Large-scale Industrial Heat Pumps

Proven high and low temperature heat pumps for up to 150°C and 70 MWth

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Large-scale Industrial Heat Pumps

As a pioneer of large heat pumps, we are committed to the benefits of this technology as an integral part of the energy mix. This spirit of intelligent innovation has resulted in more than 50 heat pump installations since the 1980s. Heat pumps are an efficient and cost-effective solution for heating and cooling. They raise the temperature by absorbing thermal energy from an existing low-temperature heat source and releasing it to a warmer space.

By using a heat source (e.g. waste heat from industry or renewable heat from nature, such as rivers or geothermal sources), heat pumps generate much more heat with a given amount of electricity than a simple direct conversion of electricity to heat. Over the next few years, heat generation will be gradually electrified and decarbonized as fossil fuel-fired heat generation plants are replaced by renewables.

Excess renewable energy can be converted to heat, paving the way for CO₂-free heat generation.

For modern district heating and cooling or industrial heating applications, our large industrial heat pumps are the best and most efficient solution for converting electricity into heat.

COP | Refrigerants
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The Coefficient of Performance (COP) is a measure of the efficiency of a heat pump. It is defined as the ratio of the heat energy produced to the electrical energy consumed by the heat pump. The higher the COP, the more efficient the heat pump installation is. For example, a COP of 3 means that three units of heat energy are produced for every one unit of electrical energy consumed.

The COP depends on several factors, including:
- Temperatures of the heat source and the heat sink
- Type of refrigerant used
- Design of the heat pump, e.g., the type, size and design of compressor, evaporator and condenser

Our large-scale industrial heat pumps usually achieve COPs between 3 and 5.
Low-temperature heat pump

For up to 100°C feed temperature and 45 MWth.

Our low-temperature heat pumps use a geared two-stage centrifugal compressor.

The heat pump design was proven in more than 50 deliveries, with more than 6 million accumulated operating hours. It is optimized for dynamic operations with fast ramp rates and can operate down to 30% load.

Components

- Evaporator
  - Panel or Falling Film Evaporator
  - Shell-and-Tube Evaporator
- Electric Motor Drive
- Gearbox
- Compressor
- Condenser
- High-pressure control valve
- Flash tank
- Low-pressure control valve

Technical data
High-temperature heat pump

For up to 150°C feed temperature and 70 MWth,

Our high-temperature heat pumps use single-shaft or geared-type compressors. The heat pumps can provide heat at temperatures of up to 150°C. For applications for instance in process industries, high-temperature heat pumps can be combined with steam compressors for steam supply up to 55 bara and 270°C.

Evaporator

The purpose of the evaporator is to extract heat from a heat source. For high-temperature heat pumps, the heat source is typically waste or excess heat from processes in the paper, chemical, oil and gas, or food and beverage industries. Other suitable heat sources include low-grade geothermal heat or waste heat from data centers or district cooling plants.

In the evaporator, the heat source transfers heat to the refrigerant and the refrigerant evaporates. The evaporator is a shell-and-tube type. It consists of a shell with nozzles, tubes, tube bundle, tube plate and water boxes. The welded construction reduces the risk of leakage, avoids high dynamic forces and reduces vibration.

A selection of materials is used in the heat exchanger to minimize damage caused by corrosion or erosion. It can be maintained on-line with a ball cleaning system.
The ruggedness of our heavy-duty industrial heat pumps has been truly proven over decades, with 50 units delivered in the mid-1980s and more than 6 million cumulative hours of operation.

Outstanding performance

High flexibility

Proven technology based on > 2,100 compressors delivered since 1948

References

Vattenfall Berlin, Germany Cooling Center Potsdamer Platz

Stockholm Exergi, Sweden Hammarby Heat Pump Plant

MVV Mannheim, Germany River Heat Pump Plant
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