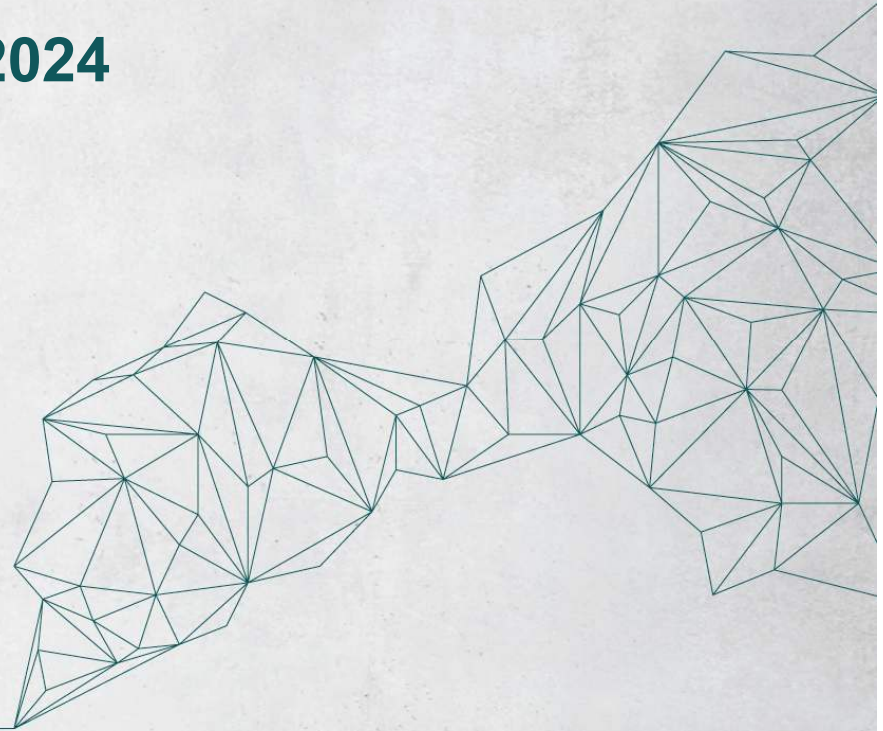




Chillventa Specialist Forums 2024 Chillventa Fachforen 2024

**CONNECTING
EXPERTS.**



controls

Presenter

Per Skov

Product manager, Heat pumps
Industrial Refrigeration EMEA
Denmark



The power behind **your mission**





Harnessing High Temperature Heat Pumps

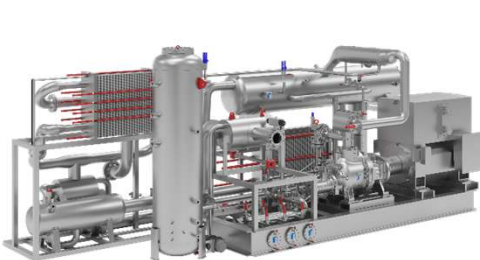
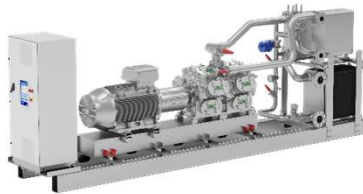
Innovative Solutions for a Sustainable Future

The power behind **your mission**



Electrification of energy systems

The carbon neutral future is electric



ELECTRIFICATION: Replacing technologies or processes that use fossil fuels with electrically-powered equivalents

CLEAN UP THE ENERGY WE USE: Electricity produced with an increasingly renewable energy for a truly clean energy system.

INCREASE EFFICIENCY: Energy because they are more efficient compared with other energy carriers.

TURN ENERGY SYSTEM INTO A SMART SYSTEMS: Electric appliances can be digitalized through smart technologies.

Excess heat – The worlds largest untapped source of energy?

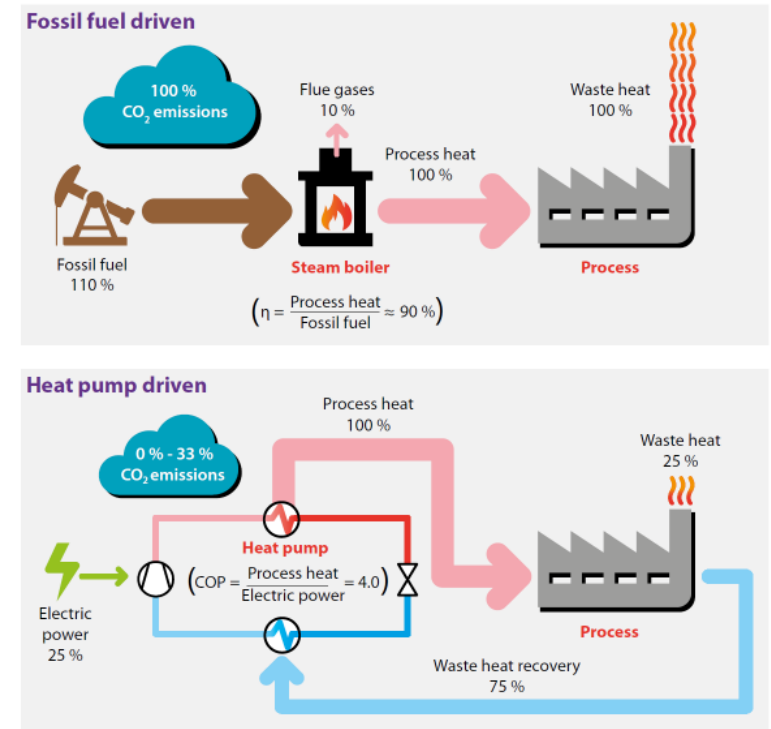
Increase efficiency and decrease energy consumption

The greenest and cheapest energy is the one you don't use

More waste heat available than the building heating demand in Europe



Heat pumps can be used to utilize waste heat or other sources at various temperature levels!



Source: Strengthening Industrial Heat Pump Innovation - Decarbonizing Industrial Heat

Excess to heat demand

Excess heat occurs in almost all thermal and mechanical processes
Excess heat is different in form of state, temperature and amount

EXCESS HEAT		
Industry	Example of processes	Approx temperature range
Breweries	Process cooling	20-60°C
Dairy	Hot water, process cooling	20- 60°C
Paper	Waste water, hot condensate	30-100°C
Brick	Exhaust air, Waste heat	50-90°C
Starch	Exhaust air, Hot condensate	50-90°C
Chemical	Waste heat, Process cooling	60-120°C
Sugar	Process cooling	60-120°C

HEAT DEMAND		
Industry	Example of processes	Approx temperature range
Brewing	Hot water or steam	60-120°C
Dairy	Hot water or steam	80-150°C
Paper	Preheating of water, steam or hot air	80-160°C
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Excess to heat demand – Heat pumps

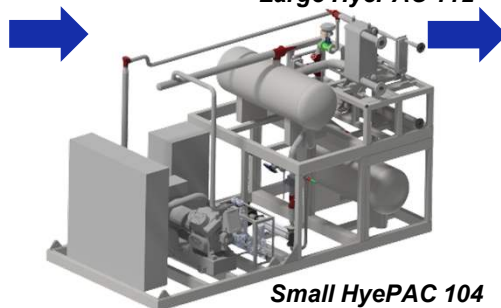
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HEAT PUMP



Large HyePAC 112



Small HyePAC 104

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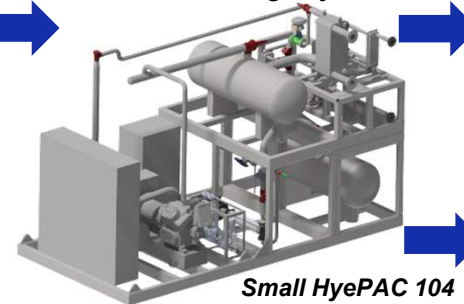
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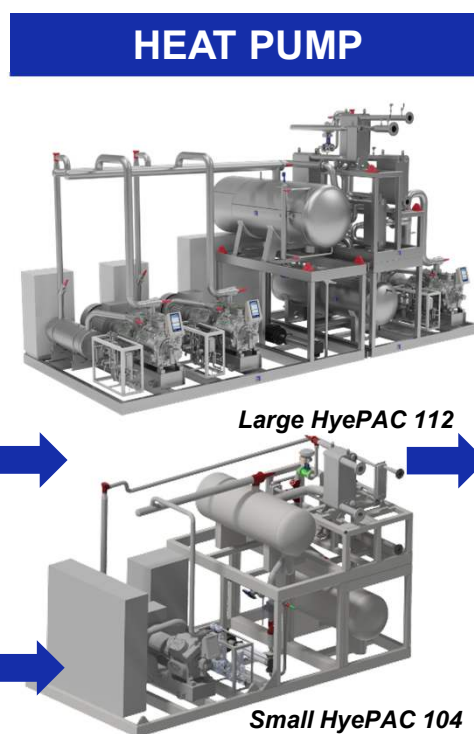
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District heating

Excess to heat demand – Heat pumps

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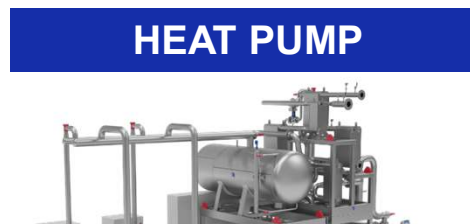


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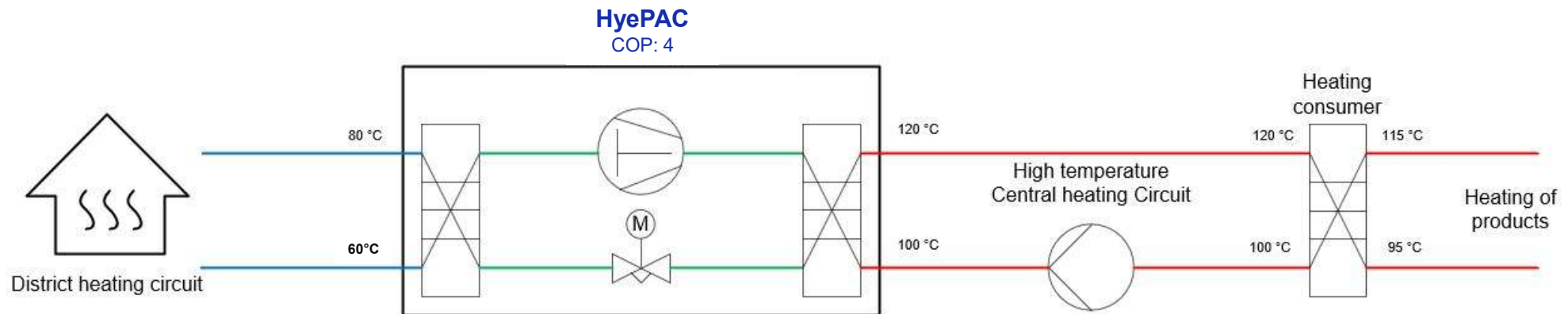
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Excess to heat demand – lift

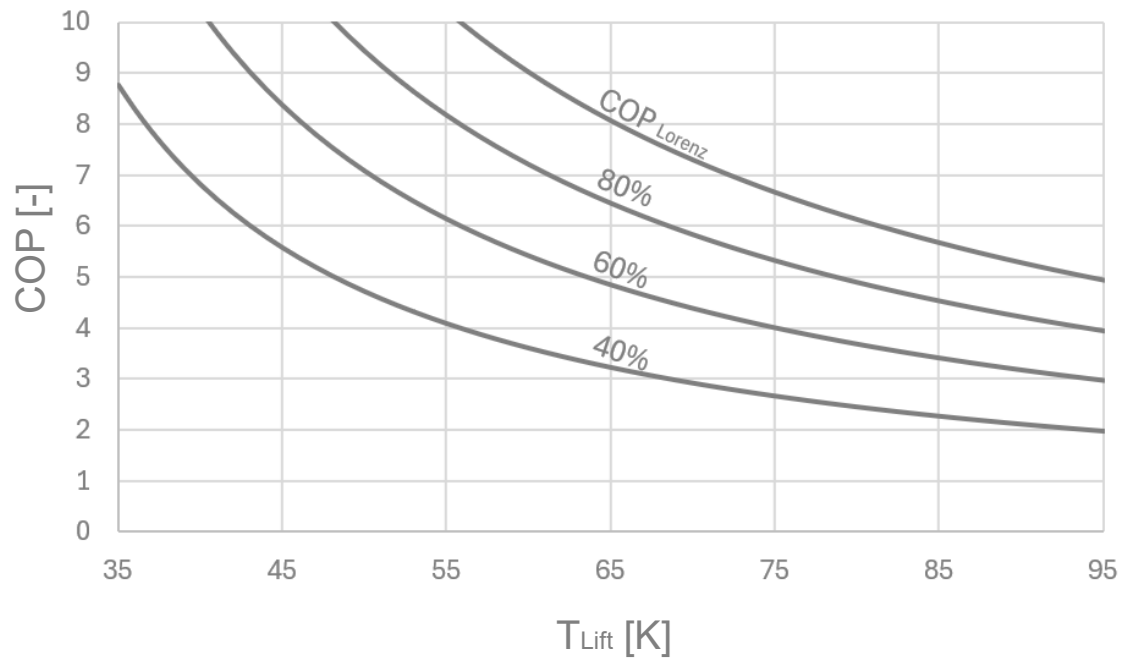
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Range of lift
Min – Avg – Max
0°K - 50°K - 100°K
20°K - 75°K - 130°K
0°K - 55°K - 130°K
20°K - 55°K - 90°K
50°K - 80°K - 110°K
0°K - 30°K - 100°K
0°K - 30°K - 100°K

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COP depended on lift



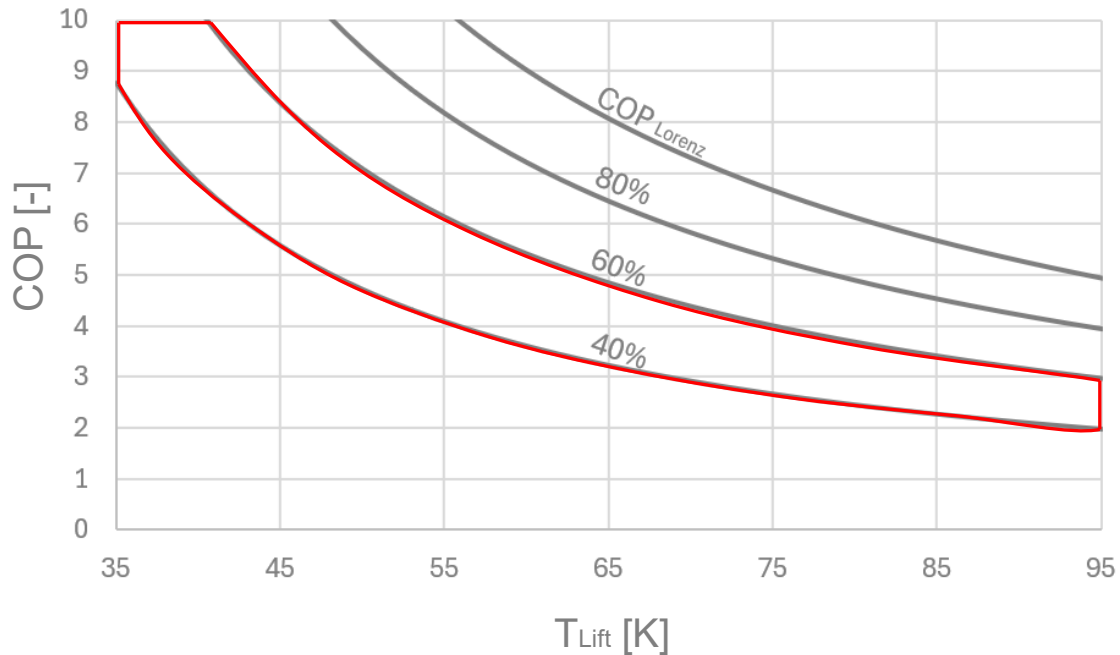
Assumptions

- Sink dT: 15
- Source dT: 20K



COP depended on lift

COP at 120°C supply temperature



Assumptions

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- Source dT: 20K

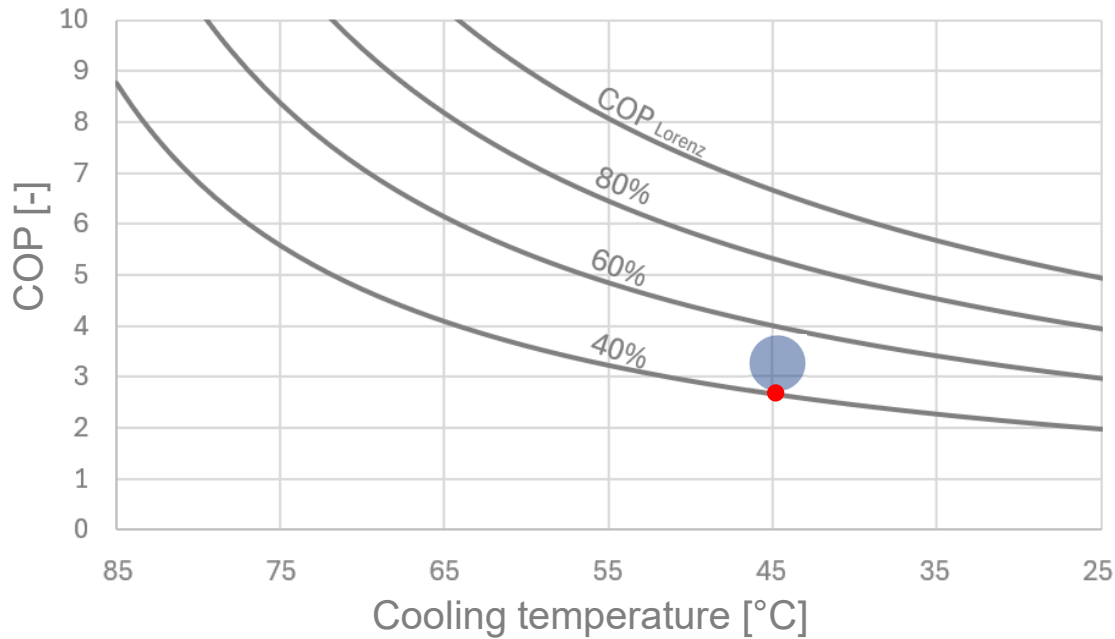
Lift has large impact on COP

- 35K lift, COP range 9 - 12
- 65K lift, COP range 3 - 5
- 95K lift, COP range 2 - 3



COP depended on lift

COP at 120°C supply temperature



Assumptions

- Sink dT: 15
- Source dT: 20K

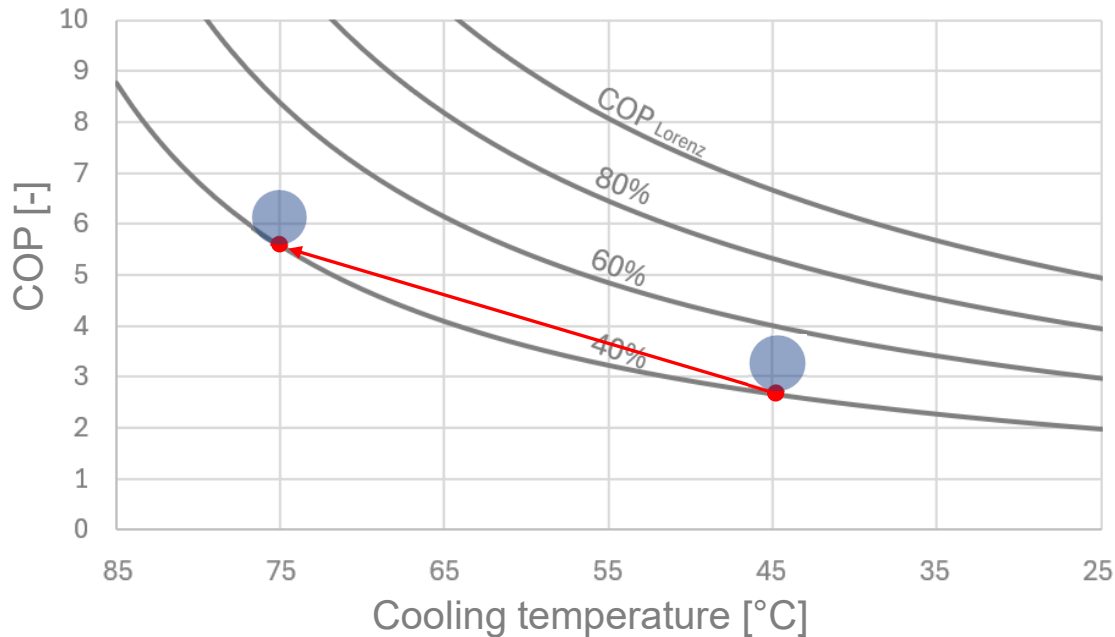
Lift has large impact on COP

Case 1:

- Cooling: 60°C - 45°C
- Heating: 100°C - 120°C
- COP range: 2.8 - 3.8

COP depended on lift

COP at 120°C supply temperature



Assumptions

- Sink dT: 15
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Lift has large impact on COP

Case 1:

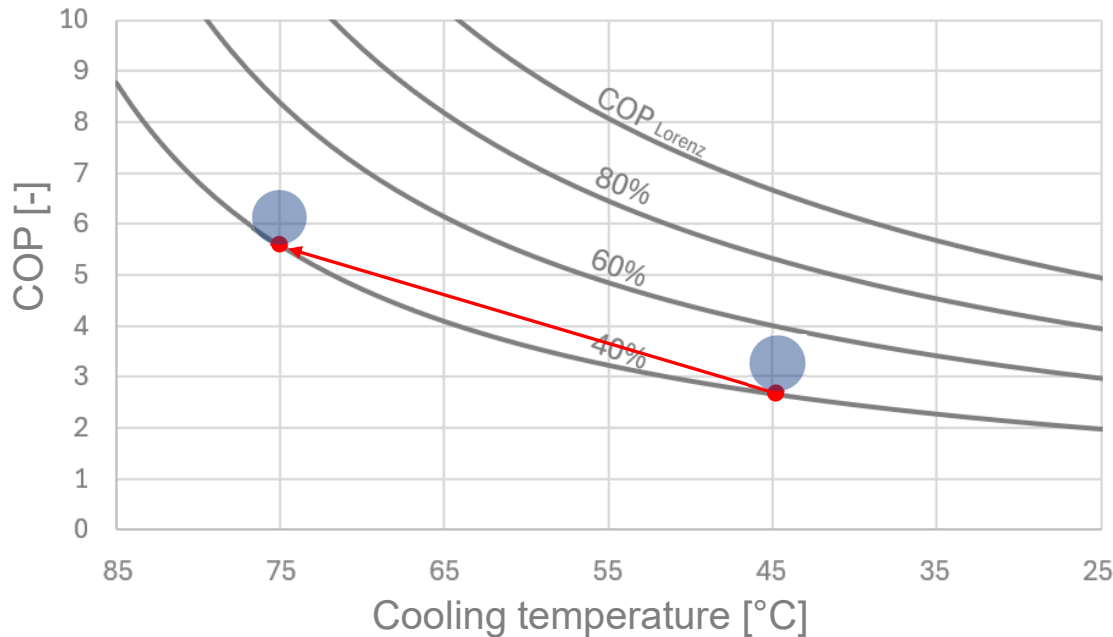
- Cooling: 60°C - 45°C
- Heating: 100°C - 120°C
- COP range: 2.8 - 3.8

Case 2:

- Cooling: 90°C - 75°C
- Heating: 100°C - 120°C
- COP range: 5.5 - 6.5

COP depended on lift

COP at 120°C supply temperature



Assumptions

- Sink dT: 15
- Source dT: 20K

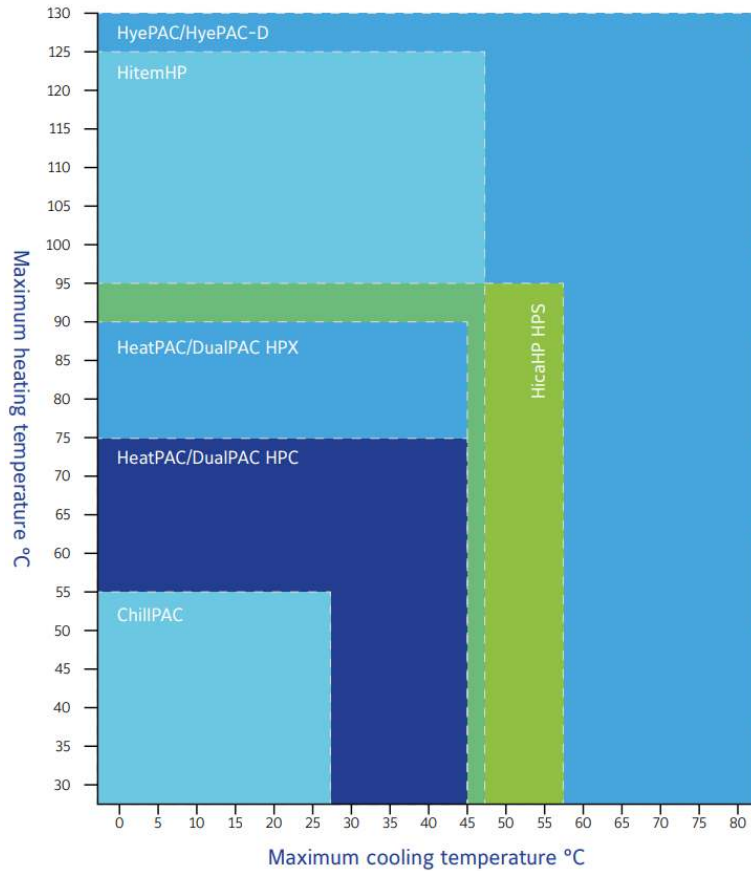
Impact

- COP: 2.7 → 5.8
 - Lower electricity consumption
 - Lower cost to operate
- Service cost: - 30 - 50%
 - Less compressors
 - Lower cost to maintain
- Investment: - 15 - 30%

TCO reduced by up to 55%

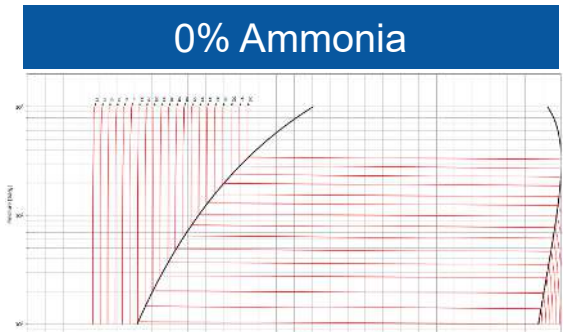
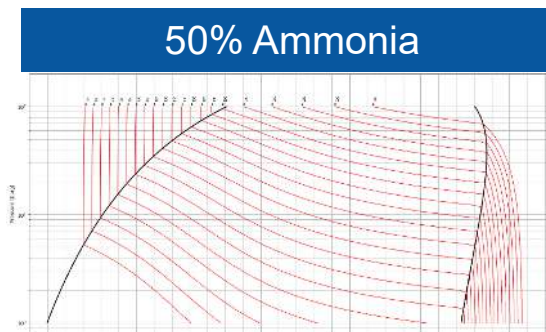
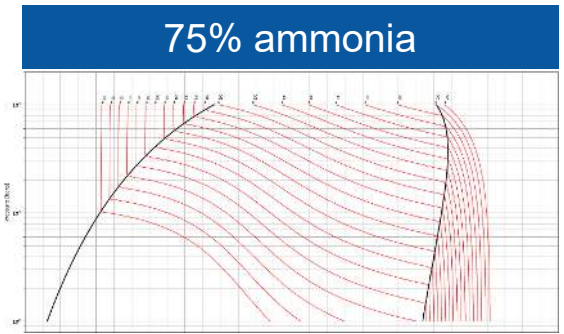
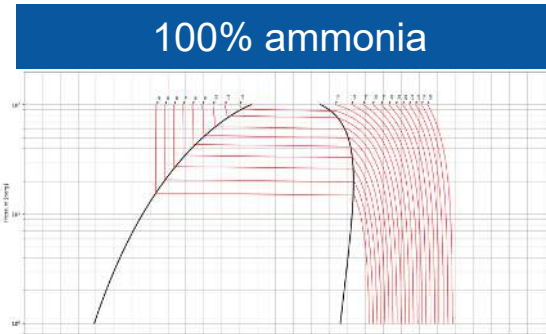
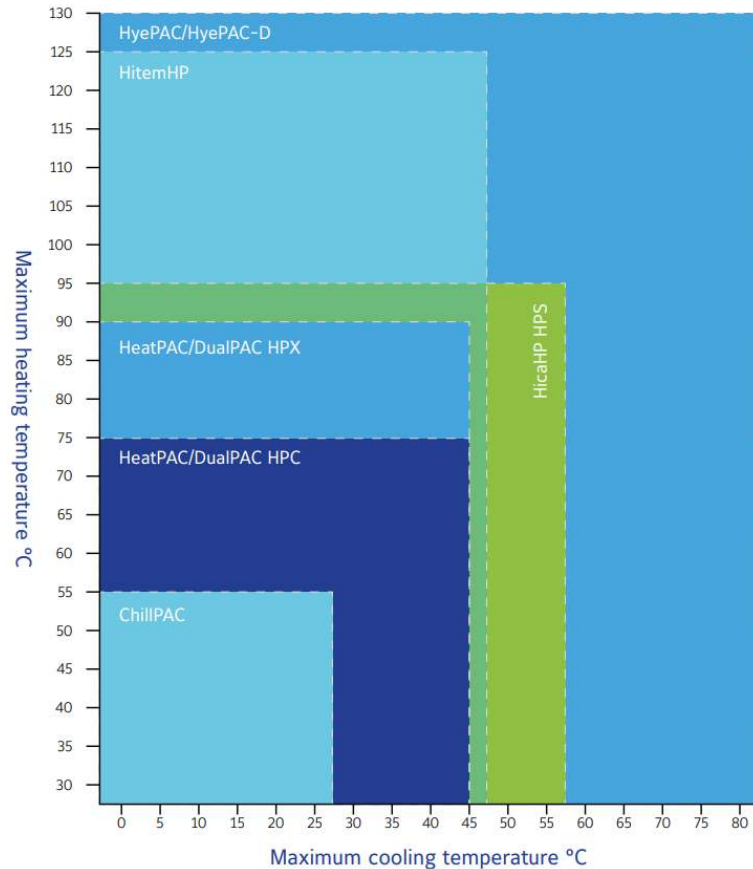
HyePAC – Up to 90°C source temperature, delivering up to 130°C

Sabroe heat pump portfolio, enables utilization of source temperature from <0°C and **up to 90°C**, delivering **up to 130°C**



HyePAC – Up to 90°C source temperature, delivering up to 130°C

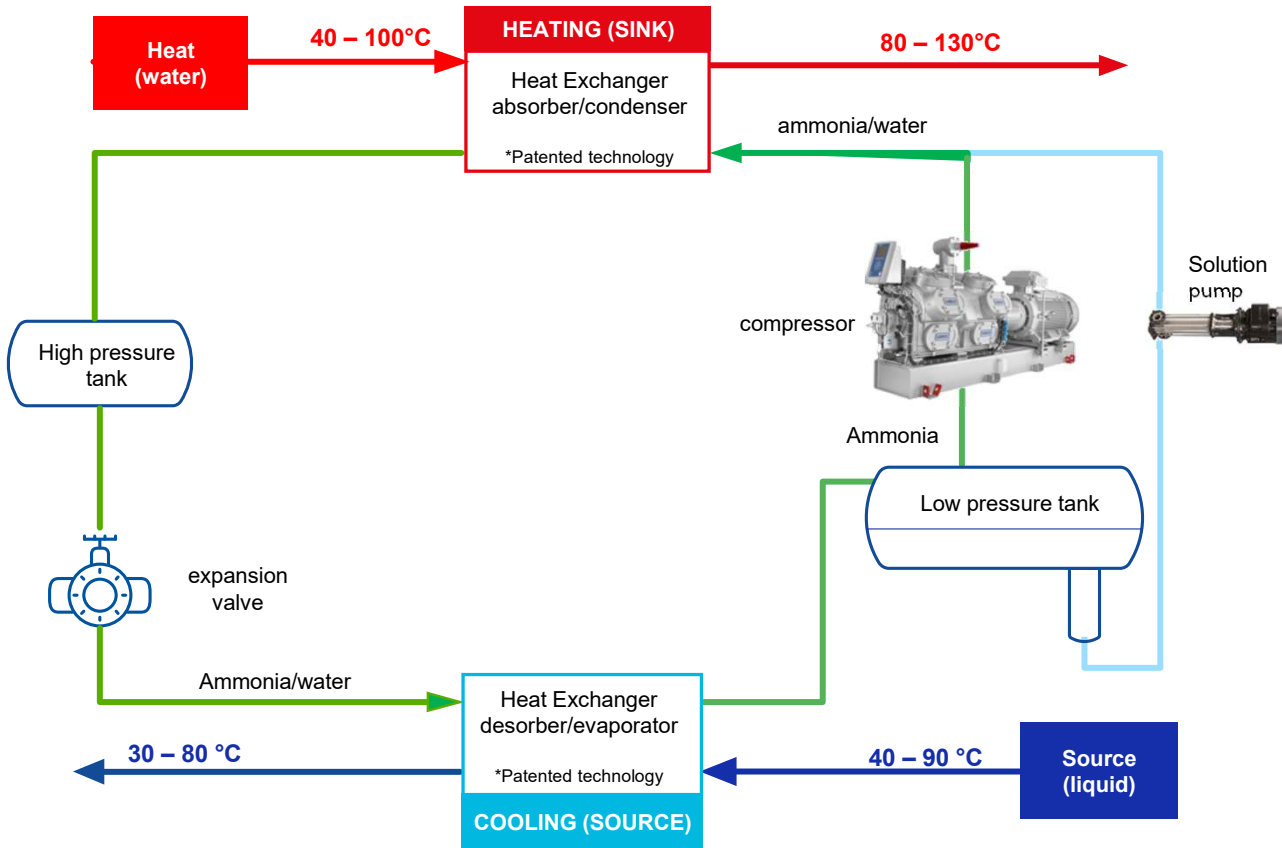
Sabroe heat pump portfolio, enables utilization of source temperature from <0°C and **up to 90°C**, delivering **up to 130°C**



Mixing water and ammonia lowers operating pressure

- Enabling high temperatures (source & sink) with existing ammonia components

HyePAC – Unique hybrid absorption/compression process

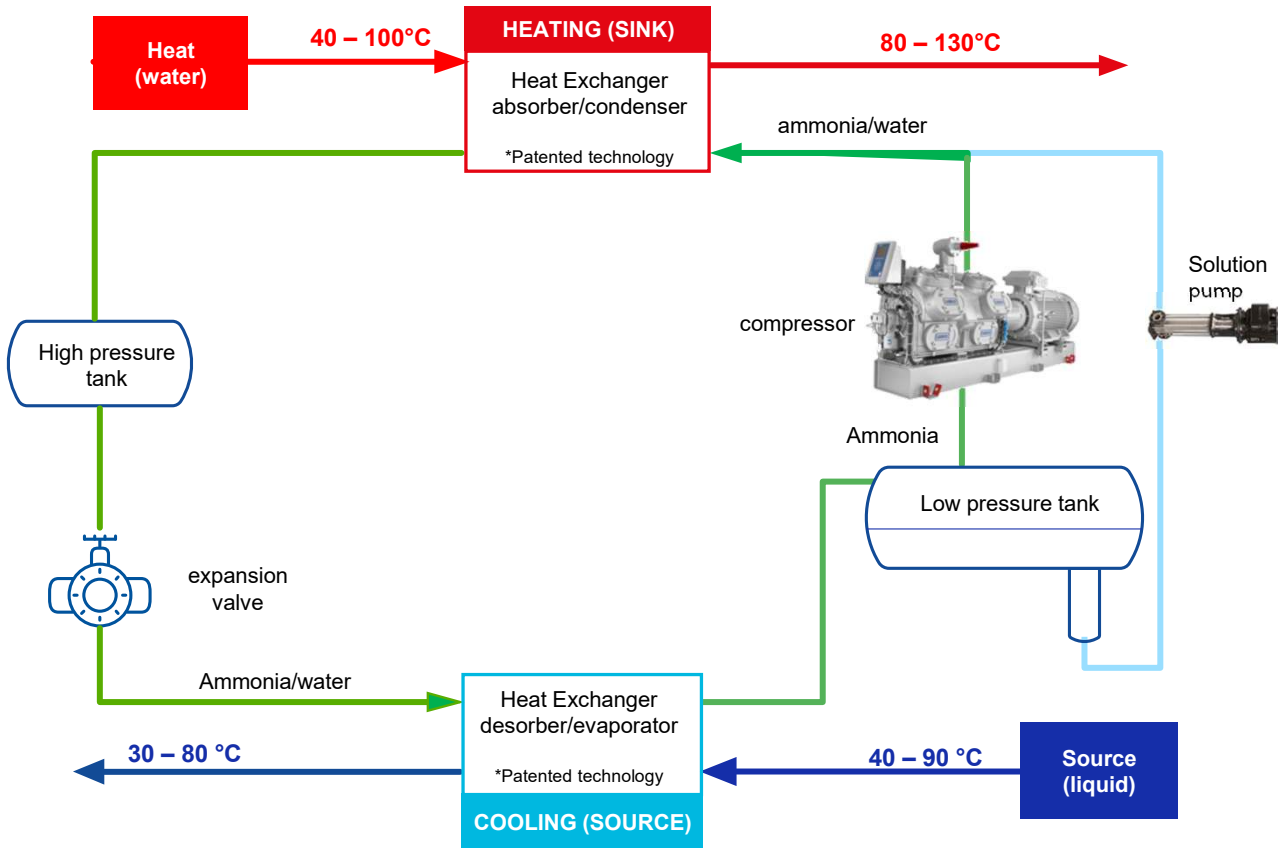


HyePAC

- Outgoing water temperature up to 130°C
- Source temperature up to 90°C
- Heating capacity up to 2300 kW



HyePAC – Unique hybrid absorption/compression process



HyePAC

- Outgoing water temperature up to 130°C
- Source temperature up to 90°C
- Heating capacity up to 2300 kW



Visit us: Hall 7, booth 7-240

- High-capacity heat pumps
- High temperature heat pumps
- Controls & Configuration tools

Want to know more? Visit us at booth 7-240 in hall 7



**Maximizing Heat Pump Potential:
Empowering Steam Generation with
MVR Technology**

**Specialist forum: Tue 13:40-14:00
Hall 4A Booth 4A-419**



**Unveiling the Cyber Security
Challenges in Industrial Controllers:
Stay Informed and Protected!**

**Specialist forum: Wed 12:00-12:20
Hall 8 Booth 8-516**



**Overcoming the obstacles to achieve
temperature above 100 °C with
hydrocarbon-based Heat Pumps**

**Specialist forum: Wed 12:20-12:40
Hall 4A Booth 4A-419**



**Future developments in refrigeration
technology - thinking about heat**

**Specialist forum: Thu 11:00-11:20
Hall 8 Booth 8-516**



**Unlocking the potential of absorption
heat transformer. The path to de-
carbonization of steam generation**

**Specialist forum: Thu 13:20-13:20
Hall 8 Booth 8-516**



**Complex made simple – how and why
sales and selection tools helps you
select the best products**

**Specialist forum: Tue 11:40-12:00
Hall 8 Booth 4A-419**

Hall 4A

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