

Data Centre Climate Solutions



Advanced energy efficient air

Reduce data centre energy costs by up to 75%

The IT industry is responsible for over 2% of the world's carbon emissions and data centres are the fastest growing part of the footprint. The industry is focused on solutions that reduce energy and carbon emissions associated with data centre operations.

Munters 35 year experience with air-to-air heat exchangers and evaporative cooling, means our advanced cooling systems provide data centres with the desired cooling using significantly less energy than standard air treatment. Munters custom designs, integrate DX, chilled water, indirect and direct evaporative and economizer cycles to meet the requirements of any facility

With Munters Oasis™ indirect air-side economizers, the energy required to remove heat is significantly reduced. Munters cooling/heat rejection strategy achieves reliability and energy efficiency for data centres, using as little as 20% of the



cooling energy required by conventional cooling systems. Due to an increasing demand for more bandwidth and society's continuous need for a faster, more efficient, and a higher capacity cyber space, this is transforming the data centre market and how data centres operate.

Today's data centres are more advanced and offer data access and storage for multiple clients through remote "cloud" servers. The move from client/server to cloud and rapid growth in co-location data centre providers is increasing demand on cooling technologies whilst requiring reduced energy consumption. The

millions of instructions per second (MIPS) transmitted via today's servers are increasing create heat energy that requires removal from the data centre to prevent overheating of equipment.

Increased supply temperatures

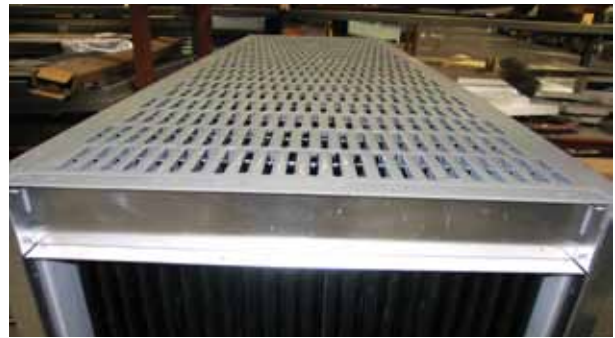
Historically data centre equipment was cooled with standard HVAC air conditioning delivering air at 10oC (55°F). As the cool air passed through the computer equipment it returned to the HVAC unit at 24oC (75) to 27oC (80°F) where it cooled to 10oC (55°F) to be redelivered.

Modern day servers and storage equipment can operate at considerably higher temperatures than legacy equipment. Most medium to large sized data centres require 0.5 to 50 MW. The recommended supply air temperature for computer rooms is 27°C (80.6°F) (ASHREA Thermal Guidelines for data processing environments 2009a) which makes demand for Munters Oasis™ Indirect Evaporative Air Cooler (IEAC) the preferred choice. Market research point towards these temperatures will increase to even higher levels... as decreased temperatures mean added cooling costs.



Indirect Air-Side Economizer

The indirect air-side economizer (IASE) cycle uses outdoor air to reject heat, but the outdoor air never enters the process or space. The IASE uses an air-to-air heat exchanger (HX) to transfer data centre heat to a separate outdoor airstream (“fresh air”). The figure below shows details of one type of Munters Oasis™ IASE system that uses horizontal polymer-tube heat exchangers



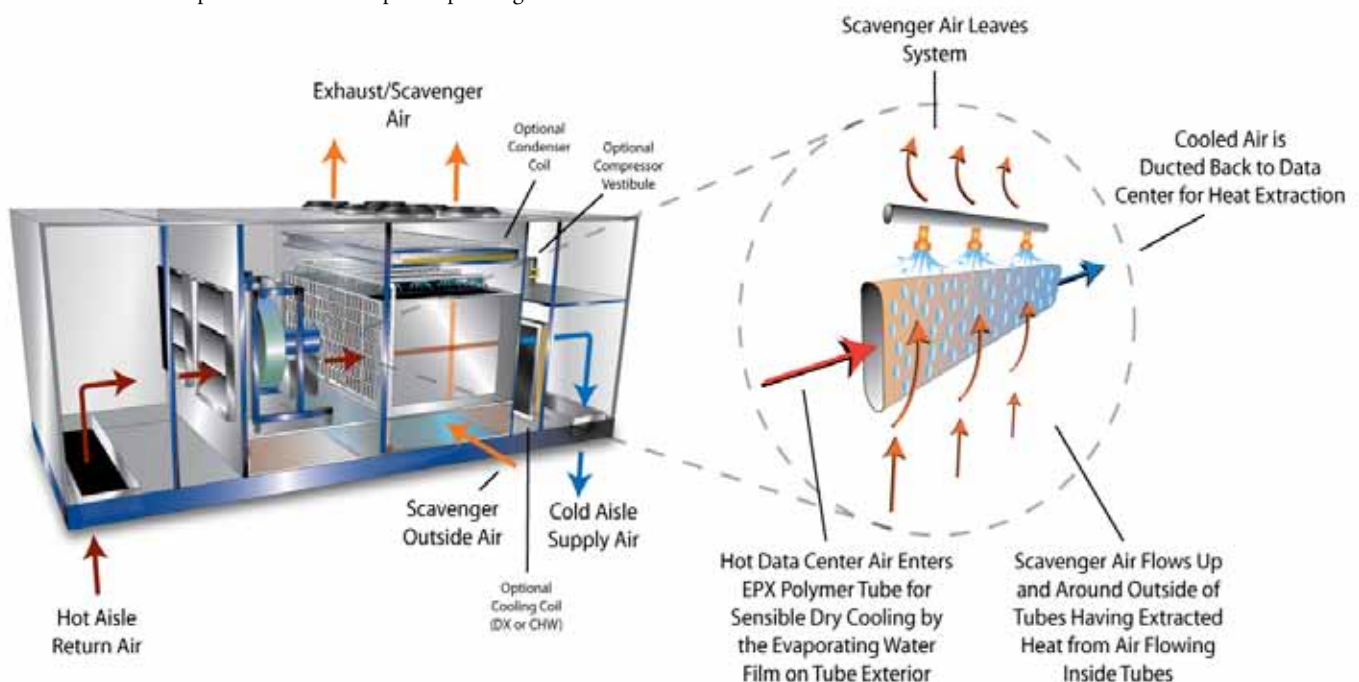
With this design, outdoor fresh air is drawn across the exterior of elliptical tubes, which are wetted by a recirculation water pump. The elliptical shape of the heat exchanger tubes maximizes the allowable surface area for heat rejection and is sufficiently elastic such that its subtle expansion and contractions, resulting from normal operation, aid the shedding of residual solids that are a by-product of evaporation.

With fresh air flowing over the wet exterior tube surfaces, evaporative heat transfer efficiently cools the data centre hot aisle air flowing through the inside of the tubes.

The HX is 45% to 50% effective when operating dry, when the outside of the polymer-tube HX is wetted, the HX is able to provide 70% to 80% wet-bulb depression effectiveness (WBDE), as an indirect evaporative cooler. WBDE is a measure of the approach of the hot-aisle dry-bulb temperature to the outdoor air wet-bulb temperature.

Using a 75% WBDE HX design, 100% of datacentre heat may be rejected solely using indirect evaporative cooling (IEC) whenever the ambient wet-bulb temperature is 19°C (66.2°F) or lower, based on a hot aisle temperature, after recirculation fan heat, of 38.6°C (101.5°F) cooling to a target cold-aisle temperature of 23.9°C (75°F).

Oasis™ Indirect Evaporative Air Cooler patent pending



Benefits of Oasis™ Indirect Air-Side Economiser

Because the data hall air is recirculated and cooled with IASE systems, and no outdoor air is introduced into the data centre by the heat rejection units, filters may be eliminated from some or all of the heat rejection air-handling units (AHUs).

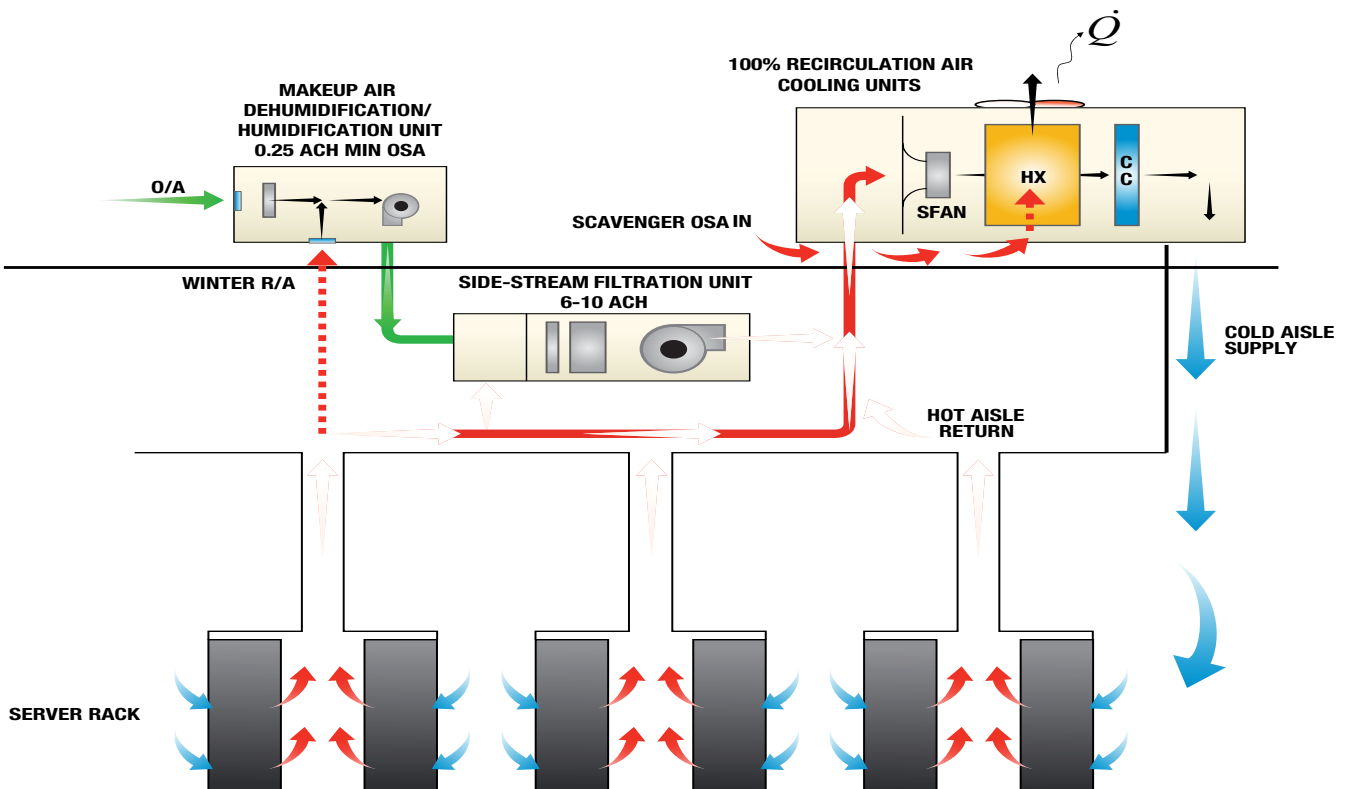
With Oasis™ IASE's particulate removal can be accomplished using a side-stream filtration unit, or filters may be included in IASE's, such that the room air is filtered at a rate of 6 to 10 ach's, leading to reduced filter, maintenance, and fan power costs compared to installing filters on all heat rejection units, which often have air turnover rates in excess of 100 ach.

Since outdoor air is not introduced into the space by the heat rejection units, there is reduced risk of outdoor air pollutants affecting the information and communication technology (ICT) equipment.

Also, space humidity and pressure are not impacted, resulting in the potential to lower humidification costs and maintain more stable moisture levels in the data hall.

Single, or multiple makeup air units, with F6 and F9 filters, equipped with dehumidification and humidification capability as required by local climates, provide the recommended ventilation (0.25 ach as a minimum) and humidity control. Humidification can be achieved using direct evaporative media with heat from the return air. The IASE units are laser focused on heat rejection.

Unlike water-side and wet-bulb economizer systems, IASE systems operate dry during cooler ambient conditions, resulting in lower annual water consumption and elimination of freeze concerns. IASE systems are able to achieve 100% heat rejection operating dry when outdoor air temperature is below approximately 10°C (50°F) based on a hot aisle temperature of 38°C (100°F), cooling to 24°C (75°F).



Low energy - with Oasis™ IASE's

Modulating mixed air dampers and relief fans/dampers are not required as part of the heat rejection cycle. IASE systems achieve supply temperature control by varying fresh air fan flow and staging/modulating DX or modulating chilled water valves.

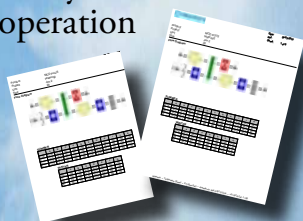
IASEs require one-third of the water flow rate of conventional water-side economizer systems, and operate with less pump head, resulting in significant annual pump power savings. IASE systems require no pump energy during cooler ambient conditions.

Contrast this with an open water-side economizer (direct tower to coil), providing 13.9°C (25°F) of air-side sensible cooling, taking a water-side temperature rise of 5.6°C (10°F). Such a water-side economizer requires approximately 0.35 L/s (5.5 gpm), 471.9 L/s (1,000 cfm) at sea level and may require 30.5 m (100 ft) of pump head, or more, depending on the installation. Water-side economizers with HXs and solids separators require additional pump power.

When integrated with indirect evaporative cooling, refrigeration capacity can be significantly reduced on IASE systems in virtually all climates, which is not true of conventional direct air-side economizers or wet-bulb economizer installations that require supply air dew point to be maintained below the current recommended value for Class I environments of 17.2°C (63°F).

Oasis™ IEAC

- Reliable engineered design, factory tested controls, installation and service.
- Fully packaged compact systems
- Free cooling to increase energy efficiency
- Integrated control optimizing energy
- Reduced CO2 Emissions
- Safe year-round operation



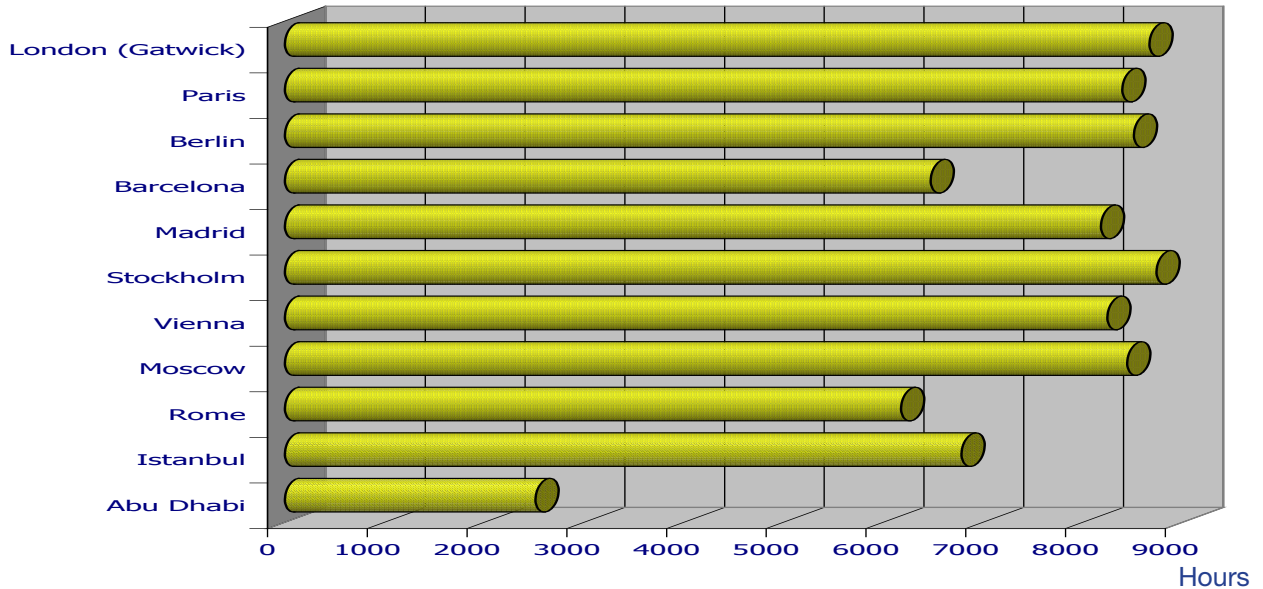
Munters specialist data centre teams have answers to the many questions posed by data centre cooling engineers and our Oasis™ IEAC performance program enables financial and thermal performance questions to be answered including energy savings for every hour in the year.



Percentage Reduction using Oasis™ IEAC

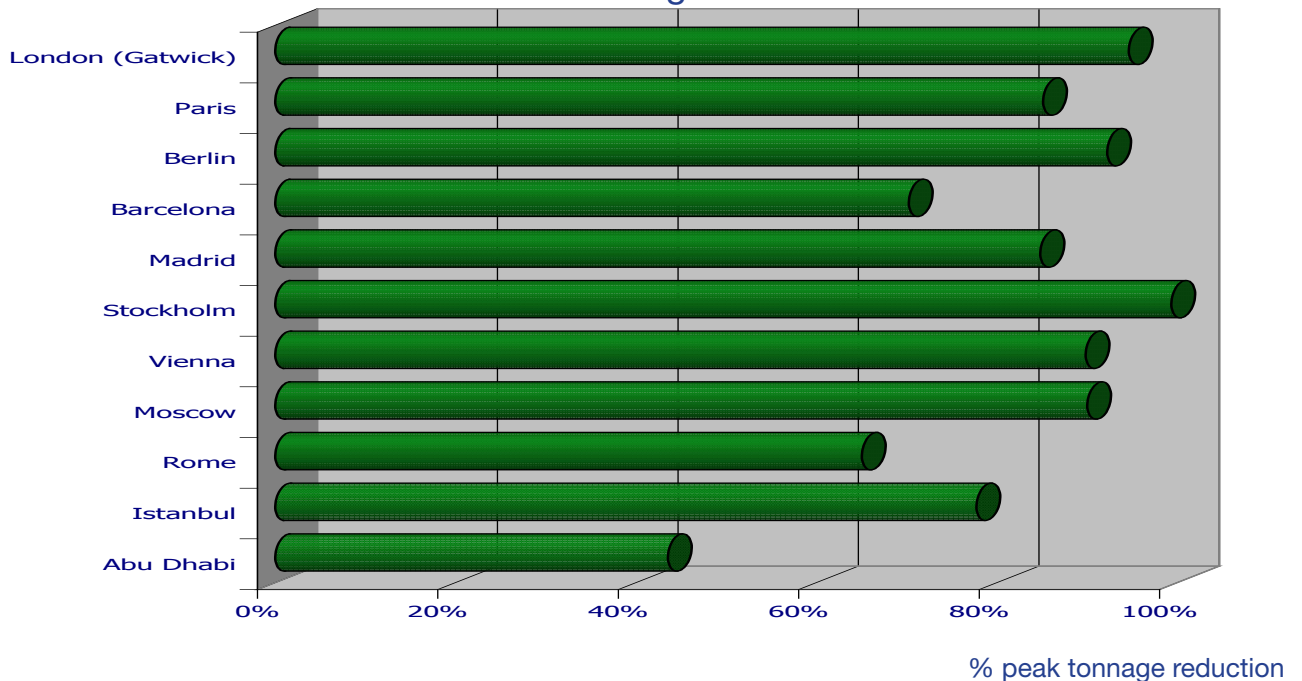
Hours per year that Oasis™ EPX can provide 23°C or below

Based on hot aisle return air temperature of 35°C



Oasis IEAC using TMY2 hour by hour weather data gives the annual hours when mechanical cooling may be eliminated for a data centre with a 24/7/365 cycle

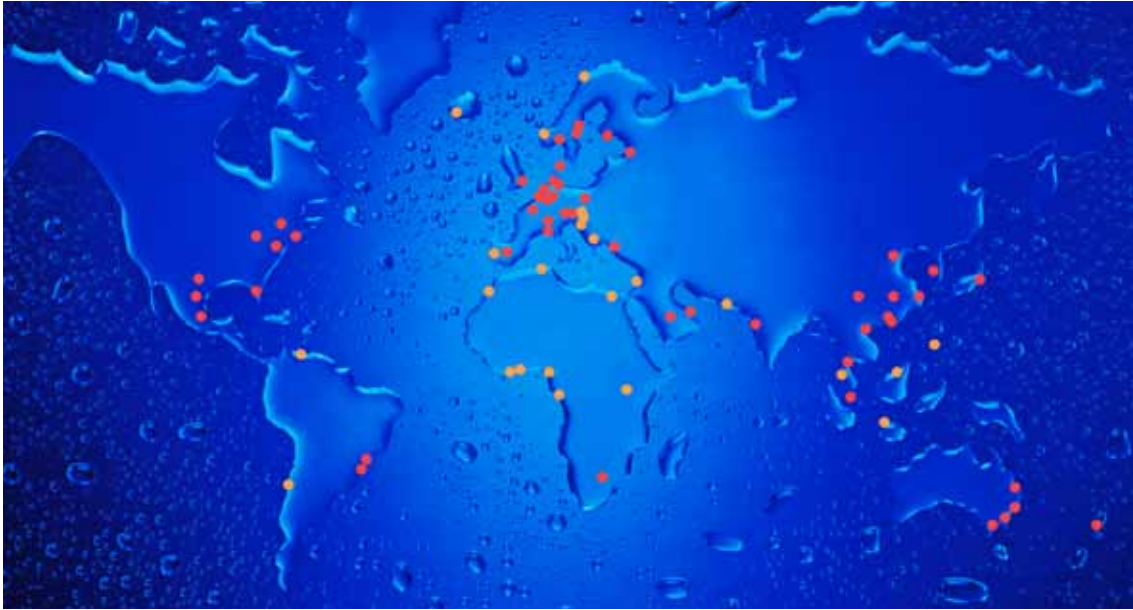
% of peak tonnage reduction using Oasis™ IEAC based on ASHRAE 0.4% WB design condition



Data centre operators are rapidly moving towards Munters Oasis™ Indirect Evaporative Air Coolers which incorporate heat exchangers with outdoor air, to give minimal air filtration and enhanced supply temperatures resulting in data centre PUE's of less than 1.2

Reference installations





An international name, where the customer comes first

Munters, part of Nordic Capital, has offices in 30 countries and over 2,200 employees in many branches around the world. We are global leaders in energy efficient air treatment for comfort, process and environmental protection with over 300,000 air treatment systems installed worldwide.

Munters shares ideas within its international network, giving the Group an outstanding reputation as a reliable, fast-acting and customer-orientated expert in air conditioning.

Munters philosophy of customer satisfaction is central to our decision-making. When developing and manufacturing our systems, we see happy customers as our number one objective. And this is what our employees strive to ensure every day.

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