiperm Pro unit provides chlorine dioxide disinfection for legionella protection. A wastewater package was also provided, including a PUST pre-fabricated tank, two AP pumps with auto couplings and guide rails, valves, non-return valves, and pipework. The system is controlled by a Grundfos LC 241 Controller and float switches. All equipment was equipped with a Modbus interface to enable integration with the client's BMS system.

Results

BMS integration across the system allows for constant monitoring and optimization, and the installation of the high-efficiency Grundfos E Pumps with IE5 motors helped achieve the low PUE demanded by the customer.
With Grundfos as a single supplier throughout the process, the customer was able to save time and money in their procurement, project management and after-sales. Grundfos provided an annual maintenance contract to inspect and maintain all the equipment regularly, ensuring the system operates at maximum efficiency and maximum uptime.

Technical Details

Loose equipment & dosing skids for two packaged water treatment plantrooms	68°F flow, 89°F return chilled water
MPC Booster set	1 Oxiperm Pro unit
Grundfos E Pumps with IE5 motors	1 Pressurization set
528 gallon pressure vessel	PUST pre-fabricated tank
2 Grundfos AP pumps	Grundfos LC 241 Controller and float switches

Modular hyperscale extension

Description

The existing mechanical and electrical installation at a hyperscale data center was assessed to increase the existing IT cooling load from 3.6 MW to 5.6 MW while meeting Tier III requirements.

The original cooling system had four 1.2 MW Chillers (N+1) providing 3.6 MW of cooling to 26 CRAH units. The limited space in the existing plant room presented challenges for installing new equipment.

The Solution

After increasing the number of CRAH units on the ground floor, Grundfos designed, built off-site and delivered a GRP-packaged chilled water plant room, housed on the roof of the building alongside the existing chillers.

The new installation included two air-cooled 1.2 MW chillers installed on the rear external plant deck and connected to the new Grundfos plantroom. N+1 secondary chilled water pumps, an additional side stream filtration unit, and power distribution panels with two motorized valves are also included. The extra chilled water capacity is connected to the existing pipe installation with a new manifold to provide a 5N+1 configuration.

With the new connection facilitated through an existing valve setup, it was possible to fit an additional pump and chiller after installation to further increase the capacity of the data center. Complimentary third-party additions to the plant room were supplied and installed by Grundfos, including a trace heating unit, air conditioning unit, a fire damper, and three external lights.

Results

The project was built within budget, FAT tested and delivered on-site to a tight deadline, successfully achieving the desired aim of increasing the cooling capacity of the data center.

The customer was able to make periodic inspections throughout the building process, and being off-site, their data center could continue to run without disruption.

Technical Details

Modular plant room & skids	**GPC weatherproof enclosure, steel base & decking, situated on roof**
2x 1.2 MW air cooled chillers	**14x CRAH units**
1x set of duty/assist standby secondary pumps with associated pipework and valves	**Sidestream filtration unit (< 5 µm)**

Tier

III

IT Load

3.6 MW, extended to 5.6 MW

Cooling load

7.2 MW

Area

250,000 ft²

Cooling Type

Air-cooled chillers

Redundancy

N+1

We believe it's possible to cool a data center without warming the planet

Sustainability is at the core of everything we do at Grundfos.

We share with the data center industry an acute sense of responsibility that drives us to even more energy-efficient solutions, helping you exceed your own sustainability goals.

With data center specialists around the world, we'll be by your side at every stage: from consultation and design to commissioning, maintenance and monitoring.

To discuss your next cooling, water treatment or distribution project, contact us at **grundfos.us/datacenters**

Visit grundfos.us/pei to learn more about Department of Energy (DOE) pump energy index (PEI) requirements and PEI ratings on specific Grundfos models.

Grundfos Americas
Brookshire, TX 77423

grundfos.us | grundfos.ca | grundfos.mx

GRUNDFOS