TRANTER
The heat transfer people

Tranter® heat exchangers in the sustainable DATA CENTER

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The digitalization mega trend has resulted in exponential growth of data centers. While promoting technological advancement, it also raises significant environmental and sustainability concerns due to the high energy, water and resource consumption associated with data centers. Let's take a look at how Tranter's plate and frame heat exchangers can be used to make the datacenters more sustainable.

Datacenters are essential for our modern society and already represent approximately 1% of the word's electricity use. The definition of a sustainable data center is one that minimizes its environmental impact while still providing reliable and secure data processing and storage services. This involves prioritizing energy efficiency, conserving water, minimizing the carbon footprint by utilizing renewable energy and increasing the energy reuse effectiveness.

The sustainability of a datacenter is therefore measured by four (4) key metrics:

PUE = Power usage effectiveness

WUE = Water usage effectiveness

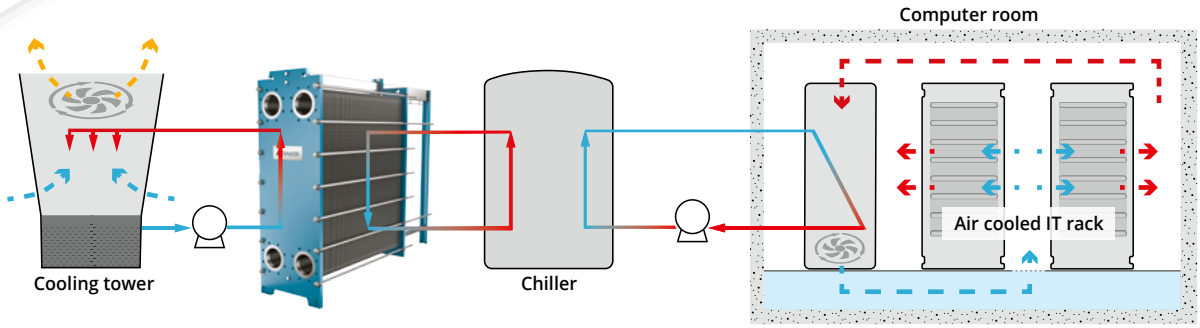
CUE = Carbon usage effectiveness

ERE = Energy reuse effectiveness

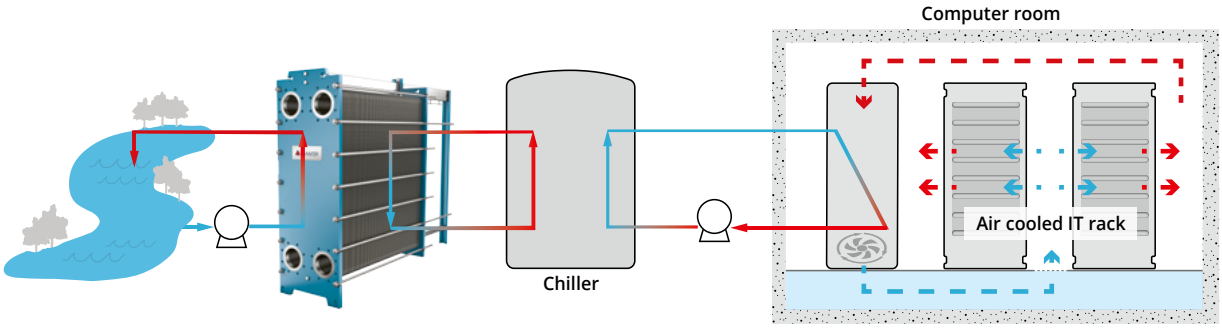
Most of the electricity and water consumption, thus also the carbon footprint, comes from cooling of the IT equipment, which is essential for the Datacenter. The IT equipment releases a lot of heat to the air of the computer room when processing data, which needs to be cooled down, and preferably be reused.

The traditional cooling system of a datacenter is by using a chiller where the condenser side of the chiller is cooled directly by an open cooling tower. The chiller has a compressor that consumes electricity and is the highest running cost of the datacenter cooling process.

Since cooling tower water is never clean, this setup will eventually cause fouling in the condenser, causing the condensing pressure to rise, which in turn increases the electricity consumption of the compressor, the water consumption and thus also the CO_2 emissions.



To make the datacenter more sustainable a Tranter plate and frame heat exchanger can be installed as a cooling tower intermediate cooler.



Or by free-cooling from a nearby lake, river or sea. Tranter's plate and frame heat exchangers can be constructed with plates in stainless steel, high alloy or titanium plate material for trouble-free operation, depending on the available cooling source.

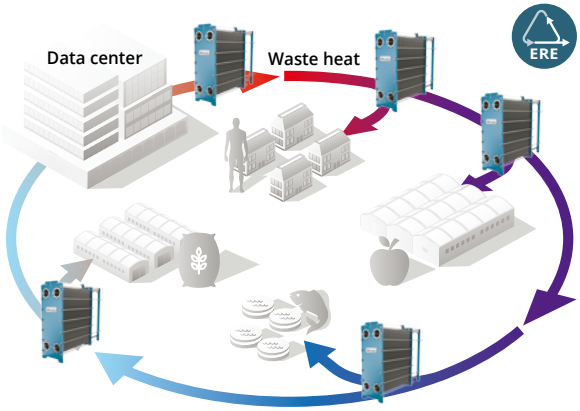
- The plate and frame heat exchanger protects the chiller from fouling, reduces the volume of fluid in each circuit and allows different design pressure on each side of the plate heat exchanger, reducing the overall cost of the system.
- By protecting the chiller from fouling the plate and frame heat exchanger will reduce electricity consumption of the chiller over time, thus reduction in both PUE and CUE.
- Reduced fouling and volume of each circuit will also reduce water usage and reduce WUE by up to 20%.
- In geographic areas where the ambient temperature allows, the chiller can be completely by-passed during certain periods of the year, cooling the datacenter through free-cooling with only the cooling tower and the plate and frame heat exchanger, providing substantial cost, PUE, CUE and WUE savings.

Waste heat recovery from Datacenters - ERE

The higher the temperature of the waste heat, the more applications it can be used for. Low temperature waste heat can also be recovered and be used for example: space heating, green houses and fish farms where plate heat exchangers play an essential part as heat recovery heat exchangers.

There are also possibilities to connect the waste heat from datacenters to district heating networks, depending on the type and generation of the district heating system. The chilled water circuit from current air-cooled data-centers delivers waste heat of up to 40˚C (104˚F), whilst traditional district heating networks require 65 – 120˚C (140 - 248˚F), hence heat pumps are needed to lift the waste heat temperature.

New and future district heating network can utilize low grade waste heat at as low as 20 - 45˚C (68 - 113˚F), enabling waste heat from datacenters to be connected direct to the district heating network.

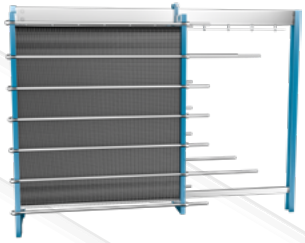


The closer to the IT equipment that heat can be recovered from, the higher waste heat temperature can be obtained. Driven by high demand data applications such as 5G, AI, VR and cryptocurrencies, air cooling will not be sufficient for the future of datacenter cooling. Hybrid systems that are adding direct liquid cooling to the IT-racks, using a coolant distribution unit (CDU) with compact plate heat exchangers are emerging. This will provide higher temperature waste heat and open up for more applications for the waste heat, further improving the ERE of the datacenters.

For datacenter cooling, temperature control is critical with higher expectations. Tranter is a global premium brand with over 85 years of experience in the world of heat transfer. Our heat exchangers are AHRI certified and our thermal engineers are ready to help in finding the best suited heat exchanger design for your datacenter cooling.

Here are a few design tips from our engineers to optimize the plate heat exchangers in your datacenter cooling system:

- Consider seasonal variations and evaluate the needed temperature of the plate heat exchangers. A difference of 0.5˚C in temperature approach can double or half the size of the plate and frame heat exchanger needed for your system.
- Do not specify margins on the flow rates and the heat duty, and do not apply fouling factors developed for shell & tube heat exchangers. Adding too many margins on a plate and frame heat exchanger will not only increase the size and cost of the heat exchanger, but will also actually increase fouling due to resulting lower channel velocities and lower shear stress.
- Allow a high pressure drop as much as possible. This will reduce the size of the plate and frame heat exchanger and result in less fouling from the cooling tower.



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AT THE FOREFRONT OF HEAT EXCHANGER TECHNOLOGY FOR MORE THAN 90 YEARS

Tranter is an American based global manufacturer of gasketedand welded plate heat exchangers and a full-service aftermarket provider for the plateheat exchanger industry. Significant manufacturing, research, design engineering and product development activities are based in the USA, Brazil, Sweden, China, India and Korea and enable responsiveness to local demands. Tranter is represented globally by a network of our own sales companies, licensees and agents.

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