Caramelli Energy S.r.l.

SPH Sustainable Process Heat

Sesto Calende, 12-09-2025

News from SPH

Read about how the ThermBooster™, the innovative steam producing heat pump from SPH, is picking up steam!

In this Newsletter you can read about how the ThermBooster™, the steam producing heat pump developed and produced by SPH Sustainable Process Heat GmbH, is finding its way into the European market. This industrial hight temperature heat pump represents a new “key-technology” for the decarbonisation of industrial thermal process heat and will also bring excellent opportunities for significant reductions of the costs of process heat. Caramelli Energy S.r.l. is the market promotor for these machines in Italy and Southern Switzerland.

Today, ten sales contracts have been signed for the delivery of a total of 13 heat pumps. Nine units have already been delivered: Two in Germany, two in the Netherlands, two in Spain, two in Austria and one in Italy. Two more units will be shipped to Spain by the end of the year.

Most of the above mentioned units will be up- and running before the end of 2025, in five different EU countries.

Principle characteristics of the ThermBooster:

- One- or two stage solutions possible on one skid,
- Direct heat or steam production up to 170 °C ,
- Can upgrade waste heat with temperatures between 35 °C and 140 °C, up to 160 °C or higher,
- In combination with a MVR unit, 11 bar steam or more can be delivered,
- Heat output between 300 kW up to 1.800 kW per machine, depending on the operating conditions,
- All compressors have stepless power control between 30 % and 100 % of their maximum power,

- Natural or synthetic refrigerants can be employed,
- Custom designed containers for outdoor placement are available,
- Full service contracts possible,
- EU wide delivery and support,
- Each machine is optimised according to the client's needs (read the full story).

1. Spirax Group plc has invested €4 million in SPH Sustainable Process Heat GmbH

On 8 August 2024, the Spirax Group released their HY report, in which they made the following statement: "*On 6 August 2024, the Group agreed to invest €4 million in return for an initial 12 % stake in Sustainable Process Heat GmbH (SPH), a technology start-up in Germany that is pioneering the development of high temperature heat pumps (HTHPs). We have an option to increase our holding upon SPH meeting certain technical milestones. This additional investment would also trigger a commercial agreement, adding the HTHPs to our portfolio of solutions to electrify the generation of steam for critical, higher temperature applications where steam is used directly in our customers' industrial processes*". Tim Hamacher and Andreas Mück, the Managing Directors of SPH, commented on the agreement: "*We are thrilled to announce our strategic partnership with Spirax Group, a global leader in steam and thermal energy solutions. Their €4 million investment and commitment to our high temperature heat pump (HTHP) technology marks a significant milestone for SPH. This collaboration will accelerate the commercialization of our innovative solutions, empowering industries to transition towards more sustainable, electrified steam generation for high-temperature applications. We look forward to the exciting journey ahead, as we continue to revolutionize industrial process heating together!*".

Dean Stephens, Group Head of M&A at Spirax Group (right), celebrates the agreement with Managing Directors Andreas Mück (left) and Tim Hamacher (in the middle)

2. Happy Birthday SPH!

Five years ago, in April 2020, SPH was born!

What began in April 2020 at the Rheinisch-Bergisches Technologie Zentrum (RBTZ) has quickly grown into an innovative company with a clear mission: transforming industrial waste heat in a valuable and sustainable source of energy for powering industrial processes.

The founders and managing directors of SPH, Tim Hamacher and Andreas Mück, have many years of experience in engine technology, energy systems, and CHP units. They have been working together since 2008. At the heart of the high-temperature heat pump they developed, there is a specially engineered piston compressor, designed for high temperatures. This compressor is derived from the ICE technology. The resistance to high temperatures is a key requirement for compressors used for the production of industrial process heat. Most

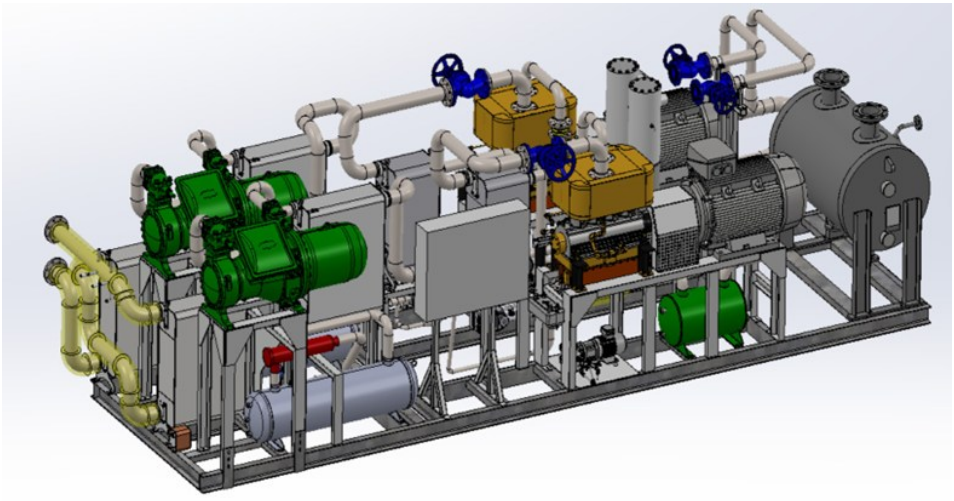
compressors used in heat pumps, have been originally designed for cooling purposes and are often less adapted for the uses at operating temperatures in the range of 100 to 200 °C.

Since 2022, SPH is located in Overath-Vilkerath, close to Cologne in Germany. It has its own production- and test facility. The latter is particularly important to assure the required performance of the machines, before delivery to the customers.

Beyond the work for industrial clients, SPH is a partner in many National and European research projects, for example AHEAD, Push2Heat, and HeatTransPlan. Winning the Start-Up Award at the 2023 Wirtschaftsnacht Rheinland was a very significant moment for the company and a strong endorsement of its vision on how to decarbonise industrial thermal processes.

3. Progress of the PUSH2HEAT project (paper mill)

After the delivery by SPH of the two-stage high-temperature heat pump at the project's demo site in Weissenborn (DE), the integration works have been finalized. The commissioning activities related to the HP system, such as the evacuation and filling of the low-temperature circuit (R515), checks on safety related components, IO-checks, etc. are underway. They also include operational tests, monitoring of the system performance, the optimization of the control logic, as well as the training of staff on site.



The 2-stage ThermBooster used in the PUSH2HEAT project. The heat pump is composed of four compressors, all mounted on one, easy transportable skid

The 2-stage ThermBooster arrives at the paper company Felix Schoeller in Weissenborn (DE)

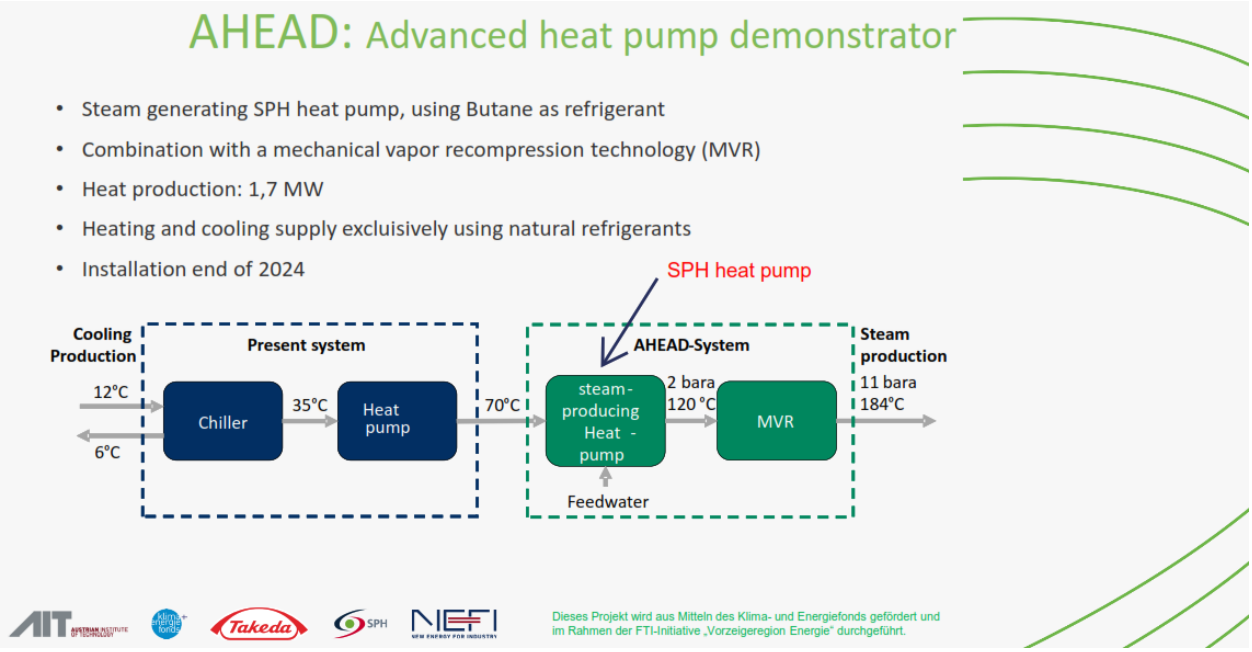
The heat pump operation has already generated the first performance data and much useful operational experience will be obtained in the coming months and provide valuable insight into the potential of this key-technology for the production of steam for industrial processes, in particular for the paper industry.

N.B. PUSH2HEAT is a Horizon Europe project grant agreement No. 10169689 (https://push2heat.eu/)

4. News from the AHEAD Project

The AHEAD project aims to make the biopharmaceutical production at Takeda's production site in Vienna, sustainable. To this end, the ThermBooster™ of SPH, will convert heat from the existing hot water system into superheated steam. The ThermBooster™ bridges a decisive step in a cascade of thermal systems: the production of steam at around 120°C, using 70 °C waste heat. The steam is further compressed with a steam compressor (MVR) up to the 11 bar required for the process. Using renewable electricity, the entire system reduces the CO_2 emissions of the site by about 90 % and enables a completely CO_2-free production for around seven months of the year. This saves 1.900 tons of CO_2 emissions each year.

In this project, the ThermBooster™ uses butane as refrigerant. The test bed at the SPH production facility in Overath, has been adapted for the use of this inflammable refrigerant. The ThermBooster™ for the AHEAD Project has been delivered in April 2025 (see also: https://nefi.at/en/project/ahead).



Block scheme of the Advance heat pump demonstrator.

5. ThermBooster planned deliveries and commissioning for 2025

The table below presents a comprehensive overview of the deliveries and commission activities of the ThermBooster for the next 12 months. The table also lists the principle characteristics of the units and the country of destination.

#	Country	Process	Unit type	No. of Units	Heat sink medium	Heat sink temp. (°C)	Heat output (kWth)	Working fluid	COP	Status	Est. CO2 savings (t/a)
1	Netherlands	Thermoplastics production	LL2	2	Hot water	130 °C	2,034	R1233zd	**4.4**	In operation	2,400
2	Germany	Paper production	LS2-2	1	Steam	123 °C	1,180	R1233zd	**2.3**	Commissioning	1,400
3	Italy	Consumer goods	LS1-2c	1	Steam	139 °C	646	R1233zd	**2.3**	In operation	780
4	Austria	Pharmaceuticals	LS2 + MVR	1	Steam	115 °C	1,270	Butane	**4.2**	In operation	1,440
5	Spain	Packaging materials	LS2	2	Steam	159 °C	1,060	R1336mzzZ	**2.5**	Commissioning	1,700
6	Austria	Chemicals	LL1	1	Thermal Oil	140 °C	290	R1233zd	**3.0**	Being installed	350
7	Germany	Bio plastics	LL2	1	Thermal Oil	110 °C	1,200	Butane	**5.0**	Being installed	1,450
8	Spain	Juice production	LL2	2	Hot water	110 °C	2,390	R1224yd	**5.6**	**Q4-2025**	2,868
9	Switzerland	Meat processing	LS1	1	Steam	140 °C	361	Pentane	**5.0**	**Q1-2026**	360
10	Germany	Whisky distillery	LS1-2	1	Steam	120 °C	621	R1224yd	**2.1**	**Q1-2026**	745
				13			**11,052**				**13,493**

The ThermBooster deliveries and commissioning program.

As can be seen from the table the delivery and commissioning activity is getting a very significant boost in 2025 and it is expected this will continue in 2026.

6. The future is electric – and it starts now!

The decarbonization of industrial production processes is progressing steadily. Political, economic, and technological frameworks already allow us a glimpse in the future landscape of industrial process heat generation – an area where high-temperature heat pumps and other power-to-heat technologies will play a crucial role.

A trend is seen across the EU, where 66 % of industrial energy consumption is related to process heat. About 37 % of this heat has a temperature below 200 °C, while circa 25 % has a temperature between 100 and 200 °C.

Today, a significant portion of waste heat from industrial processes remains unused. In Germany alone, up to 460 TWh per year is wasted. In many cases, even additional energy is used in order to cool the waste heat down before it can be released into the environment.

A study by Fraunhofer ISE[1], simulating four future scenarios, concluded that high-temperature heat pumps will be **a key technology** for the production of process heat up to 200 °C. These systems have the potential to supply between 44 % and 64 % of low-temperature process heat by 2045.

So, rethinking how industrial process heat is generated, supplied, and, above all, re-used is relevant for almost all industrial sectors.

Regulatory conditions in Europe are increasingly shaping the electrification of process heat generation. High-temperature heat pumps are central to many policymakers' strategies, as they are essential for achieving the EU's ambitious climate targets.

For manufacturers, the message is clear: shifting to climate-friendly technologies is unavoidable **and the best time to act is now**!

Potential applications include:

- Efficient waste heat recovery and re-use,
- On-site solar power generation and utilization for cost reduction,
- Integration of waste heat from other processes (e. g. data centres, biogas plants),
- Combination with mechanical vapor recompression for steam temperatures above 200 °C,
- Dynamic electricity contracts for grid stabilization and further cost reduction,
- Combining industrial heat pumps with solar thermal plants, district heating and geothermal heat production,
- Utilizing synergies in combination with heat and battery storage systems for cost optimization and grid stabilization.

Electrifying the production of process heat is not an option: it is a must and using a heat pump is the most efficient way to do so! So, the question is not if you will use a heat pump for your steam production, but when...

[1] https://www.ise.fraunhofer.de/de/veroeffentlichungen/studien/wege-zu-einem-klimaneutralen-energiesystem.html

Read the full story.

For more information:

For further information or quotations you can write to:

dolf.vanhattem@caramellienergy.eu or

tor.hodne@spheat.de .

See also:

https://spheat.de/?lang=en

https://caramellienergy.eu

In case you don't want to receive this Newsletter any more, please write to:
dolf.vanhattem@caramellienergy.eu

The SPH establishment in Overath

***