January 27, 2026

Torishima Pump Mfg. Co., Ltd.

Torishima Wins Order for World's First Superconducting Hydrogen Pumps

Revolutionary Technology
Enables Commercial-Scale Liquid Hydrogen Terminal

Osaka, Japan – Torishima Pump Mfg. Co., Ltd. announces it has received an order from Kawasaki Heavy Industries, Ltd. (KHI) for high-flow liquid hydrogen pumps using groundbreaking superconducting motor technology. These pumps will serve as the "heart" of the Kawasaki LH_2 Terminal, one of the world's largest liquefied hydrogen facilities.

The terminal is a key component of Japan's "Commercial Demonstration of the Liquid Hydrogen Supply Chain" project, funded by the New Energy and Industrial Technology Development Organization (NEDO) under its Green Innovation Fund. KHI is designing and constructing the facility through a public-private partnership, with Japan Suiso Energy, Ltd. operating the plant.

This is the world's first commercial-scale liquefied hydrogen terminal※, featuring a 50,000 m^3 storage tank, offshore loading and unloading facilities, hydrogen liquefaction equipment, gas delivery systems, and truck loading facilities.

The Engineering Challenge

Moving liquid hydrogen at commercial scale presents a critical technical problem: Heat.

Liquid hydrogen must be maintained at -253°C. Even small amounts of heat cause it to evaporate back into gas, creating what's known as "boil-off loss." The larger the volume you need to pump, the more powerful the motor required—and conventional electric motors generate significant heat, even at cryogenic temperatures.

This creates a fundamental barrier: the pumps needed for commercial-scale hydrogen infrastructure would generate so much heat that they'd vaporize a substantial portion of the hydrogen they're trying to move. You can't build an economically viable hydrogen supply chain if your pumps are constantly boiling away your product.

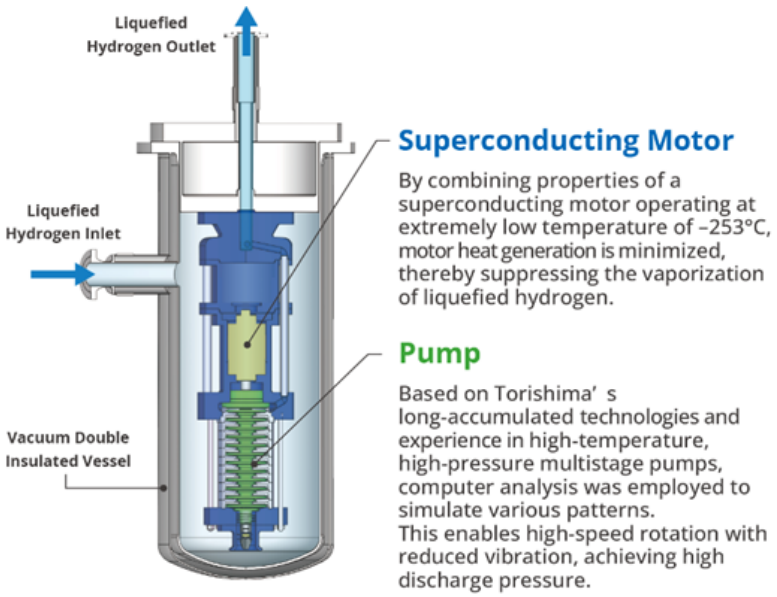
The Breakthrough: Superconducting Motors

Torishima has solved this problem by developing the world's first industrial liquid hydrogen pump equipped with a superconducting motor.

Superconducting materials have zero electrical resistance at cryogenic temperatures. This means the motor generates virtually no heat during operation. By eliminating heat generation, Torishima's pumps can handle commercial flow rates while minimizing evaporation loss.

The technology combines Torishima's 100+ years of centrifugal pump expertise with high-temperature superconducting technology developed by Kyoto University. Development was supported by NEDO's "Technology Development Project for Building a Competitive Hydrogen Supply Chain," adopted in 2023. The design was successfully tested in 2024.

Operational Testing of the Liquid Hydrogen Pump at JAXA (2024)



Pump Specifications

Torishima will supply two types of pumps for the terminal:

Pump Name	**Booster Pump**	**Loading Pump**
Application	Delivering liquid hydrogen from storage tanks to various end-users.	Transfer of liquid hydrogen to LH2 carriers.
Quantity	5 units	1 unit
Flow Rate	～51.8 m³/h	700 m³/h
Total Head	～2,400 m	510 m
Rotatating speed	～5,300 min^{-1}	3,350 min^{-1}
Motor Output	50 kW	105 kW

The loading pump's 700 m³/h flow rate represents a significant scale-up from previous liquid hydrogen pumping technology, enabling rapid ship loading at commercial volumes.

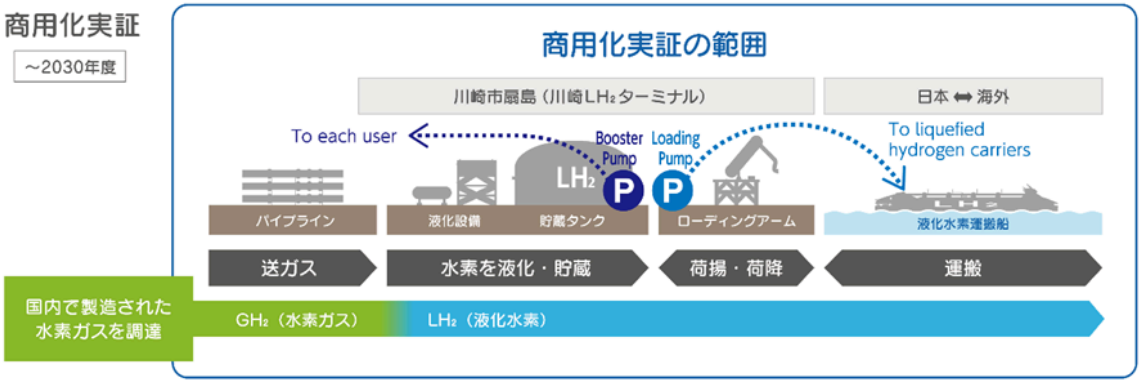


Image Note: Terminal diagram based on images from Japan Suiso Energy, Ltd. (https://www.japansuisoenergy.com/). Pump locations, labels, and flow arrows added by Torishima.

Why This Matters

Building a viable hydrogen economy requires the ability to transport large quantities of hydrogen efficiently and economically. Liquefaction increases hydrogen's density, making bulk transport feasible—but only if you can pump it without losing it to evaporation.

Torishima's superconducting motor technology removes a major technical barrier to commercial-scale hydrogen infrastructure. By minimizing boil-off loss, these pumps make "low-cost, large-scale hydrogen transport" achievable for the first time.

Future Development

Torishima will continue developing liquid hydrogen pump technology with even higher flow rates, pressures, and efficiency. Through this project and ongoing technical advancement, the company aims to contribute to building large-scale hydrogen supply chains and supporting the transition to a decarbonized society.

About Torishima Pump Mfg. Co., Ltd. Torishima is a Japanese pump manufacturer with over 100 years of experience in centrifugal pump technology, serving critical infrastructure projects worldwide.

World's first claim applies to industrial/commercial-scale liquid hydrogen pumps equipped with superconducting motors.

※ Based on public information released by Japan Suiso Energy, Ltd. (JSE) and Kawasaki Heavy Industries, Ltd. (KHI).
Groundbreaking Ceremony Key Facility for the Liquefied Hydrogen Supply Chain Commercialization Demonstration Project

【Related Links & Reference Materials】

■ Commercialization Demonstration of the Liquid Hydrogen Supply Chain: Japan Suiso Energy, Ltd. Official Website（Japanese Only)
https://www.japansuisoenergy.com/

■ Torishima Successfully Completes Operational Tests of Liquid Hydrogen Pump (March 14, 2024)
Torishima and Kyoto University Make Hydrogen History with World's First High-Flow, High-Efficiency Liquid Hydrogen Pump

■ Technical Detail Document: NEDO Hydrogen and Ammonia Briefing 2025 Materials
(Japanese only)
https://www.nedo.go.jp/content/800030717.pdf