

# Grasso 5HP heat pump

Utilizing waste heat from refrigeration plants

GEA Refrigeration



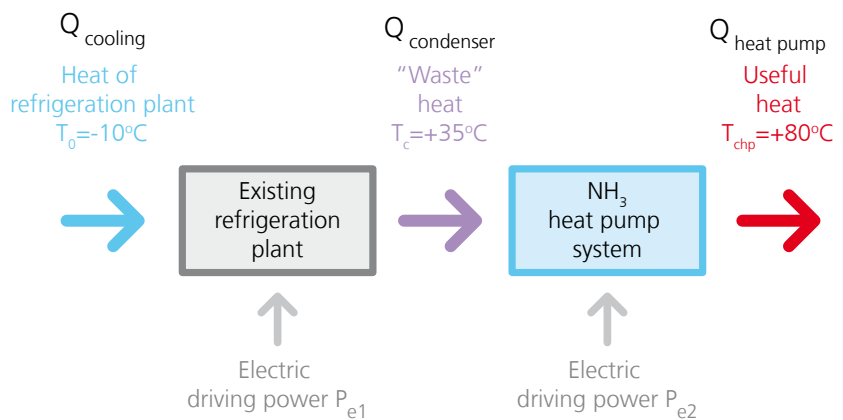
Grasso

# The Grasso 5HP in booster heat pump applications for refrigeration plants

## How does it work?

In existing refrigeration plants the heat extracted (and rejected at the condenser) is often not recovered and reused because the temperature level is too low to be useful. This low-grade “waste” heat ends up in the atmosphere.

The low-grade waste heat can however be used as a heat source for a ‘booster’ heat pump system that raises this heat to a higher temperature level.



## Increasing the process efficiency

### What is the benefit?

In this way 3-7 times more useful energy becomes available in the form of warm or hot water than the heat pump consumes. With a traditional gas boiler the ratio between useful and consumed energy is always lower than 1.

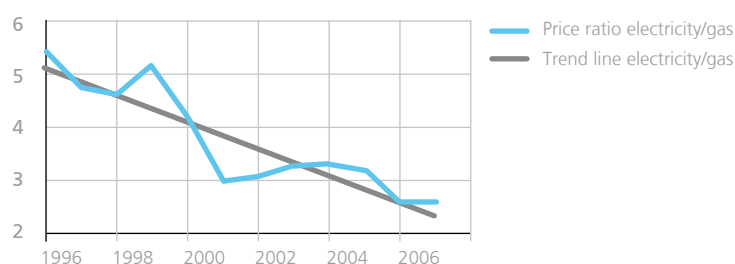
For this reason a heat pump system is always more efficient than a gas boiler if waste heat is available.

The efficiency of the heat pump system is expressed in COP (Coefficient of Performance).

$$\text{COP}_{\text{heatpump}} = \frac{Q_{\text{heatpump}}}{P_{e2}}$$

The ratio between the electricity and gas price is always an important investment criterion in the payback analysis of a heat pump system. The electricity price has been decreasing – in relative terms – compared to the gas price in recent years. This trend makes the payback analysis of a heat pump more attractive in comparison to traditional gas-fired heating systems.

Based on 15 EU countries



## How does an ammonia booster heat pump work?

The heat pump system can easily be integrated into an existing refrigeration plant that uses ammonia as the refrigerant. The system takes a part (or even all) of the compressed ammonia discharge gas from the main refrigeration plant, and further compresses (boosts) this to an even higher pressure using a Grasso 5HP compressor. The Grasso HP compressor has been specially designed to operate at these 'above normal' discharge pressures required for the high grade heat recovery that is needed for efficient heat pumps. Using this booster method, the condensing temperature of the heat pump discharge can be increased up to 82 °C.

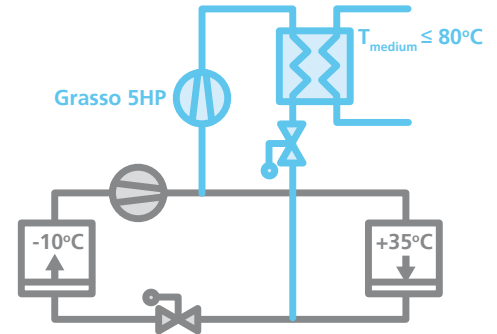
The actual heat 'release' is primarily through the process of condensing the heat pump discharge gas through an interface heat exchanger with the process fluid that requires heating.

A further advantage comes from the operation of the booster heat pump as an additional condenser for the main refrigeration system. This reduces the power consumed by the main compressor and also brings a saving on water and chemicals in the cases where an evaporative condenser is used.

The ammonia heat pump system can be isolated from the main refrigeration plant by use of an extra interface heat exchanger at the 'suction' side of the heat pump. This then leaves the two systems totally independent of each other.

In the example described here, the 'waste' rejection heat of a refrigeration plant is used. Other suitable heat sources can be:

- chemical process heat
- river or source water
- air
- etcetera



# Utilization of waste heat

## Applications

- Hot water supply for industrial processes
- Hot water supply for cleaning/scalding activities in for instance slaughter houses
- Pasteurization process in the dairy industry
- District Heating
- Horticulture using green houses
- Sport facilities with combined need for heat and cold

## Advantages

- Recovery of waste heat
- High efficiency
- Energy cost reduction
- Short payback time of investment
- Sustainability
- CO<sub>2</sub> emissions reduction

## Summary

In applications where heat and cold are required simultaneously GEA Refrigeration can help to substantially reduce the energy costs.

The Grasso 5HP compressor, the heart of the heat pump system, can be delivered "bare" or packaged. This enables the installer to design an optimum installation for the end user.

**Capacity table** based on compressor type Grasso 65HP

T <sub>c</sub> (°C)	T <sub>chp</sub> (°C)	Q <sub>heatpump</sub> (kW)	P <sub>e2</sub> (kW)	COP <sub>heatpump</sub>
15	55	254	54	5,7
	60	239	59	5,1
	65	224	64	4,5
25	65	336	69	5,9
	70	318	76	5,2
	75	299	83	4,6
35	70	455	78	6,8
	75	433	87	6,0
	80	409	95	5,3



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