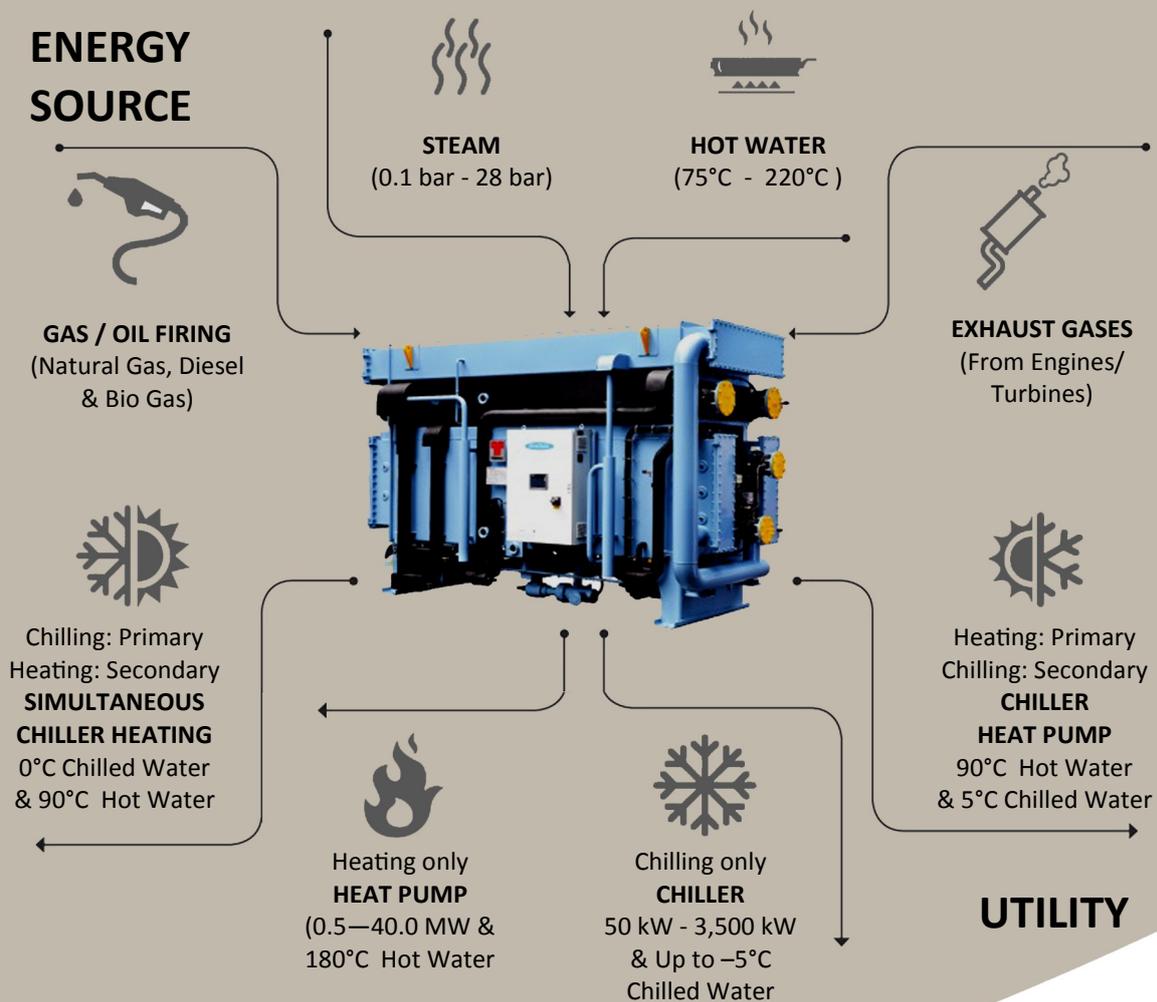


# Absorption Heat Pumps ... powered by thermal energy

Capacities from 150kW to 5000kW on the Evaporator, powered by Natural gas, Hot water, Steam and Exhaust Gasses



### Absorption heat pumps

The design of Danstoker's absorption heat pumps is based on the need for energy optimization. An extra chilling of the exhaust gases makes it possible to transfer the condensing heat in the vapour steam to further improve the system efficiency. Unlike a compressor heat pump, the absorption heat pump is driven by a high-temperature energy source instead of electric power.

#### Driving energy (auxiliary heat source), absorption heat pumps:

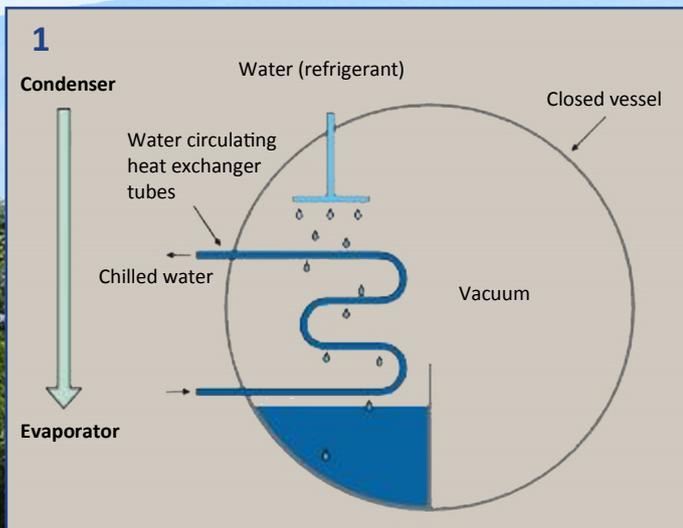
- Natural gas / Bio-gas
- Hot exhaust gases (approx. 400°C)
- High Temperature Hot Water ( min. 140°C)
- Steam

The absorption heat pumps have evaporator chilling capacities from 150 kW to 5,000 kW.

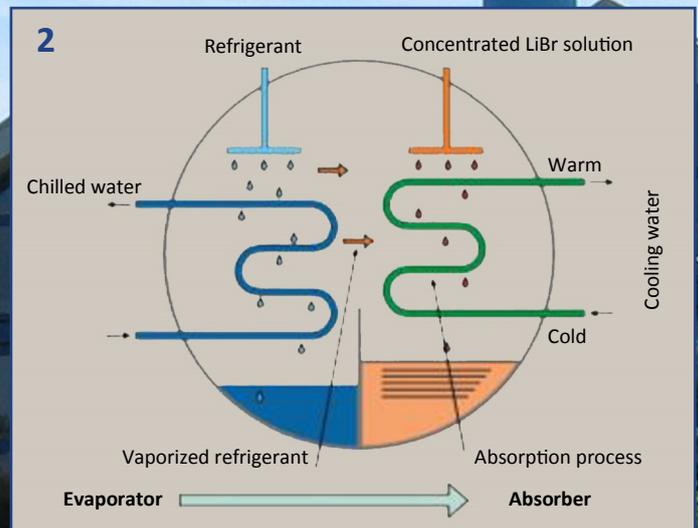
The heat pump "borrows" energy from the system to run the generator, and transfers/returns the borrowed energy to the system together with the energy extracted from the waste heat (exhaust gases) by the evaporator.

The ratio between the total energy produced and the energy "borrowed" is 1.7 for exhaust gas / HTHW powered heat pumps, and 1,65-1,75 for direct fired.

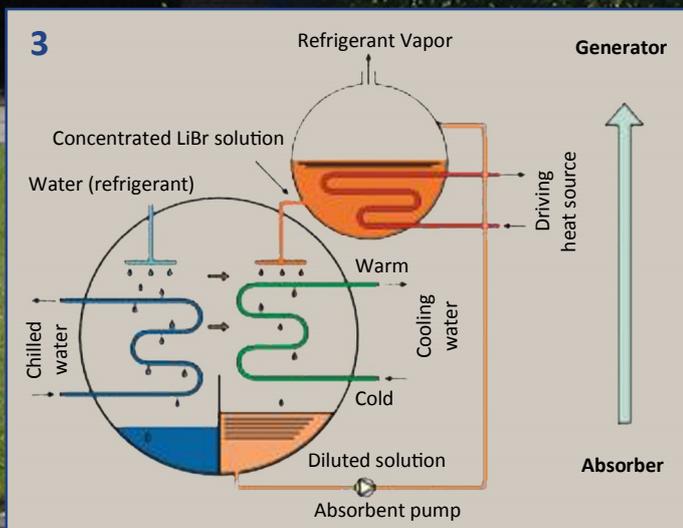
This ratio is known as the COP value.



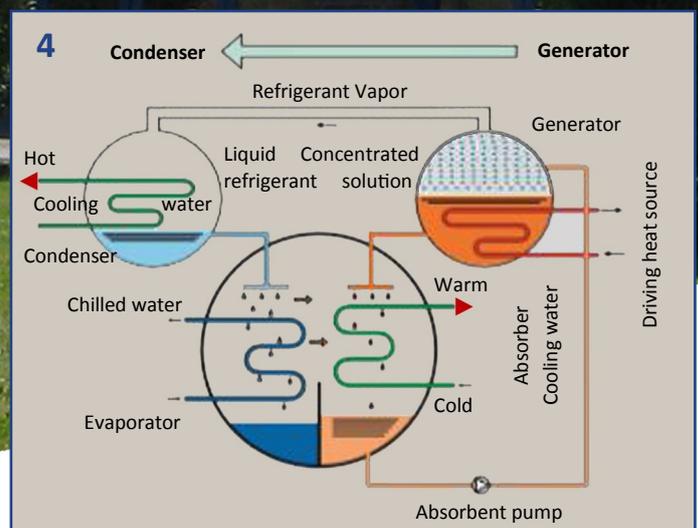
When maintained at high vacuum, water will boil and flash cool itself.



Concentrated Lithium Bromide solution has affinity towards water. The solution absorbs vaporized refrigerant water.



As Lithium Bromide becomes dilute it loses its capacity to absorb water vapor. It thus needs to be reconcentrated using a heat source.



This heat causes the solution to release the absorbed refrigerant in form of vapor. This vapor is cooled in a separate chamber to become liquid refrigerant. The concentrated LiBr is sprayed back in the absorber.

## Absorptions-Chiller

The design of Danstoker's absorption chillers is based on the need for industrial process cooling and comfort cooling in buildings.

Industrial production involves numerous production stages where electricity is currently used to cool down critical processes. However, the installation of an absorption chiller allows the industrial companies instead to utilize their waste heat to produce cooling.

As standard, the absorption chillers have an evaporator chilling effect of 50 kW to 3,500 kW. If required, combinations of several units may be designed to achieve a higher capacity.



### Driving energy (auxiliary heat source), absorption chiller:

- Hot water (down to 80°C)
- Hot exhaust gases (down to 270°C)

### Technical info:

- Lowest outlet temp. chilled water: -5°C.
- Design inlet temp. cooling water: 25 – 32°C.
- Heat source: flue gas down to 270°C or hot water (80-120°C).
- COP: 0,7 – 0,8

The waste heat is used as auxiliary heat source to the chiller's internal cycle, which offers a ratio between the total energy produced and the added "waste heat" of 0,7 to 0,8. In order to release the total energy generated by the waste heat + the process cooling, the heat pump's hot water circuit must be connected to a cooling tower and discharged to open air.

The chilling effect of absorption chillers may be designed to achieve evaporator temperatures as low as -5 °C in a water/LiBr unit. As a result, freezing temperatures can be achieved by equipment, which is not subject to the pressure equipment directive, thereby eliminating the need for annual inspections by the supervising authorities.



## Reduced CO<sub>2</sub> footprint



The Danstoker horizontal and vertical bio-fuel boilers are fire-tube boilers, and if required combined with water-tube sections. Capacities ranging from 200 kW to 24,000 kW or 40 t/h steam up to 86 barg.

Typical fuels would be:

Forest residue, bark, sawmill/construction waste, saw dust, wood pellets, fruit stones, straw, agrifibres or traditional solid fuels.

All boiler are adapted to suit the special characteristics of the fuel to be used, and designed in a close co-operation with the supplier of the combustion and fuel-handling equipment.



During the last decades Danstoker has delivered more than 2500 exhaust gas boiler on a world-wide scale. The boilers are mounted after gas or diesel engines.

Design and development of special boilers and economisers for heat recovery of hot flue gases originating from chemical and industrial processes.

The waste heat is recovered in single, double or triple pass boilers, provided with low-temperature economisers or with integrated superheaters in the steam boilers. Capacities until 35 MW, 55 ton/h Steam. Design pressure up to 32 barg.



The development and manufacture of high-performance oil and gas boilers for the energy sector has made Danstoker known as one of Europe's leading boiler-makers, featuring a wide range of shell and tube boilers with capacities ranging from 800 to 50,000 kW or 0,2 to 55 ton/h steam up to 40 barg and superheated unto 450°C.

Special boilers as combined watertube-radiation section with a firetube convection section until 50MW, 55 ton/h steam at max. 86 barg and superheated unto 500°C.



The service staff in the Danstoker's after-sales division have many years of experience within a broad variety of jobs regarding energy-technical plants, enabling them to provide quick and efficient service on Danstoker boilers as well as on boilers of other makes. Danstoker is servicing the Thermax absorption heat pumps and chillers.

The service organization includes personnel equally capable of providing expert technical advice and practical technical services. As we are often already acquainted with the plants, we are able to quickly identify the problem and conduct the necessary adjustments and/or repairs.

Contact: [service@danstoker.com](mailto:service@danstoker.com)



Backed by more than 50 years' experience, the Danstoker Group is capable of offering heat exchangers for industrial processors as well as power/heat generating plants:

- Preheating • Heat recovery • Heating • Cooling • Condensing

The heat exchangers are dimensioned to customer's individual requirements, and we optimize the thermal performance.