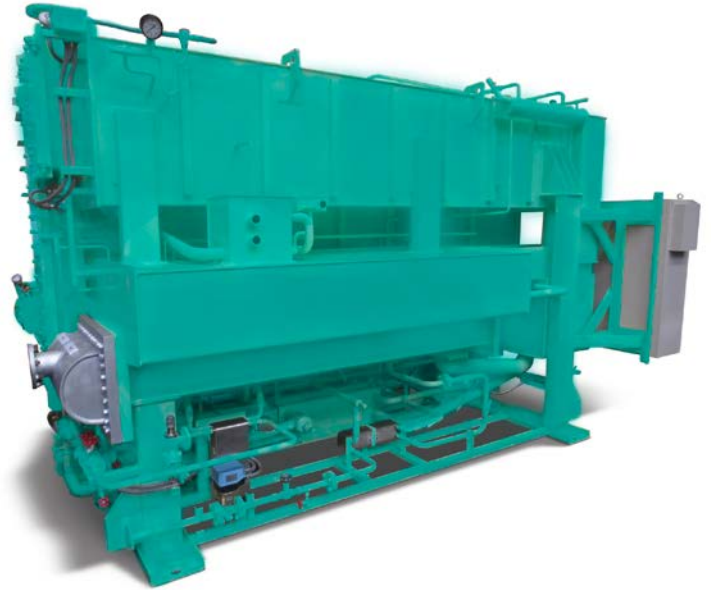




YORK[®] YHAP-C ABSORPTION HEAT PUMPS



YORK® YHAP-C Absorption Heat Pumps

ACHIEVES HIGHEST ENERGY AND WATER SAVINGS WHILE HELPING REDUCE CO₂ EMISSIONS.

The YORK® YHAP-C absorption heat pump saves energy by transferring heat (energy) from waste heat sources to increase the temperature of supplied hot water. The additional heat (energy) required by a heat pump system is far less than needed by a boiler.

YHAP-C absorption heat pumps are ideal for district heating and industrial process heating applications, because they take advantage of waste heat energy found in industrial facilities and deliver high-temperature hot water.

Maximizing performance by design

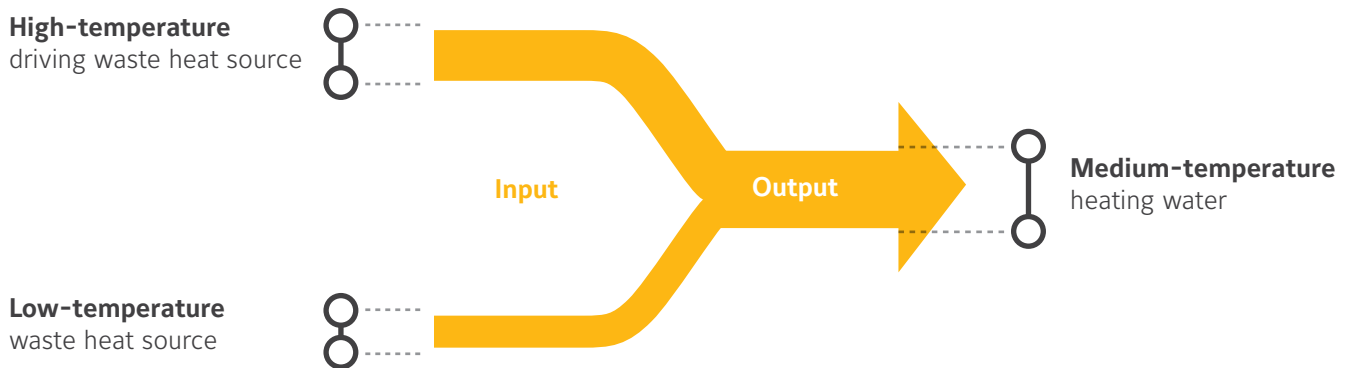
Driving heat sources: YORK® absorption heat pumps use a variety of driving heat sources, such as jacket water from a gas engine, low to high pressure steam, direct fired or even exhaust gas. As a result, the unit helps reduce primary energy consumption, water and carbon dioxide emissions. The YHAP-C design is also more efficient and reliable than conventional designs, because it employs innovative, 2-step evaporation and absorption technology.

To meet the needs of different heating applications, two types of YHAP-C absorption heat pumps are available:

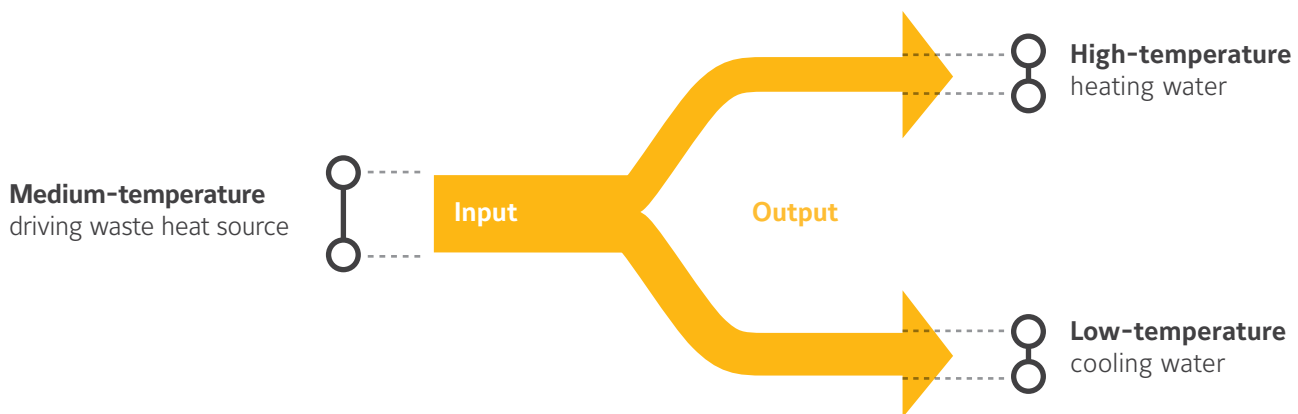
- **Type I** heat pump, also referred to as a heat amplifier, is driven by a high-temperature driving heat source in the generator section.
- **Type II** heat pump, also referred to as the heat transformer, is driven by a medium-temperature driving heat source in the generator and evaporator sections.

Two Types of YHAP-C Heat Pumps

Type I: Driven by high-temperature driving heat source in generator



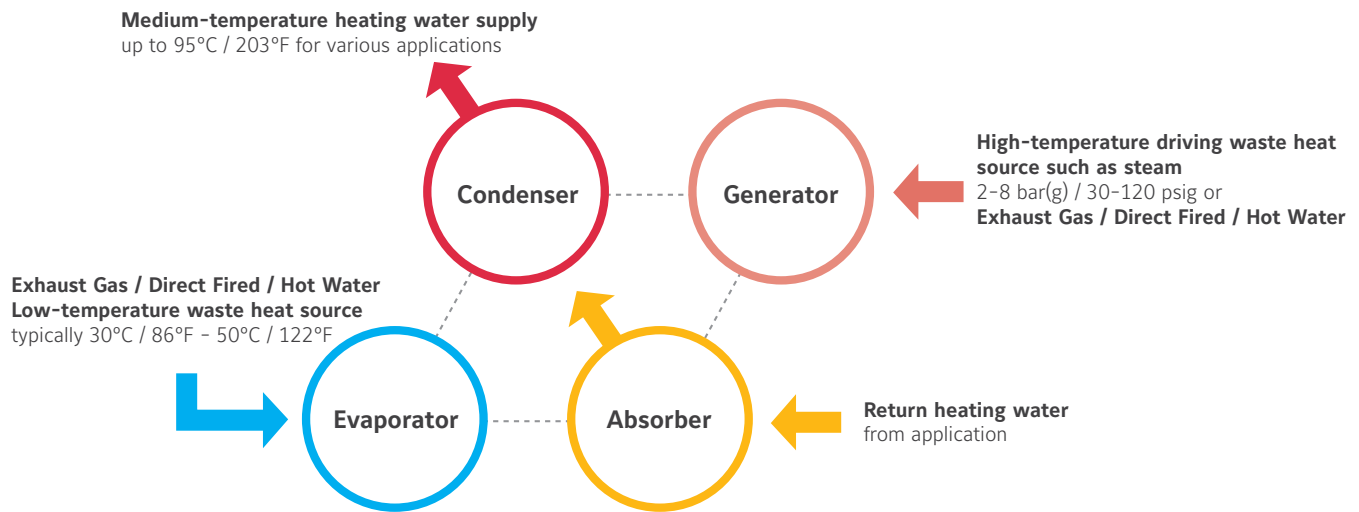
Type II: Driven by medium-temperature driving heat source in generator and evaporator



Type I Flexible Operating Envelope

The Type I heat pump, also referred to as a heat amplifier, is driven by a high-temperature waste heat source in the generator section. The low-temperature waste heat source is fed into the evaporator section. With these two heat sources, the Type I heat pump amplifies and provides useful medium temperature heat from the absorber and condenser section.

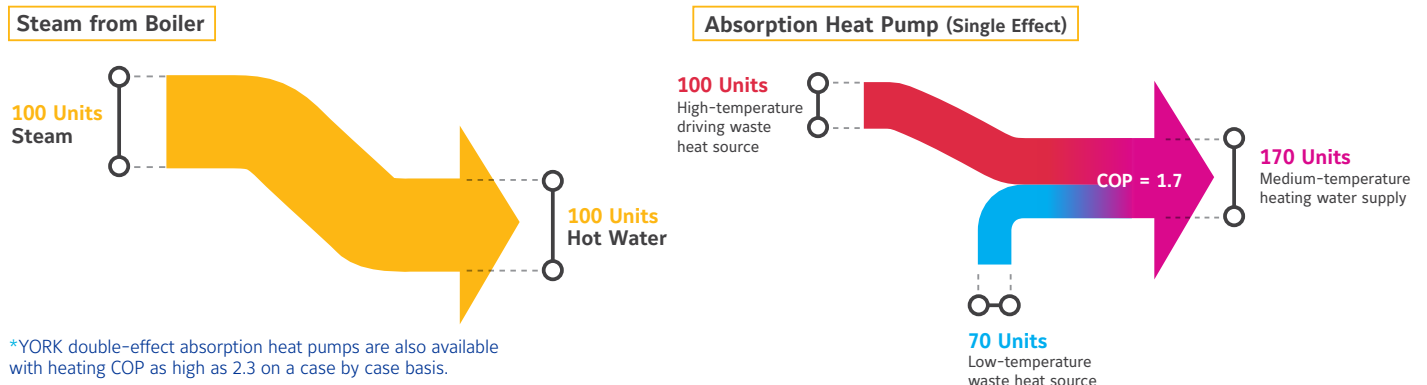
How it Works



Heat Balance

Compared to the typical steam boiler's 0.93 Coefficient of Performance (COP), the Type I unit provides a COP as high as 1.7*, delivering up to 95°C (203°F) hot water for various heating applications. This unit also provides a good turndown over a range of heating loads.

Performance of Boiler Compared to Absorption Heat Pump



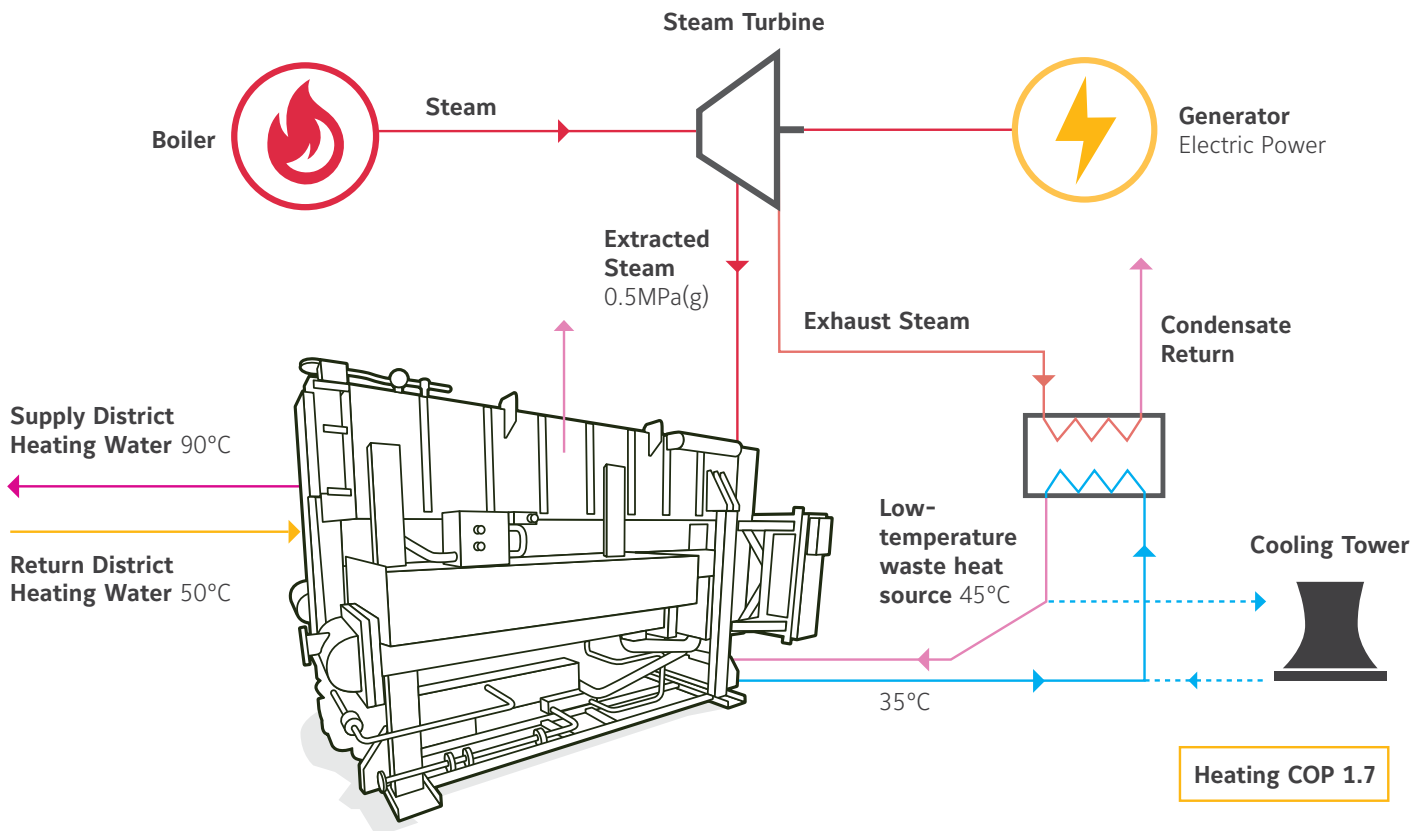
Type I Industrial Application

The Type I unit produces a high amount of medium-temperature heat from the absorber and condenser section based on a relatively smaller amount of high-temperature waste heat in the generator section and low-temperature waste heat in the evaporator section.

In this Type I application, the extracted steam at 0.5 MPa(g) from the power steam turbine is the driving heat source in the generator section. The water diverted from the cooling tower is the low-temperature waste heat source that is fed into the evaporator section. The heat pump delivers 90°C (194°F) from

the absorber and condenser section, which can be used for district heating or boiler feed water pre-heating. This application saves primary energy, reduces steam and water consumption and helps cut emissions.

With a Type I absorption heat pump, it is typical to have a heating COP of 1.7, meaning 1.7 units of heat is obtained from the absorber and condenser with a 1.0 unit of driving heat source in the generator and .7 units being in the evaporator section.

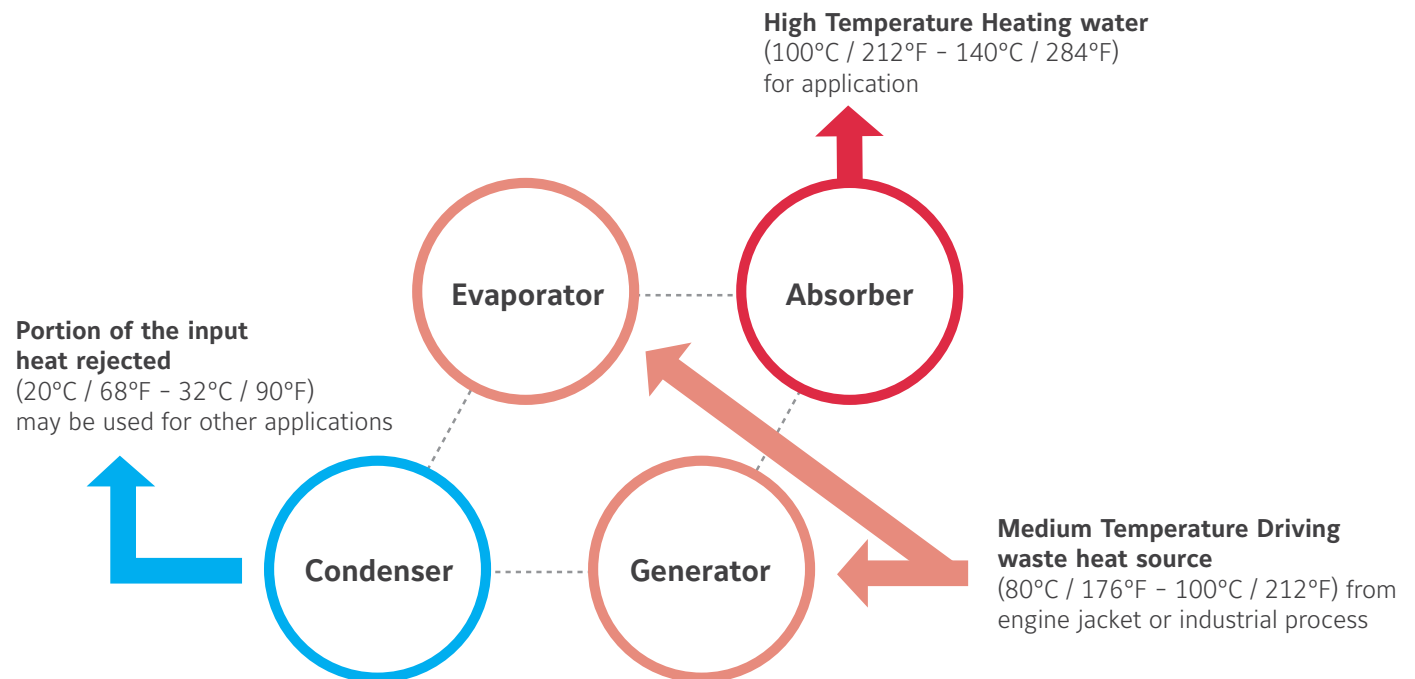


Type II

Flexible Operating Envelope

The Type II heat pump, also referred to as a heat transformer, is driven by a medium-temperature waste heat source in the generator and evaporator sections. This unit transforms and provides small, useful high-temperature heat from the absorber section. The rejected heat from the condenser can be used as the cooling water for other applications.

How it Works



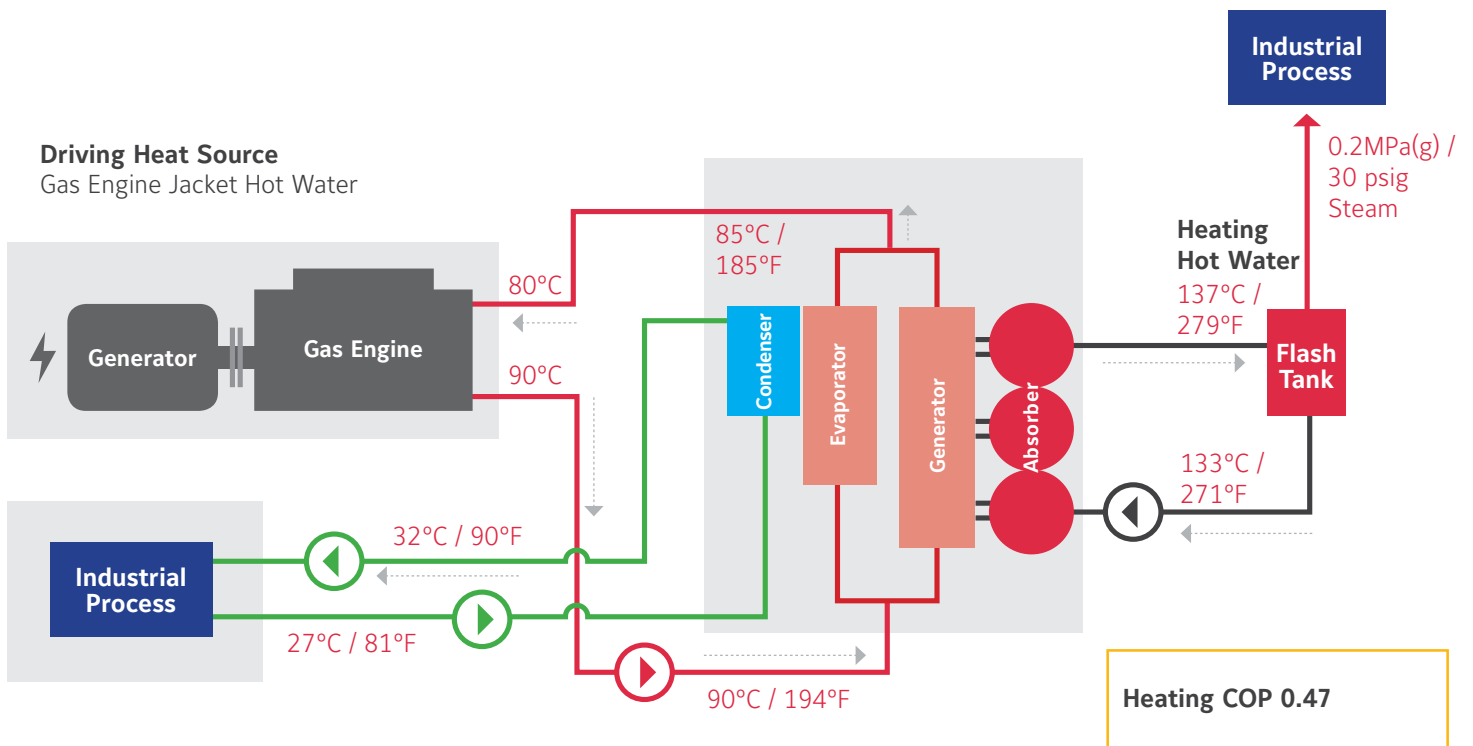
Heat Balance

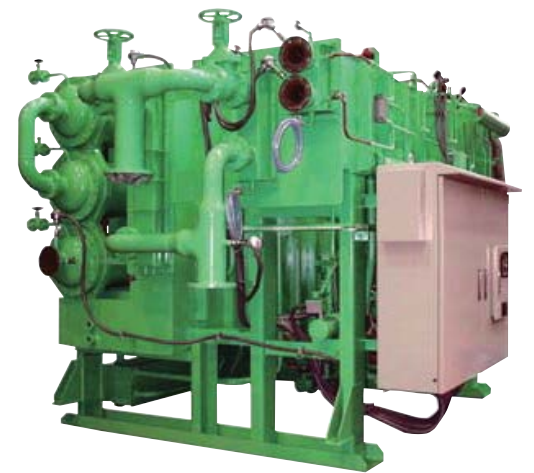
The Type II heat pump with a COP of 0.47 can deliver high-temperature hot water up to 140°C (284°F), which is ideal for industrial processes. This unit also provides a good turndown over a range of heating loads.

Type II Industry Application Process Heating Application

With a Type II absorption heat pump, it is typical to have a heating COP of 0.47, meaning 0.47 units of heat is obtained from the absorber with a 1.0 unit of driving heat source in the evaporator and generator. The 0.53 units of heat rejected in the condenser can be used for other process applications.

In this Type II absorption heat pump application, the jacket water of the gas engine at 90°C (194°F) is the driving heat source. The heat pump delivers 137°C (279°F) from the absorber section that can be flashed in a tank to produce low-pressure steam at 0.2 MPa(g) for process heating. A portion of the input heat is rejected through the condenser section and is used for other purposes in the facility.





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You want high performance. You expect efficiency. And you need a chiller that gives you confidence.

When your reputation is at stake, it's smart to demand nothing less than YORK® technology and service. That's because we provide local service and parts to keep your equipment operating at peak performance year after year. Enjoy the peace of mind knowing that trained service experts and Original Equipment Manufacturer parts are available from Johnson Controls – the largest HVAC service and preventative maintenance organization in the world.



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