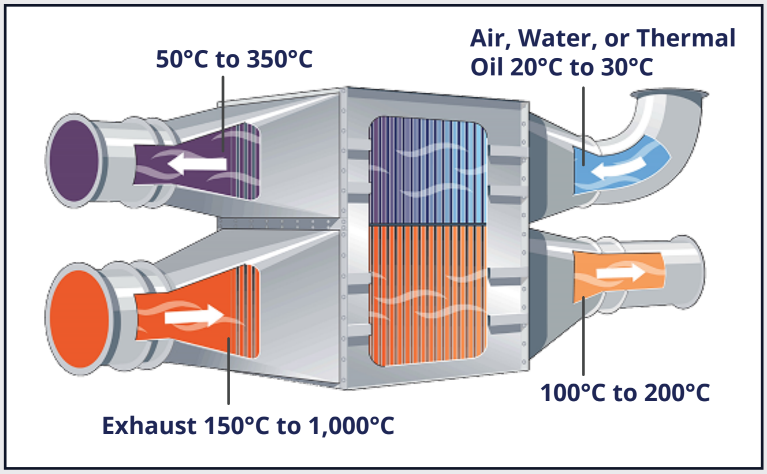
LJUNGSTRÖM

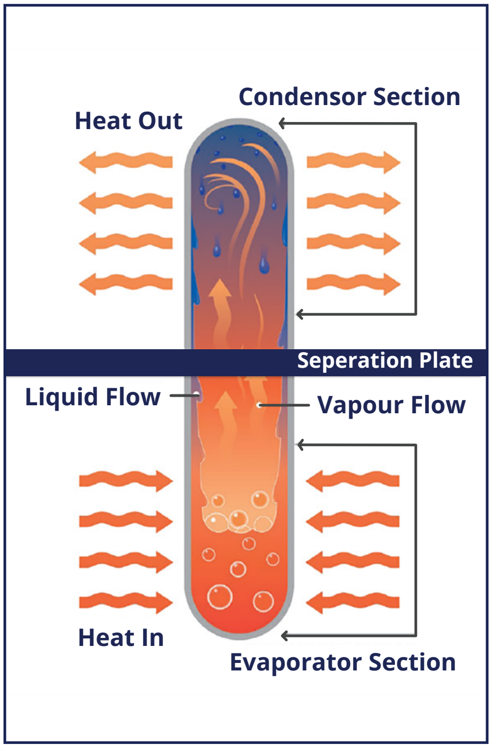
Advanced Heat Transfer Solutions

Heat Pipe Heat Exchanger

A heat pipe heat exchanger is a highly efficient thermal device that transfers heat between two fluid streams by utilizing the phase change of a working fluid contained within sealed pipes. Heat absorbed at the hot end causes the working fluid to evaporate. The resulting vapor travels to the cooler end of the pipe, where it condenses and releases latent heat to the cold-side fluid. The condensate then returns to the hot end by gravity or capillary action, establishing a continuous and passive heat transfer cycle. This mechanism enables high heat transfer rates over long distances with minimal temperature differentials.



Water-filled heat pipes are particularly well suited for operation in harsh and demanding environments, including high-temperature and contaminated exhaust streams. They provide safe, durable, and long-lasting heat recovery solutions across industries such as automotive, metals, construction, food processing, mining, oil and gas, power generation, and pharmaceuticals.



Working Principle of Heat Pipe Heat Exchanger

The heat pipe heat exchanger operates on the latent heat of vaporization of a working fluid, typically water:

Heat from the hot exhaust gas or liquid is absorbed by the working fluid, causing it to evaporate.

The vapor rises to the condenser section of the heat pipe, which is exposed to a cooler fluid such as air or liquid.

Upon contact with the cooler surface, the vapor condenses and releases its latent heat to the cooling medium.

The condensed liquid returns to the evaporator section, completing the cycle without the need for pumps or moving parts.

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Key Features and Advantages:

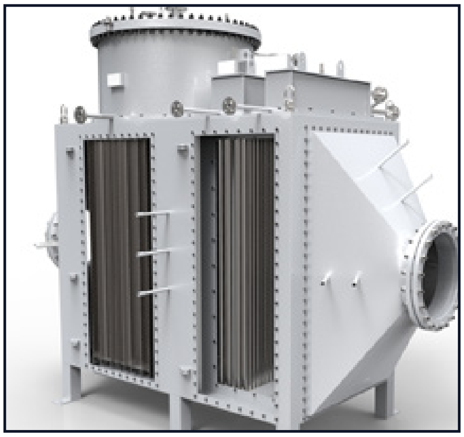
- Capable of producing **hot air, hot water, hot oil,** or **steam.**
- **Isothermal operation** ensures uniform temperature along the length of the pipe, **eliminating cold spots** and **preventing acid condensation**.
- Constructed from robust materials that allow **free thermal expansion** and contraction, **minimizing thermal stress.**
- Each heat pipe **operates independently**, preventing cross-contamination even in the unlikely event of a single pipe failure.
- **Zero leakage** between primary and secondary fluid streams throughout the **system's lifetime**.
- Heat pipes typically have service **lifetimes extending over several decades**.
- **High reliability** through multiple redundancy; failure of **individual pipes does not compromise** overall **exchanger performance**.

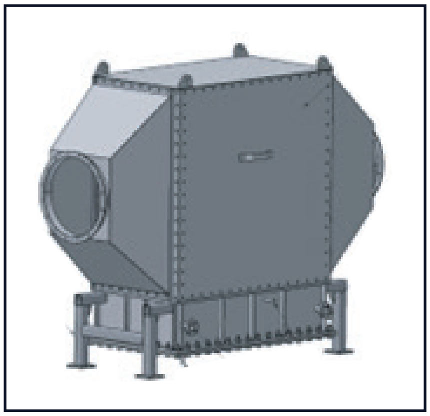
Gas-to-Gas or Gas-to-Air

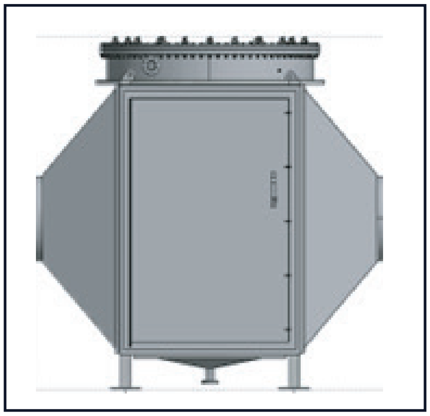
Designed to recover thermal energy from hot gas streams and transfer it efficiently to secondary gas or air flows in a variety of process applications.

Heat Recovery Steam Generators (HRSG)

Heat pipe steam generators are fully integrated units that do not require a separate external steam drum. The steam drum is incorporated within the generator, simplifying system design by reducing auxiliary piping, valves, and control requirements.





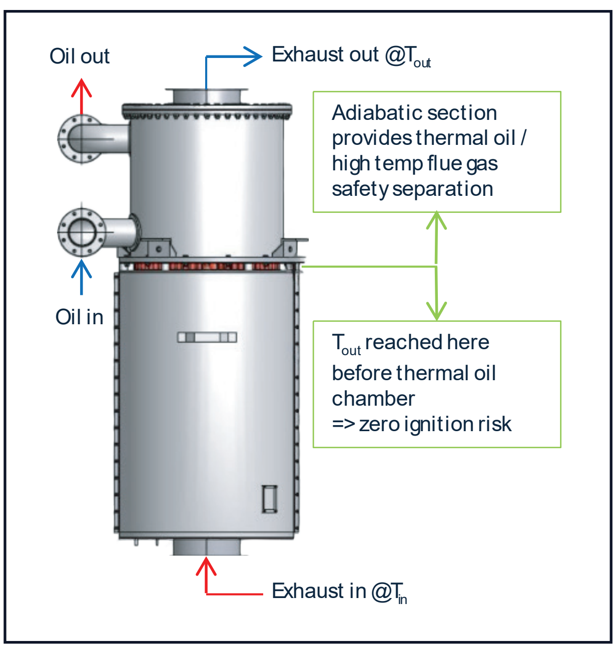


Gas-to-Water and Water-to-Gas

Gas-to-water heat pipe heat exchangers provide high reliability and are suitable for high-temperature gas applications where conventional shell-and-tube heat exchangers may suffer distortion or thermal fatigue due to rapid temperature changes.

Gas-to-Oil

Specifically designed for applications where oil separation from gas is critical, particularly near auto-ignition temperatures. The flow-through design offers inherent safety and resistance to thermal stress.



LJUNGSTRÖM Heat Exchanger Portfolio

Attribute	Conventional Rotary	Rotary RGC®	Tubular & Plate	Heat Pipe RGC®
Application Size	Mid-large	Mid-large	Small-mid	Small-mid
Efficiency	Very High	Very High	Moderate –depending on application	Very high –depending on operation
Acid Dewpoint Corrosion	Resistant Through Various Protection Concepts	Resistant Through Various Protection Concepts	Vulnerable due to cold spots/corners causing acid condensation issues	Resistant with isothermal operation and elevated heat pipe temperatures
Thermal Stress	Highly Resistant	Highly Resistant	Vulnerable to thermal stress failure and single point of failure	Highly resistant with free-floating heat pipe ends
Maintenance	Low	Low	Medium	Low
Cross-stream leakage	Low 6-10%	Ultra-low 0.5-2.0%	Low at start – but increases with corrosion	Zero –for life, even with a tube failure
Cleanability	High – Cleanable Surface Geometries & Online Cleaning Options	High – Cleanable Surface Geometries and Online Cleaning Options	Low –more prone to fouling and require manual cleaning	High –smooth surface pipes, and online cleaning options
Repairability	High – Easily Replaceable Components	High – Easily Replaceable Components	Difficult to repair with a complex structure, in many cases in-situ field repair not economical	High –In-situ field replacement possible with interchangeable pipes
Multiple Redundancy	Yes – Single Basket Failures Do Not Render Inoperable	Yes – Single Basket Failures Do Not Render Inoperable	No	Yes –single tube failures do not render inoperable

Partner With LJUNGSTRÖM For Reliable Heat Recovery

Inefficient heat recovery and thermal stress can limit performance and shorten equipment life. Heat pipe heat exchangers offer a proven, durable solution delivering high efficiency, isothermal operation, and inherent reliability across the most demanding industrial environments.

We're here to help — before energy, efficiency, and uptime are compromised.

For heat recovery evaluations, heat pipe heat exchanger applications, system design support, or technical assistance, please contact your LJUNGSTRÖM representative.

Visit ljungstrom.com to learn more.

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