EUROVENT

THE EUROPEAN COMMITTEE OF HVAC&R MANUFACTURERS

INDEPENDENT SUBUNITS ADDING VALUE TO THE MARKET

Eurovent Certita CERTIFICATION

EUROVENT CERTIFIED PERFORMANCE

EUROVENT Market Intelligence

Roadmap

- Eurovent and refrigerants
- (Upcoming) realities
- Solutions that think ahead
- ★ **GEA Group:**
  Optimizing heat recovery from industrial processes with NH_3 heat pumps

EUROVENT 友好代表团 INDUSTRY DELEGATION

WELCOME!

欢迎光临

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THE EUROPEAN COMMITTEE OF HVAC&R MANUFACTURERS

- Eurovent is the representative of Europe's leading HVAC&R associations and the **more than 1000, largely small and medium-sized, manufacturers** they represent.
- The association **represents equipment manufacturers,** i.e. appliers of refrigerants
- It is not Eurovent's task to favour or disadvantage any type of refrigerant.

→ <u>Yet:</u> **Eurovent acknowledges and values environmental developments, and wants to prepare its members for upcoming market realities!**

(Upcoming) realities

- Refrigeration industries face **challenging upheaval.**
- With latest revision of the European Union F-Gas Regulation (Regulation (EU) No 517/2014), **refrigerants impacting climate to be gradually excluded from market**
- **Creates opportunities for applications with alternative/natural refrigerants** as users have to rethink and convert their systems in the mid- and long-term
- Constitute a viable solution for many different applications
- Call for applications that can fulfil new ecological demands

Solutions that think ahead

- Solutions presented during today's UNEP roundtable include:
  - 'CO2 supermarket refrigeration in warm climates' by UTC Building & Industrial services
- Manufacturers in the Eurovent network already offer **solutions that fulfil future environmental demands and think ahead**
- **GEA Group,** member of VDMA – The German Engineering Association
- Example application of the GEA Group presented in the following:
  Optimising heat recovery from industrial processes with NH3 heat pumps

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GEA

GEA Refrigeration Technologies

Optimizing heat recovery from industrial processes with heat pumps

By

Kenneth Hoffmann

What defines industrial heat pump?

200 – 15,000 kW heating capacity

More than 200 reference projects

Ammonia

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

79%

REDUCTION

IN HFC BY 2030!

EU LEGISLATION

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What defines industrial heat pump?

200 – 15,000 kW heating capacity

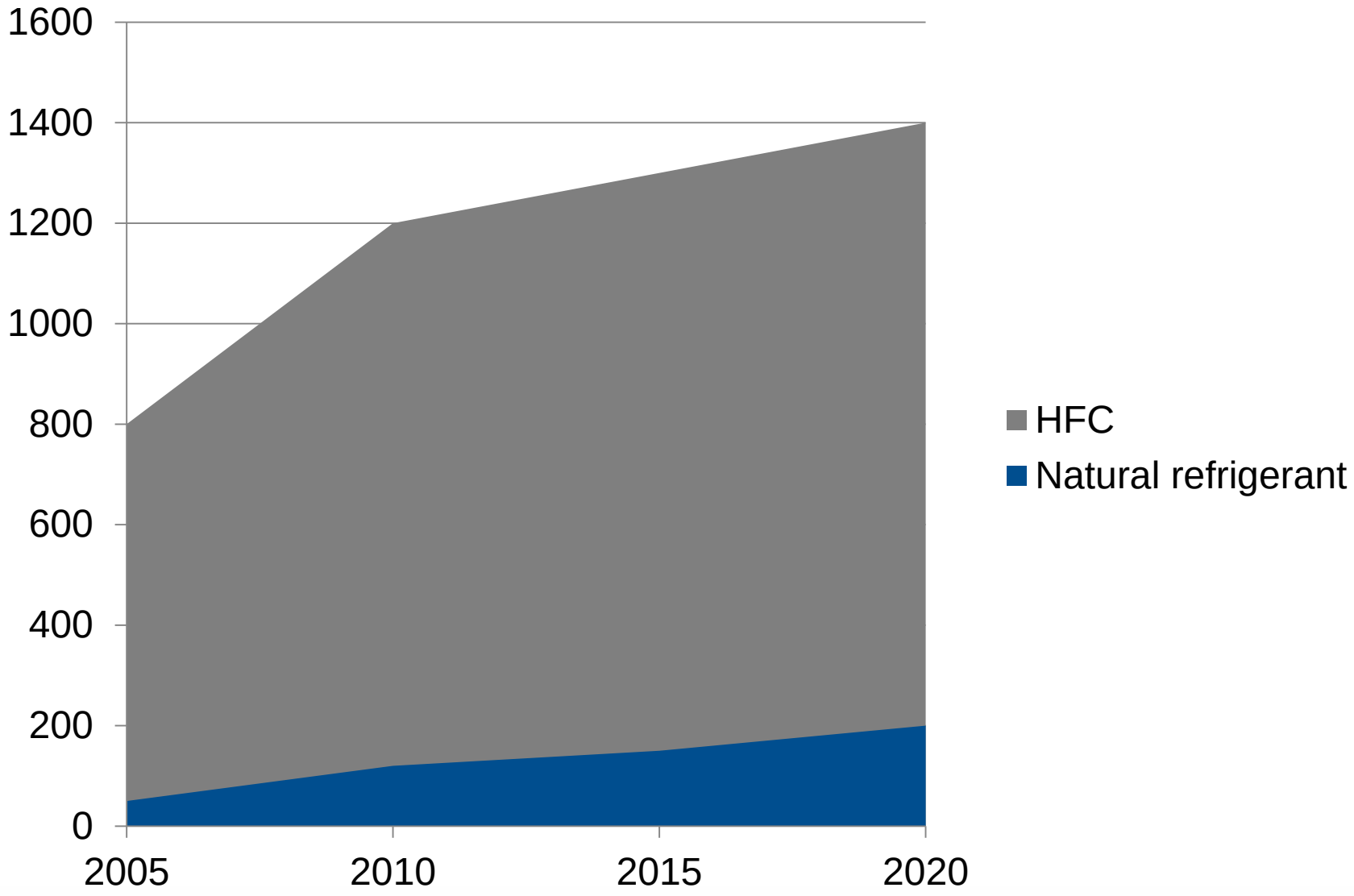
More than 200 reference projects

Ammonia

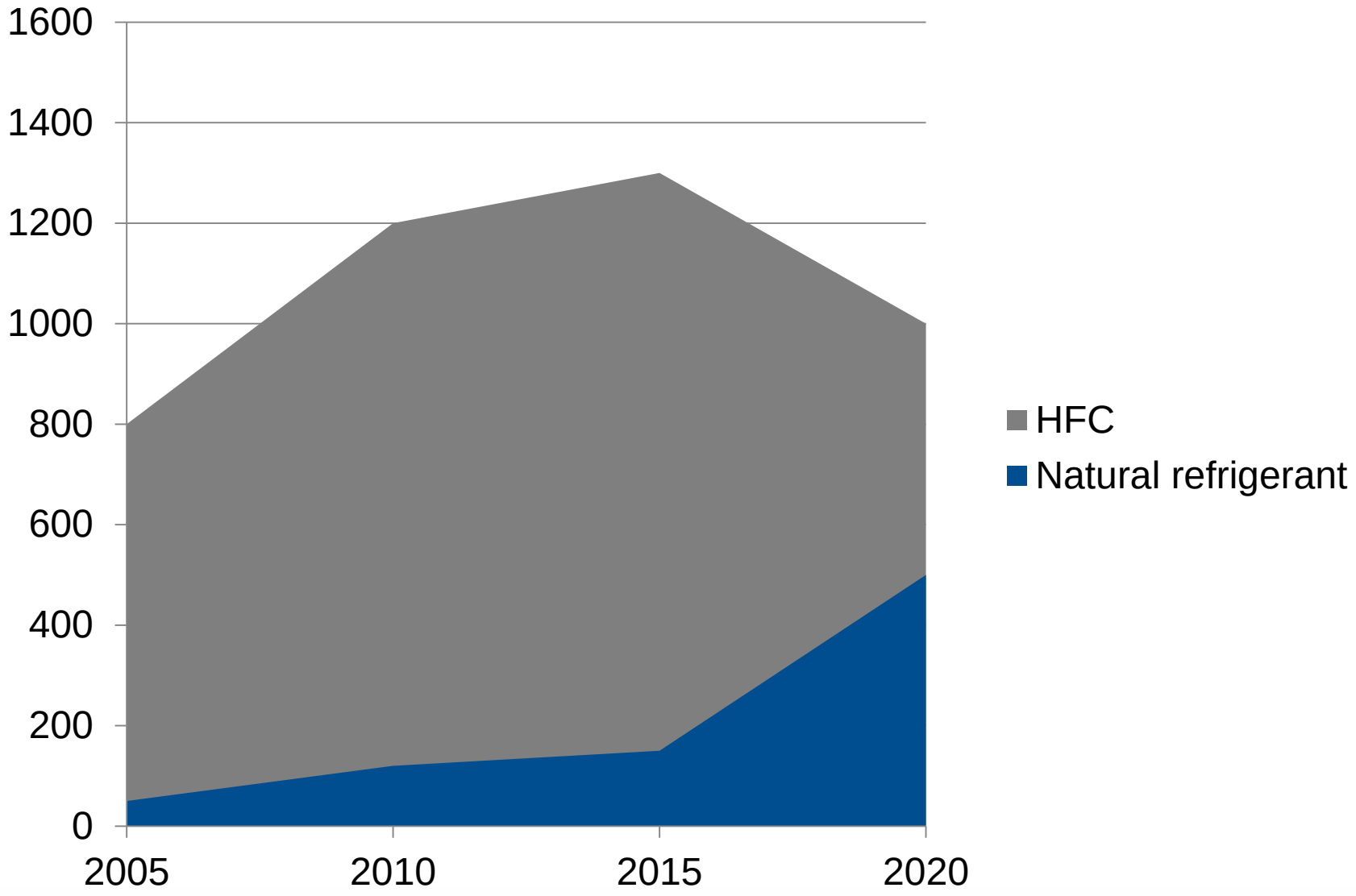
Up to 90^{0}C water

Highest efficiency – Best return of investment

Global industrial heat pump sales (Current projection)

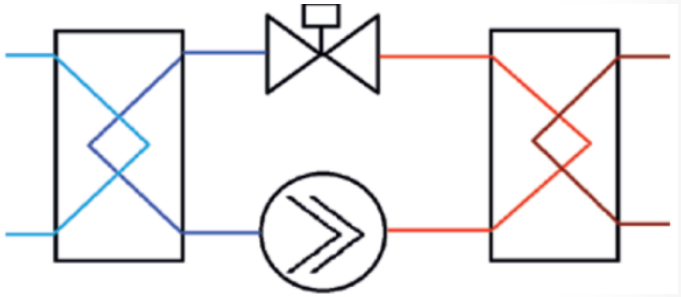


Global industrial heat pump sales (Sustainable projection)



Heat pump range

Water/water screw compressor heat pump



20+ years service life

300 – 15,000 kW heating duty

Low maintenance

High reliability

35°C to 82°C hot water (on request up to 95°C)

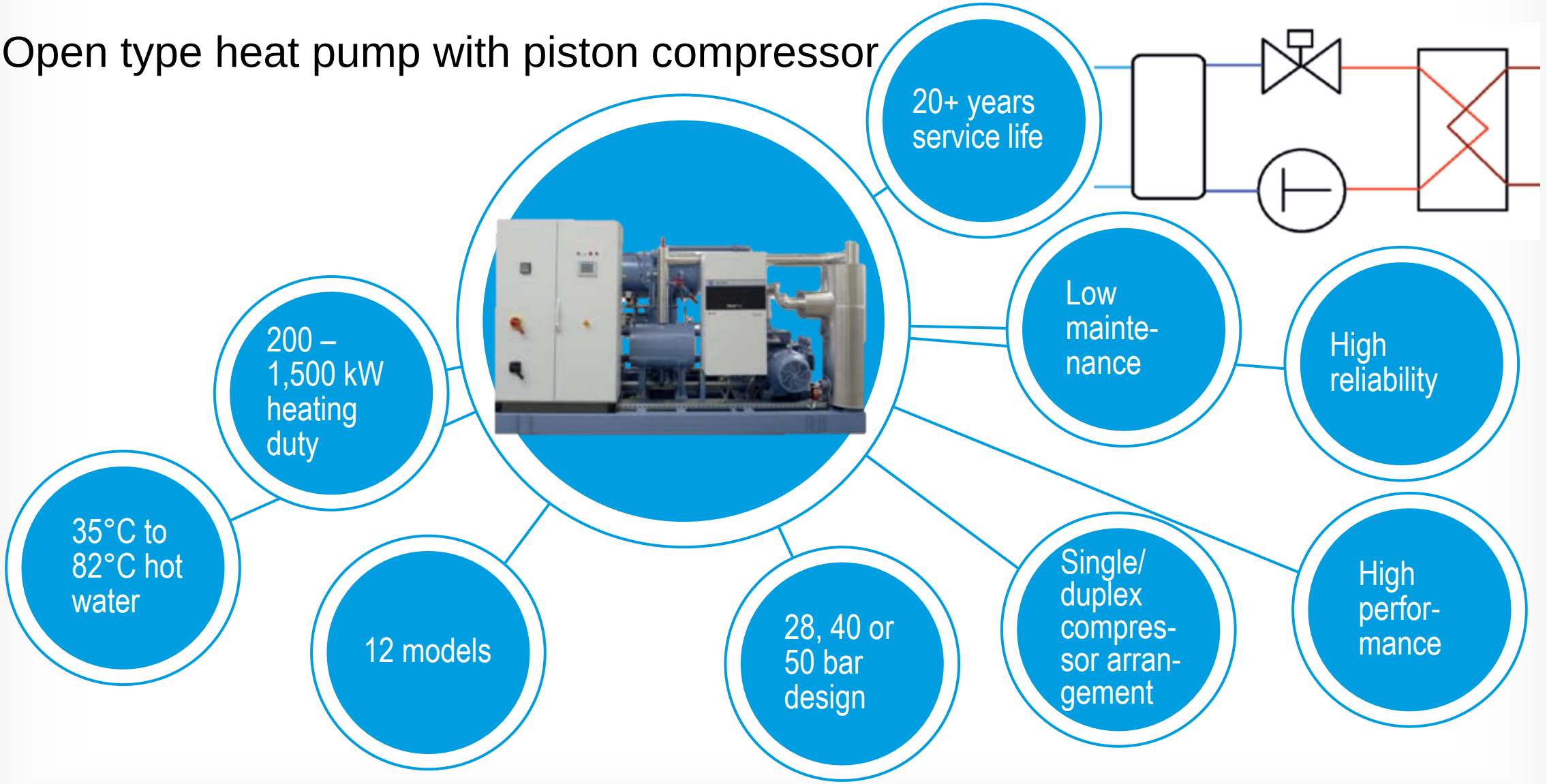
22 models

28, 40, 52 or 63 bar design

High performance

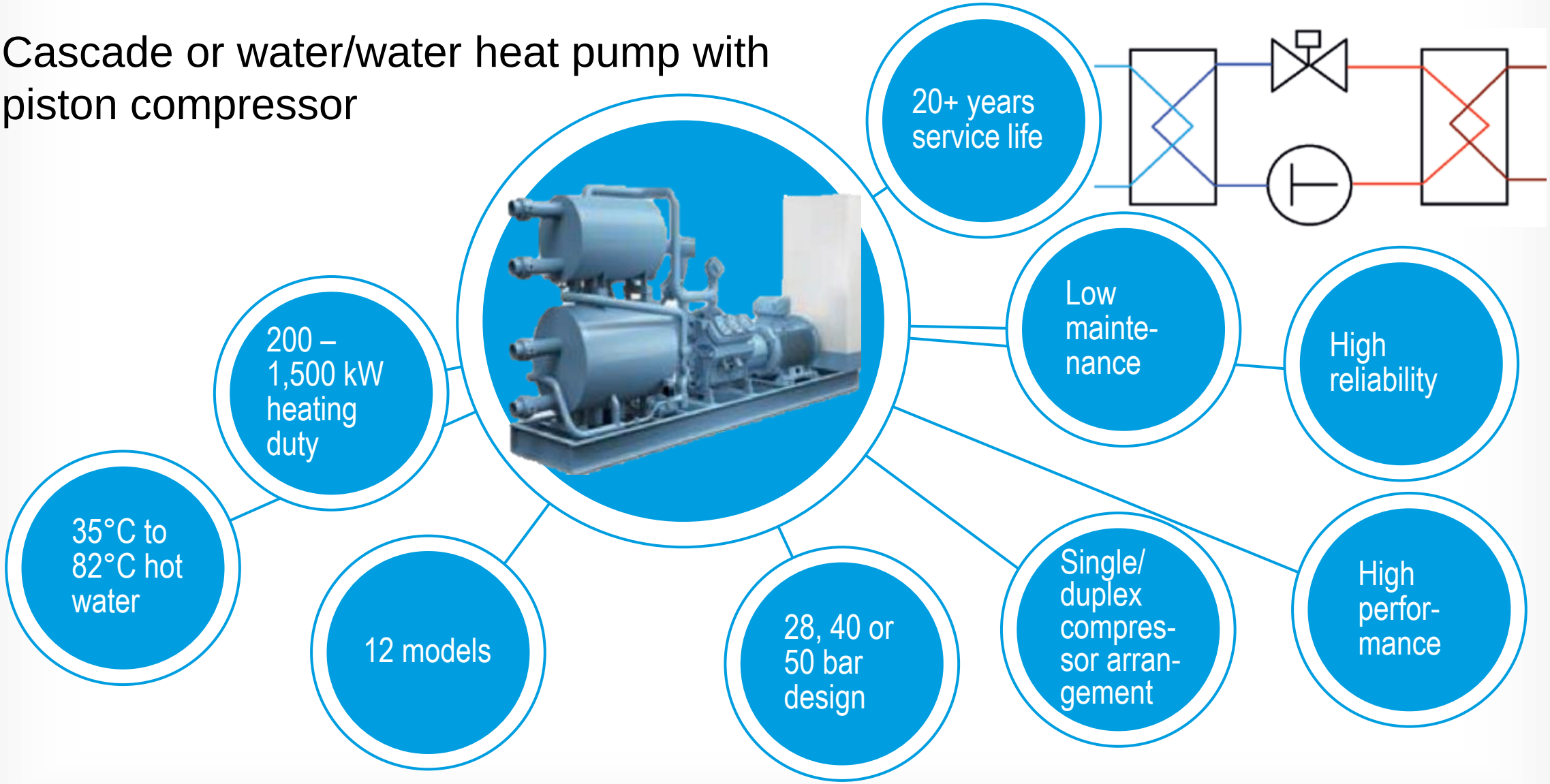
Heat pump range

Open type heat pump with piston compressor



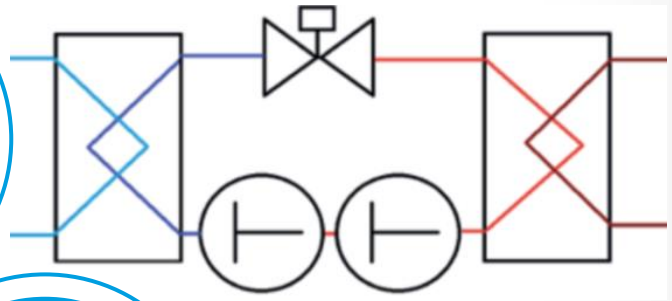
Heat pump range

Cascade or water/water heat pump with piston compressor



Heat pump range

2 stage water/water heat pump with piston compressors



20+ years service life

Low maintenance

High Temperature lift

High performance

Two stage compressor arrangement

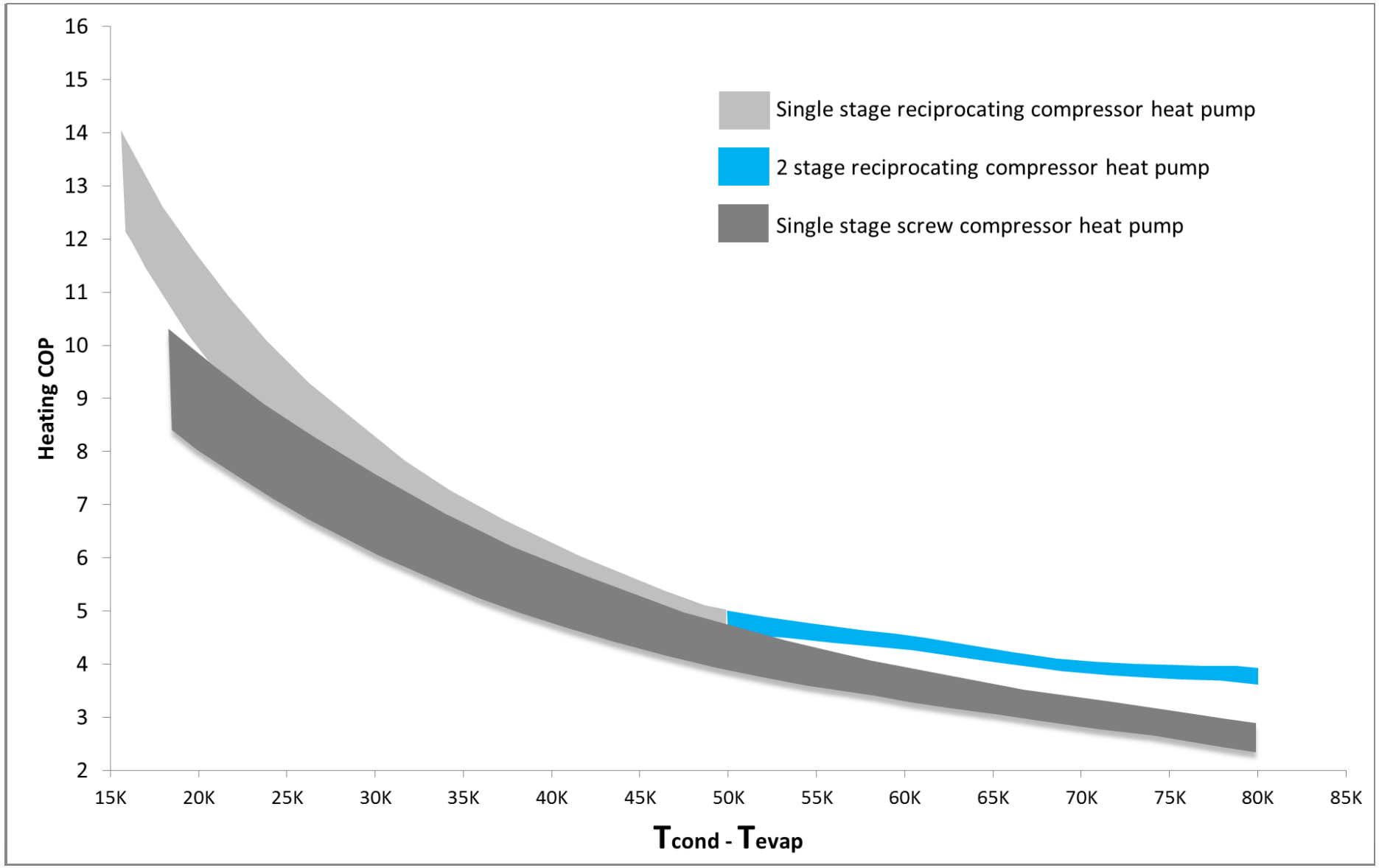
40 or 50 bar design

4 models

400 – 700 kW heating duty

60°C to 82°C hot water

Heat pump performance



2 case stories of heat pump installations

1 CROSS CUTTING TECHNOLOGY

Heat pump in combination with Combined heat and power plant

2 FOOD INDUSTRY

Heat pumps as profit generator in the dairy industry

Case story 1

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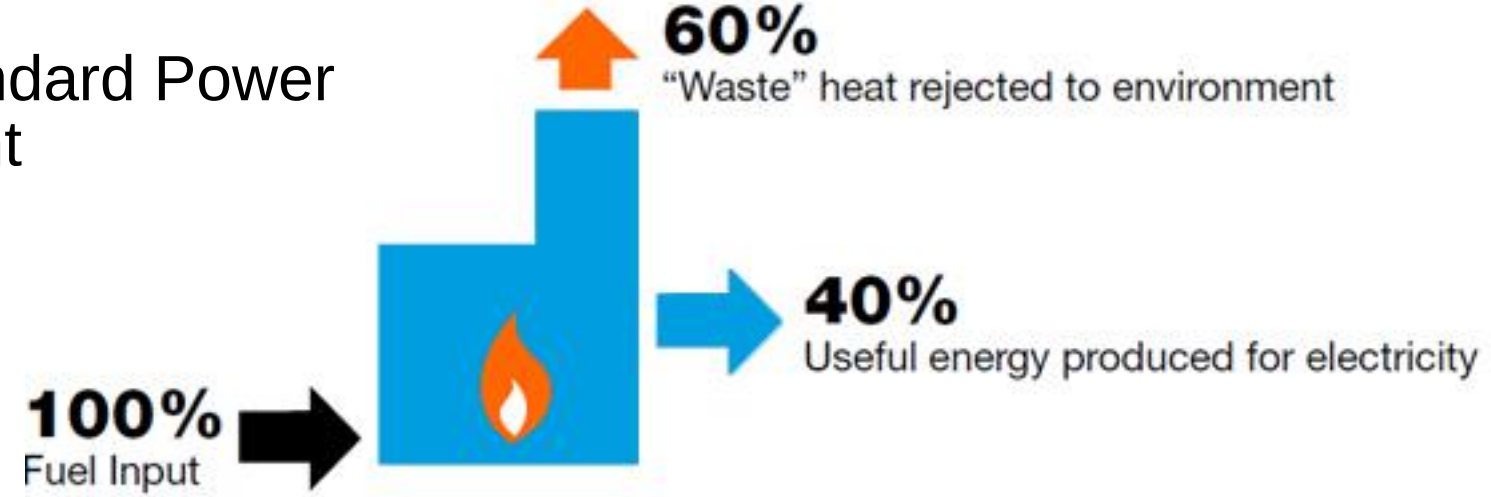
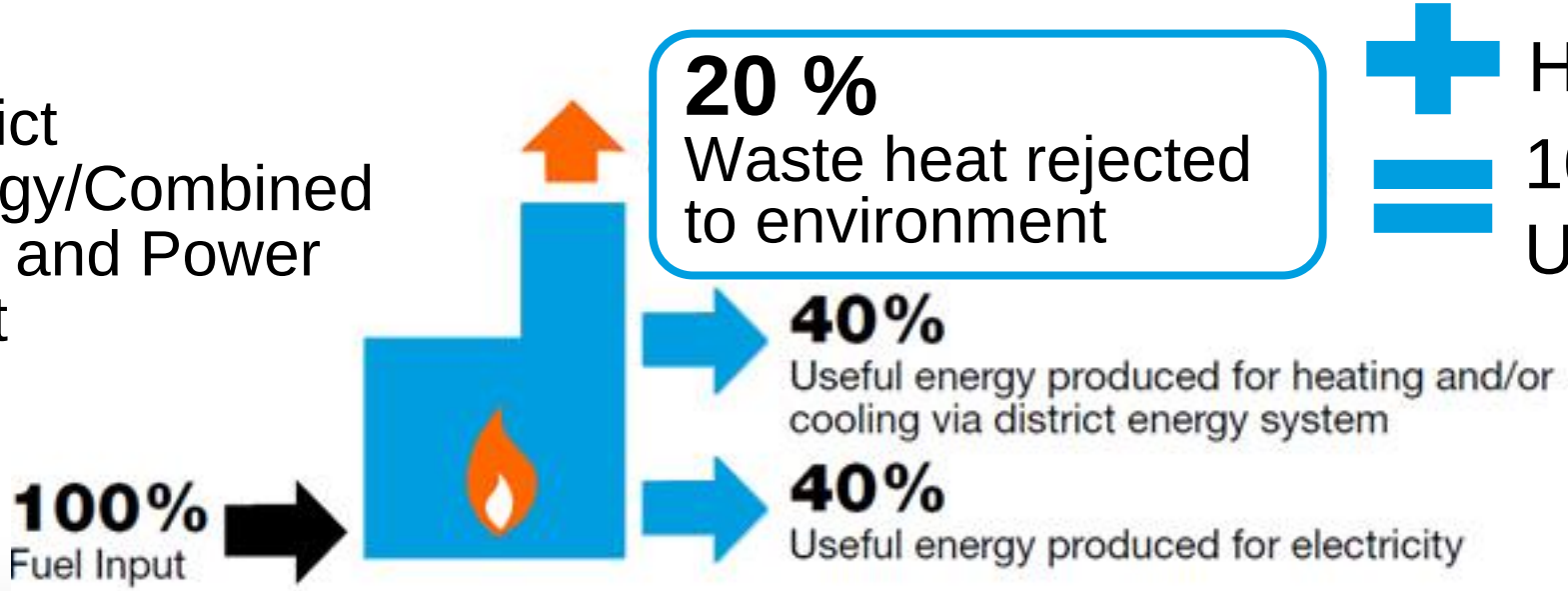
Energy Efficiency Comparison

1 CROSS CUTTING TECHNOLOGY | 2 FOOD INDUSTRY | 3 PROCESS INDUSTRY

Standard Power Plant



District Energy/Combined Heat and Power Plant



Heat Pump

100%

Useful energy

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

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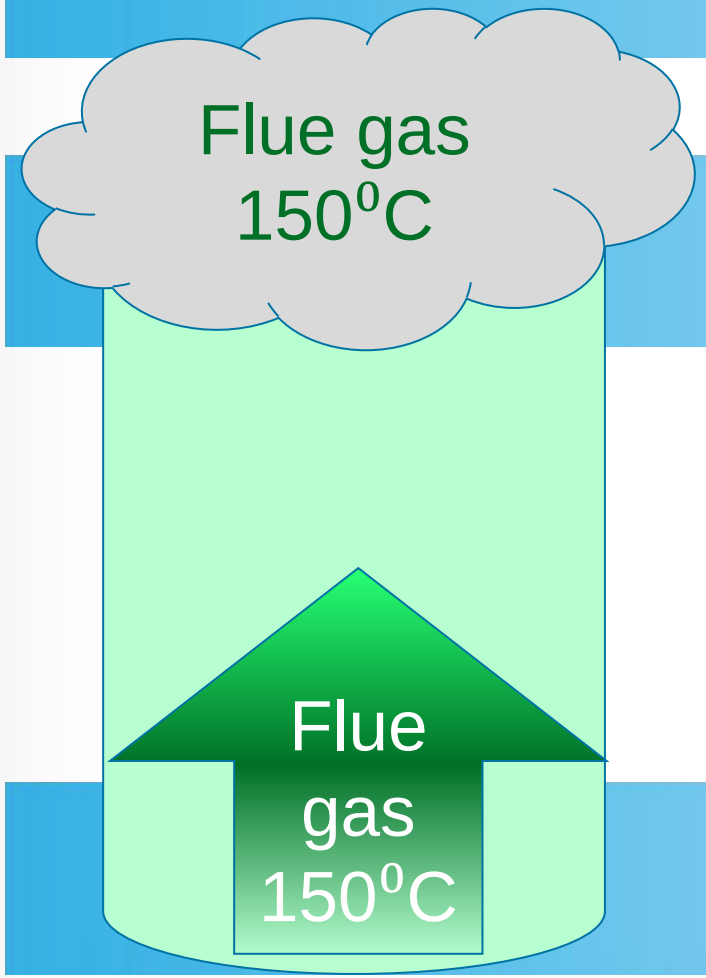
Flue gas condensation

Normal chimney stack from
a fuel burning heating process

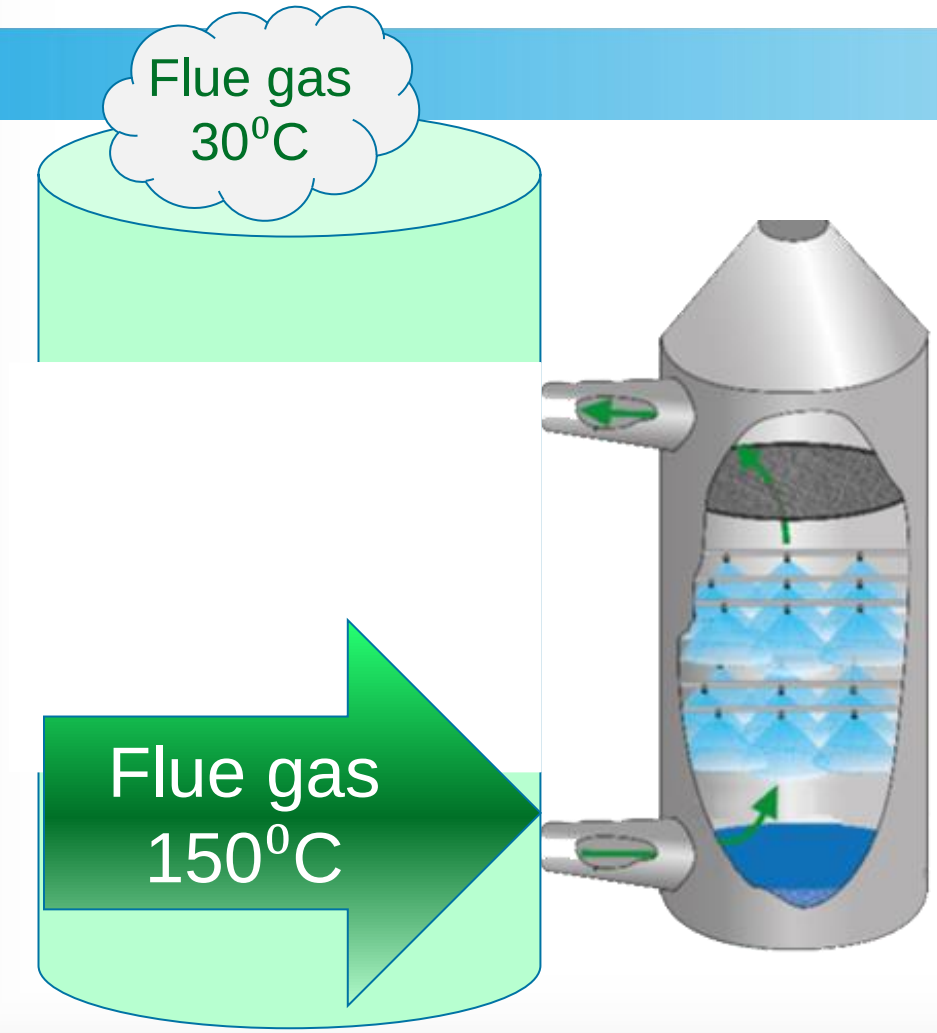


20% Waste heat

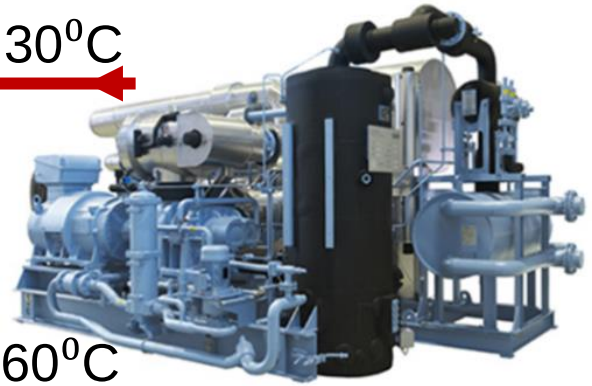
From waste heat to useful heat

Flue gas condensation

Wet scrubber + Heat pump = Useful heat



Water 30°C



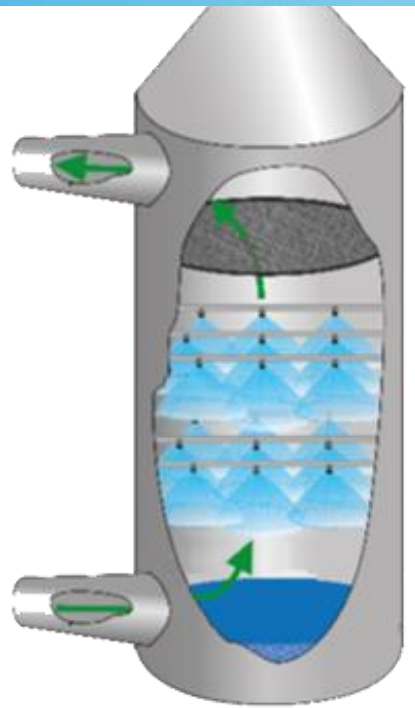
Water 60°C

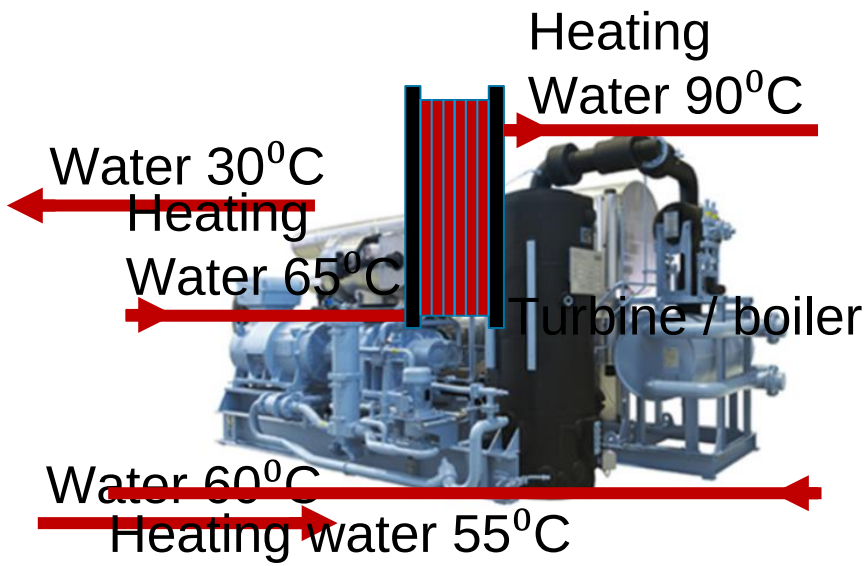
Flue gas condensation

APPLICATION:

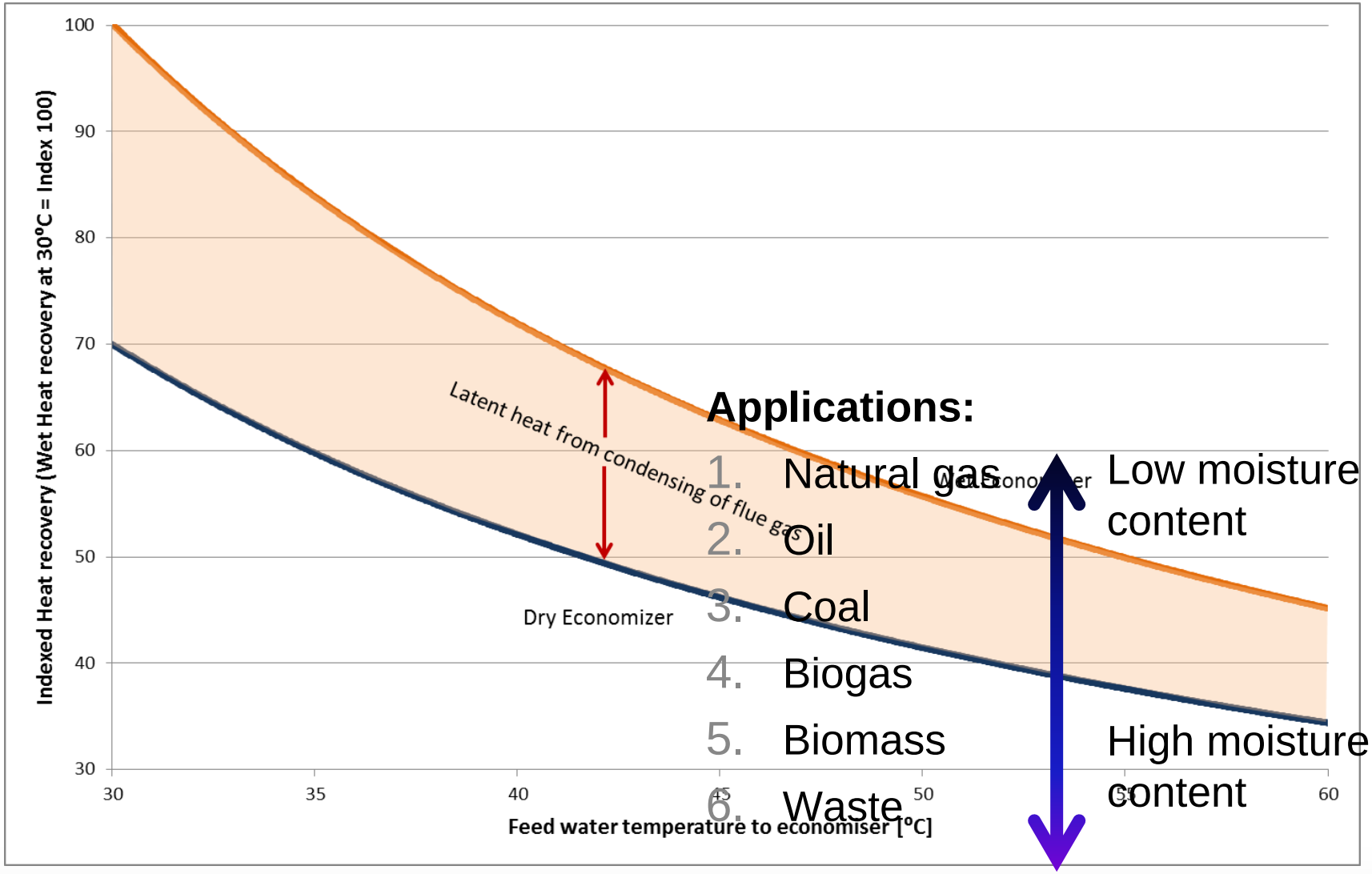
Any heat driven combined heat and power plant

Process heating or district heating





Flue gas condensation



Stockholm 2014

1 CROSS CUTTING TECHNOLOGY	2 FOOD INDUSTRY	3 PROCESS INDUSTRY
80 MW of energy 57 MW heating 7.2 MW of flue gas heat recovery	Less particles in flue gasses Less plume	14% less CO_2 emissions
Chilled water inlet temperature up to 60^0C Hot water outlet temperature up to 72^0C	Heating COP above 6.5	Payback of flue gas cooling with wet scrubber and heat pumps: Less than 3 years

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References for large installations

1 CROSS CUTTING TECHNOLOGY | 2 FOOD INDUSTRY | 3 PROCESS INDUSTRY

Heating duty	Run date	City	Country	Application	Heat source outlet temperature	Heating inlet	Heating outlet
kW		–	–	–	°C	°C	°C
7200	2013	Stockholm	Sweden	Waste incinerator	34	50	60
3080	2012	Sarpsborg	Norway	Biomass	23	60	75
2000	2010	Sarpsborg	Norway	Biomass	30	60	75
2800	2008	Odense	Denmark	Biomass (straw)	30	50	55

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Case story 2

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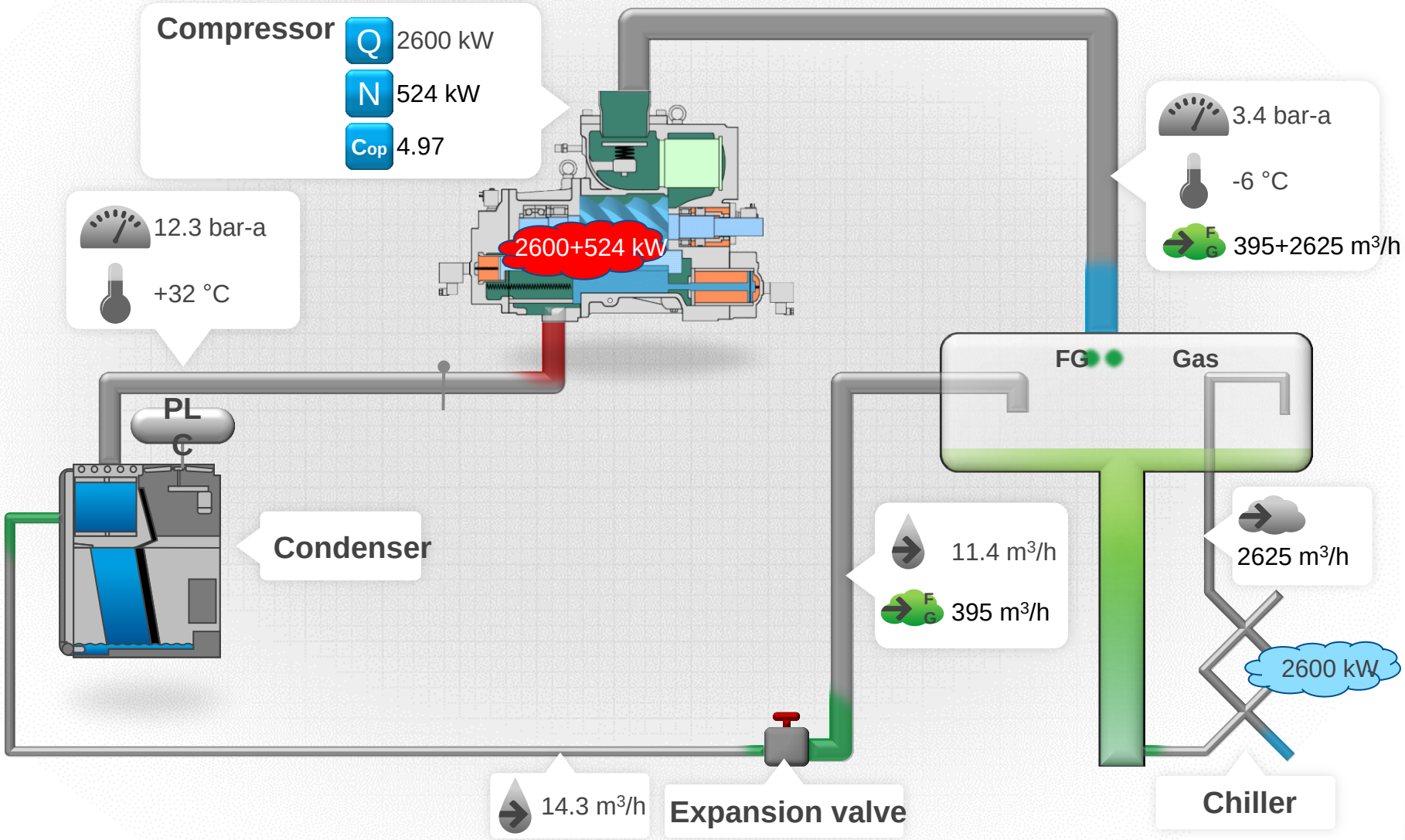
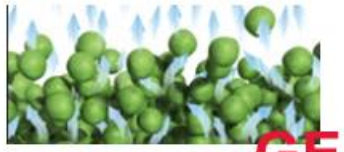
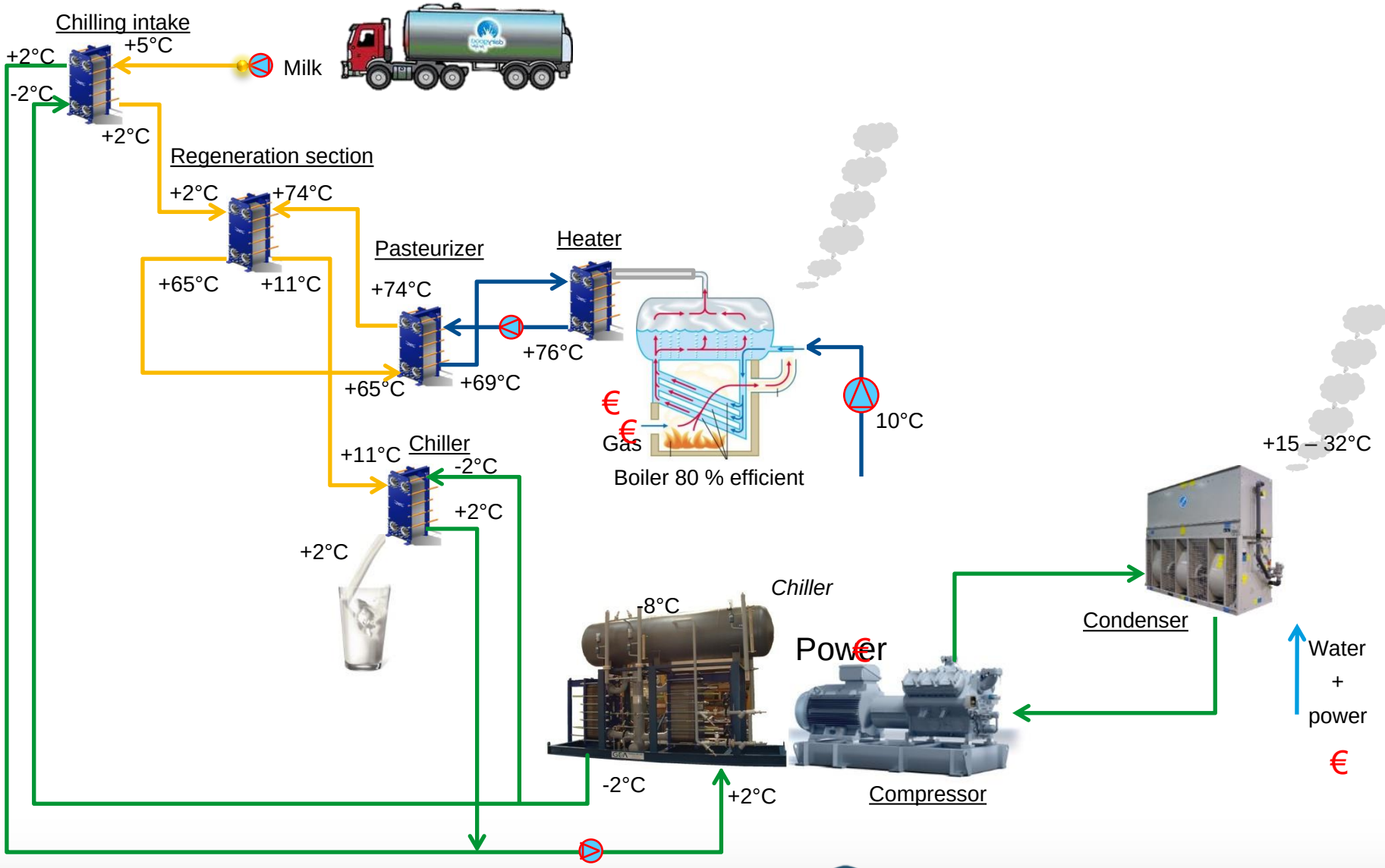


Combined heating and cooling

Poultry	Product Intake +38°C	Evisceration +52°C	Chilling +2°C	Final Product +2°C
			 GEA	
Dairy	Product Intake +2°C	Pasteurisation +74°C	Chilling +2°C	Final Product +2°C
			 GEA	
Vegetables	Product Intake +20°C	Blanching +80°C	Freezing -18°C	Final Product -22°C
			 GEA	

Refrigeration in a dairy



Refrigeration in a dairy

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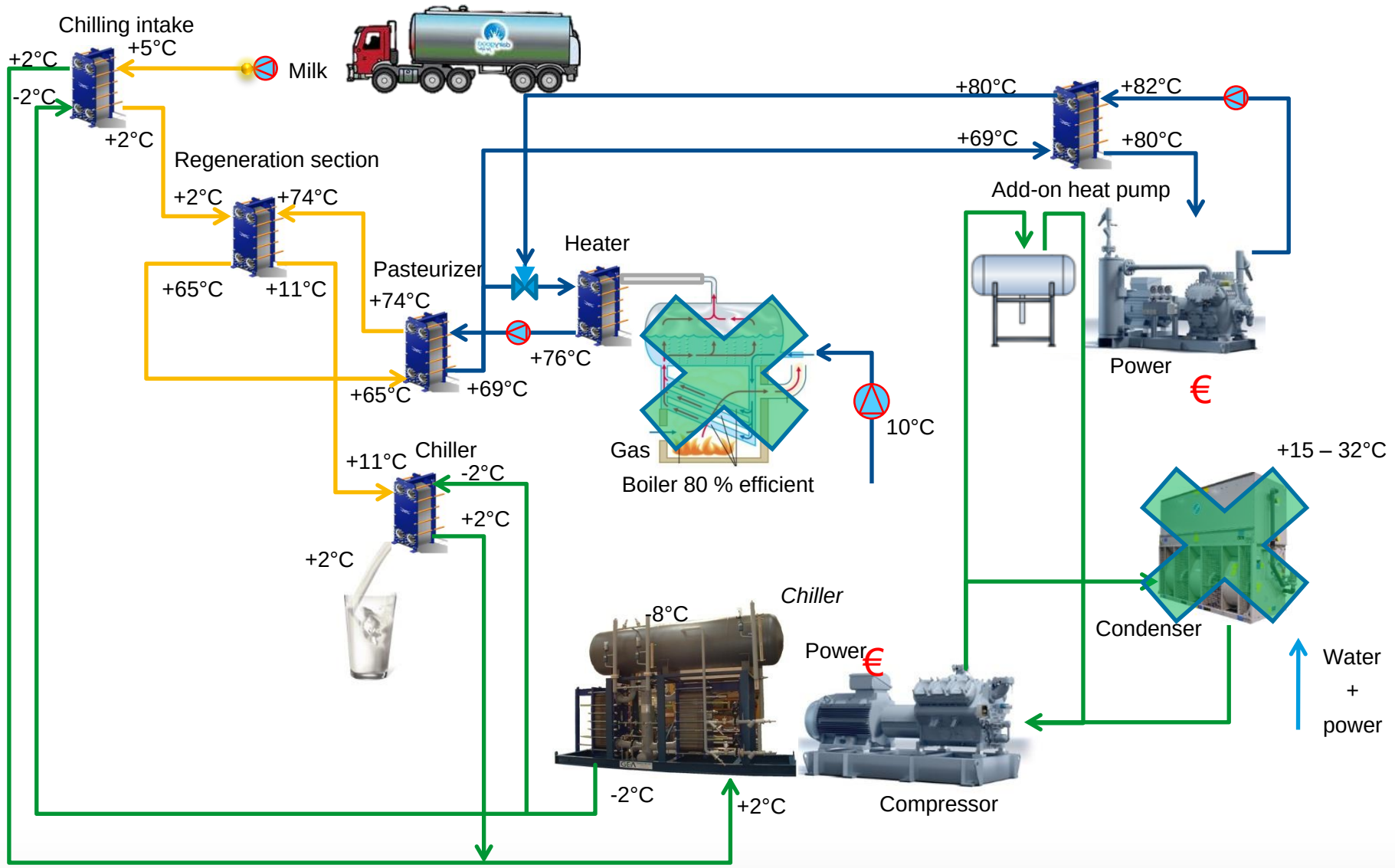
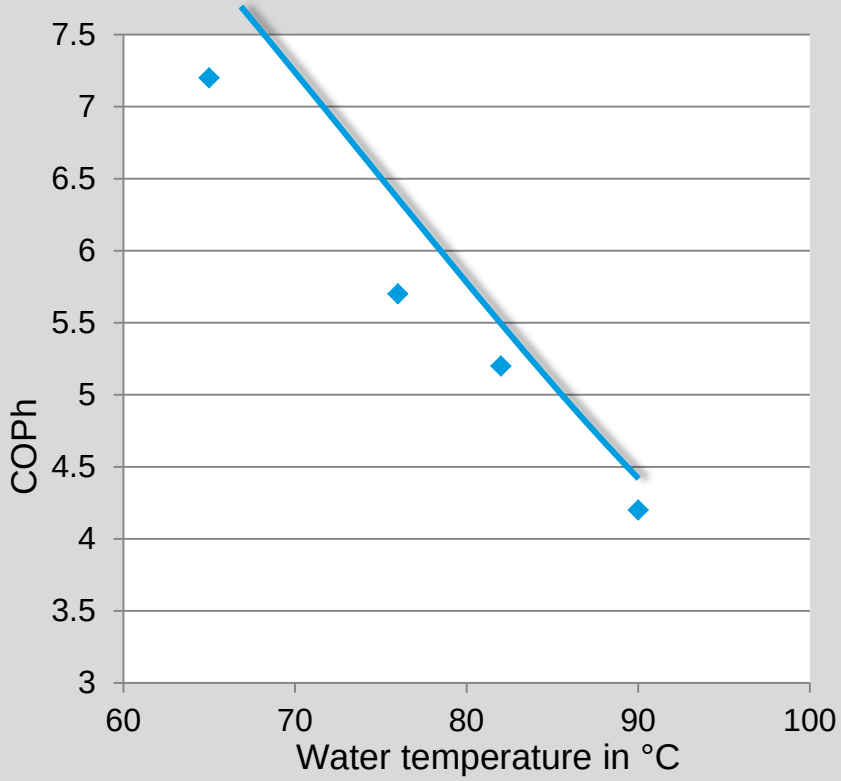


Improved heating performance

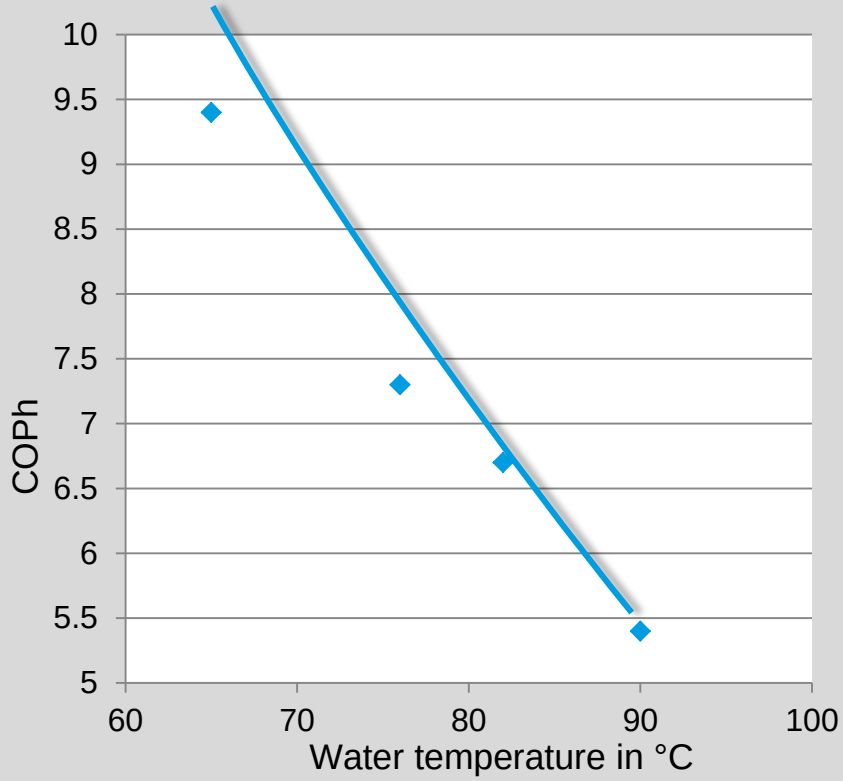
Phase 1

COPh with 10 K water T_d



Phase 2

COPh with 50 K water T_d



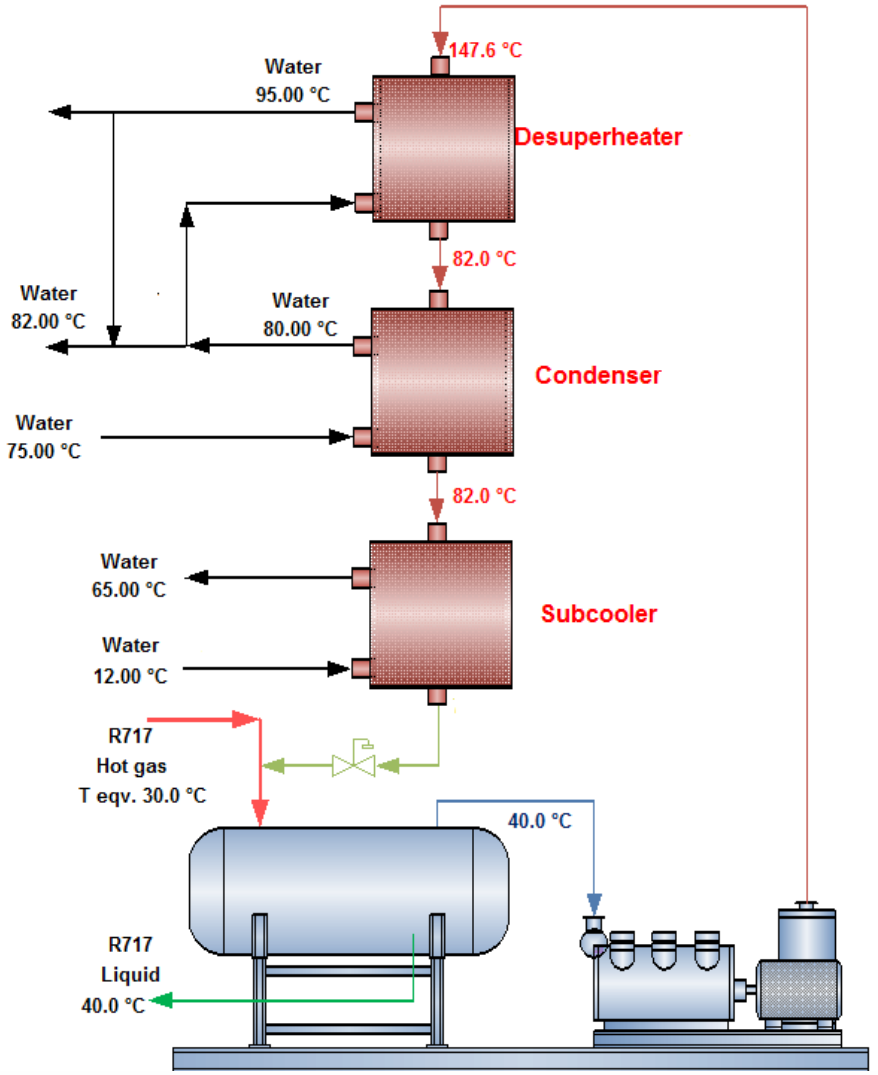
20% performance improvement by adding sub cooler to the heat pump

Multi purpose heat pump

95^{0}C hot water

80 - 82^{0}C water for pasteurization

65^{0}C sanitary hot water



Dairy in the UK

1 CROSS CUTTING TECHNOLOGY	2 FOOD INDUSTRY	3 PROCESS INDUSTRY
Electricity reduction 20% Water consumption reduction 50% Gas usage reduction 60%	Less wear on evaporative condensers More refrigeration capacity	924 kW heating 2600 kW cooling Heating COP of 4.9 1 kW el = 4.9 kW heat
Hot supply water at 82^{0}C Refrigeration plant condensing 24^{0}C - 30^{0}C	€220,000 saved on energy bill per year.	1200 tons of CO2 savings per year

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