PRESS-RELEASE

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After three years of collaborative research and technological development, the HySTrAm project has successfully completed its journey — delivering a fully operational demonstrator and a series of breakthroughs that advance Europe's hydrogen and ammonia value chains. The final review meeting was held on 27 October 2025 at Anwil's facilities in Włocławek, Poland, where partners and European Commission representatives witnessed the HySTrAm demonstrator in operation, marking the project's formal conclusion.

The HySTrAm demonstrator, engineered by Casale and Hysytech validates a new process for sustainable ammonia synthesis. The plant integrates two reactors operating in sequence — one for ammonia production and the other for sorption and recovery — enabling operation at lower temperatures of around 300 °C and pressures close to 40–45 bar, compared to traditional Haber–Bosch process. According to Casale's engineering team, the plant stabilised quickly and maintained steady-state operation, with clear ammonia production and breakthrough curves observed on the analyser as the sorbent reached saturation. These results confirm that the HySTrAm process performs as predicted by simulations, achieving conversion levels close to those expected from the models.

Anwil site provided an ideal environment for validating the demonstrator under realistic industrial conditions. Partners were able to monitor the pilot continuously, observe the switching between absorption and desorption phases and compare the data with simulation outputs. According to the final discussions, the pilot achieved the expected technical performance and demonstrated full control of operation through the digital twin interface. Therefore, the demonstrator achieved the project's target of TRL 5, confirming its readiness for further scale-up.

Throughout the final meeting, partners presented the main scientific and technological results that contributed to the final demonstration output. Johnson Matthey, TU Eindhoven and the National Institute of Chemistry reported the development of a ruthenium–cesium catalyst and a magnesium chloride–alumina sorbent, both capable of operating at the intermediate temperature range required by the HySTrAm process. These materials were successfully shaped and scaled up to multi-kilogram batches for integration into the pilot plant.

TU Berlin and the University of Oslo presented the dynamic modelling work that supported reactor design and validation. The Aalborg University team created a one-dimensional dynamic model capable of reproducing the coupled behaviour of reaction, absorption and heat transfer in real time, while the University of Oslo contributed machine learning models for the design of new MOF materials for hydrogen storage. The digital twin and dashboard developed by Paragon were used to visualise pilot data during the test campaign, showing in real time the variation of temperature, pressure, flow and ammonia concentration during the absorption–desorption cycles.

With the project officially completed in November 2025, the consortium will continue dissemination and exploitation activities throughout 2026. The results achieved confirm that the HySTrAm process can operate at lower temperature and pressure than conventional Haber–Bosch synthesis while maintaining competitive yields, enabling substantial energy savings and CO_2 reduction potential. The project's demonstrator and supporting digital tools will serve as a foundation for future collaborative initiatives aimed at scaling up sustainable hydrogen and ammonia production in Europe.

Prof. Vincenzo Liso, Project Coordinator at Aalborg University

"Through the integration of advanced materials, process modelling, and demonstration, we have shown a pathway to produce ammonia more efficiently and sustainably. The pilot validated the concept at TRL5 — an essential step toward industrial implementation. This project has strengthened European collaboration across sectors and borders."

Taira Colah, Exploitation Lead at PNO Innovation

"HySTrAm's results have not only advanced the state of the art but also laid a foundation for future commercialisation. Our exploitation activities have identified strong industrial interest in the developed technologies, particularly the modular pilot design and the digital twin. The outcomes will guide the next steps towards scaling up and integrating these innovations in future Horizon Europe and industrial initiatives."

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