Industrial high temperature heat pump for steam and hot water production

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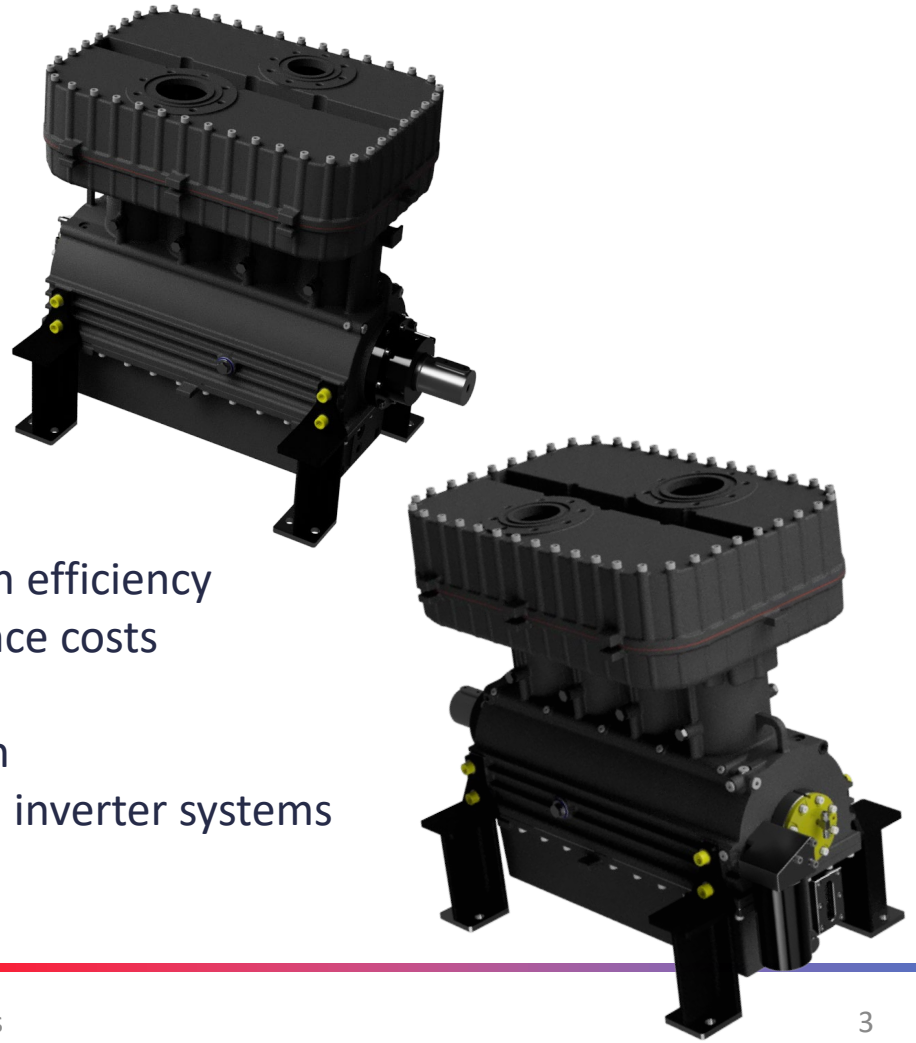
Content

- **ThermBooster heat pump system**
- 2 bara (29 psia) steam for the Gelatin industry
- 130°C (266 °F) hot water for the waste recycling industry

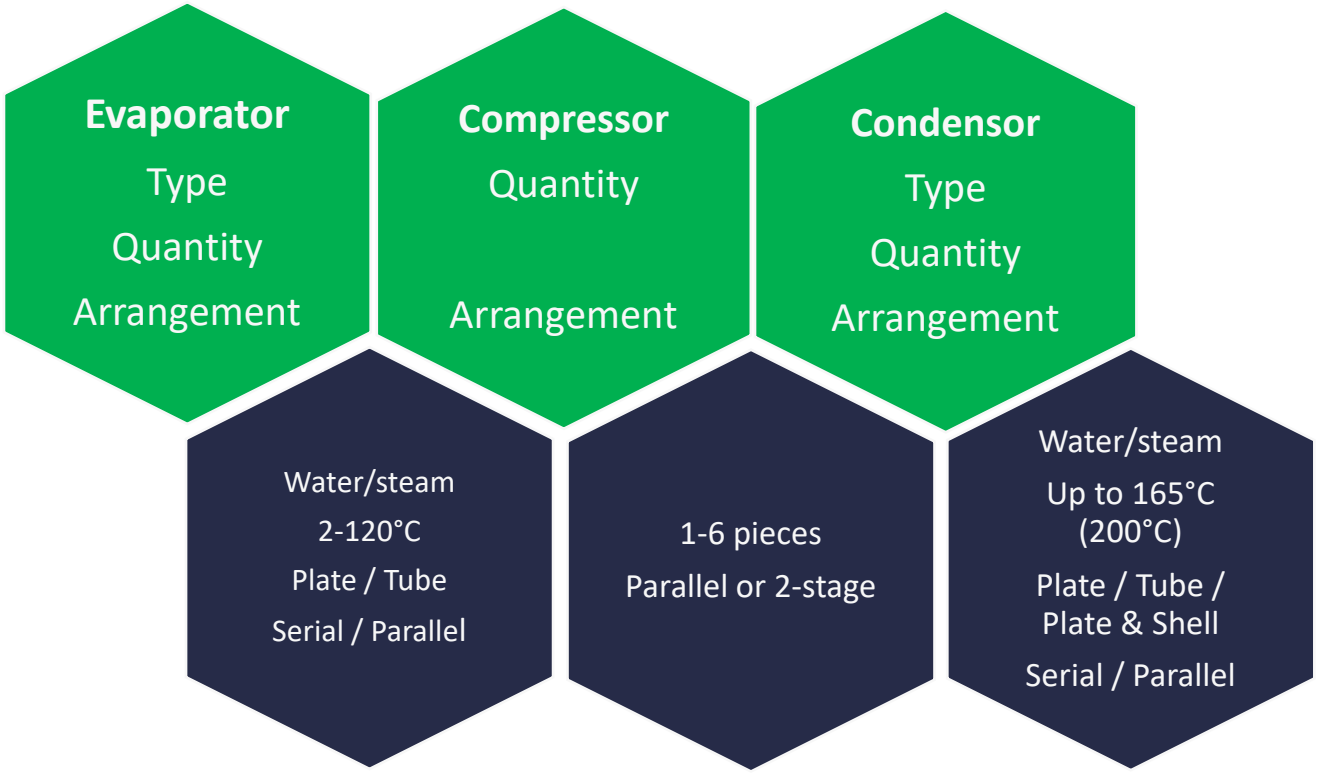
ThermBooster - Compressor

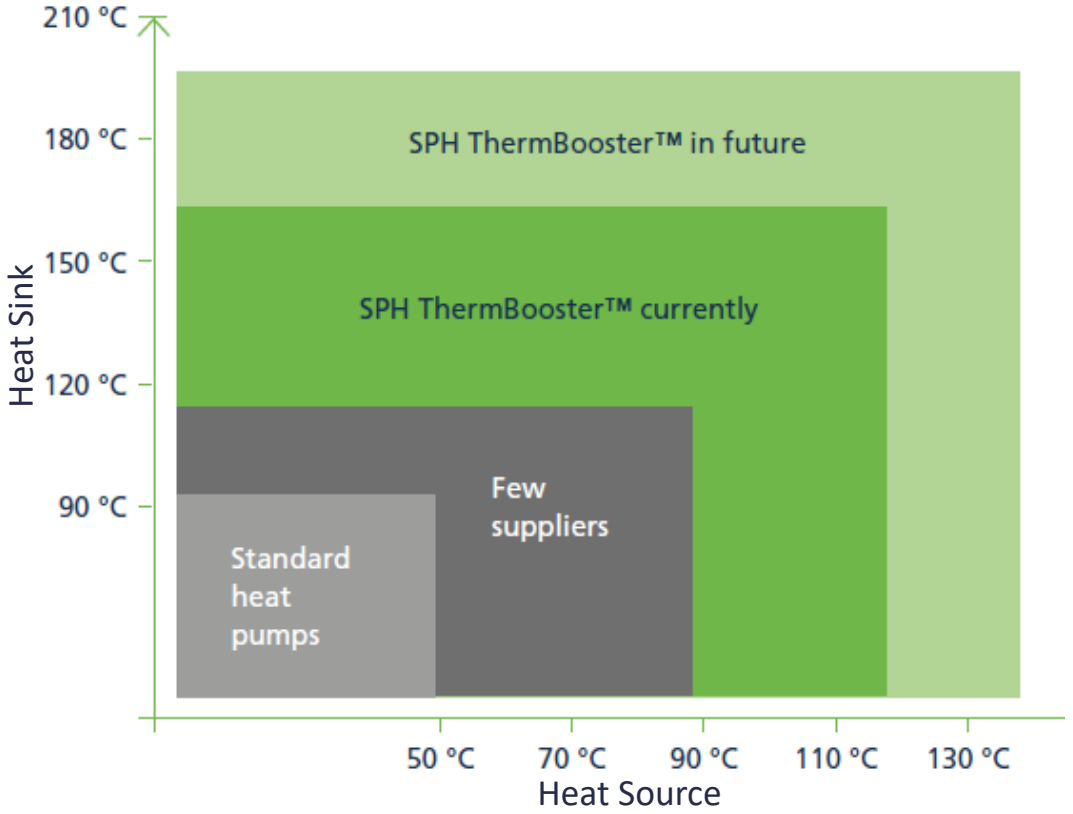
SPH – High temperature - Piston compressor

- Data
  - 4 Cylinders
  - 576 m³/h theoretical displacement
  - 35 bar/18 bar HD/ND
  - Open design
  - For engines from 110 kW to 200 kW
- Specifically developed for use in ultra-high temperature heat pumps
- Optimized for HFOs and HCs
- Optimized valve system and optimal temperature control ensures high efficiency
- Robust industrial design for a long service lifetime and low maintenance costs
- Integrated oil conditioning
- Very good partial load capability thanks to speed-controlled operation
- Use of premium efficiency motors (IE4) in combination with industrial inverter systems



ThermBooster – Building Kit





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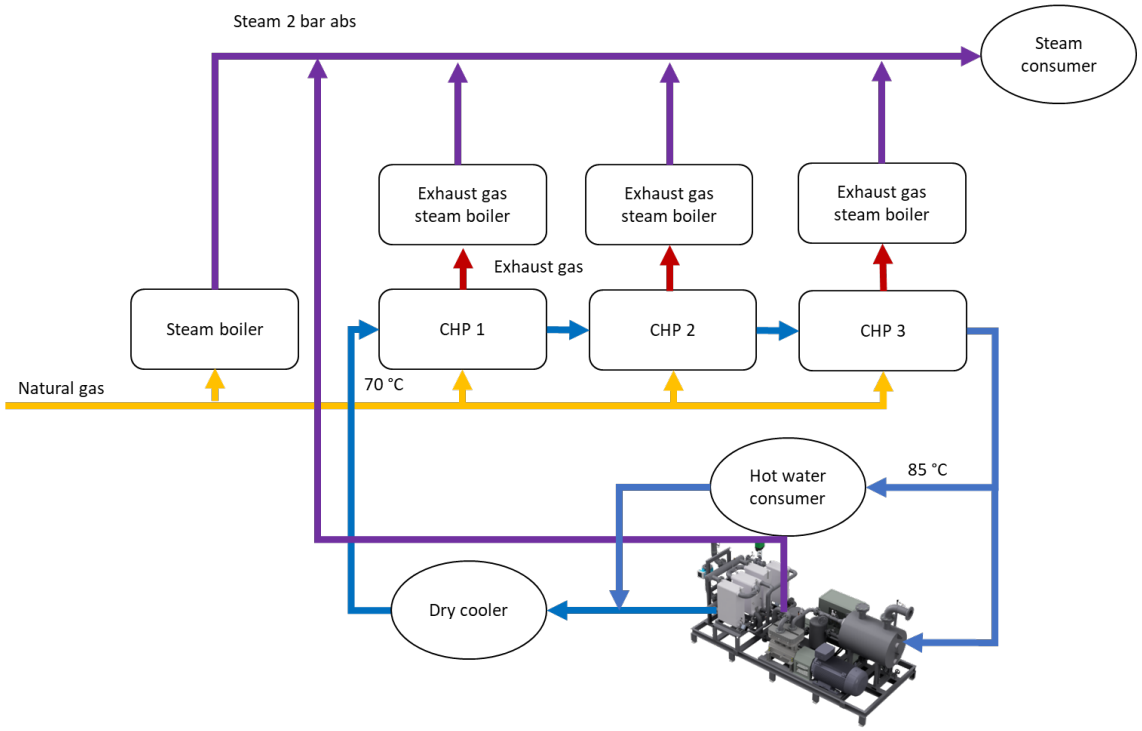
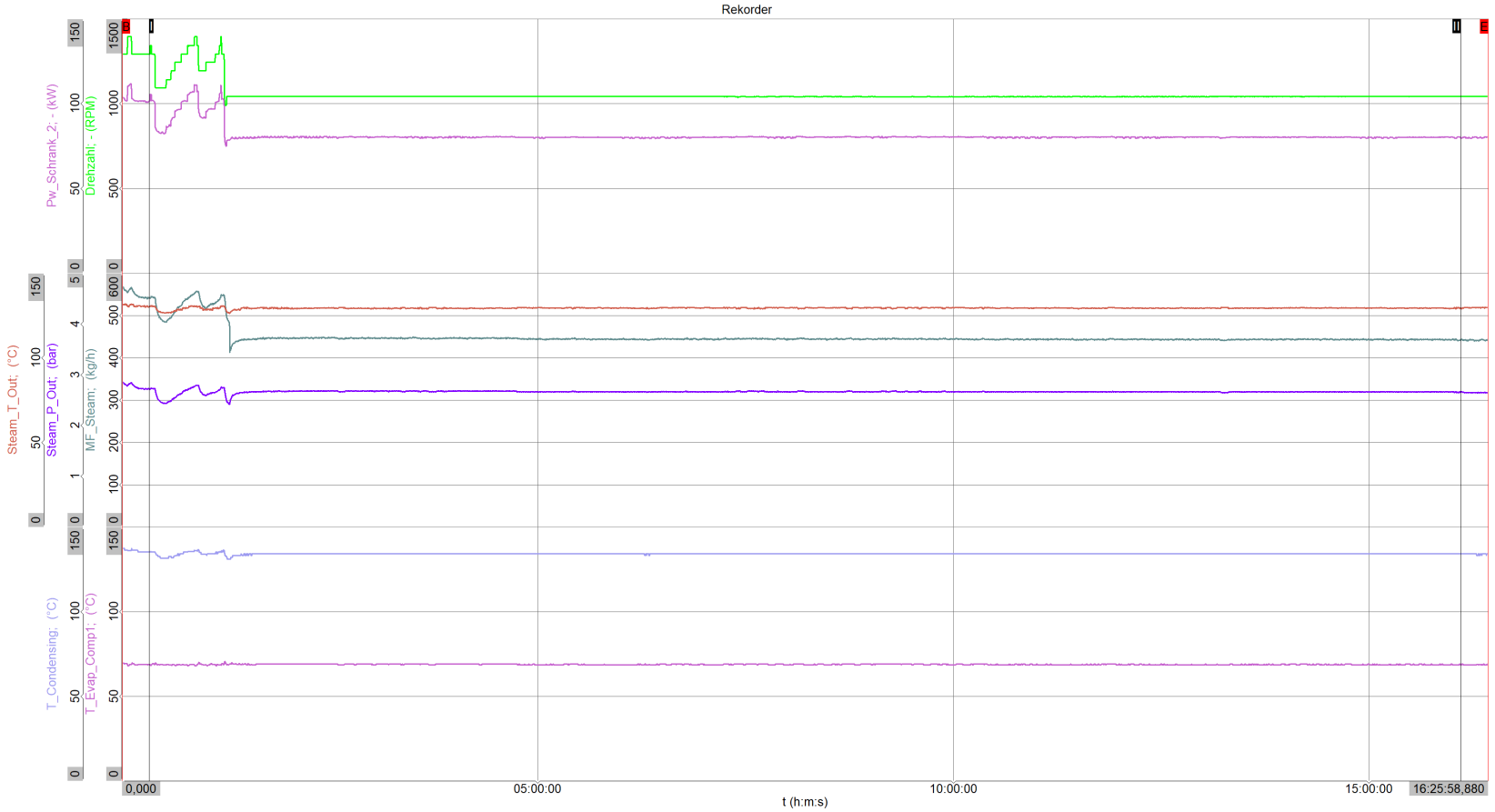
Steam production – Gelatin industry

- Installation Q2 - 2023
- ThermBooster
  - Single Compressor
  - Heat Source:
    - Water
    - 85/70°C (185°F/158°F)
    - Cooling water from CHP
  - Heat Sink:
    - Saturated Steam
    - 2 bar abs (29 psi abs), 120°C (248°F)
    - Feed in existing steam network
- Heat Pump performance:
  - Heating capacity: 514 kW (812 kg/h)
  - Cooling capacity: 407 kW
  - Electrical consumption: 118 kW
  - COP: 4,4
  - Refrigerant: R1233zd
- 4,1 GWh thermal power production per year
- 550 t CO2 emissions per year will be avoided by this solution

Steam production – Gelatin industry



Steam production – Gelatin industry



Measurement Example, Steam

- 15h stationary measurement
- Steam pressure: 2,7 bara (39 psia)
- Steam temperature: 130 °C (266°F)
- Evaporation temperature: 69°C
- Condensation temperature: 134 °C
- Steam Mass flow: 445 kg/h
- Thermal Power steam : 280 kW
- Electrical Power: 80 kW
- COP : 3,5
- Carnot Quality: 56%

Content

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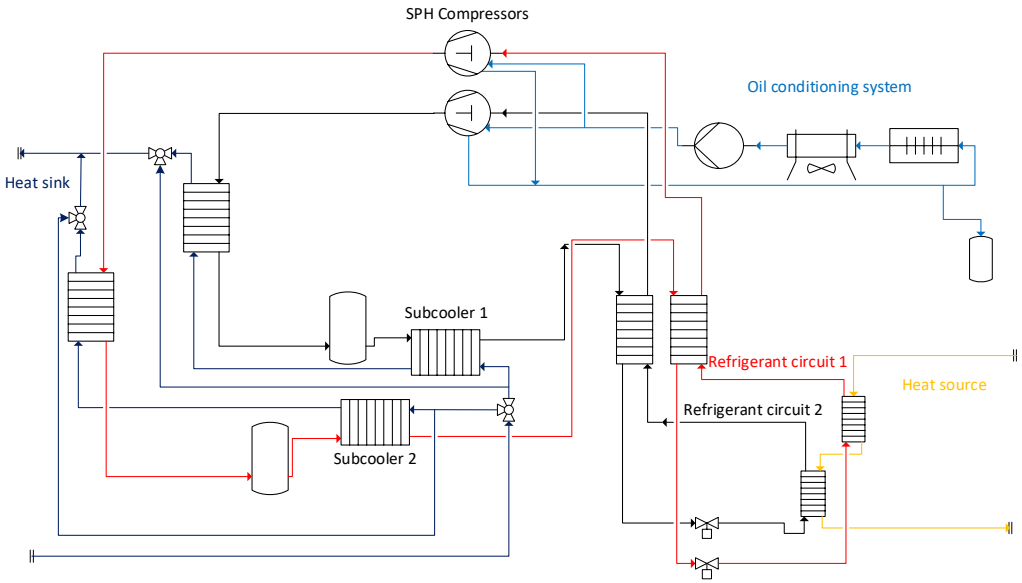
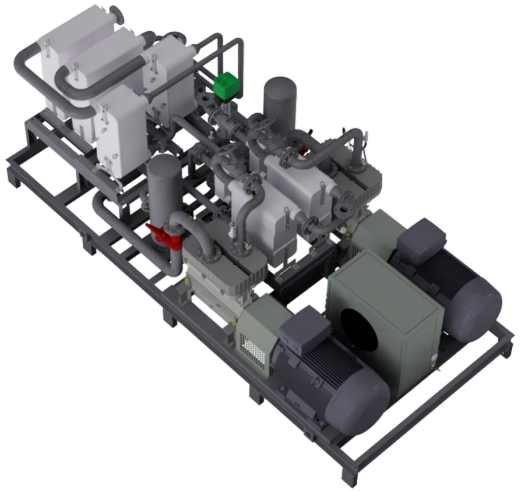
- **130°C (266 °F) hot water for the waste recycling industry**

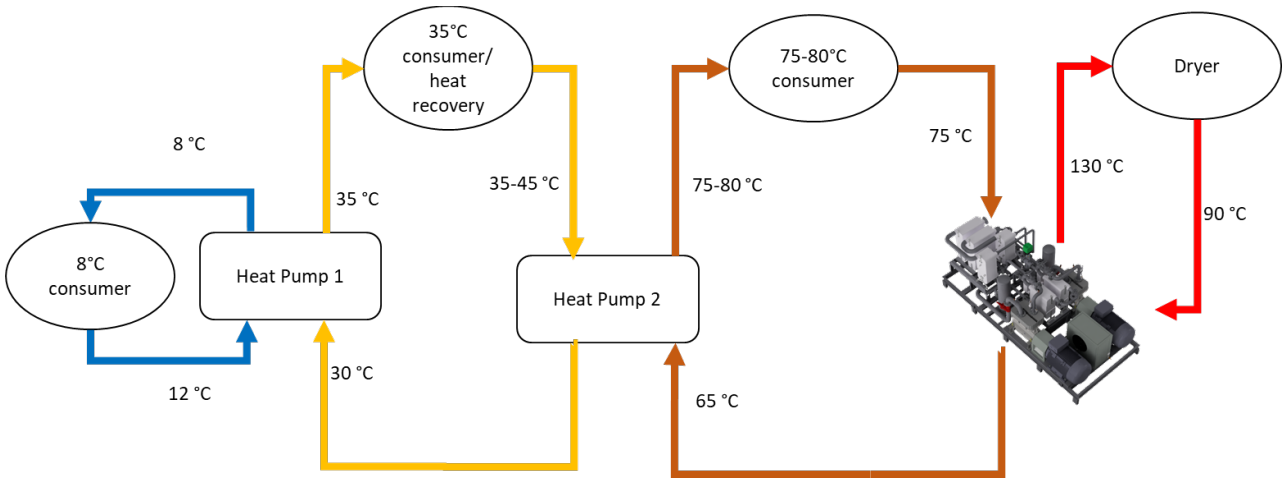
Hot Water – Waste recycling Industry





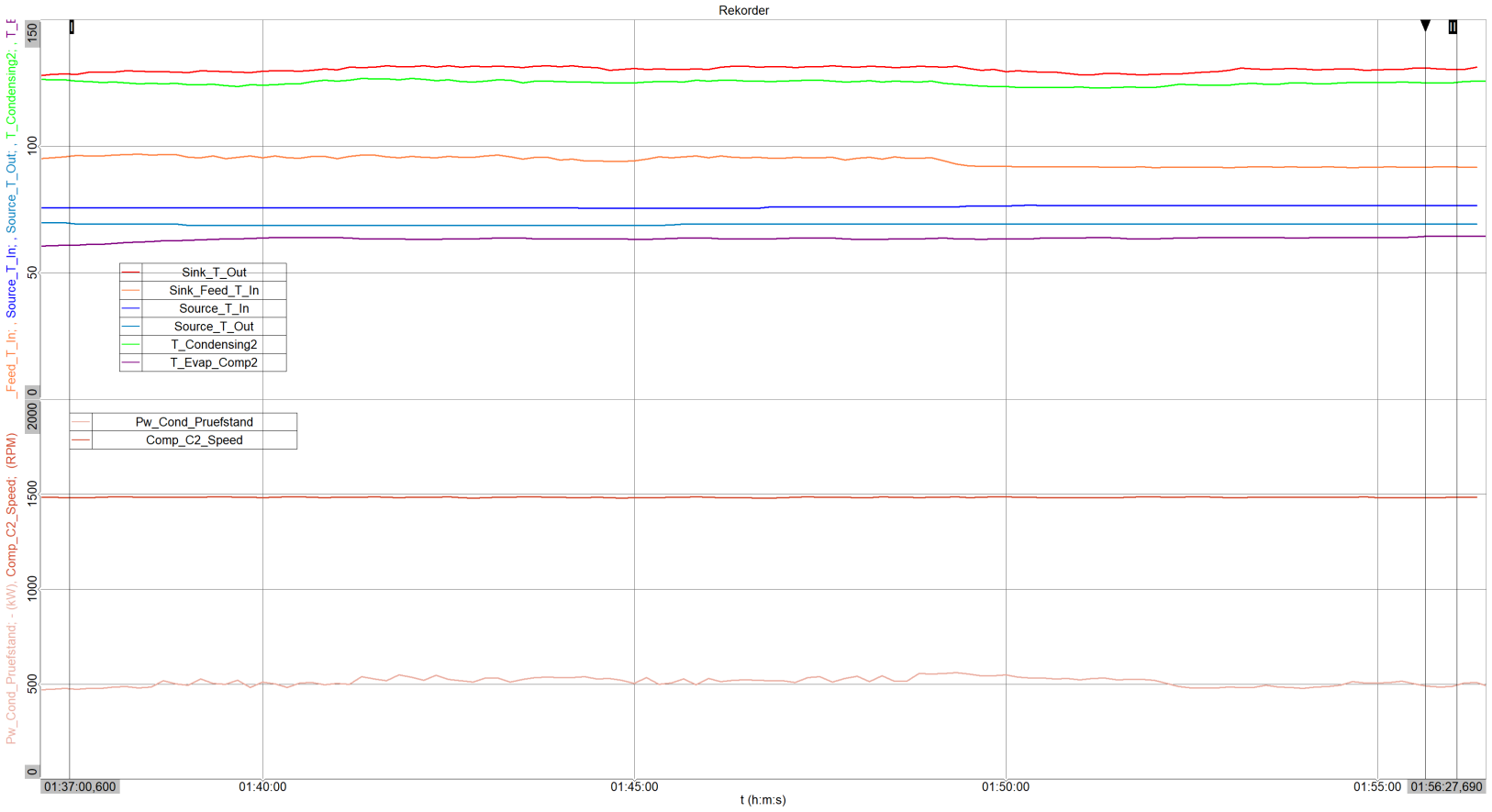
- ThermBooster
  - Dual-circuit, two compressors
  - Heat Source:
    - Water
    - 75/65°C (167°F/149°F)
    - Waste heat from cooling process and chillers
  - Heat Sink:
    - Pressurized hot water
    - 90°C/130°C (194°F/266°F)
    - For drying process
- Heat Pump performance:
  - Heating capacity: 1017 kW
  - Cooling capacity: 809 kW
  - Electrical consumption: 229 kW
  - COP: 4,4
- In total 4 compressors will be installed
  - 3 running
  - 1 as redundancy

Hot Water – Waste recycling Industry



- Delivered March/April 2023, Commissioning planned for Q2/3 - 2023
- Greenfield installation in the Netherlands
- Target: CO2 free industrial production of innovative new thermoplastics made from waste
- Installation of 2 systems
- 1,5 MW continuous need
- ~7200 h/a running time
- ~10,8 GWh ~ 39 TJ of heat will be produced per year
- Usage of 1,25 Mm³ of natural gas will be avoided per year
- By using green electricity, ~2400 t CO2 emissions will be avoided every year

Hot Water – Waste recycling Industry



Measurement Example, Water

- 20 min measurement
- Sink 90°C/130°C (194°F/266°F)
- Source 76°C/69°C (169°F/156°F)
- Evaporation temperature: 64°C (147°F)
- Condensation temperature: 125 °C (257°F)
- Thermal Power sink : 500 kW
- Electrical Power: 111 kW
- COP : 4,5
- Lorenz Quality: 44%

Research Projects

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No. 101069689 (PUSH2HEAT).

Push2Heat

2,2 bar (32 psia) steam in the paper industry

AHEAD: ADVANCED HEAT PUMP DEMONSTRATOR

11 bara (160 psia) steam in the pharmaceutical industry
ThermBooster + MVR system