Oilon ChillHeat Industrial Heat Pumps and Chillers

Jussi Alpua
Oilon Oy

OILON Briefly

- Founded in 1961, private-owned company
- Chairperson of the Board : Päivi Leiwo
- CEO: Tero Tulokas
- Turnover: 70 million euros
- Employees 360
- We manufacture and sell
  - Burners and combustion systems for liquid and gaseous fuels in the capacity range of 10 kW – 90 MW
  - Industrial heat pumps and chillers 30 kW – 5000 kW
  - Ground source heat pumps for heating houses 4 kW – 96 kW
- Our products are used in
  - power plants, waste incineration, marine boilers, district heating plants, for heating or cooling large buildings and facilities, and for heating private houses.

Oilon Dealers and Companies

Oilon Factories


LAHTI, FINLAND


KOKKOLA, FINLAND

WUXI, CHINA

THOMASVILLE, USA

St. PETERSBURG, RUSSIA

OILON Products

Ground source heat pumps 4 kW – 96kW

Industrial heat pumps and chillers 30 kW - 5000 kW

Burners 10 kW – 90 MW

OILON AROUND THE GLOBE

EREMITAGE// RUSSIA

CMA CGM MARCO POLO //
UNITED KINGDOM

MOSCOW CIRCUS// RUSSIA

TATE MODERN //
UNITED KINGDOM

DA VINCI'S BIRTHPLACE // ITALY

GARDEN BY THE BAY // SINGAPORE

BEIJING AEROSPACE CONTROL
CENTRE // CHINA

OILON ChillHeat Industrial heat pumps and chillers

Heat pump basics
Product family
Applications
References

OILON ChillHeat Industrial heat pumps and chillers

Heat pump basics

Product family

Applications

References

Introduction

- There are large amounts of energy stored in cold temperature sources
  - Ground
  - Lakes and rivers
  - Air (even in winter)
  - Waste heat of process
- Heat can transfer spontaneously only from hot to cold
- However, with the help of external work, heat can be transferred from cold to hot

Heat Pump basics

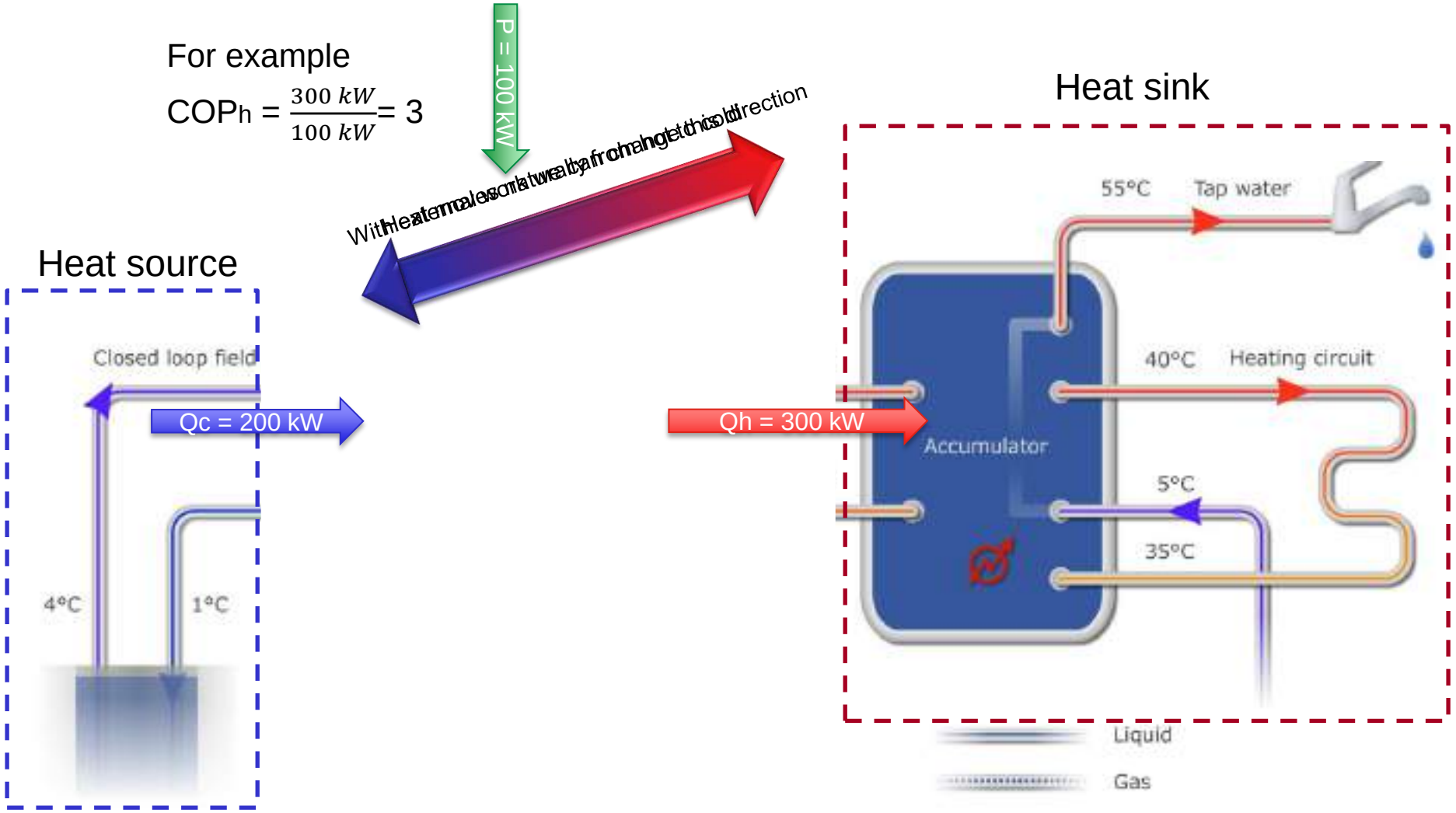
- The purpose of a heat pump:
  - Transfer heat from a cold source to a hot sink

- Efficiency is greater than with direct electrical heating
  - Coefficient of Performance (COP): $\frac{heating\ provided}{electricity\ used}$

Heat Pump basics

For example

$$COP_h = \frac{300\ kW}{100\ kW} = 3$$



OILON ChillHeat Industrial heat pumps and chillers

Heat pump basics

Product family

Applications

References

Models

	P-series	S-series	RE-series
Model	P30, P60, P100, P150, P220, P300, P380, P450	S180, S280, S380, S490, S600, S800, S1000, S1200, S1500, S2000	RE210, RE330, RE420
Compressor type	Piston	Screw	Scroll
Refrigerant	R134a, R450A, R1234ze	R134a, R450A, R1234ze	R410A

Standard factory made units

- ✓ 3 standard sizes with acoustic enclosure
  - ✓ P-, RE-series and S-series up to S490



- ✓ Two screw units S600-S2000



Options for standard units

- ✓ **Optimal efficiency**
  - Subcooler or economiser (S-series) for highest efficiency
  - Desuperheater for high temperatures
- ✓ **Variable frequency drives (S and P-series)**
  - Higher capacity
  - Precise control
- ✓ **Energy measurement system**
  - Energy metering
  - COP
- ✓ **Different refrigeration s (S and P-series)**
  - Higher temperature
  - Lower GWP-value

Abbreviations in the product names

blue marked are options

S490 SU DS AD LI HC VFDx1 R1234ze

Optional refrigerant for P- and S-series
R134a = no abbreviation
Options R450a & R1234ze

Only S-series
AD = Additional cooling
LI = Liquid injection

DS = **Des**uperheater

For P- and Series
VFDx1=One compressor with **V**ariable **f**requency **d**rive
VFDx2=Two compressors with **V**ariable **f**requency **d**rive

SU= **Su**bcooler
ECO= **Eco**nomizer (only for S-series)

Nominal heating capacity in EN14511 0/35°C conditions)

Heat exchanger set
Standard = no abbreviation
MC = **M**edium **c**apacity
HC = **H**igh **c**apacity
HC+ = Extra **h**igh **c**apacity

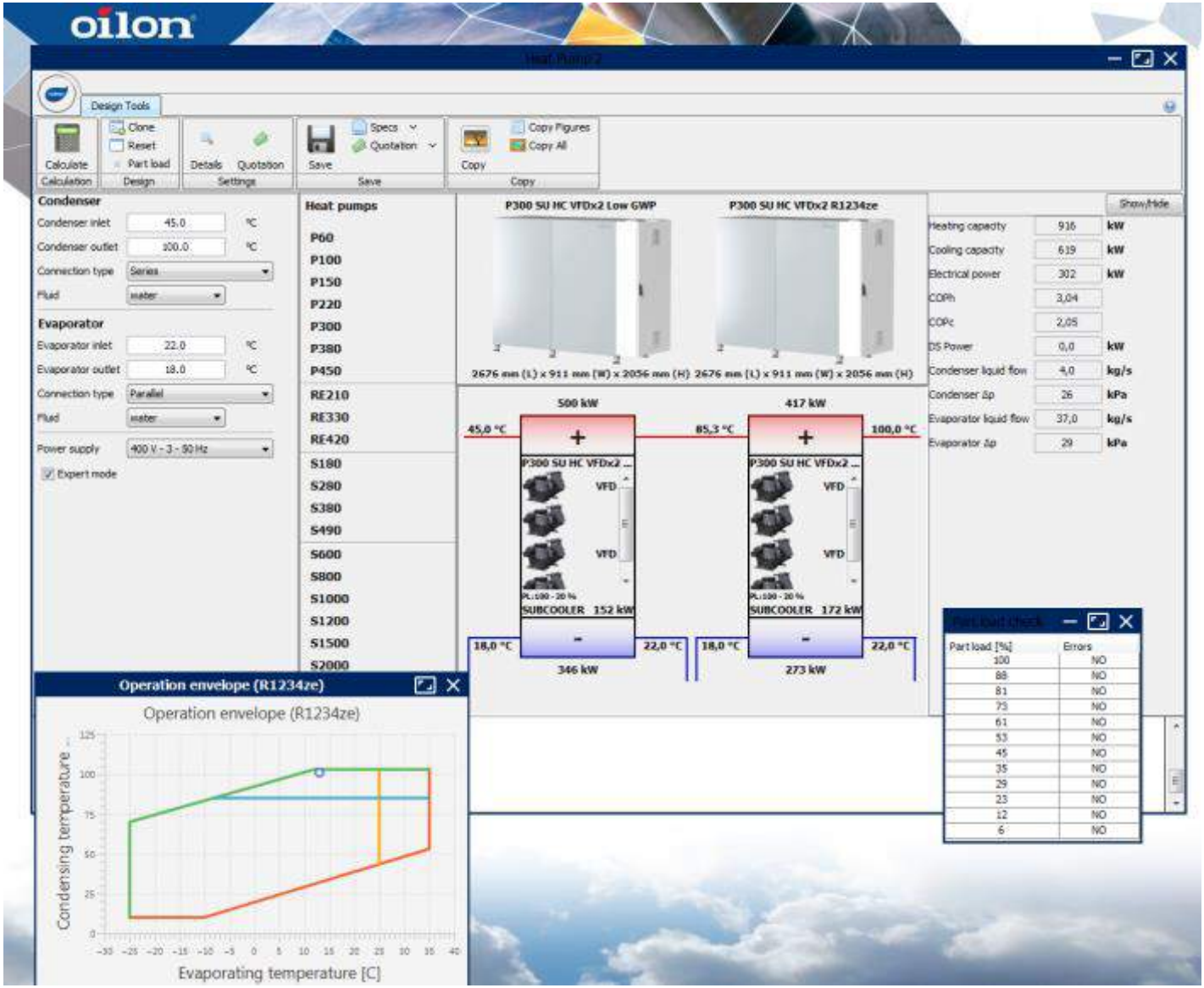
P = **P**iston
S = **S**crew
RE= **R**eal **e**state (scroll)

Oilon Selection Tool

Product selection and system design for

- Heat pumps
- GSHP
- Burners

Requests for free license :
selection.tool@oilon.com
Download:
https://oilon.com/oilon-selection-tool/



Oilon Global Monitor

- Remote monitoring of one or several ChillHeat heat pumps or the whole system .
- The client must organize an internet connection with a cable or mobile connection.
- Versatile and visual reporting and comprehensive trend monitoring.
- Operations support and optimization as a remote service to destinations around the world.
- High usability, minimizing maintenance costs and downtime

Oilon ChillHeat overall

- ✓ Compact and easy-to-maintenance design
- ✓ Electrical cabin & comprehensive automation
- ✓ Factory acceptance test (FAT) including test run in test-bench for each delivery prior to shipment
- ✓ Oilon Global Monitor remote service (Tosibox included)

➢ Key features

- High efficiency
- High temperatures
- Flexible automation
- Good part load
- Multiple refrigerant options
- Compact size
- Sound proofing enclosure for low noise
- Low vibration

OILON ChillHeat Industrial heat pumps and chillers

Heat pump basics
Product family
Applications
References

Applications

- **Large real estates**
  - Ground source heat pump
  - Air-conditioning
- **District heating and cooling**
  - Combined cooling and district heating
  - District heating
- **Industry**
  - Waste heat recovery
  - Process cooling and heating
  - High temperature process heating

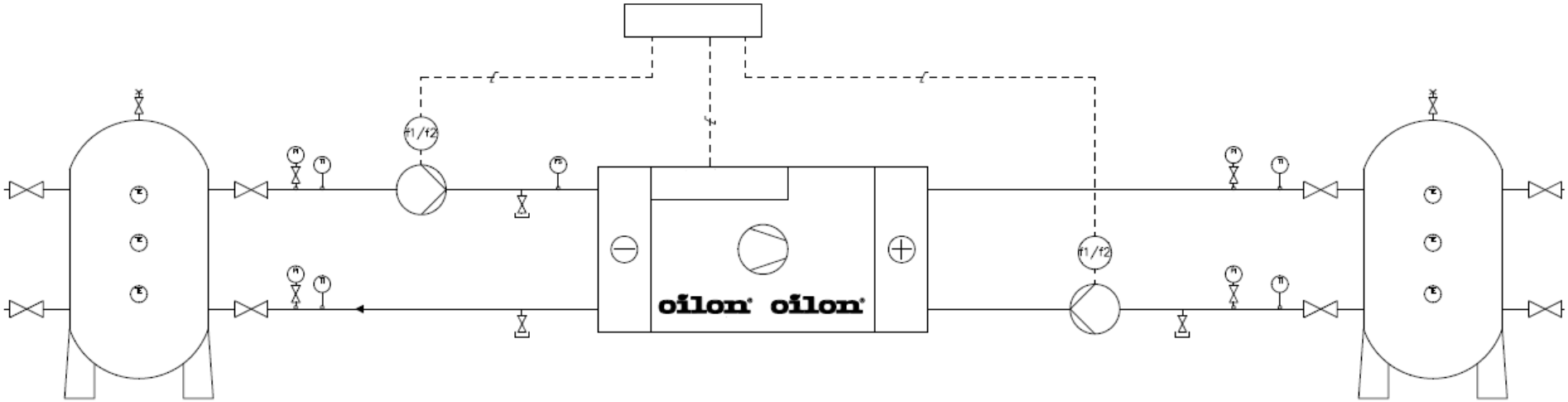
Temperature range
-20°C / 120°C
for produced cold / hot liquid

Practical range of application from
30 kW up to 10 000 kW
in terms of cooling and/or heating power

Real Estate, Hybrid Solution

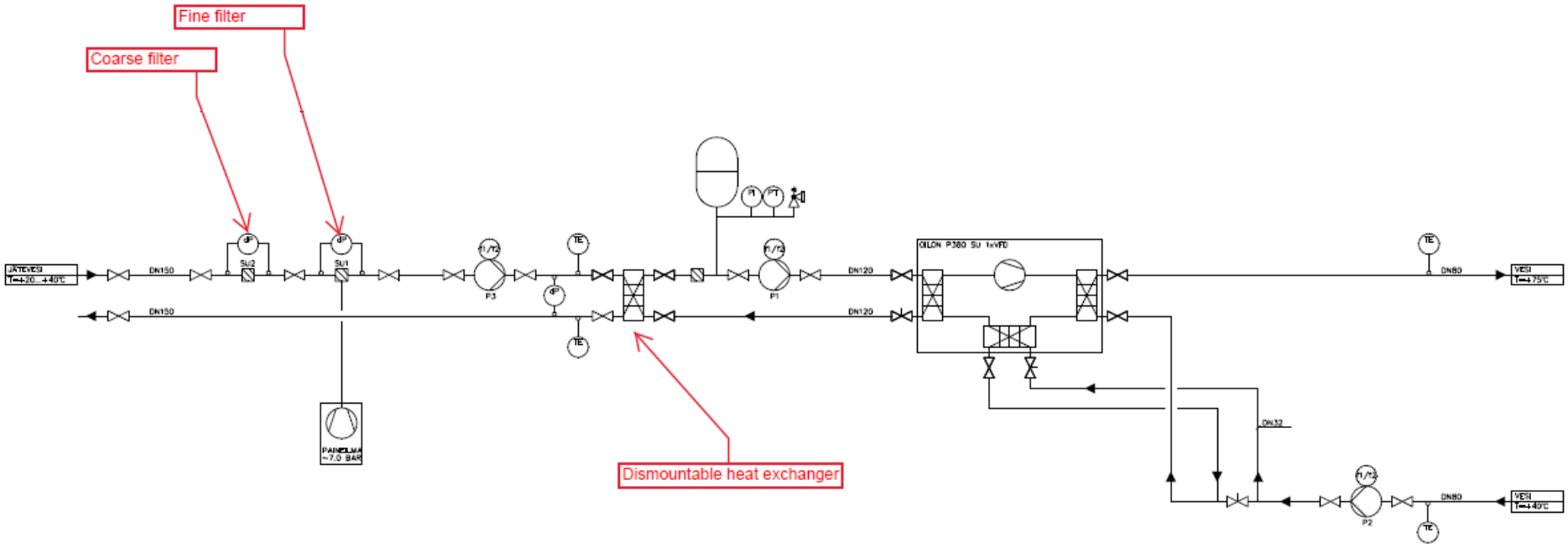
Simultaneous cooling and heating

- This will gives the best COP value ($COP_h + COP_c = COP_{tot}$)
- Buffer tanks will help balance the system running
- In ChillHeat automation you can give set point for both heating and cooling temperature

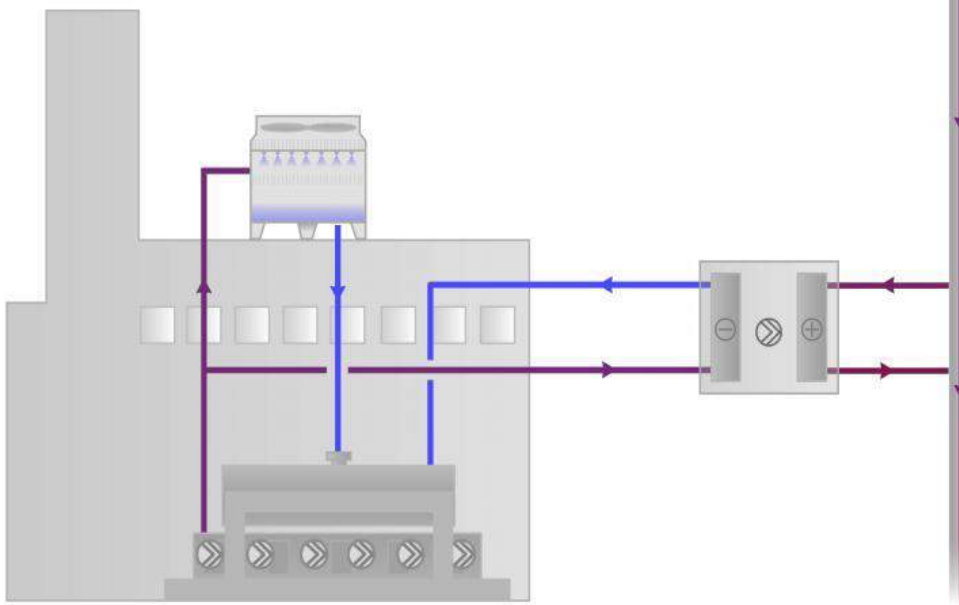


Heat recovery at waste water

- Purified waste water is usually ok to use
- **Avoid dirty waste water cases**



Heat recovery at refrigeration plant



recovery at refrigeration plants
(ammonia, HFC, CO_2)

120 °C Heat pump technology

New technology now available for ChillHeat P-series

- Maximum temperature of heated water 120 °C
- Future proof refrigerant GWP 1
- Safety class A1

Example connection for booster heat pump system utilizing DH return water for new or existing customers

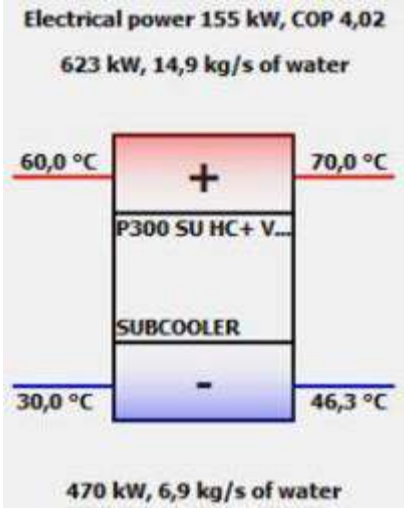
- Heat load 1.7 MW (From 45 to 110 °C)
- Electricity for HP 424 kW
- COPh 4.0
- 2 x ChillHeat P450 heat pumps

OILON ChillHeat Industrial heat pumps and chillers

Heat pump basics
Product family
Applications
References

Copenhagen Airport (CPH), Denmark

- Heat source: Exhaust gas from natural gas boiler (intermediate water circuit)
- Heat sink: Local heating network
- Water temperatures (cooling/heating): 30/70
- COP: 4,0
- 1 pc. Oilon ChillHeat P300 SU HC+ VFDx2 R1234ze

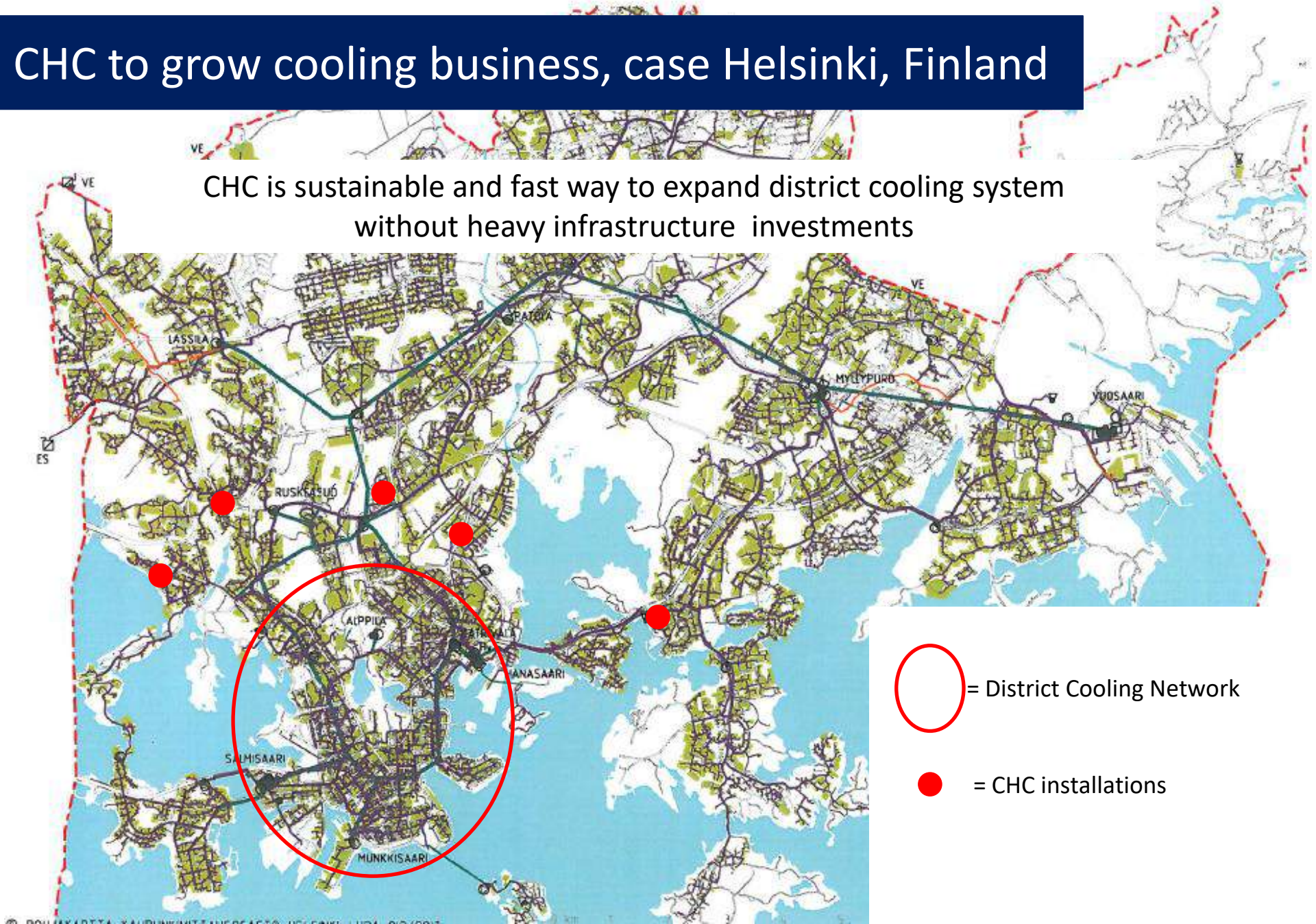


Montevideo Airport (MVD), Uruguay

- Heat source: Airport water cooling network and outside air
- Cooling capacity: 625 kW
- Heating capacity: 915 kW
  - Heat sink: Airport heating network
- Water temperatures (cooling/heating): 7/65 ºC
- ChillHeat heat pumps
  - 2 pcs. P380 SU

CHC to grow cooling business, case Helsinki, Finland

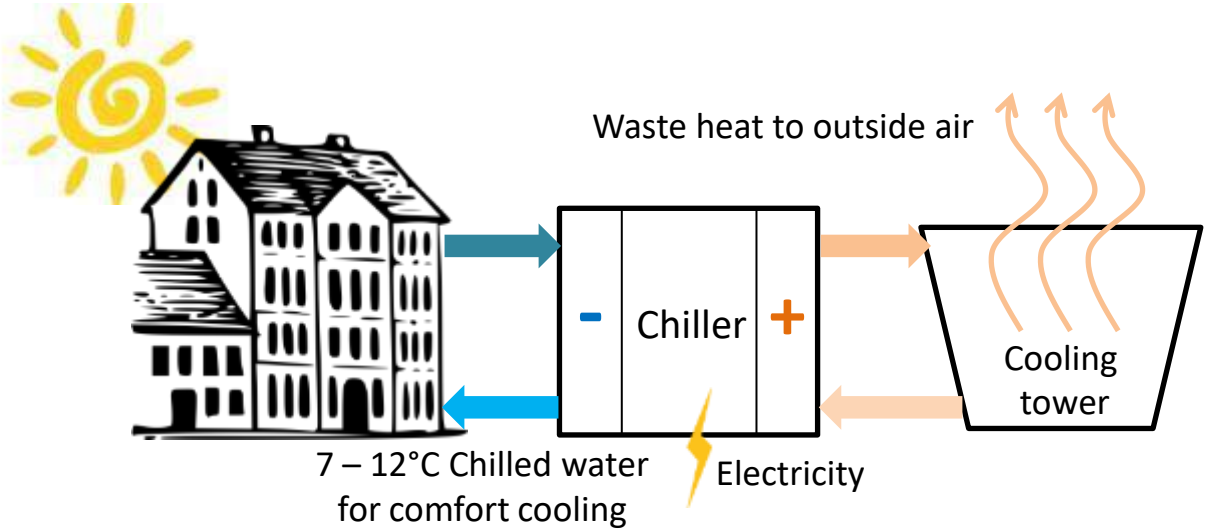
CHC is sustainable and fast way to expand district cooling system without heavy infrastructure investments



CHC – Concept description

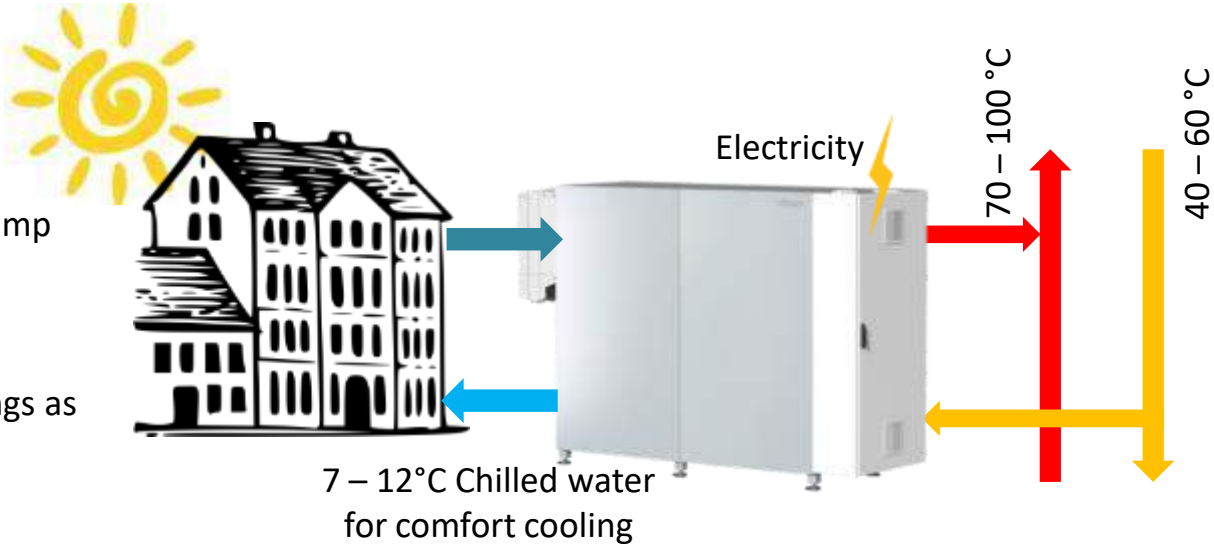
Traditional cooling process

- The low grade heat from the cooling process is wasted
- Expected COP 3.5 - 5



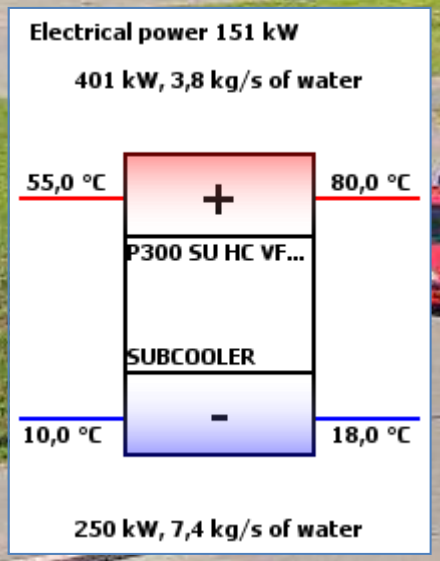
CHC concept

- Heat from cooling process is recovered to DHN with heat pump
- $COP_{combined}$ 4 – 7
- Scale:
  - 20 kW (block of flat) to
  - several MW large buildings as commercial centers and hospitals.



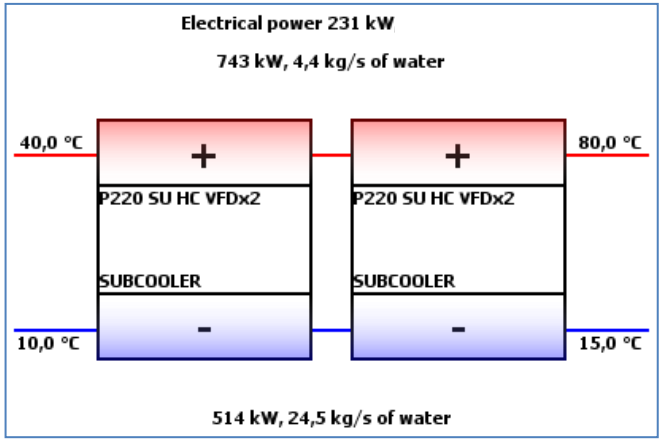
CHC: Fire station, Finland

- Heat source: Fire station cooling
- Cooling capacity: **250 kW**
- Heating capacity: **400 kW**
  - Heat sink: District heating network
- Water temperatures (cooling/heating): **10 ºC /80 ºC**
- ChillHeat heat pumps
  - **P300 SU MC VFDx2**
- COPcombined **4.3**



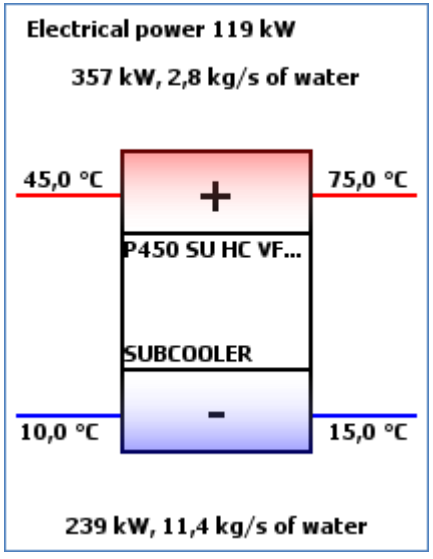
CHC: Supermarket, Finland

- Heat source: Space cooling and condensing of refrigerant system
- Cooling capacity: **514 kW**
- Heating capacity: **743 kW**
  - Heat sink: District heating network
- Water temperatures (cooling/heating): **10 °C / 80 °C**
- ChillHeat heat pumps
  - **2 pcs. P220 SU HC VFDx2**
- $COP_{combined}$ 5.4



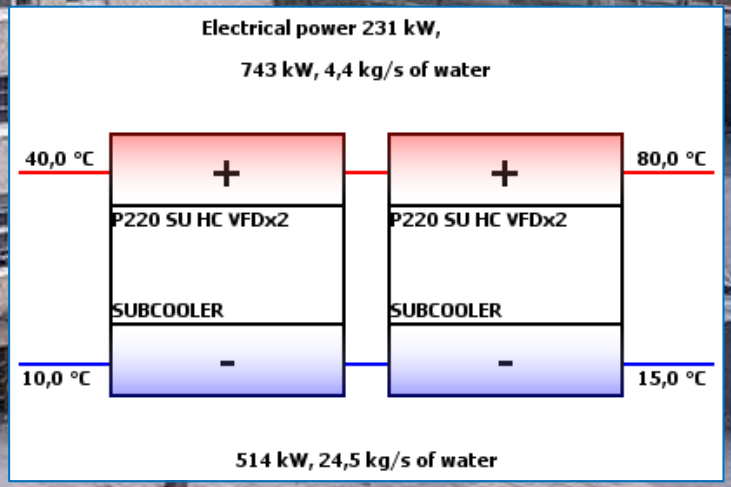
CHC: Office building, Finland

- Heat source: Space cooling
- Cooling capacity: **239 kW**
  - Reserve to 640 kW (with same heat pump)
- Heating capacity: **357 kW**
  - Heat sink: District heating network
- Water temperatures (cooling/heating): **10 °C / 75 °C**
- ChillHeat heat pumps
  - **P450 SU HC VFDx2**
- $COP_{combined}$ **5.0**



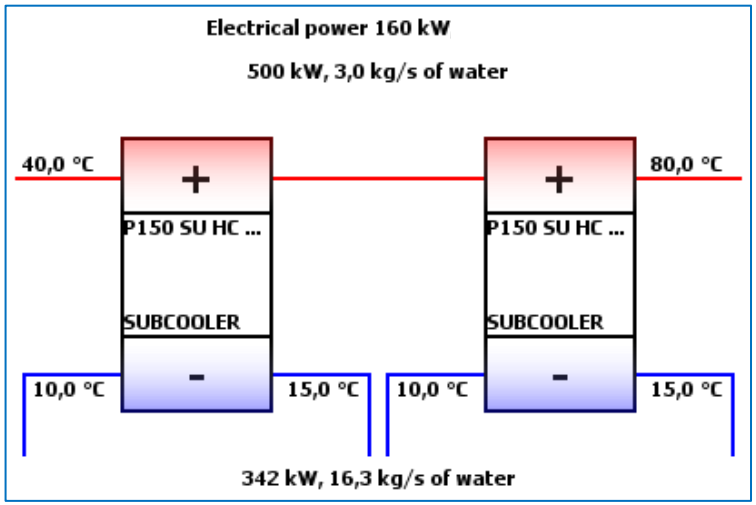
CHC: University, Finland

- Heat source: Space cooling
- Cooling capacity: 514 kW
  - Reserve to 1000 kW
- Heating capacity: 743 kW
  - Heat sink: District heating network
- Water temperatures (cooling/heating): 10 ºC / 80 ºC
- ChillHeat heat pumps
  - 2 pcs. P220 SU HC VFDx2
- COPcombined 5.4



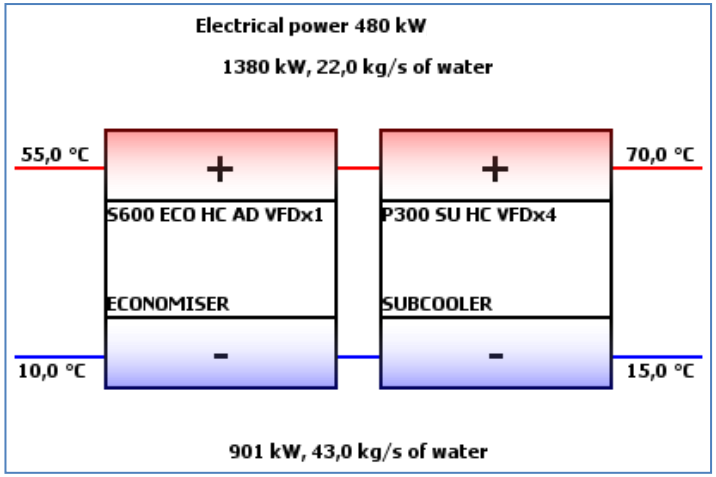
CHC: Office building, Finland

- Heat source: Space cooling
- Cooling capacity: **342 kW**
- Heating capacity: **500 kW**
  - Heat sink: District heating network
- Water temperatures (cooling/heating): **10 °C / 80 °C**
- ChillHeat heat pumps
  - **2 pcs. P150 SU HC VFDx2**
- $COP_{combined}$ **5.3**



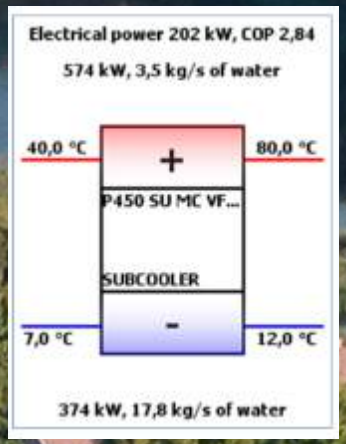
CHC: Hospital, Finland

- Heat source: Hospital water cooling network
- Cooling capacity: **900 kW**
- Heating capacity: **1380 kW**
  - Heat sink: District heating network
- Water temperatures (cooling/heating): **10 °C / 70 °C**
- ChillHeat heat pumps
  - **S600 ECO VFDx1**
  - **P300 SU HC VFDx4**
- $COP_{combined}$ **4.8**



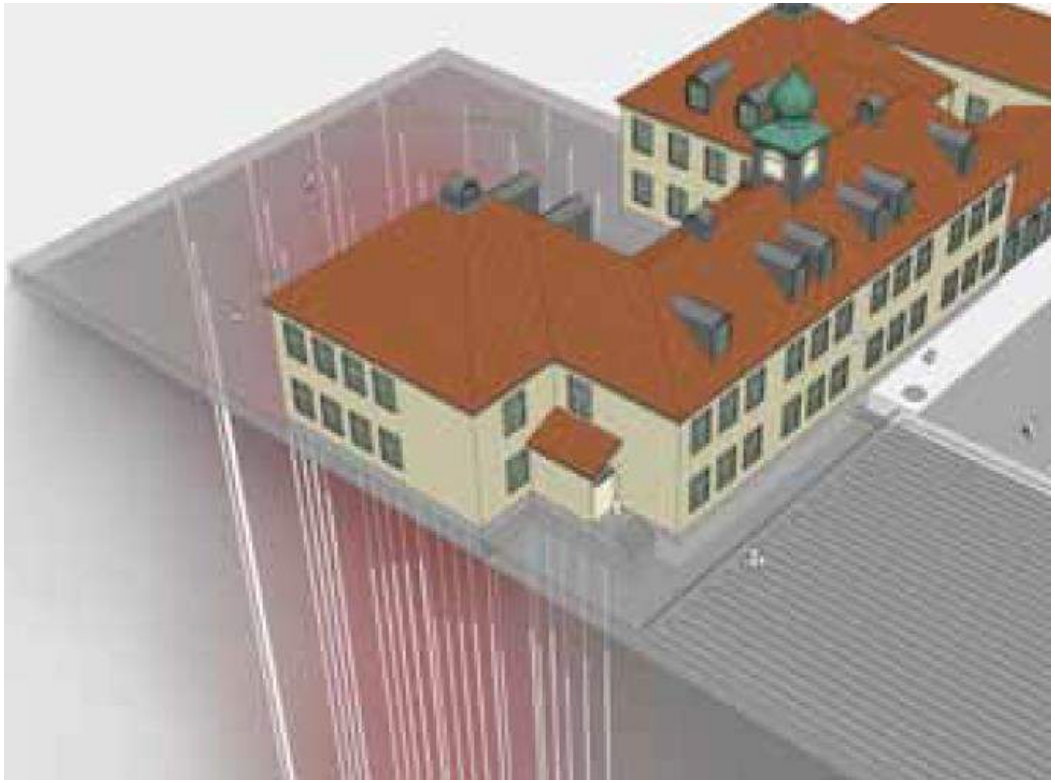
CHC: Apartment building, Finland

- Heat source: Space cooling
- Cooling capacity: 374 kW
- Heating capacity: 574kW
  - Heat sink district heating network
- Water temperatures (cooling/heating): 7 ºC / 80 ºC
- Heat pump
  - 1 kpl P450 SU MC VFDx2



Ground source: School, Norway

- Heat source: Ground
- Heating power: 215 kW
  - Buidling heating
- Water temp.: 75 ºC
- Heat pump
  - 1pc. P-series



Ground source: Manor, Finland

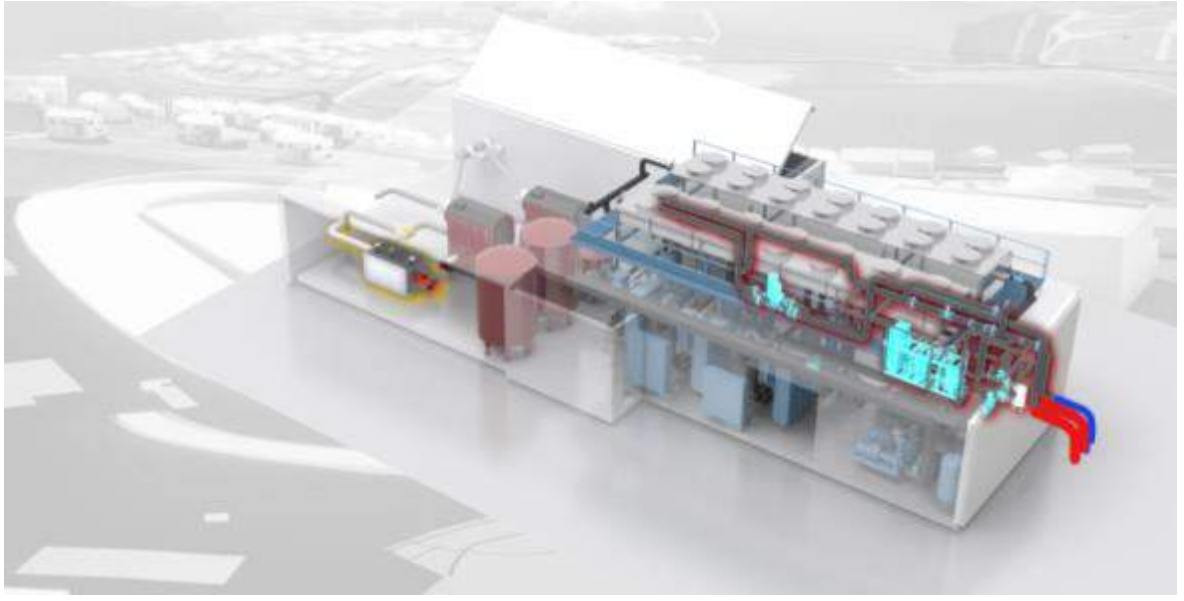
- Heat source: Ground
- Heating power: 230 kW
  - Building heating
- Water temp.: 70 ºC
- Heat pump
  - 1 pc. P380 SU VFDx2
- Replaced oil in heating

Ground source/hybrid: School, Finland

- Heat source: Ground heat (bore holes)
  - 21 pcs. bore holes → Total depth 6300 m
- Heating capacity: **270 kW**
  - Heating of building
- Water temperature: **68 ºC**
- ChillHeat heat pump
  - **1 pc. P300 SU**
- Solar collectors
  - Heating capacity 150 kW
  - Heat to the system or heat to the bore hole liquid cycle
- Oil boilers
  - Heating capacity 1 500 kW
  - For peak loads and reserve capacity

Ground source/hybrid: Sports arena, Norway

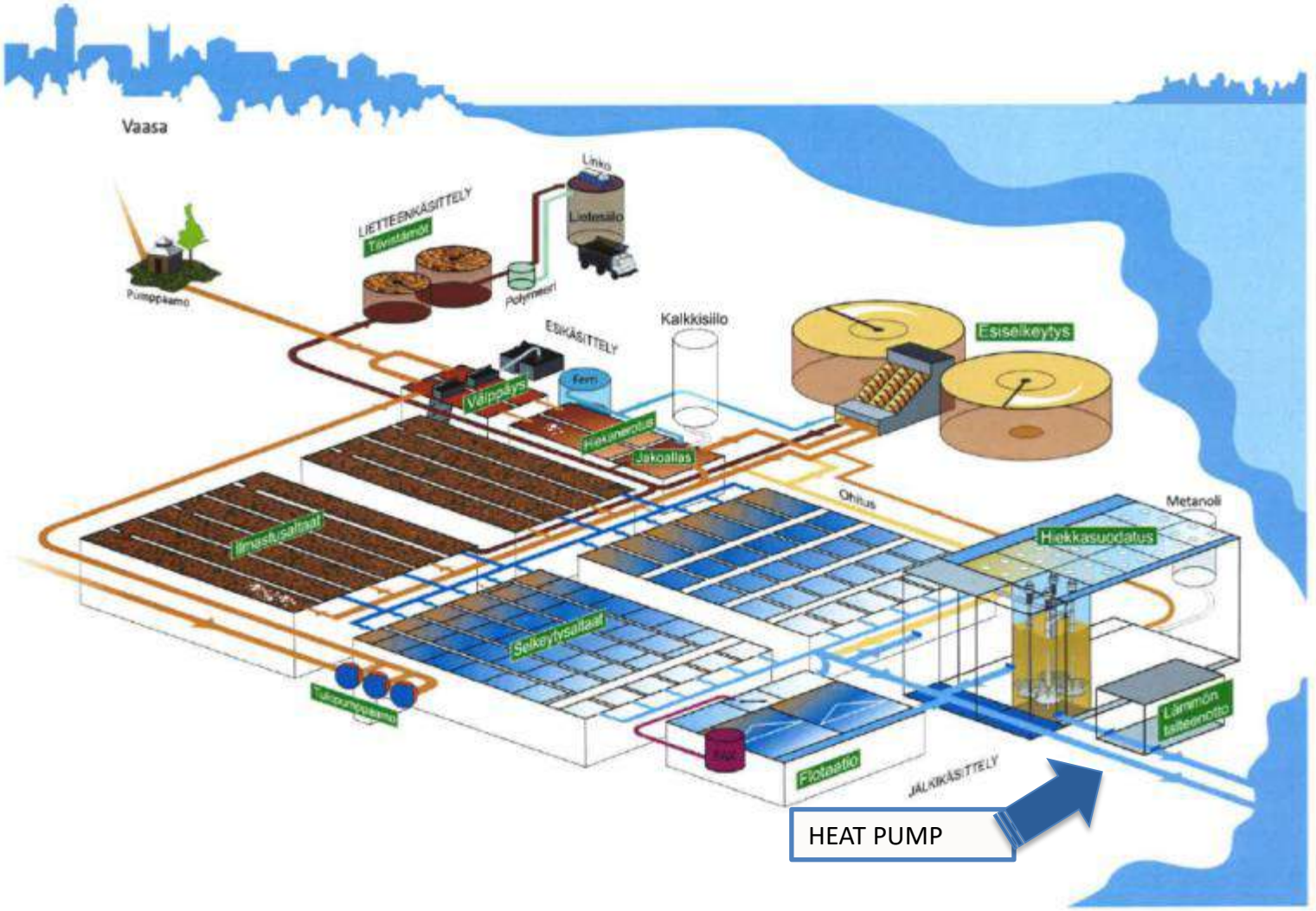
- Heating of schools, hospital, sport hall, football field and residential building
- Refrigeration plant
  - Cooling capacity 2000 kW
  - Cooling to speed skating rink
- ChillHeat heat pump
  - 1 pcs. P300 SU
  - Heat source: Heat recovery at a refrigeration plant, geo thermal heat and a condenser of the refrigeration plant (air source heating)
  - Heating capacity: 500 kW
- Wood chip boilers
  - Heating capacity 2x750 kW
- Oil boilers
  - Heating capacity 3 500 kW
  - For peak loads and reserve capacity



Water treatments plants, Finland

- Communal waste water treatment plants:
  - Vaasa (2 pcs S-series)
  - Joensuu (2 pcs S-series)
  - Oulu (1 pc. RE-series)
  - Suonenjoki (1 pc. S-series)
  - Huittinen (1 pc. P-series)
  - Rauma (1 pc. P-series)
  - Iisalmi (2 pcs. S-series)
- Fresh water treatment plants
  - HSY Helsinki (2 pcs. S-series)
- Process waste water heat recovery
  - Valio Joensuu (1 pc. S-series)
  - Koff Kerava (2 pc. S-series)

Municipal wastewater treatment plant



CHC: Data center, Sweden

- Heat source: Data center
- Cooling capacity: 590 kW
- Heating capacity: 860 kW
  - Heat sink: District heating network
- Water temperatures (cooling/heating): 20 ^{o}C / 85 ^{o}C
- ChillHeat heat pumps
  - 2 x Oilon ChillHeat P300 SU HC VFDx1
- $COP_{combined}$ 4.8

Oilon ChillHeat P300 SU VFDx2

CHP Plant, Germany

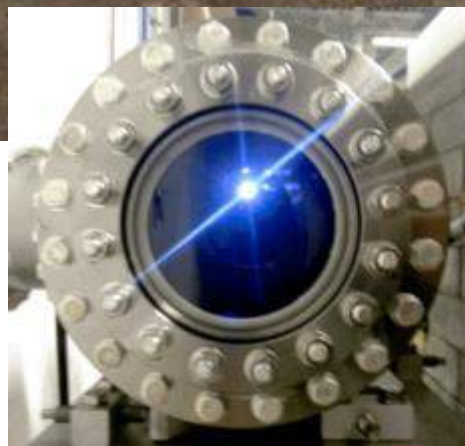
- Heat source: CHP engine cooling
- Cooling capacity: **925 kW**
- Heating capacity: **1 265 kW**
  - Heat sink: District heating network
- Water temperatures (cooling/heating): **+35 ºC / 78 ºC**
- ChillHeat heat pumps
  - **2 pcs. P220 SU HC VFDx2**

Oilon ChillHeat P220 SU HC VFDx2

CHC: Synchrotron radiation laboratory, Sweden

- 8 P-series heat pumps
- 3 S-series heat pumps

Heat source I **Process cooling 3.90 MW**
Cold water I **23 °C & 10 °C**
Heat load I **5.57 MW district heating**
COPcombined I **5.9**
Hot water I **80 °C**

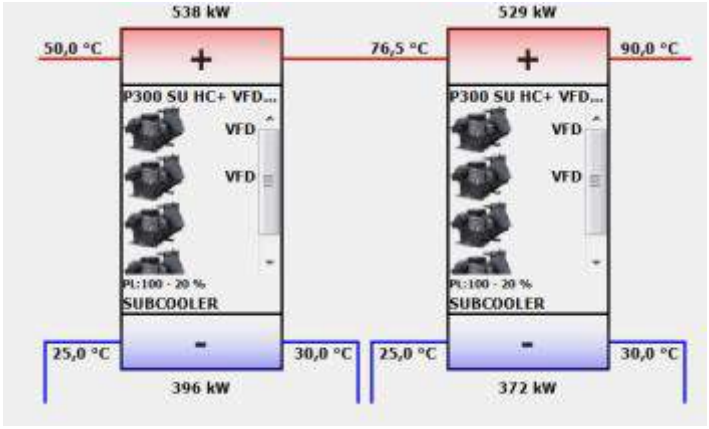


Process cooling: Factory, Finland

- Heat source: Process cooling
- Cooling capacity: **595 kW**
- Cooling water temperature: **+5ºC**
- Heat to out side air
- ChillHeat heat pump
  - **S600 ECO HC VFDx1**

Waste heat recovery: Meat processing plant, Finland

- Heat source: Refrigeration waste heat
- Cooling capacity: **768 kW**
- Heating capacity: **1067 kW**
  - Heat sink: sterilization water and kathabar dehumidification system
- Water temperatures (cooling/heating): **25°C / 90 °C**
- ChillHeat heat pumps
  - **2 pcs. P300 SU HC+ VFDx2 R1234ze**
- COPh **3.5**



Cooling and heating: Process industry (plastic), Finland

- Heat source: molding machine cooling water
- Cooling capacity: **549 kW**
- Heating capacity: **841 kW**
  - Heat sink: space heating
- Water temperatures (cooling/heating):
  9ºC / 75 ºC
- ChillHeat heat pumps
  - **P300 SU HC VFDx2**
  - **P380 SU HC VFDx2**
- COPh **3.5**

Cooling and heating: Process industry (chemical), Finland

- Heat source
  - HP1: Low teperature water/propylene glycol (30 %)
  - HP2: Cooling water
- Cooling capacity
  - HP1: **1166 kW**
  - HP2: **2566 kW**
- Heating capacity
  - HP1: **1 870 kW**
  - HP2: **3328 kW**
  - Heat sink: Air heating coils of granulation air pre-heating
- Water temperatures (cooling/heating): **0 ºC (HP1) +20 ºC (HP2) / 68 ºC**
- Heat pumps:
  - HP1 system: **S1000 ECO AD & S1000 SU AD**
  - HP2 system: **S1000 SU HC & S800 SU HC**