

Hydrocarbon Heat Pump / HS-compressor

Mayekawa Europe NV

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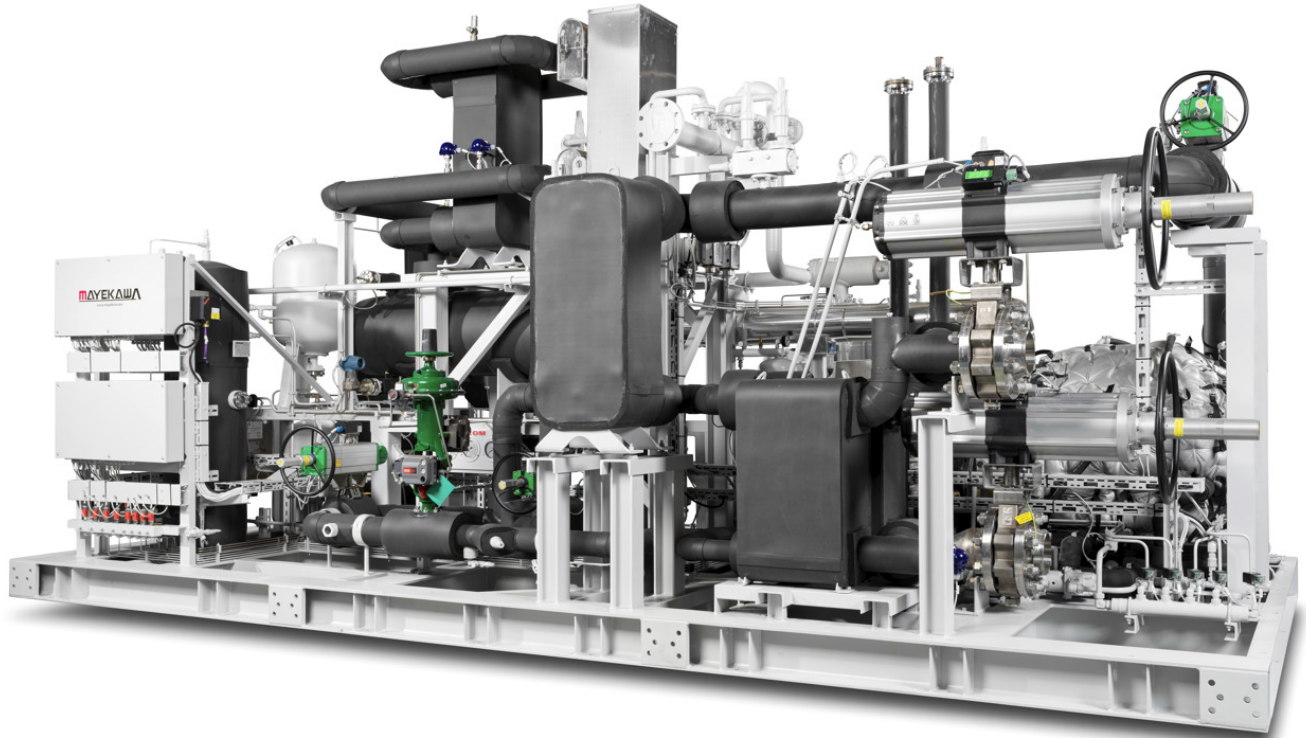


Figure 1: General layout

Summary of technology

In district heating applications the heat is commonly produced by combustion. This HS compressor heat pump package was specifically developed to replace or reduce the use of the burners by supplying hot brine up to 120°C.

The heat pump is a closed loop plug & play package which uses water as the heat source medium.

The heat source temperature is considered to be 72 °C and the heat source outlet temperature can vary between 45 and 65 °C, focusing primarily on heat recovery from water.

At the heat sink side, the heat pump heats water from 70°C to 120°C.

To achieve high efficiencies and a low GWP, Butane (R600) is considered as refrigerant. The use of R600 refrigerant results in low operating pressures combined with high operating temperatures, which allows the use of conventional refrigeration compressors.

The compressor is a reciprocating type with a heating capacity of around 750 kW. The compressor is driven by an electromotor. The heating capacity can be modified by changing the rotational speed of the motor with an inverter.

Although it is possible to use several types of alternative heat exchanger technology on the heat source side, a water-to-refrigerant heat exchanger was selected because of the reduced footprint and the ease



to recover heat from other/remote processes and transport it to the heat pump.

The oil lubrication and recovery system are integrated within the heat pump package and the entire skid is installed into a ventilated enclosure by customer request.



Figure 2: Plug & play heat pump

Performance of the heat pump is shown in Table 1. The COP is calculated theoretically by means of our in-house empirically developed compressor selection software. It does not consider additional electrical losses & power consumption of auxiliary equipment.

Table 1: Performance.

T _{source,in} [°C]	T _{source,out} [°C]	T _{sink,in} [°C]	T _{sink,out} [°C]	COP _{heating} [-]
72	65	70	120	4.8
72	60	70	120	4.4
72	55	70	120	4
72	50	70	120	3.7
72	45	70	120	3.2

Project example

The heat pump is currently installed, commissioned and being demonstrated in an application to recover heat from condensed steam from turbines of around 70°C and supply hot water of around 120°C into the district heating network.

FACTS ABOUT THE TECHNOLOGY

Heat supply capacity: 750 kW

Temperature range: T_{source}, out 45-65°C and T_{sink}, out 120°C

Working fluid: R600

Compressor technology: Piston

Specific investment cost for installed system without integration: +/- 450€/kW

TRL level: 7

Expected lifetime: 20 years

Size: 13750 kg, 18 m² footprint

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All information were provided by the supplier without third-party validation. The information was provided as an indicative basis and may be different in final installations depending on application specific parameters.

