Large-scale buildings, industry, power stations and process engineering

HIGH-CAPACITY HEAT PUMPS

OCHSNER
PROCESS HEAT
RESPONSIBILITY
It is the task of the decision makers to save primary energy and reduce pollutant and CO₂ emissions. Renewable energy from ambient warmth or exhaust heat utilisation will in the long run guarantee the supply of energy economically, efficiently and without risk. The new generation of heat pumps are the ideal solution for heating and cooling buildings in the most efficient and inexpensive fashion. With rising green electricity, emission-free operation up to 100% is possible.

CLIMATE CHANGE
In climate policy terms, the necessary targets for the reduction of the change in worldwide temperatures can only be achieved by a drastic reduction in greenhouse gas emissions. The goal of the EU is a 40% reduction of CO₂ emissions by 2030 and 80% by 2050. This is only achievable with the help of heat pumps (Fraunhofer Institute inter alia.).

READY FOR ACTION
The technology is perfected, proven and available. The Town Hall of Zurich has, for instance, been heated by water from the Limmat River using a heat pump since 1937. The technology does not need to be subsidised and has no negative ecological, economical or ethical side-effects. Using OCHSNER heat pumps, the Guidelines for Primary Energy Efficiency (Energy Building Certificate) are achieved in an inexpensive fashion, without having to compromise as far as the building fabric is concerned. This has often to be maintained, even during energy-system renovation (building conservation orders etc.).

RETROFITTING
Compared to heat insulation, the energy-system renovation by means of a heat pump usually costs significantly less, although the same savings of primary energy and operational costs as well as CO₂ reduction can be achieved.

ECONOMY
Increasing energy costs are presenting industry, commerce and above all local authorities with huge challenges. The energy costs for space heating and air-conditioning or process heat represent by far the highest cost factor. Due to the absolute minimising of the operational costs for heating and cooling, we provide economic building technology and increase the value of the building significantly. Whilst heat pumps for single-family houses represent the most used heating technology in many places, the broad use in large-scale buildings as well as in industry and commerce has still to be realised.

ENERGY EFFICIENCY
Due to the savings in energy and operational costs achieved in comparison to conventional heating or cooling systems, the use of high-capacity heat pumps is especially economical and environmentally friendly. A further essential usage potential of heat pump technology for increasing energy efficiency lies in energy and power plant technology as well as in district heating networks. Chemical, mechanical, endogenous and exogenous processes of all kinds can be used as heat sources or heat sinks. Exhaust heat of all kinds from exhaust air, cooling water or heat from waste water can be used meaningfully with heat pump technology.
INNOVATION THROUGH TECHNOLOGY
OCHSNER industrial heat pumps work efficiently and are environmentally friendly, achieving low operating costs, maximum operational safety and longevity. Components of the highest quality, decades of experience and a simple, compact design are the basis for energy efficiency, operational safety and customer satisfaction.

During the past years, OCHSNER has continuously re-engineered its high-capacity heat pump series. The aim of this research and development program was especially

- to increase the flow temperatures up to 130 °C
- to expand the operating limits for heat source and heat sink
- to provide maximum operational safety / availability
- to increase the COP values
- to control according to different parameters
- to reduce noise emission
- to secure telemonitoring

Decisive advantages

The heat pumps provide decisive advantages for building energy certificates.

Ecodesign Energy label documents the energy efficiency of a heat pump.

OCHSNER stands for highest efficiency, operational safety and longevity.
IN-HOUSE TEST BENCH FOR HIGH-CAPACITY HEAT PUMPS

The basis for the development of cutting-edge technology is the in-house test bench. OCHSNER operates a testing laboratory especially for high-capacity machines, which has been certified by TÜV for 130°C. Full-load tests up to 800 kW capacity according to EN14511, as well as under field conditions can be carried out. This ensures trust and safety for the customer. If they wish, they can be present during testing.

COMMISSIONING

All OCHSNER heat pumps are commissioned exclusively by the OCHSNER customer service. A comprehensive network of trained customer service engineers is on hand for this. In the normal course of events, an operational optimisation will take place in order to adapt all the parameters to the effective operational conditions.

Through the cooperation between the OCHSNER advisory team and the system planner and operator, along with the laboratory test run under full loading and the subsequent operational optimisation, the operator can be assured of an operationally safe, long-lived and economical system.

SYSTEM PLANNING

The optimum function and efficiency of a heat pump depends on how the complete system is integrated. OCHSNER supplies planning support for the provision of suitable hydraulics, heat use systems and heat sink systems. Thus, the optimum integration into the complete system can be carried out together.

The creation of an optimum control concept and/or the correct integration into an existing instrumentation and control system, as well as into the planned system/ building control system is just as important.

Special attention should also be paid to the selection of the most suitable type of heat pump. This must take the diverse operational points and conditions into consideration, for instance in relation to the heat source or heat sink temperatures OCHSNER offers the advantage of variety of types which allow an optimum selection to be supplied.

Differing heat load conditions and temperature spreads lead in many cases to the most economical operation with TWIN or cascade systems.

OCHSNER attaches importance to the exact documentation of the heat pump’s periphery as well, this being drawn up together with the system planner / customer.

EXPERIENCE COUNTS
SAFETY REFRIGERANT
Using its long-term experience in process use as well, OCHSNER has developed high temperature machines with safety refrigerant. This represents a real breakthrough in high temperature heat pump technology.
Comparable temperatures have up to now only been reachable by use of CO₂ as refrigerant, however leading to restrictions on the heat use side.

The high temperature refrigerants of OCHSNER, such as ÖKO 1 are non-flammable safety refrigerants. Therefore, extensive safety and maintenance work is not necessary. Due to the low pressure system and further thermo-dynamic properties of ÖKO 1, a complex high-pressure circuit can be avoided as well as a high temperature spread on the heat use side. ÖKO 1 is furthermore, due to the low greenhouse effect potential GWP, both future safe and ecologically sound.

OCHSNER supplies as an alternative a safety refrigerant ÖKO 2, which has a GWP value of 1 and thus fulfils all the ecological requirements of natural refrigerants and is at the same time non-flammable and non-toxic.

MEGATRONIC – THE BRAIN
- Micro-processor control 10” touch panel, with which the desired system values are entered and the actual values clearly displayed. The system is visualised by means of a hydraulic schematic, including status display. Pop-up menus show the operational conditions/data points of the system components, e.g. of the compressors. All measured values are recorded and regulated continuously and in real time. Interfaces are integrated for tele-monitoring purposes. Any alarms are displayed optically.
- SmartGrid-application for the use of low-tariff times and heat-storage.
- Communication-capable control for simple integration into the building’s management engineering system for networking, for instance by MODBUS®.
- Continuous tele-monitoring and recording of the operational conditions possible via LAN or Internet. Remote technology for access via the internet.
- The control has been developed especially for the high-performance compressor with Economizer in heat pump operation as well as for the two-stage high temperature refrigerant circuit.
- Periphery control allows the control of circulation pumps and valves as well as the switching of heating, active and passive cooling or buffer management and much more besides.

INNOVATIVE TECHNOLOGY

OCHSNER PROCESS HEAT
COMPRESSOR
- Semi-hermetic compact screw compressors - these have no oscillating components and thus have a low vibration as well as wear-free operation.
- Twin-shaft rotation displacement machines with asymmetric high-performance profiles
- Slide-switch control 50 %, 75 %, 100 % or continuously variable
- High operational safety and maintenance-free operation by means of efficient force-fed lubrication
- Mechanical soft-start using pressure compensation whenever the compressor is switched on

SHELL AND TUBE HEAT EXCHANGERS
- Use of robust shell and tube heat exchangers as evaporator and condenser for maximum longevity and operational safety

ELECTRONIC OECC INJECTION TECHNOLOGY
(OCHSNER electronic Cooling Cycle Controller)
- Injector for evaporator and economizer
- Highest COP due to precise overheat control
- High operational safety due to full compressor protection

MEGATRONIC MICRO-PROCESSOR CONTROL
- with 10 " Touch Display

CAPACITY RANGE
- 110 kW up to 1 MW, TWIN-UNIT up to 2 MW
**INDUSTRIAL HEAT PUMP SERIES**

### HIGH TEMPERATURE SERIES

**WITH HIGH TEMPERATURE SCREW COMPRESSORS**

**USE**
- Screw-type compressor, specially designed for continuous heavy duty at high temperatures
- Cooling system with internal circuit
- One- or two-stage refrigerant circuit, depending on the heat source and heat sink temperature

**CAPACITY RANGE**
- 60 up to 850 kW, TWIN-UNIT up to 1.7 MW

### STEAM TEMPERATURE SERIES

**WITH HIGHEST TEMPERATURE SCREW-TYPE COMPRESSORS**

**USE**
- Screw-type compressor, specially designed for continuous heavy duty at highest temperatures
- High-performance cooling system with internal circuit

**CAPACITY RANGE**
- 170 up to 750 kW, TWIN-UNIT up to 1.5 MW
USE
- Compact series with high temperature recovery-scroll compressors

CAPACITY RANGE
- 30 up to 130 kW, Cascades up to 390 kW

LOW TEMPERATURE SERIES WITH TURBO-COMPRESSORS

COMPRESSOR
- Turbo compressor, two-stage, magnet bearing, vibration- and wear-free, oil-free operation
- Highest possible COP, also in partial-load operation
- Exact adjustment of performance to the system’s heat load by means of speed-controlled drive (continuously variable rotational speed control – 18,000 to 48,000 rpm)
- Lowest noise emission (sound pressure level at 1 m distance: 78 dB(A), permit installation in sensitive settings
- Lowest starting current prevents grid overload at start-up

CAPACITY RANGE
- 220 up to 385 kW
THE OPTIONAL HYDRAULIC MODULE INCLUDES FOR OPERATIONAL TYPES:

- Heating
- Active cooling
- Heating and active cooling (simultaneously)
- Passive cooling
- Hot-water heating

PRE-ASSEMBLED UNIT WITH INTEGRATED COMPONENTS:

- Plate heat exchanger
- Circulation pumps
- Valves
- Fittings
USE OF RENEWABLE ENERGIES

Using renewable energy from ambient heat will make the supply of energy in the long term economical, efficient and without risk. In order to heat and condition a building as efficiently and inexpensively as possible, the new generation of heat pumps can be seen to be offering the ideal package.

HEAT SOURCE RENEWABLE AMBIENT HEAT
- Ground water
- Soil
- Outside air

HEAT SOURCE EXHAUST HEAT
- Exhaust heat from server rooms / data center
- Exhaust heat from climate systems / cooling networks
- Exhaust air
- Communal waste water sewers and wastewater treatment plants

EXAMPLES OF USE:
- Heating and cooling in chemical processes
- Heating and cooling in the foodstuffs industry
- Heating and cooling in beverage industry
- Heat recovery from refrigerant plants
- Heat recovery from heating plant flue gasses
- Heat recovery from CHP cooling water
- Heat recovery from the plastics industry
- Heat recovery from mechanical processes
- Expansion of district heating networks by using the return lines as heat sources

ENERGY EFFICIENCY

Exhaust heat flows – which otherwise would have to be removed – can be converted into useful heat using heat pumps. Thermal waste can be avoided with this type of energy recycling and the total system efficiency / energy balance can be rethought. The heat pump’s heat source and heat sink will be used simultaneously – thus halving energy costs.

LARGE VOLUME BUILDINGS
Heating and air-conditioning of office buildings, residential buildings, administrative buildings, educational establishments, hospitals, supermarkets, warehouses, manufacturing facilities etc.

CATERING INDUSTRY AND SPORTS FACILITIES
Heating for accommodation areas, swimming pool heating, hot-water heating, air conditioning

AGRICULTURE
Heating of greenhouses or pools for fish breeding

INFRASTRUCTURE
Icing prevention on roads, railways, concrete roads, grass and sports fields
HEATING AND COOLING SIMULTANEOUSLY IN BUILDINGS AND PROCESSES

BUILDINGS
The heating and cooling load in many buildings is often present at the same time. Instead of generating heat with a fossil fuel furnace and parallel to that cooling with a water chiller, the heat pump can fulfil both functions (heating and cooling) simultaneously.

PROCESSES
Exhaust heat is to a great extent unused at present and pollutes the environment. In many processes, heating and cooling are generated separately. Heat recovery using heat exchangers reaches its limits.

When using the heat pump’s cooling and heating function simultaneously, the performance factors of the heating (COP) and cooling (EER) operation can be added together (COP heating + EER cooling = COP integrated). Doing this, phenomenal energy efficiency and economy is achieved. The requirements of the Energy Efficiency Guidelines are fulfilled by the saving of primary energy and CO₂ certificates can be awarded due to the reduction of CO₂ emissions.
INCREASING THE DISTRICT HEATING PERFORMANCE AND EFFICIENCY

High-temperature heat pumps can raise the low return temperatures in district heat networks to a useful level and thus increase the capacity of the network without having to extend it. If cooling of the return temperatures is desired, the heat pump will increase the system efficiency.

HEAT RECOVERY FROM COOLING SYSTEMS FOR HOT WATER GENERATION

By using free waste heat from cooling systems, the load on the heat destruction system which is normally needed will be reduced (cooling tower, air reverse cooler) and thus costs saved. At the same time, hot water will be heated more or less free-of-charge at e.g. 95 °C or up to 130 °C, this water being required in large quantities in foodstuff plants, dairies, slaughterhouses and in the beverage industry.

Heat pump utilization as District Boost, also for the exploitation of regulation energy/minute reserve for heat feed into an existing store in the form of a district heat network.

Simplified schemata for heat recovery from cooling plants by means of high-temperature heat pumps.
HEAT RECOVERY IN HEATING PLANTS

In spite of the installation of Economizers, there is normally unused latent heat still in the flue gasses. This can be recovered by using process heat pumps. Furthermore, additional heat of condensation will be set free. Increase in efficiency and reduction of the fuel consumption/biomass consumption are the main advantages for the operator.

HEAT RECOVERY IN CHPs / THERMAL POWER STATIONS TPSs

In CHP / TPS systems, the cooling water (mixture coolant) can be used as the heat source. The cooling towers, and thus the “destruction of energy” can be eliminated to a large extent. Instead, additional useful heat on a high temperature level will be generated. The exhaust air or exhaust gasses can also be used as a heat source.

Simplified schemata for heat recovery from flue gases by means of high-temperature heat pumps.

Simplified schemata for increasing the total efficiency of TPS / CHP systems by high-temperature heat pumps.
IMPLEMENTED OCHSNER-PROJECTS

- RESIDENTIAL PROPERTY IN VIENNA
  Heat source well with separation heat exchanger, heating capacity 158 kW

- IKEA WUPPERTAL
  Heat source geothermic field, heating capacity 2x 270 kW and 658 kW, cooling capacity 2x 228 kW and 557 kW

- SEWAGE PLANT ANNECY
  Heat source sewage water, heating capacity 2x 280 kW

- STADTWERKE LÜBECK
  Heat source glycol/water-mixture, heating capacity 232 kW and 66 kW, cooling capacity 189 kW and 54 kW

- BIO-MASS HEATING PLANT KRUMPENDORF AND EBENTHAL
  Heat source flue-gas exhaust heat, heating capacity 245 kW and 286 kW

- NEW MIDDLESCHOOL AND SPORT CENTRE SCHWANENSTADT
  Heat source exhaust heat from ice machine, heating capacity 136 kW and 180 kW

- VATTENFALL HAMBURG
  Heat source IT server room, heating capacity 2x 360 kW, cooling capacity 2x 245 kW

- ÜBERLANDWERK KRUMBACH
  Heat source urban sewer, heating capacity 120 kW

- UNIVERSITÉ DE BOURGOGNE DIJON
  Heat source climate system server and offices, flow temperature 90°C, heating capacity 420 kW, cooling capacity 255 kW

- PLANSEE REUTTE
  Waste heat sinter process 45 °C, flow temperature 90 °C, heating capacity 380 kW, cooling capacity 287 kW

- DISTRICT HEATING VIENNA
  Heat source return line of district heating system 45 °C, flow temperature 75 °C, heating capacity 255 kW, cooling capacity 207 kW

- STADTWERKE AMSTETTEN
  Heat source urban sewer, heating capacity 228 kW, cooling capacity 185 kW
- IKEA BERLIN-LICHTENBERG
  Heat source waste water liner, sprinkler basin, internal, flow temperature 40°C, heating capacity 3x 500 kW

- IKEA INNSBRUCK
  Heat source ground water, flow temperature 50°C and 60 °C, heating capacity 2 x 499 kW and 73 kW, cooling capacity 385 kW and 52 kW

- OLD TOWN HALL BONN
  Heat source ground water, heating capacity 142 kW, cooling capacity 157 kW

- ENERGIE AG
  Heat source ground water, heating capacity 337 kW

- FRONIUS WELS
  Heat source ground probes, heating capacity 375 and 170 kW, cooling capacity 396 and 203 kW

- CITYGROUP FRANKFURT
  Heat source cooling water, heating capacity 2x 175 kW

- GEMÜ EMMEN
  Heat source ground water, heating capacity 930 kW

- EVANGELISCHE GEMEINDE BONN
  Heat source ground water, heating capacity 2x 130 kW

- ROSENZUCHT DEPARTMENT VAR
  Heat source breeding pool, heating capacity 440 kW
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