Energy Recovery Systems

Make the most of your heating, ventilating and air conditioning

CenterPoint® Energy

Always There.®

ENERGY RECOVERY SYSTEMS
CAN INCREASE YOUR EFFICIENCY

	Fixed plate	Rotary wheel	Heat pipe	Runaround loop
Cross leakage	0 to 5%	.5 to 10%	Minimal	0%
Heat transfer effectiveness	50 to 80%	50 to 85%	45 to 65%	55 to 65%
Capacity control	Bypass ducting	Speed control Bypass ducting	Tilt angle	Speed control
CFM range	>50	>50	>100	>100
Limitations	Large size at high CFM rates	Cross leakage	High air side pressure drop	Requires accurate sizing
Advantages	No moving parts	Compact large sizes	No moving parts	Separate supply and exhaust air streams

To maintain healthy indoor air quality (IAQ) and meet building codes, buildings must have fresh, outdoor air, also called ventilation air. This requirement can be expensive since the air must be heated or cooled and then exhausted to make room for more ventilation air. Energy recovery systems recover thermal energy from the conditioned exhaust air, helping building owners and operators save on energy costs.

There are many types of energy recovery systems, but the most commonly used are rotating wheels, plates, heat pipes and runaround loops. CenterPoint Energy recommends working closely with a design engineer to evaluate and design a system that is the most efficient and effective for your operation.

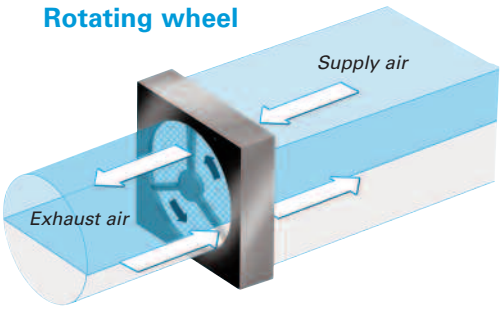
Rotating wheels

Rotating wheel technology is sometimes referred to as rotary heat exchange. Rotating wheels are typically constructed of aluminum, copper, stainless steel or monel and include a dedicated electric motor and drive belt(s). The wheel can be purchased as a standalone cassette, with fans, or as an assembly complete with a filtration system and other needed components.

How it works. With this technology, a wheel rotates, absorbing and transferring energy from an exhaust air stream to an intake air stream. Either warm air is cooled or cool air is warmed, depending on the need. The air streams can be directed in either parallel or counter flow patterns, whichever is most convenient.

Wheels are among the most effective of energy recovery systems, operating at 50 to 85 percent efficiency, depending on application type. However, they require a good filtration system to optimize energy transfer.

Rotating wheel



Generally, the size and depth of the wheel, along with its speed, will determine the rate of recovery. Additional controls could include wheel speed controls and/or face and bypass dampers. There are two types of rotating wheels, sensible heat wheels and total energy wheels.

Sensible wheels, also called **heat wheels,** transfer sensible heat, or heat that can be felt and measured on a thermometer. Humidity is not transferred. Sensible wheels are often used in office buildings and other facilities where humidity is not a critical factor.

Energy wheels, also known as total **energy wheels** and **enthalpy wheels,** use the application of a desiccant (or absorbent) material such as molecular sieve or silica gel for humidity transfer. A portion of the moisture in the air stream with a higher humidity ratio will transfer to an area of lower humidity.

To determine the best system for a facility, the ideal amount of humidity to be recovered should be included in the air properties calculation. This wheel type can be a good choice for schools, hospitals and other environments where maintaining comfortable humidity is important.

Caution. With rotating wheel systems, there is typically some leakage between the intake and exhaust air streams. In most HVAC applications, the mix of ventilation air can be 5 to 30 percent of the air supplied to the space. That means that 70 to 95 percent of the air supplied to the space is recycled. If the exhaust air is toxic or contains odors from a bathroom exhaust system and a small amount of carryover is not acceptable, then a wheel may not be the right energy recovery system for the facility.

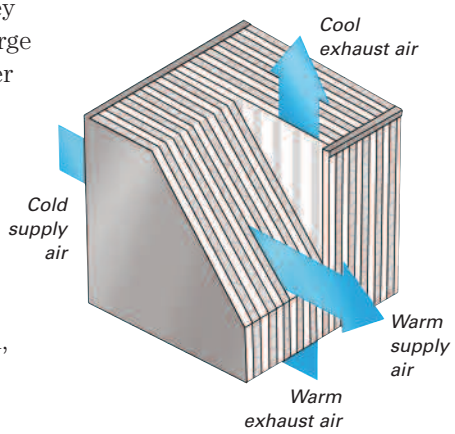
A potential solution for contamination is to add a purge section into the wheel assembly. A purge uses a small amount of ventilation air to drive the exhaust air trapped in the wheel from the ventilation side of the wheel back to the exhaust side of the wheel. The purge system may use more energy to drive the fan, but it can effectively eliminate unhealthy exhaust air.

Plates

The low cost of plate technology has made it an increasingly popular choice for energy recovery systems.

Plates are most widely used for small to medium-sized applications. Since they typically need to be large to accommodate higher air flow rates, they are generally space prohibitive for larger applications. Their efficiency ranges from 50 to 80 percent, and air streams can be arranged in parallel, cross-flow or counter flow patterns.

Fixed plate heat exchanger



How it works.
Plate technology uses layers of static plates which are sealed into either cross-flow or counter flow patterns to accommodate the intake and exhaust air streams. Because the plates are separated and sealed, there is minimal or no crossover contamination between air streams. This technology uses face and bypass dampers to control capacity.

There are two types of plates, fixed plates and membrane plates. Plates are available as stand alone, with or without blowers, or as complete packages.

One of the benefits of the technology is their static design makes them easy to clean. However, both plate systems require filtration to prevent plugging of the air passages.

Fixed plate units, also known as **heat recovery ventilators** are sensible devices consisting of alternate layers of plates, which are usually made of aluminum. The aluminum allows for easy temperature transfer, without transferring humidity. Steel alloy construction can also be used depending on the application – some can accommodate temperatures exceeding 400° F.

Since there is minimal leakage between air streams, fixed plate technology is ideal for applications where the exhaust air is poor or foul, such as for stack economizers and process dryers.

Because frosting on plate type energy recovery units can occur at approximately 25° F, a means for defrosting should be installed such as face and bypass dampers or an auxiliary heat source. A condensation removal system is also recommended.

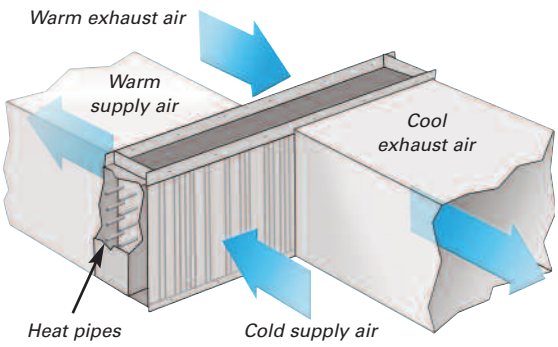
Membrane plates, also known as **energy recovery ventilators** or **membrane energy recovery ventilator** units have the ability to transfer moisture as well as recover energy. The static plates are constructed of permeable membranes made out of cellulose, polymers or other synthetic membranes. The plates transfer energy and moisture while minimizing air leakage.

When selecting a membrane-type fixed plate, the desired amount of humidity to be captured should be included in the air properties calculation.

Heat pipes

Heat pipes are made up of three or more tubes that are not interconnected. The tubes are filled with a heat transfer fluid and permanently sealed at both ends. The pipe is divided into two sections, a condenser section and evaporator section, which are separated by a partition plate. The air streams can be set up in counterflow or parallel flow patterns.

Heat pipe heat exchanger



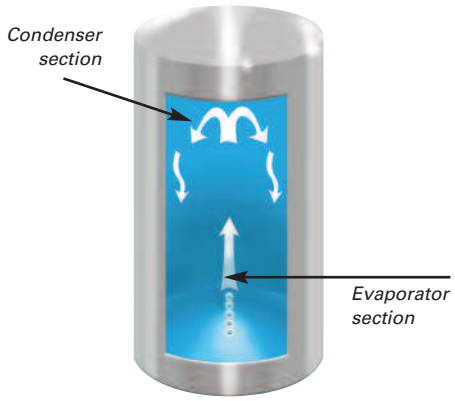
How it works.. Heat is absorbed into the evaporating section, which causes the fluid to boil to a vapor. The vapor then rises to the upper part of the cylinder where the heat is released. Then the vapor condenses back to a liquid state and returns by gravity to the lower part of the cylinder where it begins its cycle again. The cycle continues as long as there is a temperature difference between the two air streams.

Heat pipe energy recovery systems are sensible devices with efficiencies ranging from 45 to 65 percent. Efficiency can be lowered by the pressure drop of moving air through each side of the system.

One of the advantages to a heat pipe energy recovery system is that there is no threat of air stream cross contamination, allowing the system to be used where high air pressure differentials exist between the two air streams. The lack of crossover air contamination and flexibility in construction materials also makes this a good option for corrosive environments.

Capacity is controlled with face and bypass dampers or by tilting the pipes. With the exception of the tilt option, the system has no moving parts, making it easy to clean.

Heat pipe



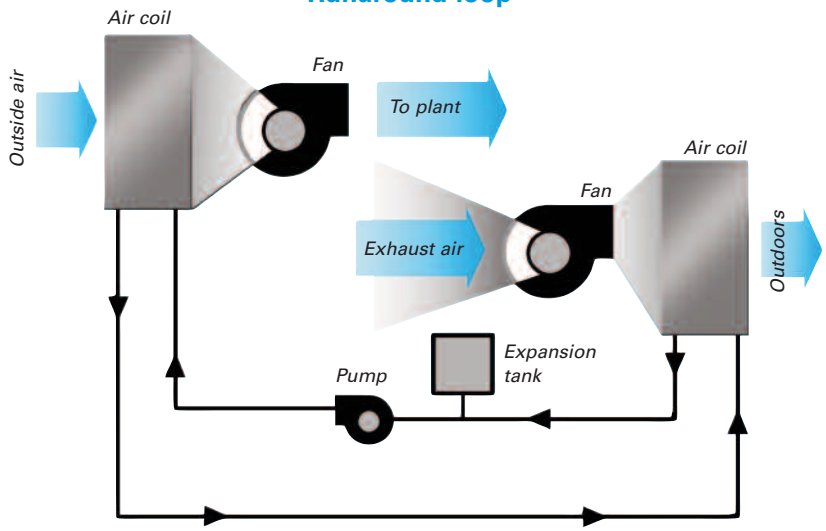
Runaround loops

Runaround loops offer an energy recovery solution for the many applications where the exhaust air stream is far from the ventilation air stream, making it difficult and expensive to use other methods. They can be built from a variety of materials with efficiencies ranging from 55 to 65 percent.

How it works. Runaround loops, also known as coil energy recovery loops, use a coil placed in each air stream that are connected by pipes filled with a heat transfer fluid, generally a glycol solution. A pump transfers heat from the exhaust air stream to the incoming ventilation air. This type of system is for sensible heat transfer only.

Because the two air streams are separate units, there is no threat of exhaust contamination.

Runaround loop



Rebates and other assistance

Through CenterPoint Energy's Custom Rebate program, facilities can enjoy swifter returns for investing in qualifying energy recovery systems. The amount of the rebate depends on the equipment specifications and level of efficiency. For details, contact your CenterPoint Energy account manager.

Many types of industries have already benefited from the Custom Rebate program, including schools, restaurants, foundries, green houses, pharmaceuticals, printing companies, asphalt plants, casinos and many more. Here are some real-life examples of savings:

Opportunity: A senior high school needed to renovate their HVAC system.

Solution: Install three energy recovery wheels to capture exhaust heat to pre-heat ventilation air.

Opportunity:	
Equipment cost:	$58,195
CenterPoint Energy rebate:	$7,211
Annual energy savings:	1,602 Dkt
Annual cost savings:	$14,098
Payback:	**3.6 years**

Opportunity: A restaurant wanted to reduce their energy costs, provide a well-ventilated eating area and fix the problem of kitchen odors seeping into dining area.

Solution: Install three plate type ventilators.

Equipment cost:	$24,894
CenterPoint Energy rebate:	$1,890
Annual energy savings:	775 Dkt
Annual cost savings:	$4,650
Payback:	**4.9 years**

Questions? Call your Account Manager

or 612-321-4330

1-800-234-5800, ext. 4330

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