



# CyrusOne

## 54MW Data Centre Cooling Solution

### Case Study

**CyrusOne challenged their partners to design a cooling system that would deliver exceptional energy and water efficiency, to compliment 100% renewable green energy usage and bespoke landscaping, which included a biodiversity and pollinator plan.**



## The Client

Since 2001, and with years of continued success, CyrusOne competes at the forefront of the data centre industry as a respected leader and innovator. CyrusOne's portfolio now includes more than 40 enterprise-class facilities across three continents and more than four million square feet of total net rentable square footage (NRSF).

Sustainability initiatives at data centre giant CyrusOne are a core tenant of everything they provide and do. They embrace an eco-centric mindset and their responsibility is guided by a qualitative, quantitative and meaningful sustainability plan that includes a pledge to become carbon neutral.

As a founding member of the Climate Neutral Data Centre Pact (CNDCP), and with senior representation on the Board in the form of EVP Managing Director, Matt Pullen, CyrusOne is committed to achieve carbon neutrality by delivering to agreed criteria set out by the self-regulatory framework for energy and water efficiencies (PUE and WUEs), clean energy, the circular economy and waste management. Over and above targets set out in the Pact, CyrusOne's plan includes commitment to sustainable construction and habitat.

Recently, CyrusOne reported it had successfully adhered to terms of the CNDCP, and was the first to inform the board that all its fully operational data centres in Europe have been independently audited to comply with the Pact's terms.

## The Project

- 54MW DC Campus
- 33,500 sqm technical space across three buildings

One site, a 54MW data centre campus offering 33,500 sqm technical space across three buildings, exemplifies where they have successfully implemented changes to improve sustainability during design, construction and operation.

With such focus on sustainability as well as performance, CyrusOne were keen to appoint a cooling solutions provider that could advise them on design as well deliver the solution; Airedale was the obvious appointment.

Base line model PUE	1.38
Delivered PUE	1.2
Energy reduction vs. base line	34%

At commissioning, a further analysis was carried out and the dPUE was reduced to 1.18.

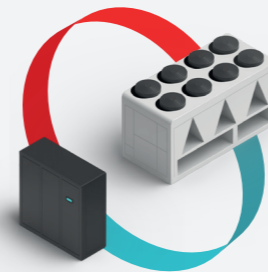
## Airedale solution



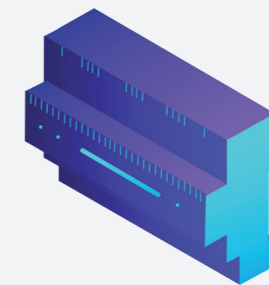
64 x SmartCool ONE™ chilled water CRAHs



12 x OptiChill Free Cool™ air-cooled chillers with Enhanced Free Cooling™



"Water Side Optimisation" system design



Cooling System Optimiser™ controls platform

# The Sustainable Cooling Solution

## Water Side Optimisation™

**A technique called “water side optimisation” was key to success on site. Raising air temperatures in line with technical guidelines like ASHRAE TC9.9, is a positive first step towards greater energy efficiency. However, this doesn’t take into account water variables and these temperatures are usually simply allowed to rise along with the air conditions. Understanding how to impact both air and water conditions and therefore creating optimal approach temperatures and water-side Delta Ts, is the key to unlocking huge chunks of free cooling potential.**

Large CRAH units with 365kW cooling capacity were deployed in the data halls, with deep row cooling coils to maximise heat exchange efficiency. Air path management in the white space was also optimised, resulting in 40°C return air temperatures back to the CRAHs, increasing efficiency further and resulting in a return water temperature of 31°C, creating ideal conditions for free cooling in the regions climate. Supply water is 23°C, a massive increase on what was possible even 5 years ago, with supply air in the data centre set at 27°C. Closing approach temperatures and widening the water-side Delta T is one of the fundamental characteristics of the water-side optimisation technique, where water and air temperatures are managed to maximise free cooling.

## Cooling System Optimiser™

**With any data centre cooling system it is important to balance sustainability with performance by delivering the required operating conditions, resilience and redundancy at the lowest possible energy outlay. It is not simply a case of creating set-points and letting equipment select operating conditions to meet them; optimising all the system variables and constantly fine-tuning them during operation is key to this balance.**

**Airedale’s Cooling System Optimiser was key to this ongoing management/optimisation of the system components and variables. Cooling System Optimiser is a dedicated data centre cooling controls platform, delivering resilience and redundancy for the lowest possible energy input. It is an additional controls layer, positioned above the unit controls and under the BMS, monitoring data from units and field sensors placed at critical points in the system:**

- Live water volumetric flow requirement from the CRAHs is used to automatically adjust water flow through the chillers, reducing the use of the bypass valves. The optimiser automatically calculates and adjusts the chiller’s pumps speed to achieve the water flow required.
- Ambient temperature is monitored intelligently and free cooling is optimised by increasing system Delta Ts at part-load.
- Chiller flow rates are optimised and reduced where possible, saving energy while maintaining SLAs.
- Optimised chiller sequencing based on cooling and flow demand – determines optimum number of operational units at any one time to ensure cooling demand satisfied at optimum loading.
- All data is fed back to the BMS for in-depth monitoring, offering a full picture of the system.

The entire cooling system was also designed based on a variable primary architecture, which is quite rare for a European data centre. The chillers were supplied with on-board variable speed pumps, allowing them to modulate the flow of chilled water to the data centre based on load. Variable flow provides benefits at part-load as chilled water temperatures can be stabilised, with flow being varied in proportion to the requirement. In theory, a variable primary system is more sustainable to run as rotating machinery is modulated during part-load conditions, reducing energy output.

# CyrusOne's sustainability commitments

Working in partnership with J Dunton Associates, Airedale committed to, and delivered on the following working practises which are implemented by the CyrusOne site and project management teams. This commitment from Airedale allowed our client to feel confident that our commitment to sustainability was sincere, deliverable and would contribute towards meaningful results.



**Project Management – Reduce construction site impacts:** CyrusOne tracked the journeys of materials, supplies, and equipment to and from the site to understand the carbon footprint of the project. They monitored staff transport management plans and advocated the use of public transport, bikes, and other lower carbon methods.



**Waste – Reduce environmental impact through construction site waste management:** Site general contractor operated under BRE's SMARTWaste Plan to manage compliance with regulations, set targets and align with BREEAM. Zero waste to landfill is a tough target to reach, but we did an incredible job of achieving it and diverting waste from landfill.



**Water – Reduction in water use:** Our standard in cooling is closed loop chilled water systems as they deliver a good PUE alongside low water usage. This was the solution delivered by Airedale. We harvest rainwater as standard for onsite irrigation to support ecology and measure WUE worldwide.



**Energy Use – Water side optimisation:** A technique called "water side optimisation" is championed by Airedale as a means of significantly reducing water waste in mechanical cooling systems. The cooling system implemented was designed in this way, with all air and water temperatures optimised to deliver approach temperatures and water-side Delta Ts that unlocked huge chunks of free cooling potential and fantastic PUEs without the use of adiabatic cooling, delivering substantial savings in both energy and water usage.



**Energy Use – Water system:** The cooling system was implemented using a variable primary architecture managed by a holistic controls system... a trailblazing technique designed by Airedale for this European data centre. This technique saves on plant requirements and also allows the system to flex with demand, with efficient part-load performance due to the use of variable speed pumps adjusting water flow based on a fixed temperature water delivery. Airedale's expertise in optimising flow in line with cooling demand delivers sustainable results.



**Materials – Lower environmental impact of buildings over full life cycle:** CyrusOne implement the 'Green Guide': a BRE Specification of high-performance materials that will increase the life cycle and performance on equipment on site. As part of this, Airedale were specified due to their proven track record in delivering products that reduce waste due to their longevity, endurance and reliability as well as performance.



**Land use & ecology:** The data centre campus is an example of how a thoughtful landscape strategy and habitat can support biodiversity, promote local ecology and help protect and grow bee populations. In order to be so effective, it is crucial that CyrusOne work with partners who can deliver on their sustainability commitments.

## Delivering on the promise

The base line model PUE was 1.38, but following the successful implementation of the design parameters and features mentioned above, CyrusOne were able to deliver a PUE of 1.2. This equates to a 34% energy reduction compared to the base line model. At commissioning, a further analysis was carried out and the dPUE was reduced to 1.18.

## Key to Success

*"The technology and expertise delivered by Airedale was of course an important factor in CyrusOne being able to meet their sustainability objectives. However another critical success factor was that CyrusOne and their consultants J Dunton Associates take a holistic view of sustainability and involve experts from their supply chain at a very early stage. When the entire value-chain collaborates and shares responsibility for sustainability, innovation can be unlocked. Flexibility around variables like air on temperatures will be a catalyst for innovation and help the industry take the big steps required to reach the next level."*



**Headquarters**

Airedale International  
Leeds Road  
Rawdon  
Leeds LS19 6JY  
T: 0113 239 1000  
E: [connect@airedale.com](mailto:connect@airedale.com)

**Dubai Office**

5EA-822  
Dubai Airport Freezone  
Dubai, UAE  
PO Box 371068  
T: +971(0)46091380  
E: [connect@airedale.com](mailto:connect@airedale.com)

**US HQ**

Airedale by Modine  
1500 De Koven Ave  
Racine  
WI 53403-2552  
T: 1-800-828-HEAT  
E: [connect@airedale.com](mailto:connect@airedale.com)