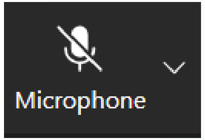
E-CAFÉ #2 ALLICE

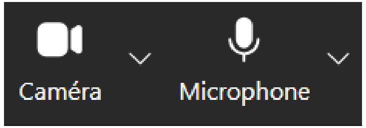
High temperature heat pump

Rules and objectives of the e-café

- Please turn off your micro during the presentation phase (first 30min)



- Camera and micro on for the networking phase



- Get some insights from the presentation
- Meet other participants interested by the topic
  - Exchange email addresses
  - Make further appointment to discuss partnership, project…

Agenda

Welcome and ALLICE introduction

(5min)

Léo Pasquier, ALLICE

PUSH2HEAT project presentation

Laura Alonso Ojanguren, Tecnalia

SPH technology and first references

Franz Helminger, SPH

Networking

(2x10min)

Facilitators: ALLICE team

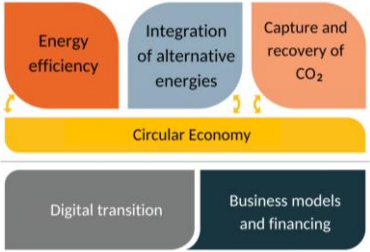
Alliance ALLICE

Federate and innovate to decarbonise industry

Our missions

- ✓ **Bringing together all the players** in the sector to innovate collectively in order to decarbonise the industry
- ✓ **Supporting the development of a range of high-performance,** differentiating decarbonisation solutions in France and abroad
- ✓ **Supporting manufacturers** in accelerating their decarbonisation

Our areas of intervention



Our structure

- ✓ Funding mostly coming from **members' fees**
- ✓ An **independent** animation structure
- ✓ A Governance that **meets members' needs** and provides a **strategic vision** of the challenges facing the industry
- ✓ A network of over **120 members and partners**

Our founders and shareholders

cetiat – ensemble, innover et valider
CETIM
blunomy
CTMNC
CTCPA
ctp – centre technique du papier

Our activities

Collective studies & monitoring

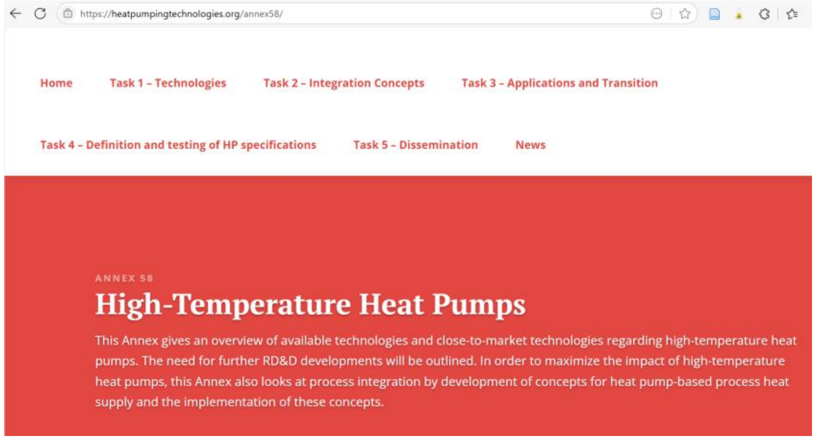
Coordination of the ALLICE network

Promoting the decarbonisation sector

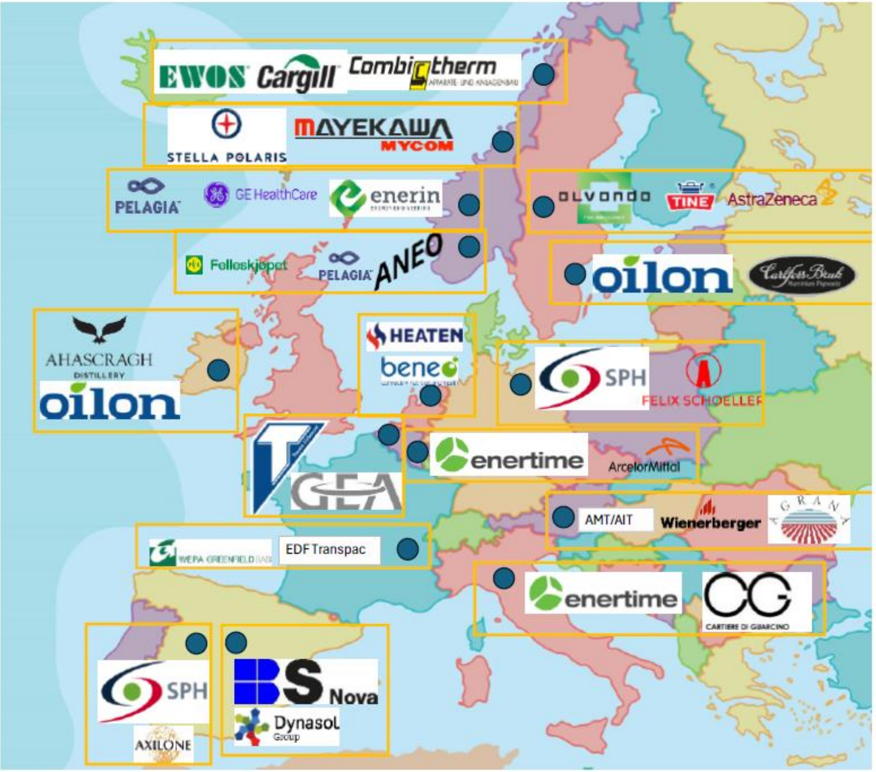
Prestations & speeches

High temperature heat pumps

[IEA HPT- Annex 58]



[State of the art High Temperature Heat Pump - part 2]



Push2Heat

PUSH2HEAT PROJECT

Event: ALLICE e-café / High Temperature Heat Pump

Speaker: Laura Alonso Ojanguren (TECNALIA)

Date: 23rd May 2025

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Context and motivation behind PUSH2HEAT

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

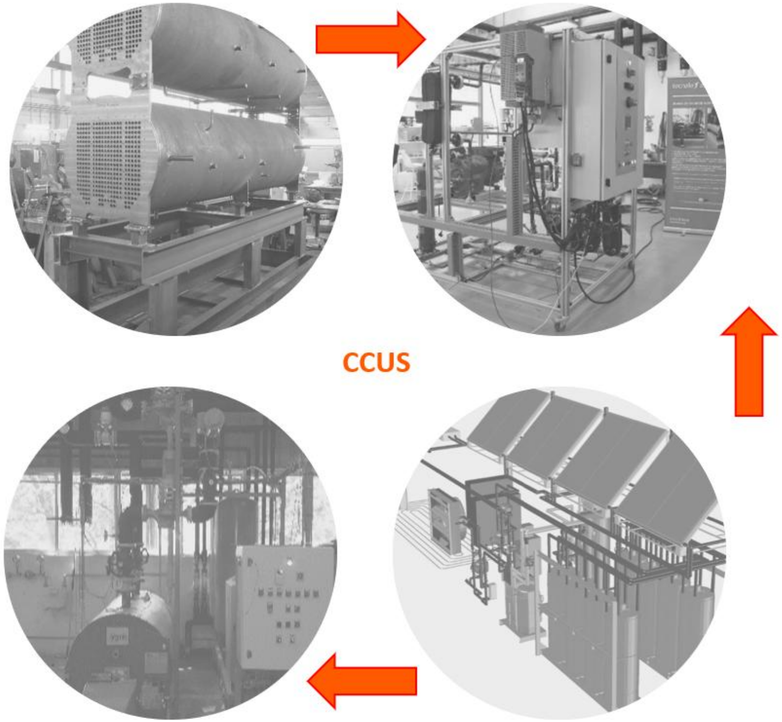
Decarbonisation of industry

A huge challenge… and urgent!

Energy efficiency

Essential role for decarbonising industrial processes.

Waste heat recovery and revalorisation plays a key role.



Electrification

Powered by low-carbon electricity, can provide process heat with net-zero emissions.

- Heat pumps
- MVR
- Electric heaters/boilers

Alternative fuels

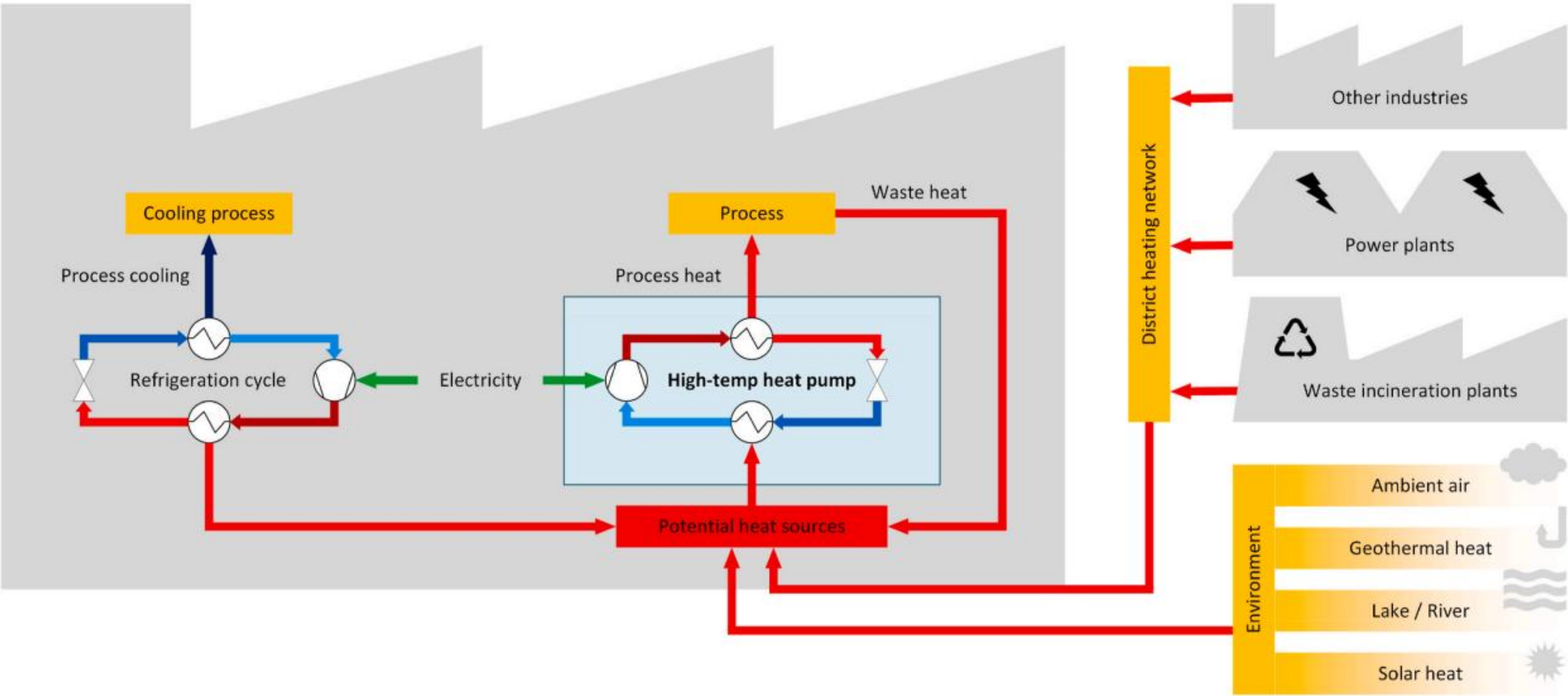
Use of biomass, hydrogen or other carbon-neutral fuels.

Renewable energy

For thermal and/or electrical energy supply to industries.

- Self-generated biogas (anaerobic digestion)
- Solar technologies
- Others

The role of high temperature heat pumps



Source: High-temperature heat pumps in climate pathways for selected industry sectors in Switzerland. Obrist et.al (2023)

Funded by the European Union

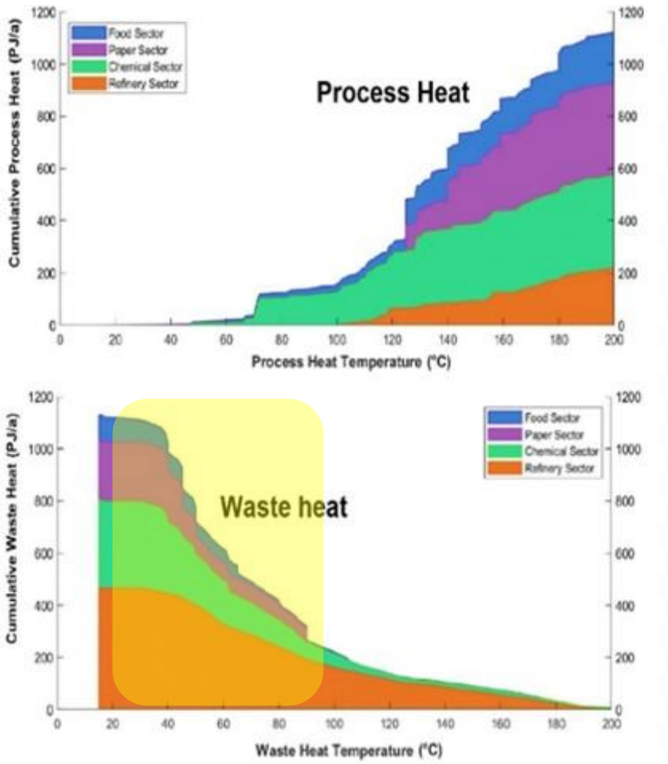
Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

The role of high temperature heat pumps

Market potential is huge:

- 37% of the process heat required by the European industry is below 200 ºC (730 TWh/year)
- Available waste heat between 40-100 ºC is estimated in 220 TWh
- Highest potential in the food, paper and chemical industry

… but still the actual market is emerging



Source: An estimation of the European industrial heat pump market potential. Marina, A. et al (2021)

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

PUSH2HEAT Project

Funded by
the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Push2Heat

PUSH2HEAT main objectives

TECHNOLOGY RELATED OBJECTIVES:

- Optimization of **four heat upgrade technologies**

MARKET/BUSINESS RELATED OBJECTIVES:

- **Pushing forward the market potential, new business models** and actions towards technologies market deployment

Demonstration of four full-scale pilot plants in different industrial applications:

- Waste heat~ 40-90 °C
- Heat supply~ 100-160 °C
- System size: 0,5 – 1 MW

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

PUSH2HEAT technologies

- Electrically driven HPs
  - SPH — DEMO 1
  - Cannon Bono — DEMO 2
- Thermally driven HPs
  - Absorption Heat Transformer
    - BS Nova — DEMO 3
  - Thermochemical Heat Transformer
    - QPINCH — DEMO 4
- Steam pressure upgrade
  - Thermocompression
  - Mechanical vapor recompression

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

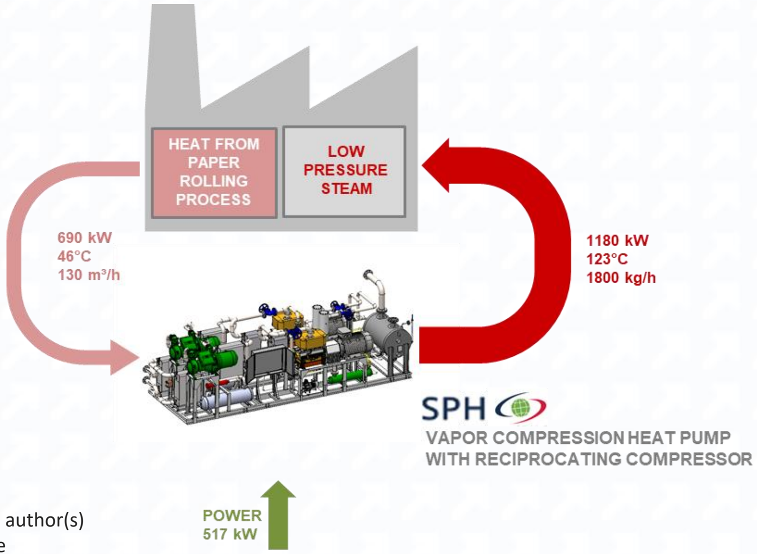
PUSH2HEAT demo sites

DEMO 1: Paper industry

Felix Schoeller GmbH & Co. KG (Germany)

Location	Weissenborn, Germany
Sector	Paper industry
Plant owner	Felix Schoeller GmbH & Co. KG
Technology	HTHP with reciprocating piston compressor (by SPH)
Waste heat source	Exhaust heat from the paper machine dryer: water glycol circuit from the exhaust humid air heat recovery circuit **(30-50 °C)**
Heat supply	**Low pressure steam at 2,3 bar(a)** (123 °C)
HTHP Unit	1.2 MW; expected COP: 2.3

Production plant in Weissenborn, Germany (Felix Schoeller GmbH & Co. KG)



Funded by the European Union

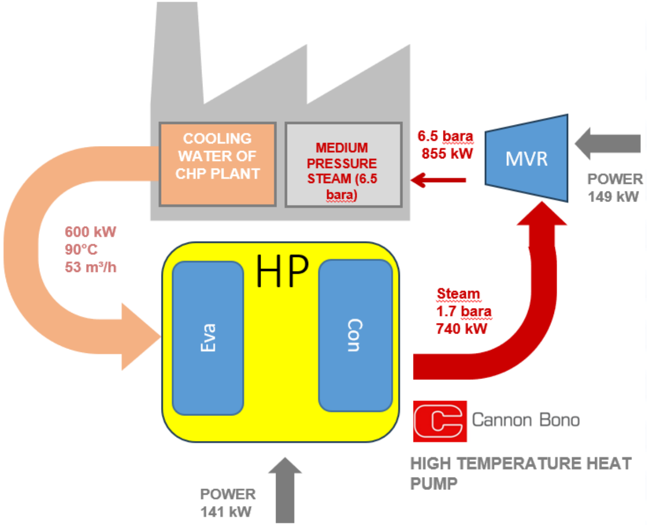
Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

PUSH2HEAT demo sites

DEMO 2: paper industry
Cartiere di Guarcino (Italy)

Location	Lazio, Italy
Sector	Paper industry – CHP plant
Plant owner	Cartiere di Guarcino
Technology	HTHP (by CANNON BONO) + MVR
Waste heat source	Cooling water of the cogeneration plant **(85-90 ºC)**
Heat supply	**Low pressure steam by HTHP:** - 1180 kg/h at **1.7 bar(a)** (115 ºC) - Recompression to 6,5 bara (162 ºC)
HTHP Unit	855 kW; expected COP: 3

Cartiere di Guarcino plant in Lazio, Italy



Funded by the European Union

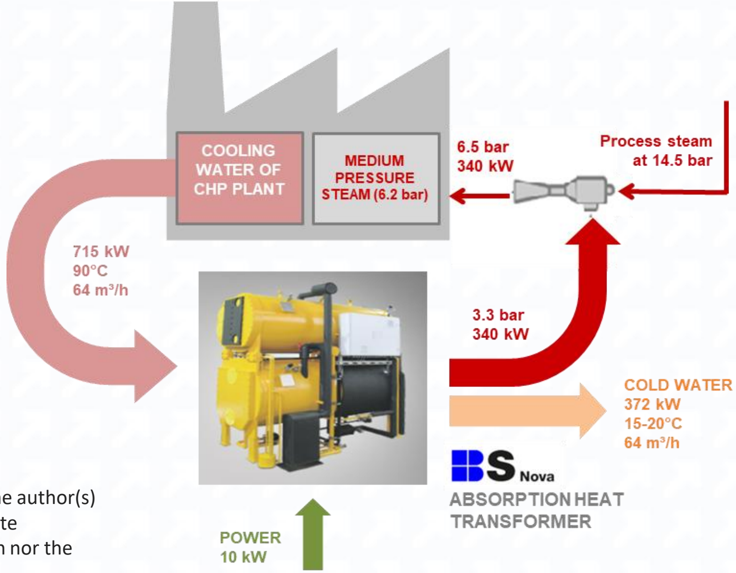
Funded by the European Union. Views and opinions expressed are however those of the author(s only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

PUSH2HEAT demo sites

DEMO 3: paper industry
Cuartiere di Guarcino (Italy)

Location	Lazio, Italy
Sector	Paper industry – CHP plant
Plant owner	Cuartiere di Guarcino
Technology	Absorption Heat Transformer (AHT) (by BS-NOVA) Working fluid: H2O/LiBr
Waste heat source	Cooling water of the cogeneration plant (**85-90 °C**)
Heat supply	Low pressure steam by the AHT at **3.3 bar(a)** With +14.5 bar(a) steam and thermocompressor → upgraded steam at **6,5 bar(a)**
AHT Unit	340 kW, thermal efficiency: 0.48, expected $COP_{el,system}$: 25-35

Cuartiere di Guarcino plant in Lazio, Italy



Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

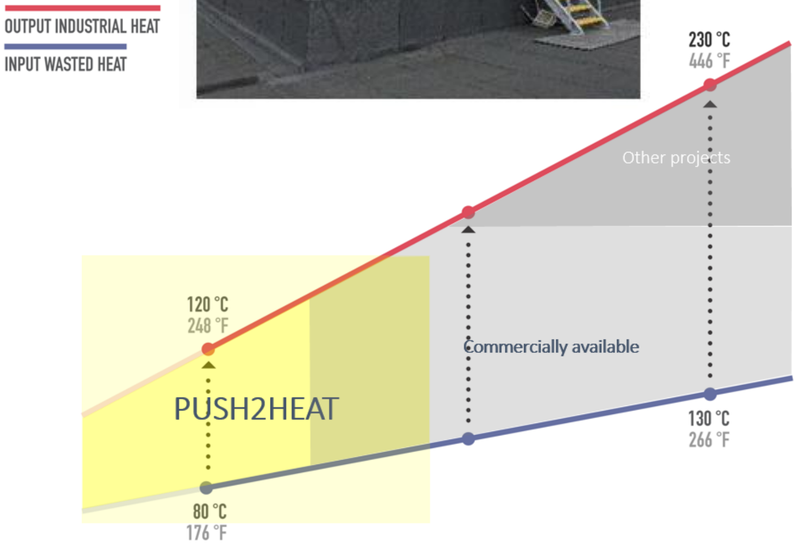
PUSH2HEAT demo sites

DEMO 4: R&D plant (Belgium)

QPinch facilities

Location	Antwerp (Belgium)
Sector	R&D plant focused to chemical industry
Plant owner	QPinch
Technology	Thermochemical Heat Transformer (by QPINCH)
Waste heat source	Waste heat between **60-90 ºC**
Heat supply	Process heat as **hot water or steam at 110-150 ºC**
HTHP Unit	1 MW

2 MW R&D Plant at Qpinch



Funded by the European Union

Funded by the European Union. Views and opinions expressed are however t
only and do not necessarily reflect those of the European Union or the Europ
Infrastructure and Environment Executive Agency (CINEA). Neither the Europ
granting authority can be held responsible for them.

More information

- **Visit our website:** https://push2heat.eu/
- Follow us on Linkedin (Push2Heat) and X (PUSH2HEAT_EU)

- Interested in **receiving periodic information** on the progress of PUSH2HEAT? **Join our Stakeholder Network** here

- **Open Call for Experts:** Apply to the Push2Heat's External Advisory Board here

- We are **open to hear you**! Any input, recommendation, (positive/negative) experiences, needs… will be very valuable to steer the Project in the good direction and generate interesting results for the value chain of industrial heat upgrade systems

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

www.push2heat.eu

Follow Push2Heat online

to stay up-to-date with the project's developments

Thank you!

Laura Alonso

TECNALIA

laura.alonso@tecnalia.com

linktr.ee/push2heat

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Push2Heat

Company presentation

History

2020 Founded

2021 European Family Office Invests

2022 Compressor, heat pump and test facility development

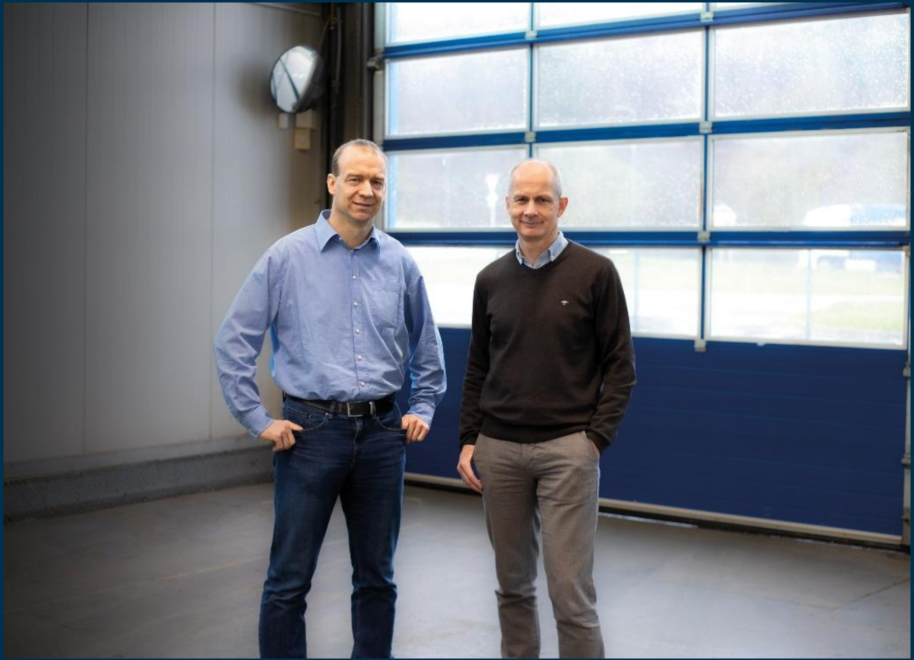
2023 Awarded

WIRTSCHAFTSPREISE RHEINLAND
Gewinner 2023 | Gründung

2023 First ThermBooster to industry

2024 Spirax Group Strategic investor

2025 10+ units will be in operation



Dr. Tim Hamacher Andreas Mück

Hot.
Efficient.
Green.

ThermBooster

SPH – High-temperature – Piston compressor

Advantages

Patented

Developed for ultra-high temperature heat pumps

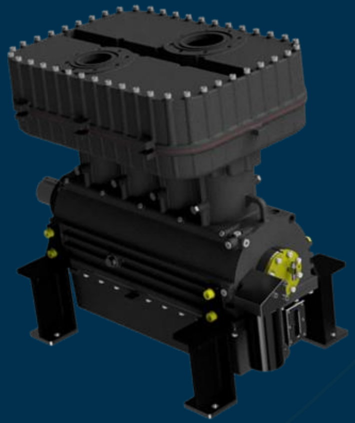
Very high efficiency

Very good speed-controlled partial load capability

High temperature lifts even in part load

Optimised for synthetic and natural refrigerants

Robust industrial design (>250 °C)



ThermBooster

Boosting Waste heat temperature

Heat source
8 – 120 °C

Cooling water
typ. 30 – 90 °C

Heat recovery
typ. 30 – 120 °C

Condensate cooling
typ. 50 – 90 °C

Machine waste heat
typ. 50 – 90 °C

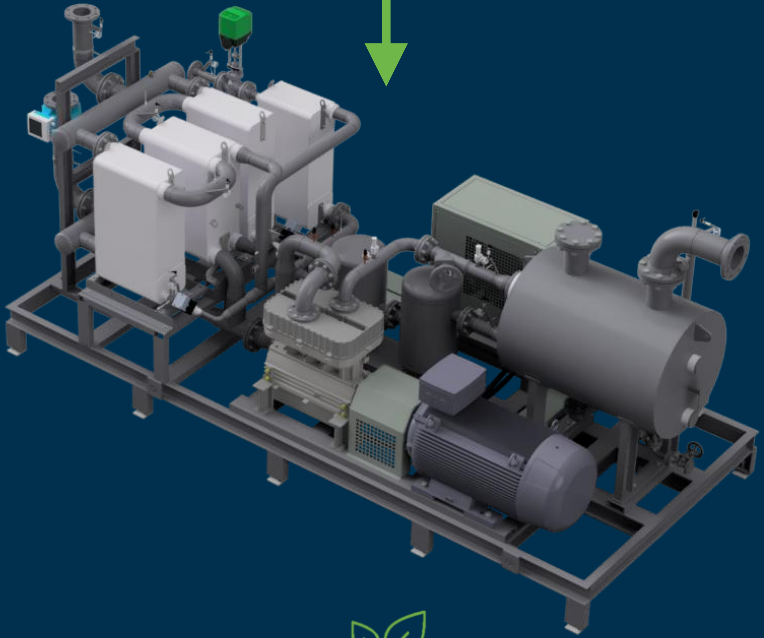
Process waste heat
typ. 50 – 120 °C

Waste heat from chillers
typ. 15 – 40 °C

Solar thermal energy
typ. 30 – 90 °C

District heating
Typ. 50 – 120 °C

Electricity



No Emissions

typ. COP 2 - 7

Heat sink
80 – 180 °C

Hot water
typ. 90 – 180 °C

Thermal oil
typ. 100 – 180 °C

Feed water preheating
typ. 100 – 180 °C

Saturated steam
typ. 110 – 175 °C

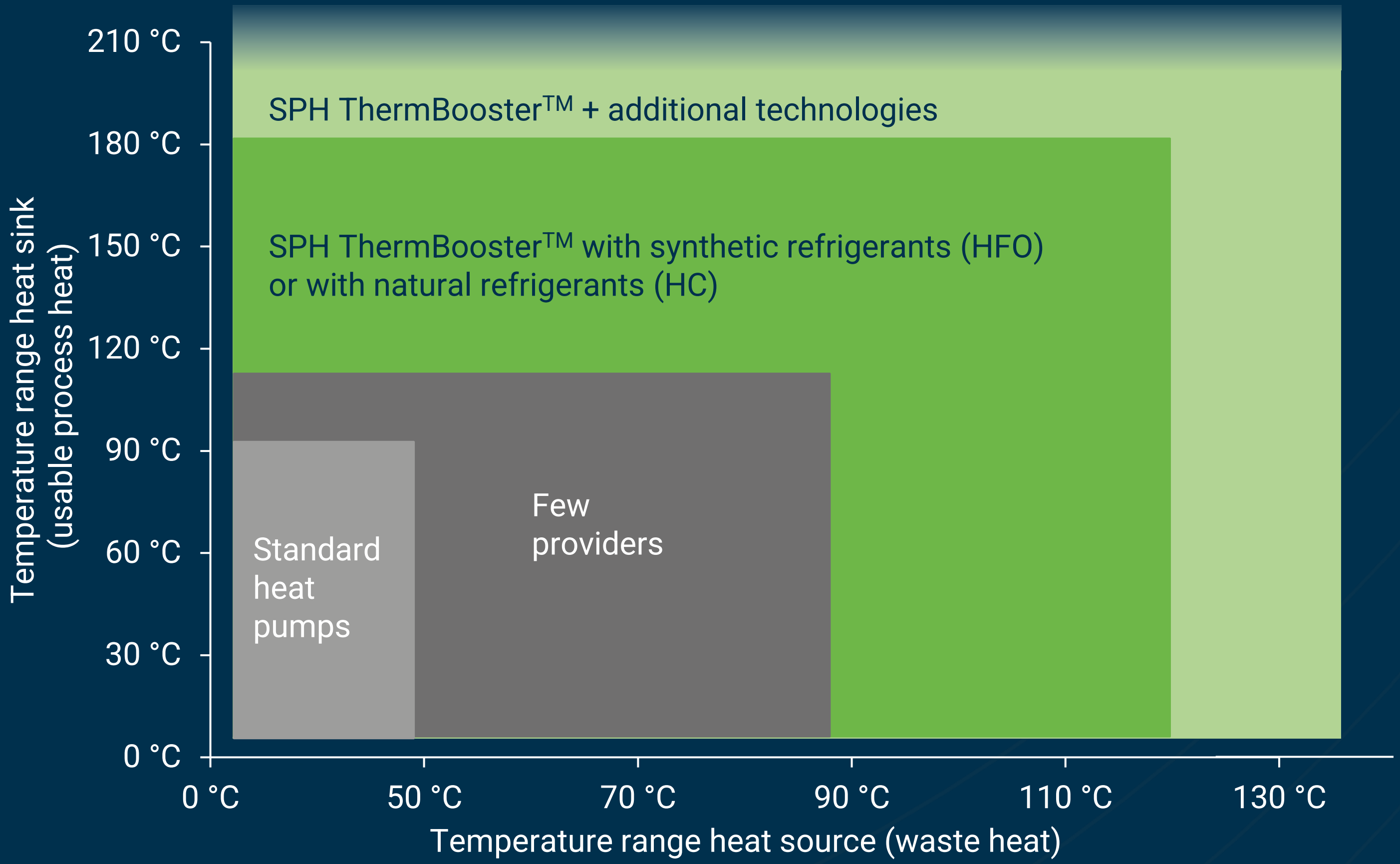
Air heating
typ. 90 – 170 °C

Warm water
typ. 80 – 120 °C

Hot.
Efficient.
Green.

ThermBooster

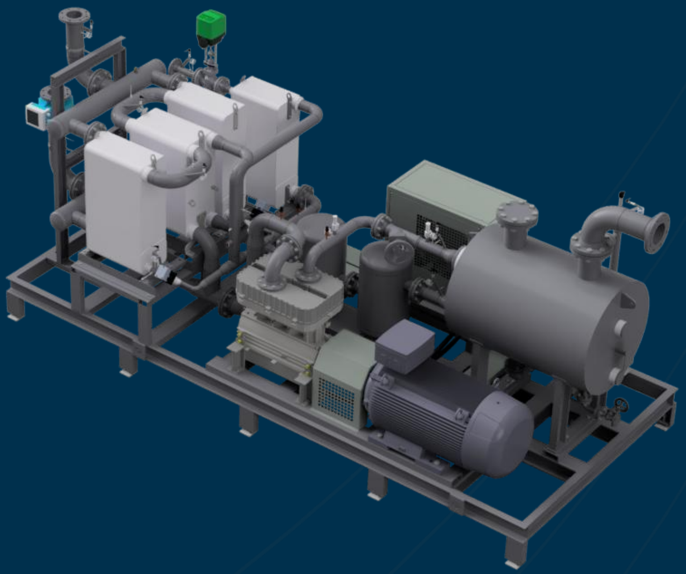
Maximum temperature for your process



ThermBooster

Customised industrial high-temperature heat pump

Medium heat source	Water, Water-Glycol, Thermal oil, Steam
Temperature heat source	8 up to 120 °C
Medium heat sink	Water, Thermal oil, Steam
Temperature heat sink	Up to 180 °C (higher with additional technologies)
Temperature lift per stage	Up to 80 K
Design	1- or 2-stage
Cooling circuits	1 or 2, Serial / Parallel
Refrigerant	HFO and natural hydrocarbons
GWP	1 – 9, max. < 20
Capacity per module	300 kW up to 2.5 MW per boundary conditions
Modular	Up to 5-10 MW
Power control	30 % up to 100 % stepless per compressor
Heat exchanger	Plate / Tube bundle / Plate & Shell
Control / Communication	S7, SG-ready, Remote maintenance



ThermBooster

Liquid Liquid

Heat source medium water | water glycol | thermal oil | steam

Heat sink medium water | thermal oil

Modular principle enables customer-specific customisation

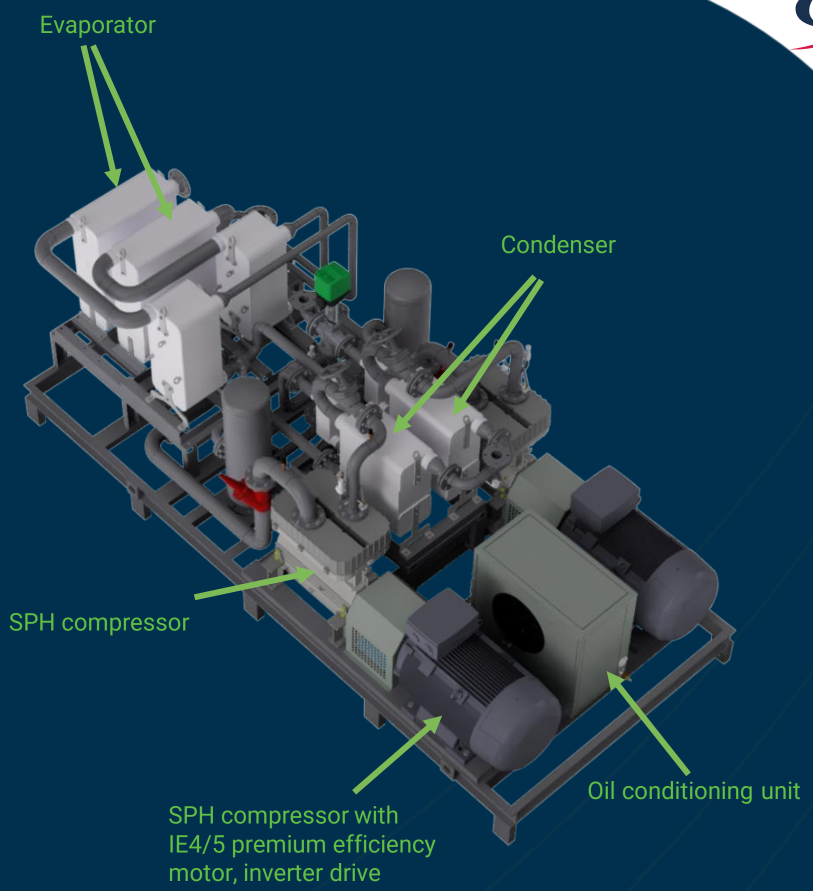
Decentralised process connection

Flexible placement thanks to modular design

Increased performance with up to 3 parallel compressors

180 °C supply temperatures

2-stage configuration for highest temperature lifts



Hot.
Efficient.
Green.

ThermBooster

Liquid Steam

Heat source medium water | water glycol | thermal oil | steam

Heat sink medium steam

Modular principle enables customer-specific customisation

Decentralised process connection

Flexible placement thanks to modular design

Increased output thanks to up to 3 parallel compressors

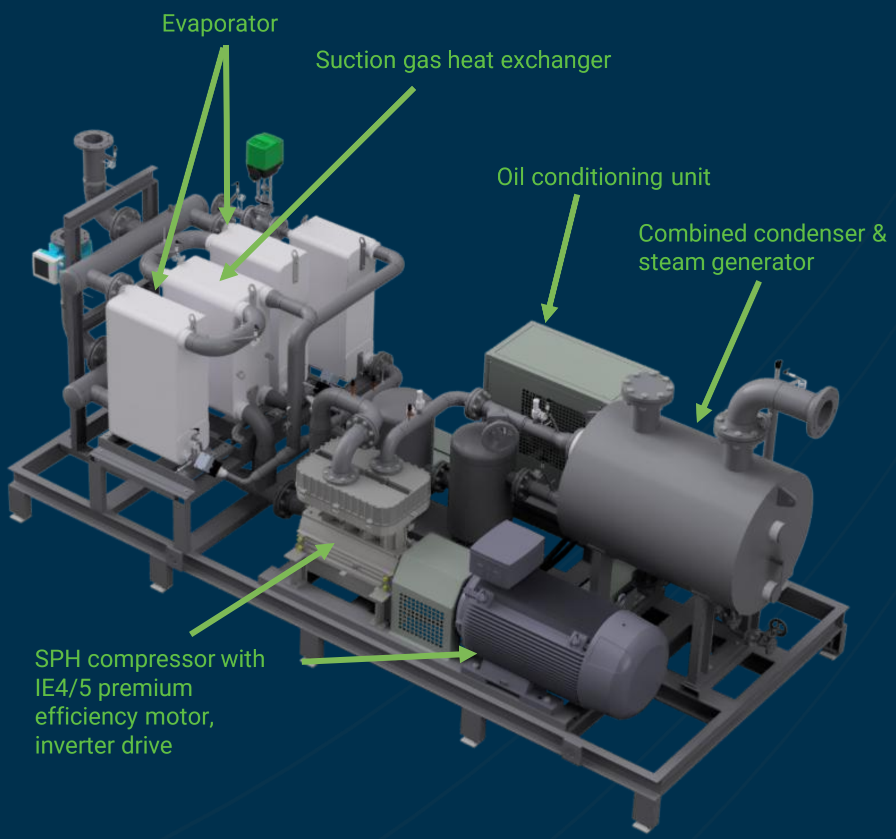
Directly integrated saturated steam generator

Slightly superheated steam optional

Steam up to 7 bara, 175 °C

2-stage configuration for maximum temperature lifts

Additional heat extraction for feed water preheating



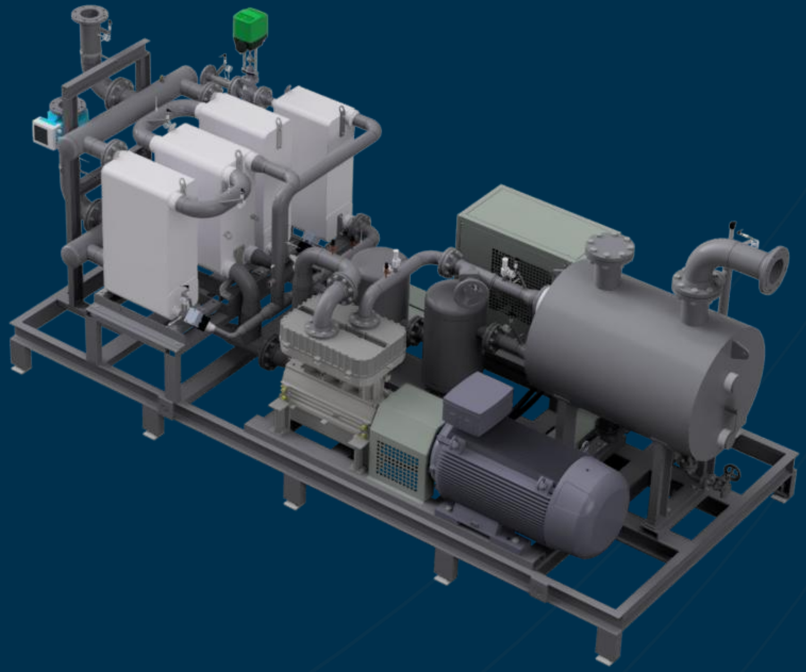
Hot.
Efficient.
Green.

References

Demonstration and test system

ThermBooster	LS1
System	1-stage
Refrigerant	R1233zd
Commissioning	2023
Medium Heat Source	Water
Heat Source	85/70 °C
Medium Heat Sink	Steam
Heat Sink	90/120 °C, 2 bara
Heat capacity	514 kW
Cooling capacity	407 kW
Electrical power	118 kW
COP	4.4
Heat generation	4.1 GWh / a
Decarbonisation	550 t CO_2 / a

Exemplary design
Gelatine production



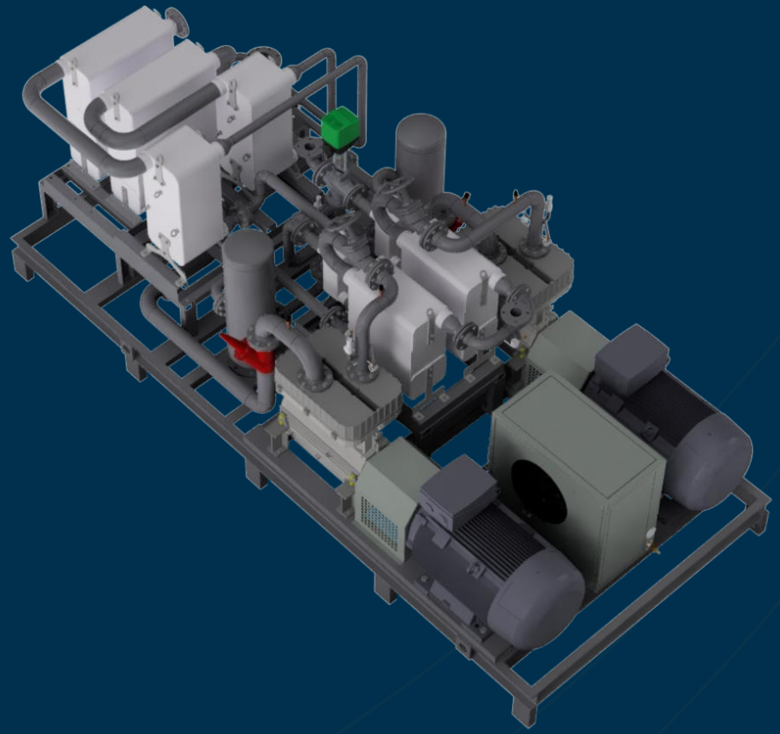
Hot.
Efficient.
Green.

Hot.
Efficient.
Green.

References

Thermoplastics - Netherlands

ThermBooster	2 x LL2
System	1-stage
Refrigerant	R1233zd
Commissioning	Q1/2 2023
Medium Heat Source	Water
Heat Source	75/65 °C
Medium Heat Sink	Water
Heat Sink	90/130 °C
Heat capacity	1,017 kW
Cooling capacity	809 kW
Electrical power	229 kW
COP	4.4
Heat generation	10.8 GWh / a
Decarbonisation	2,400 t CO_2 / a



In cooperation with technotrans

Hot.
Efficient.
Green.

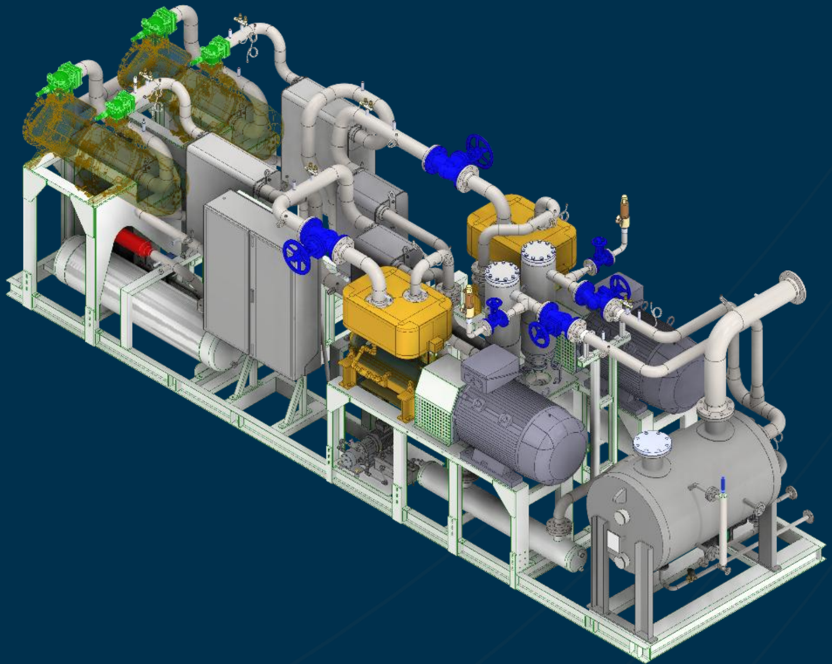
References

Push2Heat Paper drying - Germany

ThermBooster	LS2 - 2
System	2-stage
Refrigerant	R515B/R1233zd
Commissioning	Q2/2025
Medium Heat Source	Water-Glycol
Heat Source	46/41 °C
Medium Heat Sink	Steam
Heat Sink	103/123 °C, 2.2 bara
Heat capacity	1,180 kW
Cooling capacity	690 kW
Electrical power	520 kW
COP	2.27
Heat generation	7.1 GWh / a
Decarbonisation	1,420 t CO_2 / a

Felix Schöller paper mill in Weißenborn

Container installation next to the building



Hot.
Efficient.
Green.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

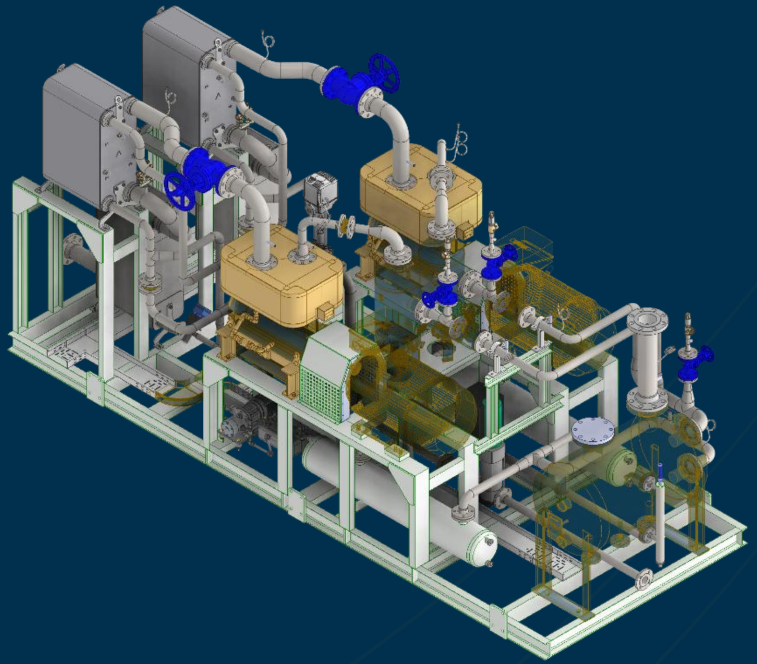
Hot.
Efficient.
Green.

Hot.
Efficient.
Green.

References

Aluminium coating - Spain

ThermBooster	2x LS2
System	1-stage
Refrigerant	R1336mzzZ
Commissioning	Q1/2025
Medium Heat Source	Water
Heat Source	92/84 °C
Medium Heat Sink	Steam
Heat Sink	90/159 °C, 6 bara
Heat capacity	2x 706 kW
Cooling capacity	2x 572 kW
Electrical power	2x 231 kW
COP	3.0
Heat generation	8.4 GWh / a
Decarbonisation	1,700 t CO_2 / a



Hot.
Efficient.
Green.

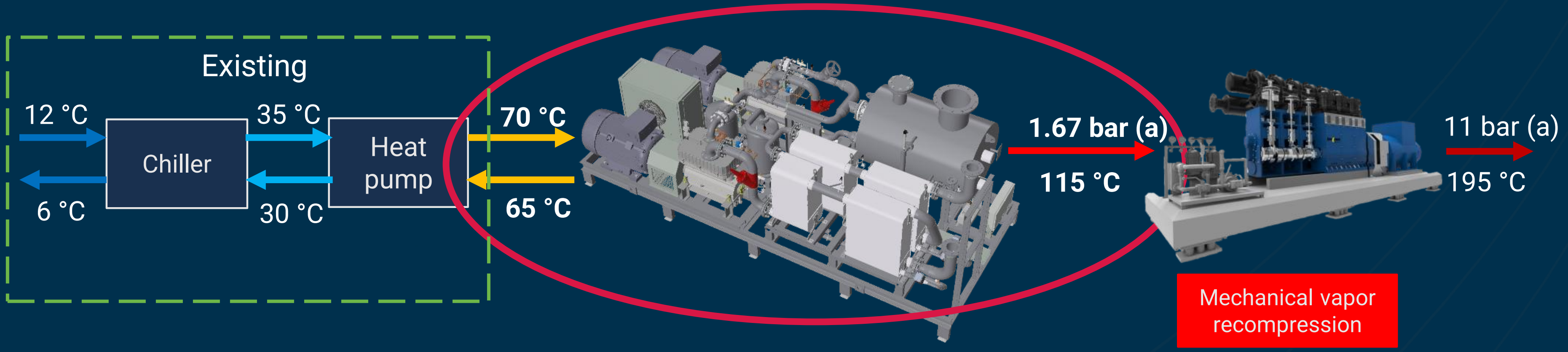
References

AHEAD - Pharmaceuticals - Austria

All systems are based on natural refrigerants → **ThermBooster Butane**

0 % CO_2 emissions for up to 7 months a year (no use of fossil fuels)

Up to **90 % CO_2 reduction on the production side**

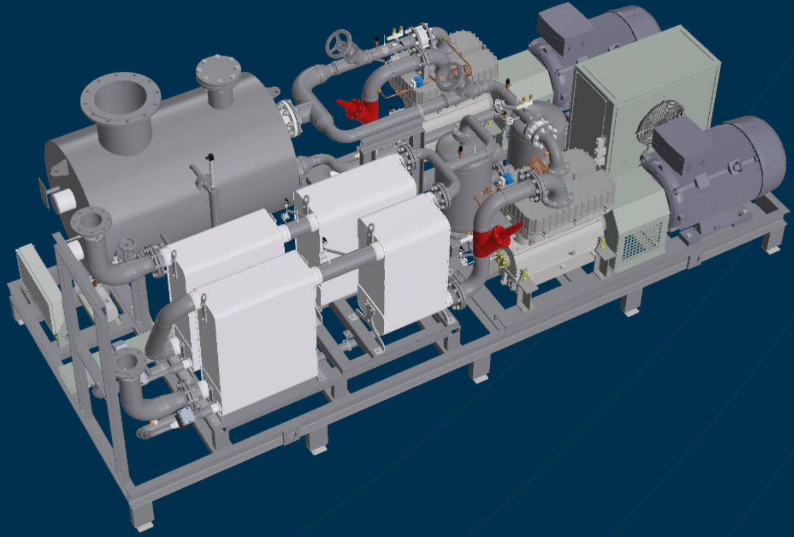


References

AHEAD - Pharmaceuticals - Austria

NET-ZERO INDUSTRIES AWARD 2023

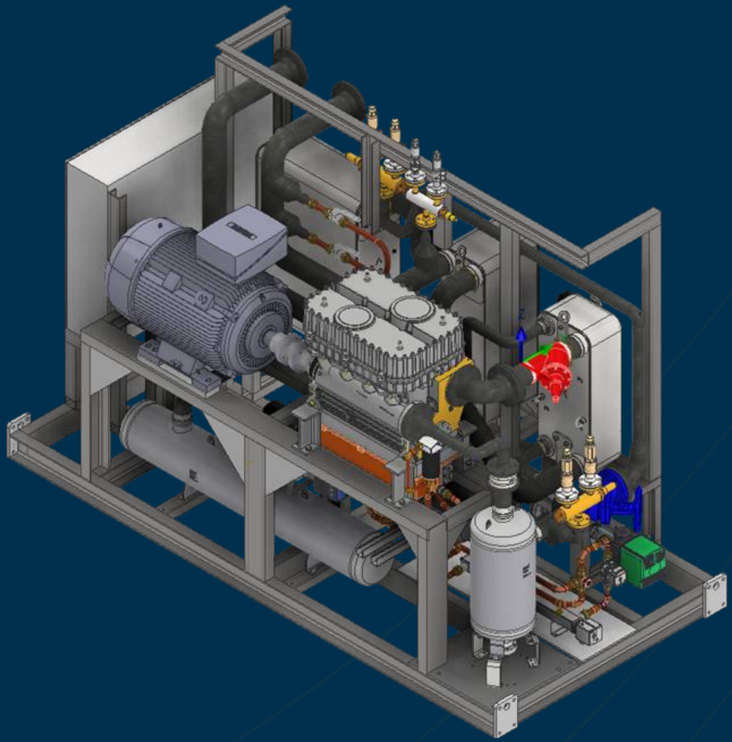
ThermBooster	LS2
System	1-stage+ MVR
Refrigerant	Butane
Commissioning	Q1/2025
Medium Heat Source	Water
Heat Source	70/65 °C
Medium Heat Sink	Steam
Heat Sink	90/115 °C, 1.67 bara | 195 °C, 11 bara
Heat capacity	1,270 kW | 1,561 kW
Cooling capacity	1,030 kW
Electrical power	300 kW | 372 kW
COP	4.3 | 2.3
Heat generation	7.2 GWh / a
Decarbonisation	1,440 t CO_2 / a



References

Chemical industry - Austria

ThermBooster	LL1
System	1-stage
Refrigerant	R1233zd
Commissioning	Q3/2025
Medium Heat Source	Water-Glycol
Heat Source	70/60 °C
Medium Heat Sink	Thermal Oil
Heat Sink	130/140 °C
Heat capacity	290 kW
Cooling capacity	212 kW
Electrical power	95 kW
COP	3.0
Heat generation	1.7 GWh / a
Decarbonisation	350 t CO_2 / a



Hot.
Efficient.
Green.

References

Bioplastics - Germany

ThermBooster	LS1
System	1-stage
Refrigerant	Pentane
Commissioning	Q1/2026
Medium Heat Source	Water
Heat Source	88/83 °C
Medium Heat Sink	Steam
Heat Sink	120/126 °C, 2.4 bara
Heat capacity	361 kW
Cooling capacity	296 kW
Electrical power	72 kW
COP	5.0
Heat generation	2.2 GWh / a
Decarbonisation	435 t CO_2 / a

SPH
Sustainable Process Heat

We have the solutions –
Let's implement them together!

Thank You!

Franz Helminger
franz.helminger@spheat.de
+49 2206 90506 - 69

Networking

- First round of mix & match:
  - Small breakout rooms (5 people max) for 10min
  - Short round of introduction: answer the questions
  - Open discussion in each small group
- ~~Second round~~
- Optional: Leave your coordinates in the Excel of the Teams meeting:
  - First Name / Name / Company / e-mail / Reason to be contacted*
    **Examples: looking for a partner for a European project, looking for an expert in this sector, looking for feedback on this technology/use case, looking for*
  - This file can be filled and consulted afterwards, by any attendee

- Conclusion of the e-café

Picture time

1. Open the camera
2. Smile
3. Picture*

***We will use this picture to communicate on LinkedIn**

Round of introduction (~1’30” per participant)

- Name and company, position
- What interests you about high temperature HP ?
- What do you expect from this e-café ?
  Examples: monitoring technology, identifying partners, proposing my solution(s), identifying experts, etc.

Timing : 10’ in the breakout room

ALLICE 3rd congress

Face-to-face event

- The right balance between **innovative technologies** and **practical applications** in industry
- A **cross-sectoral** approach that facilitates the sharing of technologies, pioneering best practices and complementary visions
- **Feedback** and expertise rigorously selected for their technical quality and innovative dimension

CONFERENCES & KEYNOTES

ROUND TABLES

MEETINGS ET NETWORKING

COCKTAIL & GALA DINNER

Thank you!

Next e-café: September / October

Topic: industrial symbiosis (to be confirmed)

Feedback welcomed: leo.pasquier@alliance-allice.com