Indirect Adiabatic and Evaporative Data Center Cooling

10 YEARS
2010 - 2020

Advanced Data Center Cooling

After 10 years and close to 1,000 units installed, Excool launch the next evolution the Mk6 Excool model for 2020 'Excool Zero'

Now 2020 marks the next evolutionary step in Excool data center cooling technology with the release of the Excool Zero.

Developed in response to the broadening of the ASHRAE recommended server inlet temperature envelope in 2008, Excool represents the most advanced technology of its kind.

Unique in its approach Excool is able to cool data centers globally with year-round free cooling.

Excool now introduce a ground breaking technological advance to address the need to reduce water consumption in Data Centers. EXCOOL ZERO can operate with or without water.

Excool's unique indirect heat exchanger prevents both particulate and gaseous contamination from entering the white space.

The system uses outdoor air to indirectly cool the indoor air supply via a specially designed composite plastic heat exchanger.

Heat transfer is achieved without allowing potentially contaminated outdoor air entering the datahall. This could include particulates from fire, pollution and salt aerosols that would accumulate in server intake fans and filters resulting in more energy consumption and higher operating temperatures.

Gaseous contamination is different, sulphur and hydrocarbon combine with humidity to form acids that erode joints and connectors.

Excool's unique indirect heat exchanger prevents all outdoor contamination from entering the white space.

Advanced Data Center Cooling

30% reduction in capital cost

Significant reduction in footprint size

No remote water storage or pressurization tank required

No remote water treatment required

Up to 75% reduction in water consumption with option of zero water consumption

90% reduction in overall sound power

80% reduction in maintenance hours

Significantly reduce size for generators

After 10 years and close to 1,000 units, Excool launch the next evolution the Mk6 Excool model for 2020 'Excool Zero'

eXcool zero
advanced data center cooling

zero

High Quality Construction

– Lifetime anti Corrosion Warranty

The Excool product uses high quality components and materials to ensure long term reliability and resistance to corrosion.

The product is provided with a lifetime warranty against corrosion. Stainless steel framework and support structures are used throughout the unit. Outer panels are a composite of PVC and aluminium.

The air movement is achieved using high efficiency ECDC fan and motor assemblies and the system pumps use robust stainless steel internal components for long life.

- Main base frame – Stainless steel
- Outer panel framework – Aluminium pentapost
- Main external panels – painted aluminium outer skin with composite inner skin
- Internal panels – Stainless steel
- Heat exchanger outer frame – Stainless Steel
- Heat exchanger support frame – Stainless steel
- Drip tray – stainless steel
- Heat Exchanger – Composite material medium to remove the heat from the data center.

Compact and Lightweight

The technologically advanced design and use of high grade materials results in an industry leading unit size and weight.

The footprint of the Excool zero has been reduced by 82% compared to the 2010 Excool Mk1 model. Enabling the unit to installed in more Data Center building types without consuming valuable floor space.

- 83kW of cooling per linear meter
- 25kW of cooling per linear foot
- 36kW of cooling per square meter footprint
- 3.3kW of cooling per square foot footprint
- 637kgs per square meter (operating weight)
- 130lbs per square foot (operating weight).

Noise

Due to the redesign of component location the new Excool zero has a overall sound power reduction of 90% compared to the previous Excool model.

Integrated Water Storage

24 hr water Store

On Board Bacterial Control

Water flows through tank

Adiabatic Cooling Water Treatment

The system is complete with on board water treatment. A clean water supply (up to 250mg/l of calcium carbonate) is required for normal operation and maintenance intervals.

Each Excool Zero unit fitted with a decentralized emergency water tank to safely store and manage enough water for 24hrs of operation.

The units have an automatic drain down and purge cycle to ensure all areas of potential bacterial growth are removed.

The system also employs cartridge based biological filters.

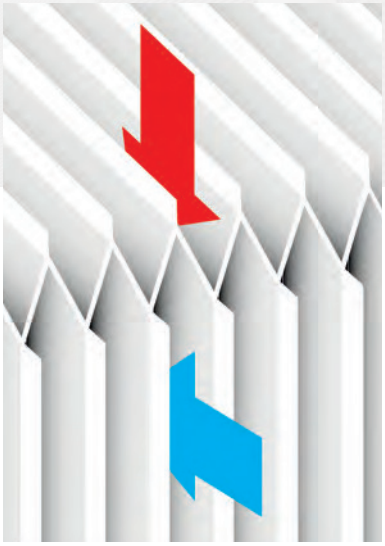
Excool Services

Our range of services include:

- Maintenance
  During the redesign of the solution, maintenance and access was considered as a priority.
- The new Excool Zero unit now has easier access to components and enables an 80% reduction in annual maintenance hours.
- Remote Monitoring.
- Recording and evaluation of consumption values.
- Selectable operational cooling modes.
- UK and US test laboratory for factory acceptance tests and product development.

How it works

Excool have optimized air to air heat exchanger technology specifically for the application of adiabatic and evaporative cooling in data centers.



Excool's unique heat exchanger is manufactured from a composite material which unlike the more commonly used aluminium, makes it non corroding, stronger and leak resistant.

The Excool cooling system has been developed specifically for the purpose to ensure highly efficient saturation of the outdoor air.

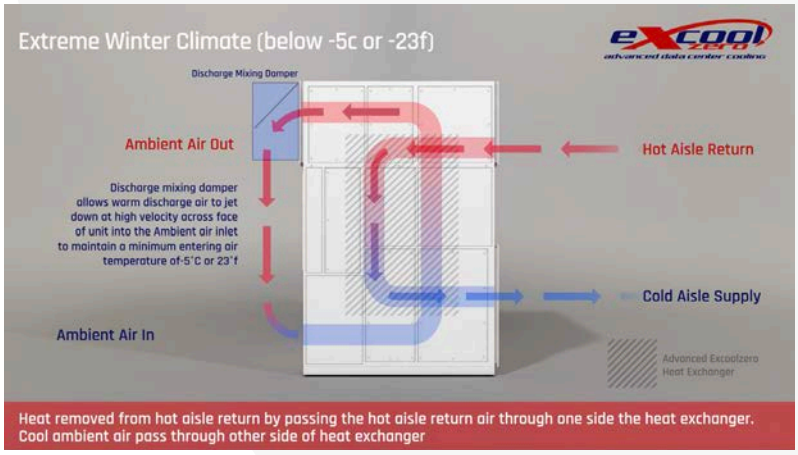
Supply air temperature is controlled by a modulating outdoor air volume, water use and mechanical cooling.

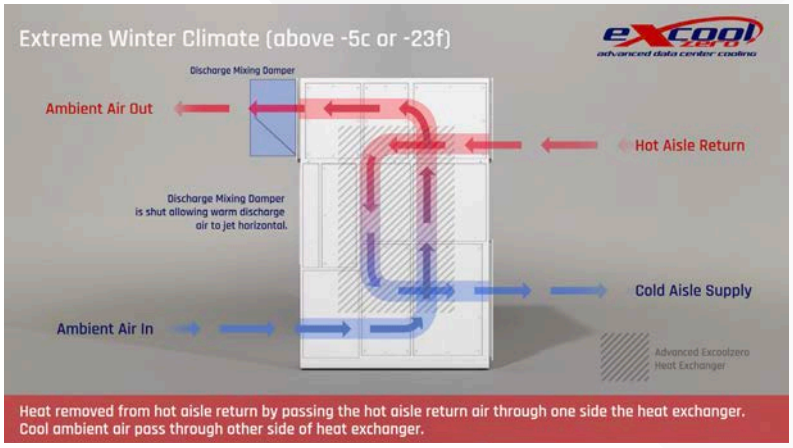
Operating temperature seasonal scenarios

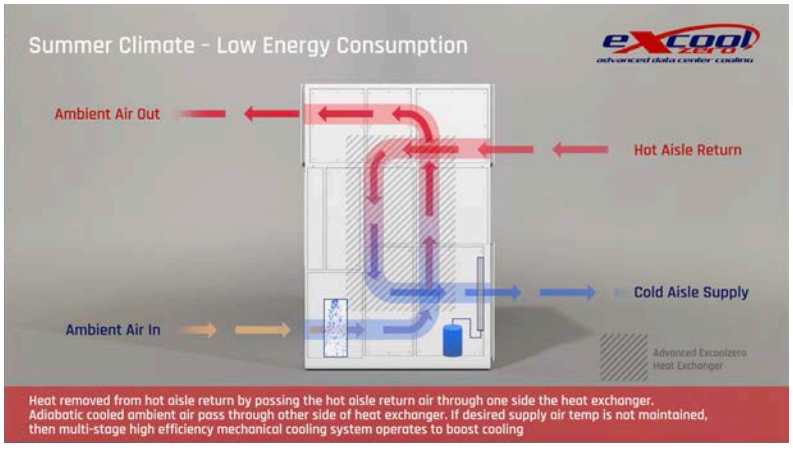
Prolonged Extreme Winter Operation (option only) (temp below –5˚C or 23˚f)
During extreme winter conditions the warm exhaust air is mixed with the cold Ambient intake air and drawn across the heat exchanger. The mixing of the warm exhaust air with the cold ambient intake air prevents over cooling and condensation forming in the heat exchanger.

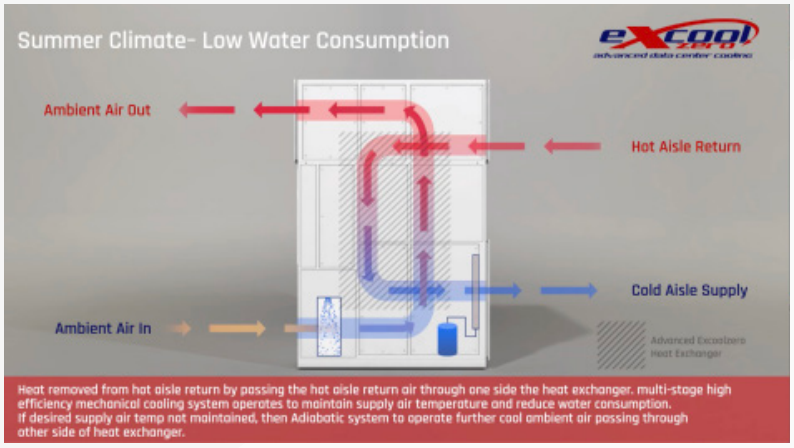
Winter/Temperate Operation
Hot aisle return air is drawn thought the heat exchanger by ECDC process plug fans. Cool outdoor air is drawn through a second air path in the heat exchanger by ECDC Exhaust plug fans. The supply air temperature is controlled by regulation of the speed of the Exhaust ECDC plug fans.

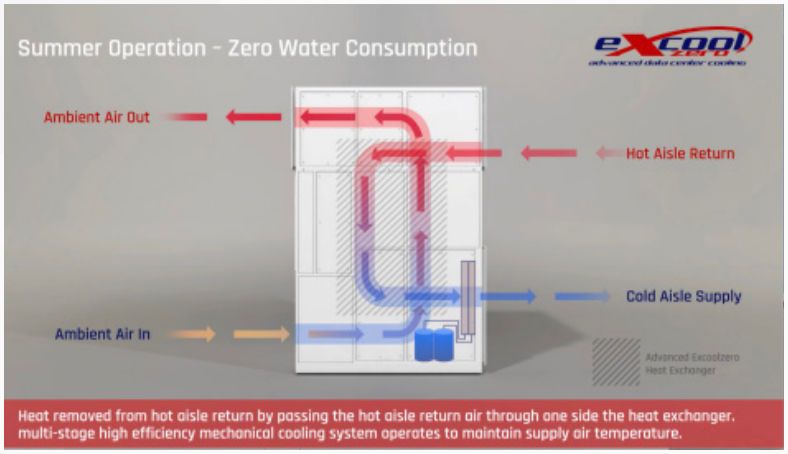
Summer Climate Operation - Low Energy
To keep energy consumption to a minimum, during the summer period, the adiabatic section is activated so that moisture is added to the hot ambient air which has the effect of lowering the ambient air temperature being drawn through the second air path of the heat exchanger. This reduced temperature ambient air is then used as the cooling medium to remove the heat from the hot aisle return air. The high efficiency multi stage integrated DX cooling section will remain available should additional cooling boost be required to maintain the supply temperature to the white space.

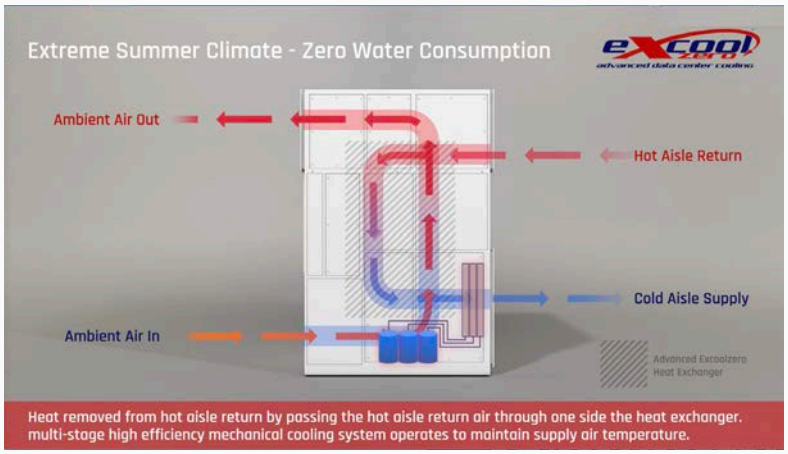


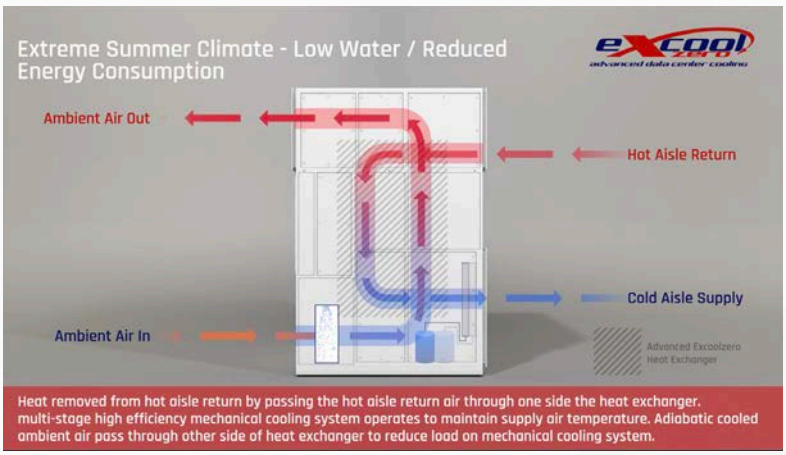












Summer Climate Operation – Low Water Consumption

To keep water consumption to a minimum during summer, the high efficiency multi stage integrated DX cooling section is activated to provide initial cooling during the hot summer hours. When the ambient air temperature increases further the cooling can be boosted by adding moisture to the hot ambient air which has the effect of lowering the ambient air temperature being drawn through the second air and thereby reducing the energy consumption of the DX cooling section.

Summer Climate Operation – Zero Water Consumption

When water is not available or water use restrictions are in place it is possible to continue to operate the unit in water-free mode. The high efficiency multi stage integrated DX cooling section is activated to provide all the cooling capacity required during the hot summer hours.

Extreme High Ambient Temperature – Zero Water Consumption

During extreme high ambient temperatures the use of water could be heavily restricted or banned for non-essential operations. In these cases it is possible to continue to operate the unit in water-free mode. The high efficiency multi stage integrated DX cooling section is activated to provide all the cooling capacity required during the even the most extreme hot ambient conditions.

Extreme High Ambient Temperature - Low Water Consumption

When a limited volume of water is available during extreme high ambient temperatures. The unit will operate in water saving-mode where. The high efficiency multistage integrated DX cooling section is activated first to provide the majority of cooling capacity required and the adiabatic section will activate as the final stage of cooling to maintain the cold aisle supple temperature during the even the most extreme hot ambient conditions. Water saving mode reduces both water and energy consumption for extreme conditions.

Operational data

Reduced Electrical Infrastructure

The reduction in the dependency on mechanical cooling has a major impact on the size and cost of the electrical infrastructure.
When considering the lower capacity requirement of the electrical to mechanical power loads, the plant, equipment and machinery power infrastructure is reduced.

- Diesel generator
- Electrical distribution
- Diesel storage
- Switchgear
- Transformer

Operation Data

Typical operational data for a 1 MW data hall.
Based on 75°f air temperature 95°f return temperature. 0.6 in.w.g Pa external static pressure.
75% average annualized demand. N + 1 resilience.

Cooling Only PUE

Operational data is calculated by analyzing the systems energy requirements for every one of 8760 hours of temperature data for the typical reference year published by ASHRAE.
It assumes the average load throughout the year is at 75% and that all units including the standby unit are in operation.

	Location	Energy Consumption kW/hrs	Water Consumption US Gallons	pPUE	WUE l/kWh
Adiabatic sprays in operation before mechanical cooling	Atlanta	420,316	339,240	1.064	0.2
	Chicago	316,386	272,448	1.048	0.16
	Dallas	489,233	571,560	1.074	0.33
	San Jose	285,276	455,928	1.043	0.26
	Ashburn	373,145	321,024	1.057	0.19

	Location	Energy Consumption kW/hrs	Water Consumption US Gallons	pPUE	WUE l/kWh
Water Saving Mode. Mechanical cooling in operation before adiabatic sprays	Atlanta	519,720	145,200	1.079	0.084
	Chicago	387,502	93,456	1.059	0.054
	Dallas	689,226	322,080	1.105	0.186
	San Jose	383,382	91,872	1.058	0.053
	Ashburn	469,136	145,464	1.071	0.084

Typical operational data for a 1MW data hall. Based on 75˚f supply air temp, 95˚f return air temp, 75% average annualised demand and N+1 resilience

pPUE = Partial Power Usage Effectiveness (cooling only) **WUE** = Water Usage Effectiveness

pPUE Calculation = $\frac{\text{Total (Cooling) Facility Energy}}{\text{IT Equipment Energy}}$

Data sheet

Model: EXHR2500 UL

Features

- Unique design plate heat exchanger; Manufactured from non-corrosive composite plastic with lifetime guarantee.
- Hermetically sealed joints to ensure zero leakage.
- Multiple adiabatic discharge matrix's.
- High pressure variable speed water distribution system.
- UPS for control panel.
- High pressure control solenoid valves.
- Latest programmable controls, with user & communication interface.
- Temperature Sensors.
- High & Low Water Pressure sensors.
- 24hrs integrated water storage.
- On board water treatment system.
- High efficiency multi stage integrated DX cooling section.

Equipment Selection		
Model Number	EXHR2500 UL	
Nominal Operating Data per Unit		
Cooling Capacity at 12degC dT	250	kW
Supply air volume per unit	36,444	CFM
Design Internal static air pressure	0.4	in.w.g
Design External static air pressure	0	in.w.g
Power Input – Fans	38	kW
Power Input – Pumps	3	kW
Power Input – Compressors	52	kW
Total Power Input	93	kW
Nominal Max running current on 400V with 0.91 P.F	132	Amps
Filters		
	EU1 Washable Media	
Water Data		
Peak Water Consumption	Configurable from 0-2.6	GPM
Min/Max operational water pressure required at unit inlet	30 to 60	psi
Physical Data		
Depth	91	in
Width	119	in
Height	138	in
Weight Shipping	7,054	ibs
Weight operating	9,700	lbs
Electrical Supply		
Recommended Fused Supply	180	Amp
Supply 3ph + N + E / 50HZ / 400V	200	Amp
	3ph + N + E / 60HZ / 480V	

Witness Testing and Validation

Excool has committed significant financial resource to enable clients to see the product operating in simulated and controlled environmental conditions.

Equipment can be fully witness tested at site specific ambients under full heat load and data hall temperatures to validate performance.
The facility to carry out acoustic testing is also available.

The test facility is located at the company's UK headquarters in Bromsgrove and the Excool's new US facility in South Carolina.

European HQ

Bromsgrove,
Worcestershire, UK

USA HQ

Spartanburg,
South Carolina, USA

excool.com

Modularity, efficiency and availability were not the only important features in the building but especially in the air conditioning sector. Here Excool has qualified as the right partner for us, from planning to commissioning. Our customers also benefit directly from this forward-looking technology in the form of low electricity prices - which makes us particularly happy.

Globalways AG

Employing Excool and the indirect air cooling method, has played a major part in delivering the award winning innovation and efficiency of VIRTUS LONDON2 data centre. It is part of the operations platform that enables us to deliver the most energy efficient solutions and lowest total cost of service in the industry to our customers

Virtus

The Excool indirect adiabatic cooling solution represents a very exciting evolution in data centre low energy cooling technology. The system, whilst novel in its means of integration, comprises tried and tested system building blocks extant across a broad range of cooling technologies

Digital Realty

Bluefjords had considered numerous cooling systems, well suited for both our climate as well as other demands. With the Excool solution we get this, both in regards to scalability, simple building adjustments and a substantial energy friendly solution. We are very pleased with the assistance given by Data Center Technology (Excool's Nordic partner), which allowed us to build a more energy efficient and progressive /modern data centre.

Bluefjords AS

For a large part of the year the air cooling process is sufficient. At certain times of the year when it gets warmer we spray additional water onto the face of the heating system. There's a lot less complexity – it's a very simple cooling process. It also means significantly reduced energy consumption

Rackspace

Awards Include:

excool zero
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excool.com

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