

## Steam-Producing Heat Pump System for Industrial Drying at Philip Morris

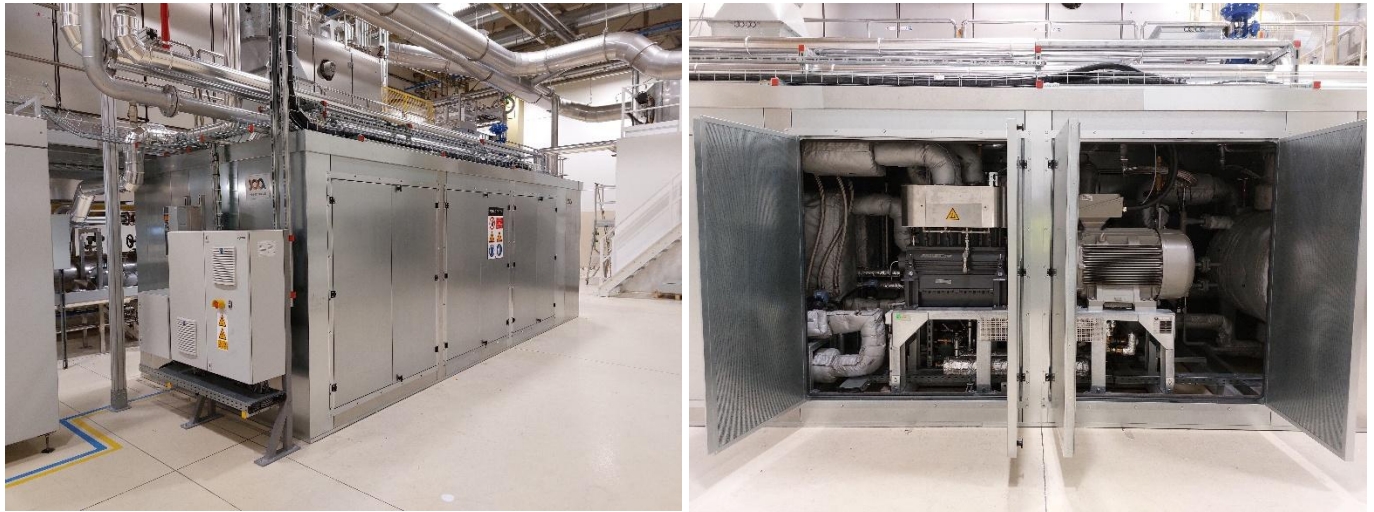


Figure 1: JOA integrated the ThermBooster heat pump from SPH at PMMTB.

### Summary of demonstration case

At Philip Morris Manufacturing & Technology Bologna (PMMTB), a pioneering heat recovery system has been installed, marking a major step forward in industrial energy efficiency. In a global first, the installation directly produces steam for drying processes using a two-stage high-temperature heat pump supplied by **SPH Sustainable Process Heat GmbH** and engineered in partnership with **JOA Air Solutions** (Netherlands).

The system integrates direct heat recovery from humid exhaust air of an industrial dryer with a high-temperature heat pump. This allows for more than half of the total dryer heat demand to be supplied entirely from recovered energy. Residual heat at about 36 °C is upgraded in two stages—first to 80 °C, then to 139 °C, producing saturated steam at 2.5 bar(g) that is resupplied into the dryer. Despite the unusually large temperature lift, the system achieves high efficiency, with a measured coefficient of performance (COP) of 2.5. Annual heat delivery is approximately 3.9 GWh/year, translating into estimated CO<sub>2</sub> savings of ≈1700 tons/year. The system demonstrates how large-scale industrial drying can be decarbonized without compromising reliability or performance.

“This is a breakthrough for the industry,” said Martin Tukker, Managing Director of JOA Air Solutions. “A heat pump capable of delivering this volume of steam, and so seamlessly integrated into the drying process, sets a new benchmark in the processing industry. We are proud to have collaborated with Philip Morris International, who have shown true leadership by being first-movers.”

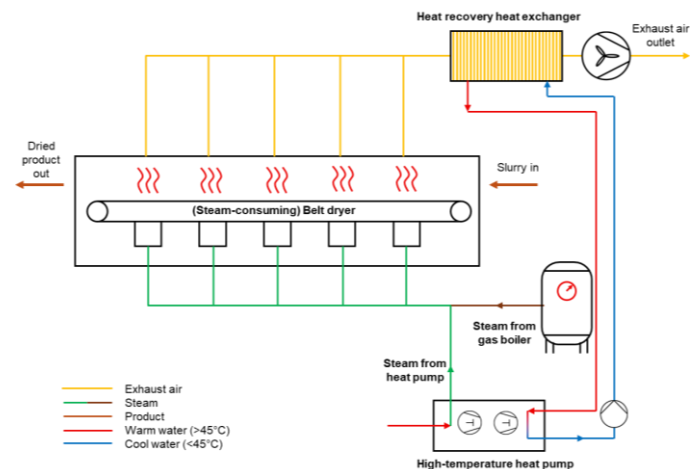


Figure 2: Process schematic of the heat recovery system.

All information were provided by the supplier without third-party validation. The information was provided as an indicative basis and may be different in final installations depending on application specific parameters.



## Operating experiences

During engineering and commissioning, the partners overcame several engineering challenges typical for first-of-its-kind systems, mainly linked to conversion from medium to low pressure steam operation of the dryer. This was an essential prerequisite for this project. The result is a fully automated, robust system that provides stable steam output across variable operating conditions.

“We knew we were pushing boundaries in the right direction,” said Arjun Arya, Engineering Lead. “The results clearly show how much potential there is in applying heat-pump technology at this scale.”

The experience confirms that high-temperature heat pumps can reliably replace or supplement fossil-fuel-based steam boilers in industrial drying and other process applications. The project has also strengthened cooperation between technology suppliers and end users, setting an example for further rollouts across Philip Morris International’s production network and beyond.



Figure 3: Another view of the heat pump installation.

## FACTS ABOUT THE CASE

**Installation year:** 2025

**Operating hours:** ca. 5000 hours/a

**Working fluid used:** R515B, R1233zd

**Compressor technology:** Reciprocal

**System Integrator:** JOA Air Solutions

**System manufacturer:**

SPH Sustainable Process heat GmbH

**Sector:** Tobacco drying

**Performance in design point:**

- **Heat source:** 50 °C → 36 °C, water
- **Heat sink:** 90 °C → 139 °C, saturated steam
- **Heat supply capacity:** 650 kW
- **COP<sub>Heating</sub>:** 2,5 Measured during FAT

**Investment cost:** Not available

**Savings:** Not available

**Estimated annual CO<sub>2</sub> savings:** 1.7 kt/a

**Link to webpage or report:**

- [www.spheat.de](http://www.spheat.de)
- [www.joaairsolutions.com](http://www.joaairsolutions.com)

## Contact information

**PMI Italy S.r.l**

✉ [arjun.arya@pmi.com](mailto:arjun.arya@pmi.com)

☎ +39 3667787750

**SPH Sustainable Process Heat GmbH**

✉ [tor.hodne@spheat.de](mailto:tor.hodne@spheat.de)

☎ +47 957 67 170

**JOA Air Solutions**

✉ [wietse.bandstra@joa.nl](mailto:wietse.bandstra@joa.nl)

☎ +31 621266050

All information were provided by the supplier without third-party validation. The information was provided as an indicative basis and may be different in final installations depending on application specific parameters.

