

FAQs

Frequently Asked Questions -- Heat Recovery

Q: What are some uses of waste heat from compressors?

A:

- Warming production areas, workspace, warehouses, etc.
- Makeup air heating
- Air curtains
- Drying air for paint spraying
- Pre-heating combustion air to improve efficiency
- Boiler makeup water preheating
- Industrial process heating
- Water heating for showers, bathrooms, etc.
- Heating process fluids
- Heating food and beverage products
- Heat-driven chillers

Q: How much heat can I practically recover from my compressor?

A: This depends on the compressor type and configuration. 96% of the energy going into the compressor is converted to waste heat, but capturing it is another matter. In the industrial arena, screw compressors are prevalent, and the most common among these are air cooled units. The discharge cooling air temperature on these compressors is often 30°F to 40°F higher (some up to 75°F) than the cooling air inlet temperature. 72% of the input energy is easily recovered from exhaust air through the coolers using ducting. It is also possible to tap into the hot fluid (oil) circuit in the compressor for fluid-to-fluid heating. Fluid-to-fluid heat exchangers are typically more efficient, so water-cooled compressors offer higher heat capture.

To illustrate, think of a production facility with a 200 hp compressed air system that consumes about 170 kW of electricity during 8,000 operating hours per year. That's an annual consumption of nearly 1.4 million kWh. If we can capture 96% of the residual heat, this would be 4.45 billion BTUs available for other work. This could replace up to 26,000 gallons of heating oil or 3.65MMcf of natural gas per year.

Put another way, with rotary screw compressors running at full load, it is possible to "harvest" approximately 50,000 BTUs of energy per hour for each 100 cfm of capacity. This value is based on 80% recoverable heat from the compressor and a conversion factor of 2,545 BTU/bhp-hr, although recovery efficiencies of up to 90% are frequently attained.

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Q: Is it worth the cost of the extra heat recovery equipment and installation?

A: Current energy costs make an investment in heat recovery systems highly attractive for industrial air systems. Generally, the payback calculation depends on several things:

- how much heat you have available (i.e., the size of your compressors)
- how much of the waste heat you can use for other purposes
- the cost of the heat recovery equipment
- the cost of the alternative energy source (such as relatively lower-cost natural gas)

If the alternative heating source is an old, inefficient system, heat recovery may be a great option, but upgrading your boiler, for example, may be more cost effective.

After factoring in the installation cost, it's possible that smaller systems will not provide enough recoverable BTUs of energy to make the investment worthwhile. If you are running a small, unenclosed piston compressor, for example, it will be difficult to capture the heat.

To reduce the investment costs, some screw compressor manufacturers offer heat recovery heat exchangers as options. In some cases, they are fully integrated inside the compressor cabinet and require very little onsite engineering.

Q: How do I prevent contamination of process fluids by compressor fluid?

A: “Fail-safe” heat exchangers provide additional protection against contamination of process water or fluids by the compressor cooling fluid. This makes them more suitable for heating applications in the food and pharmaceutical industry sectors, as well as for heating potable water.