

PRESS RELEASE

DATE 26.01.2023

SUBJECT **Cryomotive and Fives enter into a partnership to develop a leading cryogenic pump for truck hydrogen refueling stations**

Basel, 26.01.2023: German CleanTech hydrogen mobility startup Cryomotive and French industrial group Fives have signed a Cooperation Agreement to jointly develop and validate a cryogenic pump for generating CRYOGAS hydrogen based on Fives' cryogenic reciprocating pump technology. The Cryomec Hy-Filling™ pump designed by Fives, will be a key component of future hydrogen refueling stations for long-haul truck and other heavy-duty transport applications.

CRYOGAS, also called cryo-compressed hydrogen gas (CCH₂), is a high-density cryogenic compressed hydrogen gas, which can reach densities of 80 kg/m³ and more at pressure levels between 30 MPa and 40 MPa. The CRYOGAS technology offers a higher physical density than liquid hydrogen while being thermally robust since it cannot evaporate. As CRYOGAS can be generated by cryogenic compression of liquid hydrogen (LH₂) as well as by cryo-cooling of compressed hydrogen gas (GH₂), Cryomotive and Fives target to develop a reciprocating cryogenic pump to compress LH₂ with a high-flow rate, low footprint and low energy consumption.

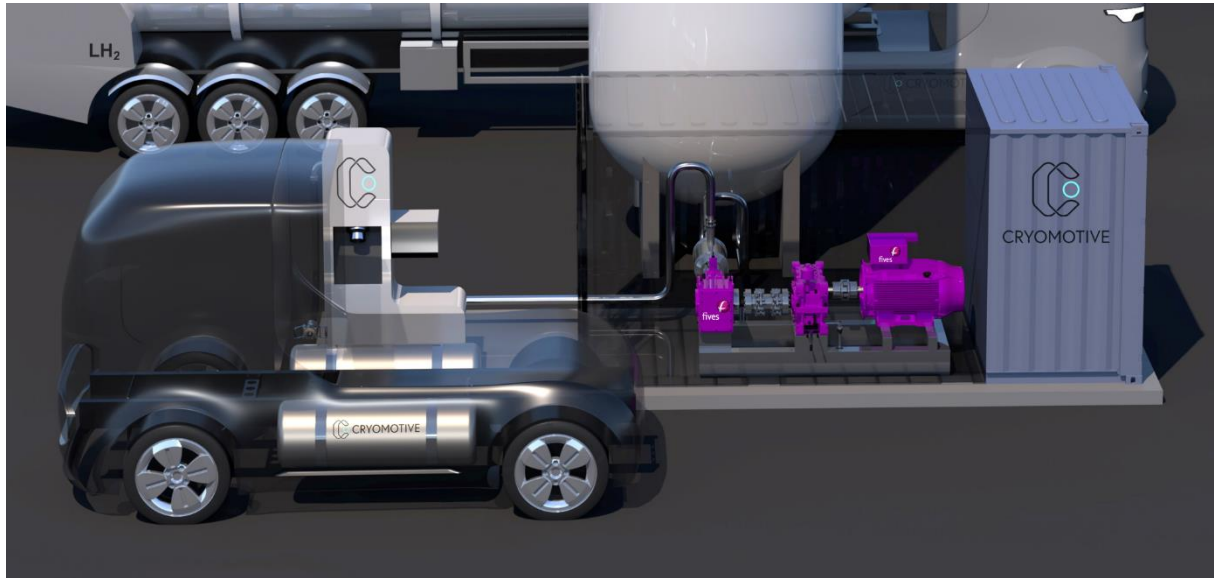
A disruptive technology at the heart of future hydrogen truck filling stations

Based on agreed performance targets for the future Cryomec Hy-Filling™ CRYOGAS reciprocating pump, Cryomotive's refueling station will be able to fuel future hydrogen trucks in 10 to 15 minutes with up to 80 kg of CRYOGAS, enabling a 1,000 km drive in a long-haul fuel cell or hydrogen internal combustion engine truck. As a part of Cryomotive's CRYOGAS hydrogen refueling station, the Cryomec Hy-Filling™ CRYOGAS pump will open the door for a cost-effective and energy-efficient compact hydrogen filling station, allowing unlimited back-to-back refuelings of trucks, buses and other heavy-duty vehicles.

"Cryomotive's CCH₂ CRYOGAS storage and refueling technology can pave the way for emission-free hydrogen-powered long-haul trucks at par with Diesel in terms of range, refueling time and cost. Fives' reciprocating cryogenic pump to generate high-density CRYOGAS is a key enabler of future cost-effective hydrogen refueling stations", emphasized Christiane Heyer, Managing Director and Co-founder of Cryomotive.

“As a worldwide leader in cryogenics, Fives has been at the forefront of hydrogen for decades. We have manufactured more than 8,000 pumps in our workshop in Allschwil, Switzerland, and are looking forward to developing this new model with Cryomotive to boost green mobility for trucks and heavy-duty vehicles.” declared Xavier Nicolas, CEO of Fives Cryomec AG.

“Fives is proud to enter a strategic partnership with Cryomotive in the field of CRYOGAS, and to extend its footprint as a key hydrogen pump technology provider to the industry” added Frédéric Thrum, Deputy General Manager of Fives and President of the Energy Division. “This agreement follows our ambition to serve the decarbonization of the industry, providing cutting edge cryogenic equipment along the hydrogen value chain.”



From left to right: Dr. Thomas Funke, Cryomotive Senior Engineer Process & Systems Integration; Xavier Nicolas, CEO of Fives Cryomec AG; Dr. Tobias Brunner, CEO of Cryomotive; Vincent Pourailly, President of the Energy | Cryogenics Business Line of Fives

About Cryomotive GmbH

Established in October 2020, **Cryomotive** is a leading German hydrogen mobility startup focusing on developing high-density hydrogen onboard storage and refueling technology to enter the market with first small series applications starting in 2025. Cryomotive focusses on the proprietary CRYOGAS hydrogen storage technology that has previously been developed and demonstrated in BMW passenger cars based on the concept of one of Cryomotive's founders. Cryomotive's CRYOGAS hydrogen technology offers a range of 1,000 km with a refueling time of 10 to 15 minutes in long-haul heavy-duty commercial vehicles, combining it with multiple performance and flexibility advantages. As part of the CryoTRUCK consortium, supported by the German Federal Ministry for Digital and Transport (BMDV), Cryomotive will develop a CRYOGAS hydrogen storage system and its core components and test them together with the two truck partners MAN Truck & Bus and Clean Logistics. Cryomotive will also provide a CRYOGAS test refueling station with a novel CRYOGAS refueling system for test operations.

In May 2021 Chart Industries, Inc. ("Chart", NYSE: GTLS) and Cryomotive have entered a strategic partnership, including Chart's minority investment and in-kind contribution, as well as a commercial agreement. Chart and Cryomotive will collaborate on developing and validating core components for future CRYOGAS hydrogen refueling stations for heavy-duty applications beyond the cryogenic pump.

About Fives

Fives, a pivotal player in the hydrogen industrial ecosystem

From the first railway lines to the Eiffel Tower lifts and factory 4.0, for over 200 years, Fives has been designing the disruptive solutions and technologies that make up industry. As a pioneer of decarbonization and digitalization, Fives is always one innovation ahead thanks to its ability to anticipate customer needs. By responding to the specificities of each market locally, Fives combines economic and environmental performance in 25 countries thanks to its 8,200 employees.

Fives is the independent supplier worldwide of key process equipment required to produce, convert, liquefy and transport hydrogen, in its various chemical states. Through its Energy | Cryogenics activity, Fives specializes in the design, manufacture, installation and maintenance of brazed heat exchangers, cold boxes, core-in-drums, and Cryomec® centrifugal and reciprocating pumps for the gas production, processing industry and hydrogen applications.

For more information visit www.fivesgroup.com/energy-cryogenics

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