



**Your Complete Guide  
to Understanding &  
Selecting the Right Heat  
Recovery System**

Heat loss represents a significant source of wasted energy and money in industrial settings. By some estimates, as much as 50% of the energy used in industry is subject to heat loss in some form. Recovering even a portion of this heat allows companies to improve energy efficiency, save money, and reduce their carbon footprint, all without altering existing workflows. To do so, facilities can leverage heat recovery systems, which redirect vented energy to heat incoming air. At [PRE-heat Inc.](#) we match companies from all industries with efficient, affordable heat exchange systems tailored to their unique energy needs.

## Important Qualities of Heat Recovery Systems

Although heat recovery systems differ in design, they all offer a similar set of benefits for industrial users. Most critically, heat recovery systems help companies achieve optimal energy efficiency and minimal carbon footprints. The primary advantages of implementing an industrial heat recovery system include:



**Reduced Energy Costs:** One of the key benefits of heat recovery systems is reduced operating costs. Recovering heat that would otherwise escape extends the utility of each unit of energy, thereby reducing the average cost to supply the facility with electricity. Over time, this effect can yield marked reductions in energy costs and a corresponding increase in profitability.



**Improved Air Quality:** Because they ventilate warm, filtered air, heat recovery systems have the added benefit of improving air quality. As a result, facilities with heat recovery systems may be less likely to experience mold, condensation, and even toxic gas buildup.



**Reduced Equipment Costs:** Although less direct of a benefit compared to energy savings, heat recovery systems can also reduce spending on other pieces of equipment. For instance, minimizing fuel consumption has the side effect of reducing flue gas production. As a result, companies with heat recovery systems can use smaller, less expensive units to eliminate flue gas. Along the same lines, reusing otherwise wasted heat allows facilities to use smaller energy conversion systems, offsetting the initial investment in heat recovery units.



**Better Environmental Performance:** Industrial heat recovery systems are inherently environmentally friendly and can drive significant reductions in carbon emissions. While industrial processes inevitably lead to heat loss, this heat does not need to be wasted. Reusing heat redirects waste that would have otherwise become harmful emissions, so the more heat that can be recovered, the lower the carbon footprint for the same industrial process.

## How to Select the Right Heat Recovery System and Equipment

To get the maximum benefit from a heat recovery system, it's important to choose the ideal model for your process equipment's needs. Despite varying in form and mechanism, all heat recovery equipment relies on a heat exchanger system to make use of escaping heat.

Rather than allowing the heat to vent out of the process equipment unused, heat recovery systems direct the heat into an exchanger system to warm an incoming airstream. Pipes from the heat exchanger direct the air down into one or more rooms. The result is clean, filtered air that enters the process equipment at a comfortable temperature, without the electricity draw of a standard heating system.

Some of the most common heat recovery systems and heat exchangers include:

### Thermal Wheel Heat Recovery

As its name suggests, thermal wheel systems use rotating, honeycomb wheels to direct heat. The wheels rotate opposite one another, generating two opposite air streams. Outgoing air, which contains energy from vents or exhausts, transmits heat to the incoming air as the streams pass one another. These units tend to be larger and can heat more space than smaller units.

### Plate Heat Technology

Plate heat-powered recovery systems tend to be smaller than thermal wheel models. These units use a compact heat exchanger containing metal or plastic plates, which separate the two air streams while still allowing heat to transfer from the outgoing to the incoming air.

### Wave Plate Heat Exchangers

Wave plate heat exchangers incorporate waved plates to generate turbulence. Ideal for heavy-duty applications, these heat exchangers are designed with excellent structural integrity to withstand higher turbulence without an increase in pressure drop.

### Heat Pipe Technology

Heat pipe systems are the simplest and lowest-maintenance option of all heat recovery systems. Heat pipe technology models use a simple tube-based system to transfer heat exhaust heat into the supply air. Although these systems are easy to operate, they are only compatible with all-in-one air handling systems.



### Run-Around Coil Technology

Run-around coils can be installed in existing air handling systems to salvage exhaust heat with minimal extra equipment. These models use a set of coils interconnected with pipes to transmit air between distant air streams. Accordingly, run-around coil systems are primarily used where the air supply and exhaust streams are too far apart for other systems to be viable.

### Shell and Tube Heat Exchangers

Shell and tube heat exchangers are ideal for heavily polluted exhaust or extreme-temperature applications. For this reason, they are especially common in refineries and other oil industry settings. These larger systems contain bundles of pipes within a casing, using water to cool high-temperature exhaust. [Shell and tube exchangers](#) can also neutralize VOCs, improving air quality when used with contaminated air supplies.

### Dimple Plate Heat Exchangers

Dimple plate exchangers are another option for [polluted or high-temperature applications](#), featuring thick, indented plates that help remove contaminants as exhaust air moves through the system.

# How to Correctly Customize Your Heat Recovery Equipment

Beyond choosing the optimal heat exchanger for your facility, you can achieve even better results by customizing the system to your application's constraints. Customizable elements include the material, tubing, shape, and flow configuration. Before attempting to make these decisions, it's important to define your waste heat. Without an understanding of your exhaust heat's temperature, quality, and availability, you won't be able to choose the most appropriate model. Once you have analyzed your needs, you can begin narrowing in on the following key elements of the heat recovery system.

## Size Considerations

Exchanger size is one of the most important factors that influence a heat recovery installation. The right size for your facility depends on several variables, including:



Airflow  
Requirements



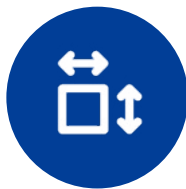
Efficiency



Temperature



Pressure Drop



Square Footage of  
Area Being Installed



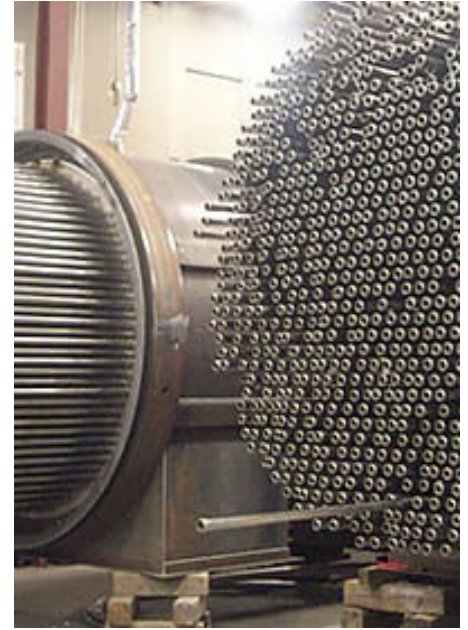
Heat Exchanger  
Type



Environmental  
Constraints

## Choosing a Heat Exchanger

The next consideration is the type of heat exchanger to use. The ideal heat exchanger is tailored to the quantity and quality of vented heat while accounting for the relative position of other air supplies. While the above descriptions of heat exchanger types may help narrow your selection, it's best to consult a heat recovery professional for personalized guidance.



## System Configuration

Other configurations to consider include:

### **Tube Material:**

Tube types may be welded or seamless, and they may be made from a range of materials. Common choices include mild steel and stainless steel, although heavy-duty applications may call for titanium or similar high-strength alloys.

### **Flow Configuration:**

Flow configurations include cross-flow, multiple shell pass, and multiple tube pass. Passes may also have either internal or external turns.

### **Orientation:**

The heat exchanger may be orientated vertically or horizontally and mounted within a rectangular or rounded casing.

Finally, optional add-ons may benefit your specific installation. Some potential add-ons include:

Access door	Wash systems
Hot gas by-pass damper	Expansion joints
By-pass ductwork with controls or dampers	Structural supports and/or walkways
Transitions	Castable refractories
Plenums	Companion flange sets
Intake filters	Internal or external insulation

Careful selection of customizations can turn an effective installation into an optimal one, so it's worth taking the time to consult with an engineer about your needs.



# Partnering with PRE-heat for Your Heat Recovery Systems


PRE-heat has been in the heat recovery industry for over 40 years, offering custom industrial air-to-air heat exchangers and packaged heat recovery systems. Our clients come to us from diverse industries ranging from oil and gas to general manufacturing, and we design custom assemblies to suit each unique situation.


To learn more about our innovative approach, request a quote from our expert team today.

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