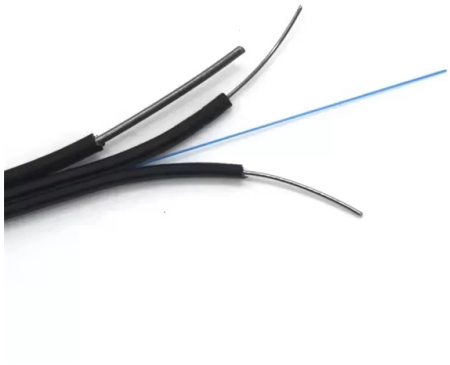
Function of Liquid-Cooled Exchanger



Overview

The liquid flows through the heat exchanger, where the heat is released and carried away by chilled air from the cold aisle. The liquid coolant is then recirculated, maintaining a continuous cooling loop.

Key Takeaways

Liquid-cooled exchangers efficiently transfer heat between fluids, preventing overheating, maintaining optimal operating conditions, and enhancing energy efficiency in industrial and data center applications. Core FunctionLiquid-cooled heat exchangers are designed to transfer heat from one fluid to another without mixing them, enabling precise temperature control and preventing equipment overheating. Heat is primarily transferred through conduction from the heat source into the exchanger wall, followed by convection from the wall into the cooling liquid, with some internal convection within the liquid itself.

This process ensures that machinery, servers, or other heat-generating components operate within safe thermal limits, extending their lifespan and reducing downtime.

Applications in Industry and Data Centers

In industrial settings, liquid-cooled exchangers absorb heat from machinery and release it elsewhere, maintaining operational efficiency and protecting sensitive equipment from thermal stress. In data centers, where high-density servers generate significant heat, liquid cooling—such as direct-to-chip (D2C) cooling or immersion cooling—removes heat directly at the source, reducing the load on facility-level cooling systems and enabling denser compute configurations. This approach is more energy-efficient than traditional air cooling, particularly for high-power racks running AI or cloud workloads.

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Design and TypesLiquid-cooled exchangers come in various designs to suit specific needs: Shell-and-tube: One fluid flows through tubes while the other flows around them, suitable for high-pressure applications. Plate and frame: Thin, corrugated plates create channels for fluids, offering high heat transfer efficiency and compact size. Finned tubes: Increase surface area for heat transfer when one fluid has a lower heat transfer coefficient.

Microchannel and direct-contact designs: Provide extremely efficient heat transfer for localized or high-intensity heat sources. Counterflow arrangements, where hot and cold fluids move in opposite directions, are often used to maximize heat exchange efficiency.

Operational Benefits

Precise temperature control: Maintains consistent operating conditions for sensitive equipment. Energy efficiency: Liquids have higher thermal conductivity than air, reducing energy consumption for cooling. Flexibility and modularity: Many systems allow modular connections, field servicing, and scalable configurations.

Safety and reliability: Sensors, leak detection, and drip pans help prevent overheating and manage potential leaks. In summary, liquid-cooled exchangers play a critical role in modern thermal management, ensuring equipment longevity, operational efficiency, and energy savings across industrial and high-performance computing environments.

Article Content

Liquid cooling heat exchanger units

The liquid flows through the heat exchanger, where the heat is released and carried away by chilled air from the cold aisle. The liquid coolant is then recirculated, maintaining a continuous cooling loop.

Heat exchanger

OverviewTypesFlow arrangementHVAC and refrigeration air coilsHelical-coilSpiralSelectionMonitoring and maintenance

By maximum operating temperature, heat exchangers can be divided into low-temperature and high-temperature ones. The former work up to 500–650°C depending on the industry and generally do not require special design and material considerations. The latter work up to 1000 or even 1400°C. Double pipe heat exchangers are the simplest exchangers used in industries. On on

Heat Exchangers: Types, Equations & How They Work

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Unlike a turbine or compressor, an ideal heat exchanger does not primarily produce shaft work; its job is to change fluid temperatures, condense vapor, evaporate liquid, recover waste heat,

Liquid Cooled Heat Exchangers: A Comprehensive Overview

Liquid cooled heat exchangers are indispensable components for thermal management across a wide spectrum of industries. Their ability to efficiently transfer heat allows for precise temperature control,

Mastering Liquid Cooling in Industry How Heat Exchangers

In the context of liquid cooling systems, shell and tube exchangers play a crucial role by ensuring that coolant temperatures remain optimal to prevent equipment from overheating.

Calculating the Loads for Liquid cooling Systems

A closed loop liquid cooling system requires a liquid-to-air heat exchanger. Because of its structure, several equations must be calculated to fully understand the performance and behavior of a liquid

How is a Heat Exchanger Used in Liquid Cooling

Heat exchangers are commonly used in liquid cooling systems to dissipate heat from a fluid that has passed over a cold plate attached to the heat-producing component. The cool fluid is

Liquid-cooled heat exchanger (liquid-liquid) | chillers

It is used for heating and cooling by efficiently exchanging thermal energy using fluids such as liquids and gases. It is used in a wide range of applications,

Functions | ASHRAE 8.5 Liquid-to-Refrigerant Heat Exchangers

A LIQUID cooler (hereafter called a cooler) is a heat exchanger in which refrigerant is evaporated, thereby cooling a fluid (usually water or brine) circulating through the cooler.

Cooling Environments

In these cases liquid cooling, and specifically warm water cooling, becomes an effective alternative for heat extraction. Liquid Cooling Technologies Overview is

#datacenter #liquidcooling #aiinfrastructure #thermalmanagement # ...

Unlike traditional CRAH or CRAC systems that cool the entire data hall, liquid cooling walls remove heat directly at the rack level through high-efficiency liquid-to-air heat exchangers.

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Heat exchanger

Tubular heat exchanger Partial view into inlet plenum of shell and tube heat exchanger of a refrigerant based chiller for providing air-conditioning to a building A heat exchanger is a system used to transfer

Liquid vs Air Cooling for Data Centers 2026: Cost

Data Center Cooling 2026: Liquid Immersion vs Air — TCO & Performance Institutional TCO comparison of liquid immersion vs air cooling for data centers:

Mastering Liquid Cooling in Industry How Heat Exchangers

A air cooled heat exchanger is vital components in liquid cooling systems, playing a pivotal role in transferring heat between different mediums. Their primary function is to absorb heat

Cryogenic pumping of liquid hydrogen for aerospace propulsion

Different propulsion architectures that can be powered with hydrogen include Proton Exchange Membrane Fuel Cells, Hydrogen-Electric hybrid power trains, and Hydrogen combustors.

Heat exchangers | Eaton

To function, liquid cooling systems need a heat exchanger to reject heat. Liquid heat exchangers enables liquid systems to absorb heat while maintaining safe

Water Heat Exchangers | Tark Thermal Solutions

Water cooling heat exchangers (WL, LA and WW Series) are designed to circulate water or a water glycol (antifreeze) mixture and keep the temperature of the

What Is the Function of a Heat Exchanger in Cooling Systems

Conversely, if heat loads decreases, the exchanger flow rate of cold liquid is reduced to prevent over-cooling to save energy. Moreover, the heat exchanger''s buffer effect stops the cold

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