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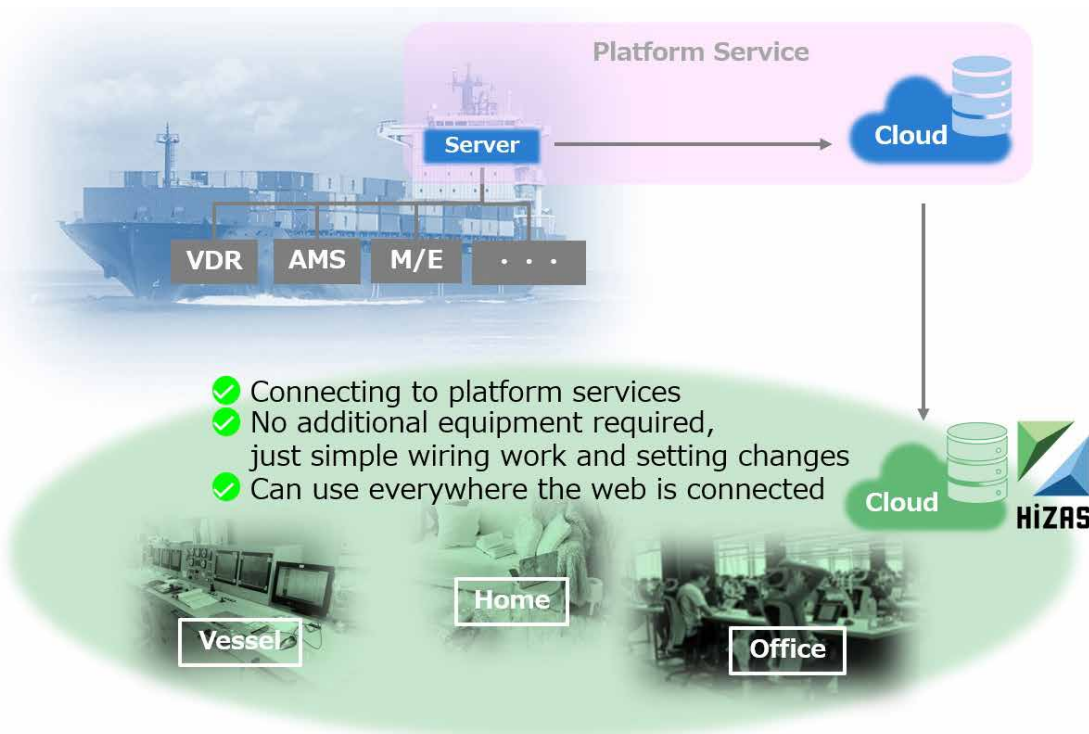


By Builder

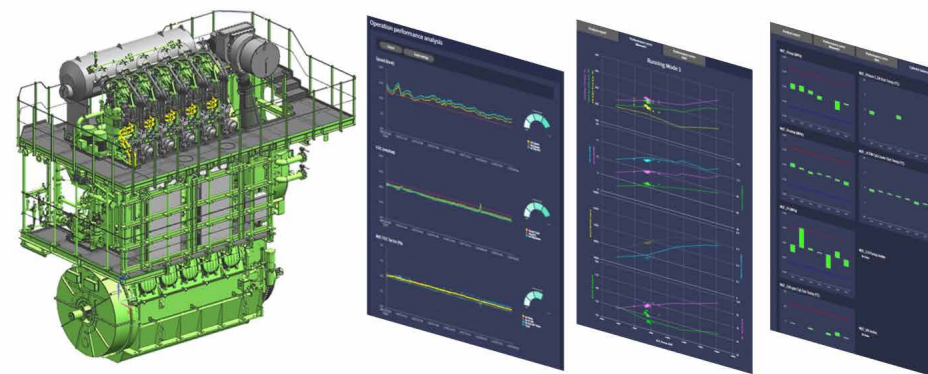


By Ship Type

# HiZAS VDA Service (Vessel Data Analysis Service) 1



- ✔ Automatic M/E performance analysis
- ✔ Supports multiple M/E running modes
- ✔ Evaluation of advanced analysis values (TC efficiency, etc.)



Various companies are providing platform services that automatically transmit measured data from ship to shore, and these services are increasingly being applied to new vessels. By connecting to each platform services of these companies, HiZAS is provided as web applications with various functions at minimal cost and without installing additional equipment on vessel.

For vessels that are not applied with platform service, HiZAS is available by manual data upload.

## Service

Cloud base web application

## Contract

Annual contract (subscription)

## Main functions

- Main engine performance analysis
- Alarm notification
- Vessel operation performance visualization and evaluation
- Parts measurement data management
- Data export

Hitachi Zosen Marine Engine Co., Ltd. is one of the group companies of Kanadevia Corporation



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By Builder



By Ship Type

# Catalyst Technology for Next-Generation Fuels (GHG reduction, NOx reduction) 2

## Catalyst Technology for Next-Generation Fuels

We solve the challenges of next-generation fuels with Catalyst Technology.

### Methane Slip Reduction Device

Development of methane slip reduction technology from LNG fueled ships by catalyst and engine modification

- Development Period: 2021-2026
- Aim to reduce methane slip by over 70% by combining improvements in the 4-stroke engine with a methane oxidation catalyst.
- Commence full-scale demonstration tests on large coal carrier vessels starting in 2024.

### N<sub>2</sub>O decomposition catalysts

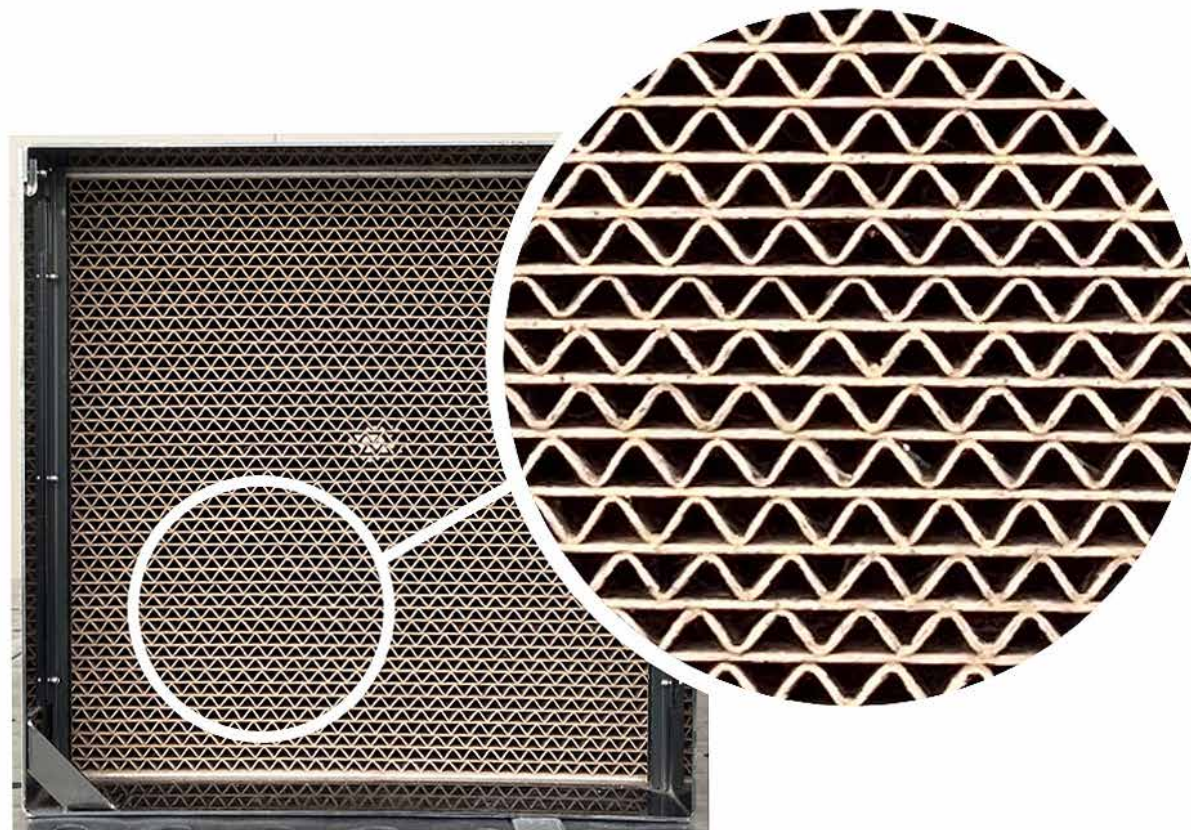
Development of N<sub>2</sub>O reactor installed on ammonia-fueled ships

- Development Period: 2024-2027
- Aim for an N<sub>2</sub>O decomposition rate of 90% or less than 5 ppm at the reactor outlet.
- Starting in 2026, plan to conduct full-scale demonstration tests on ammonia-fueled ammonia carrier vessels.

### Ammonia cracking catalyst

Catalyst for Separating Hydrogen from Ammonia

- Capable of separating a portion of fuel ammonia into hydrogen, which can then be used as an igniter for ammonia.
- Also capable of decomposing and removing high-concentration leaked ammonia





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By Builder



By Ship Type

# Hydrogen-fueled Vessel Wins AiP Towards Demonstration Operation 3

**MOL** Mitsui O.S.K. Lines **MOL** MOL Drybulk

**ONOMICHI DOCKYARD** **Kawasaki**

**J-ENG**

Mitsui O.S.K. Lines, Ltd.

MOL Drybulk, Ltd.

Onomichi Dockyard Co., Ltd.

Kawasaki Heavy Industries, Ltd.

Japan Engine Corporation

Mitsui O.S.K. Lines, Ltd. (MOL), MOL Drybulk, Ltd., Onomichi Dockyard Co., Ltd., Kawasaki Heavy Industries, Ltd. (Kawasaki) and Japan Engine Corporation (J-ENG) conducted a risk assessment of a Multi-Purpose Vessel powered by hydrogen, zero-emission fuel and has been granted Approval in Principle (AiP) of parcel layout concept (\*1) from Nippon Kaiji Kyokai (ClassNK).

This is the world's first AiP certification for a ship equipped with a low speed two-stroke hydrogen-fueled engine as the main propulsion engine.

Demonstration operation of the vessel will be conducted for two years from around FY2027 as part of the "Development of marine hydrogen engines and MHFS (\*2)" which was adopted by Green Innovation Funding Program of the New Energy and Industrial Technology Development Organization (NEDO). Prior to the demonstration operation, J-ENG's large low-speed two-stroke hydrogen-fueled engine and Kawasaki's MHFS will be installed in the vessel by FY2026. MOL and MOL Drybulk will be in charge of ownership and operation management of



Image of Hydrogen-fueled Multi-Purpose Vessel (D/W 17,500 M.T.)

the vessel and Onomichi Dockyard will be in charge of the development and building of the vessel, and they will cooperate toward the demonstration operation.

The five companies held a Pre-HAZID meeting (\*3) on June 28-

29, 2023, together with ClassNK and the National Maritime Research Institute, National Institute of Maritime, Port and Aviation Technology. The parties completed identification of the risks and issues to be considered in further design for the





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By Builder



By Ship Type

# Hydrogen-fueled Vessel Wins AiP Towards Demonstration Operation

3

parcel layout concept of liquefied hydrogen fuel tank and fuel supply system, and confirmed that the design of the vessel can proceed further based on the current parcel layout. MOL, MOL Drybulk, Onomichi Dockyard, Kawasaki and J-ENG will contribute to reducing GHG (Greenhouse gas) in the maritime industry and achieving carbon neutrality by 2050 through the demonstration operation of the vessel.

#### \*1 Parcel layout concept :

Proposed layout of liquefied hydrogen fuel tank and other hydrogen fuel related equipment onboard and the design concept.

#### \*2 MHFS :

Marine Hydrogen Fuel System (Marine Hydrogen Fuel Tank and Fuel Supply System)

#### \*3 Pre-HAZID meeting :

Risk assessment meeting held to review the parcel layout concept of the marine hydrogen fuel tank and the fuel supply system prior to the HAZID (Hazard Identification Study) meeting that will be held for whole vessel in this project.

HAZID meeting : Risk assessment meeting in which experts discuss the magnitude and frequency of potential system hazards to ensure that the system as a whole is sufficiently safe.

## Related press release

“Development of marine hydrogen engines and MHFS” is adopted by NEDO, part of Green Innovation Funding Program  
～ Moving to Realize a Zero Emissions Vessel ～  
(Oct. 26, 2021)

MOL, MOL Drybulk, J-ENG Sign Agreement for Trial of Hydrogen-fueled Engine equipped Onboard ～ Aiming to Realize a Zero Emissions Vessel ～ (Nov. 9th, 2021)

[https://www.j-eng.co.jp/en/news/2021/te8a72000000mjj-att/J-ENGPressRelease20211109\\_EN.pdf](https://www.j-eng.co.jp/en/news/2021/te8a72000000mjj-att/J-ENGPressRelease20211109_EN.pdf)

Testing of hydrogen fuel injection device for a large low-speed



#### AiP Certificate Handover Ceremony (From left)

Hiroyuki Motoya, Executive Officer/General Manager, Design Department, Onomichi Dockyard

Terumi Moriguchi, Managing Executive Officer, MOL Drybulk

Yoshihiko Sugimoto, General Manager, Technical Division, Technology Innovation Unit, MOL

Masaki Matsunaga, Corporate Officer/Director of Plan Approval and Technical Solution Division, ClassNK

Hideaki Murata, Associate Officer/General Manager, Marine Machinery Business Division, Kawasaki

Seiji Shindo, Representative Executive Managing Director of Technology, J-ENG

two-stroke engine has begun. (May 16, 2023)

<https://www.j-eng.co.jp/en/news/20230516.html>





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By Builder



By Ship Type

# Kawasaki Completes Hybrid Propulsion System Using Gas Engine for Bulker 4

Kawasaki Heavy Industries, Ltd. (Kawasaki) has completed a hybrid propulsion system using a natural gas-fueled engine for a limestone bulk carrier operated by NS United Kaiun Kaisha, Ltd. of Japan. This hybrid propulsion system consists of a natural gas-fueled engine and a large capacity battery, and is the first such installation on a bulk carrier.

This hybrid propulsion system uses a gas-fueled engine as the main engine. The gas-fueled engine can achieve approximately 24% reduction of CO<sub>2</sub> emissions when compared with the conventional heavy-oil-fueled diesel engine installed on a ship of the same type. Furthermore, emissions of SO<sub>x</sub> and NO<sub>x</sub> in the engine exhaust can be greatly reduced. The limestone bulk carrier is scheduled to enter service in February 2024, and will operate with the hybrid propulsion units consisting of the gas-fueled main engine and 2,847kWh lithium-ion battery. The LNG fuel tank for the main engine has been designed using 7%-nickel steel developed by Nippon Steel Corp for the first time for ships.

During navigation, the Kawasaki main gas engine generates the propulsion force and inboard electric power. With only natural gas fuel, the ship can cruise over long distances and extended service under high power. When entering and leaving a port, the ship is operated by electric propulsion mode using the battery. This mode achieves ship operation with



Limestone bulk carrier image

zero-emission of greenhouse gases (GHGs).

Emissions control of the main engines will become more severe in international ship operation, so main engines must adapt to the requirements for environment conservation.

Gas-fueled engines can surmount such severe emission control requirements without treating the exhaust gas.

Kawasaki has developed the marine gas engine, model L30KG, based on the technology accumulated through manufacture

of gas engines for electric generator use, which demonstrate the highest power-generation efficiency in the world. The Kawasaki marine gas engine has obtained a Type Certificate of the DNV and is now marketed worldwide. Moreover, Kawasaki is now preparing the acquisition of a Type Certificate for the control system, same as the gas engine, within 2024. Emission control reinforcement of GHGs has been promoted by the International Maritime Organization (IMO) in the





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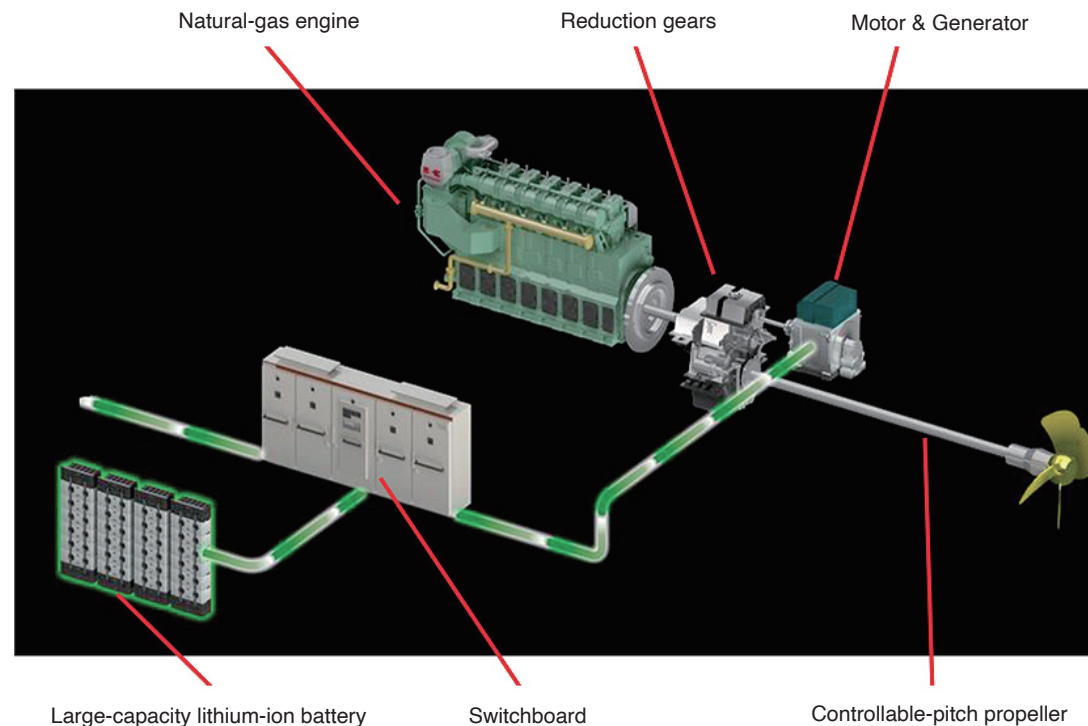


By Ship Type

## Kawasaki Completes Hybrid Propulsion System Using Gas Engine for Bulker 4



Gas-engine hybrid propulsion system



### Gas-engine hybrid propulsion system

marine transportation area as well. Kawasaki, as an integrator of ship propulsion systems, will continue to develop superior propulsion systems in the environmental performance by optimal combination of the gas-fueled engine and propulsion components to contribute to reduction of load on the environment.

### Outline of limestone bulk carrier

Deadweight:	Apprx. 5,549 t
Length (o.a.):	94.0 m
Width (mld.):	18.2 m
Depth (mld.):	9.90 m
Main service route:	Coastal line between Shiriyasaki Port and Muroran Port
Cargo:	Limestone



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By Builder



By Ship Type

# Kawasaki Successfully Completed Verification of Automated Berthing and Unberthing Operations with Advanced Safety Berthing/Unberthing Assistance System

Safety and Efficiency Improvements for In-Port Vessel Maneuvering, Berthing, Unberthing and Mooring Operations **5**

Kawasaki Heavy Industries, Ltd. announced today its success in automated in-port vessel maneuvering, berthing and unberthing operations\*<sup>1</sup> using Advanced Safety Berthing/Unberthing Assistance System, for which research and development are being carried out jointly with Kawasaki Kisen Kaisha, Ltd. ("K" Line) and Kawasaki Kinkai Kisen Kaisha, Ltd. ("K" Line Kinkai). The operations were conducted as part of system verification tests in real-life operating environments. Following confirmation of successful automated operations, Kawasaki began accepting customer orders for the system. During development of the Advanced Safety Berthing/Unberthing Assistance System, issues were raised in regard to the technically challenging task of keeping the vessel attitude parallel to the berthing quay amid varying wind conditions and other external influences while maneuvering the ship laterally toward the berthing location. The Kawasaki-developed "Advanced Berthing/unberthing Assistance System - Display Unit"\*<sup>2</sup> and "Advanced Berthing/unberthing Assistance System - Control Unit"\*<sup>3</sup> were utilized during verification tests to enable the test vessel to automatically follow a preset course amid winds and waves, from harbor entry to berthing (fender touch). Automated berthing and unberthing operations were successfully completed during both entry into and departure from port, moving ahead and astern.

Normally, berthing and unberthing operations are carried out by skilled crew with thoroughgoing knowledge and experience in vessel maneuvering technique, as well as the specific maneuverability characteristics and mooring equipment features of their own vessel. However, increasing ship



Vessel used for verification tests

sizes have made vessel maneuvering more sophisticated and challenging, while shortages of crew personnel have become a widespread problem throughout society. These have led to demands for improvements in terms of labor savings, reduced skill-level requirement and improved safety management in vessel maneuvering and mooring operations. The introduction of Kawasaki's Advanced Safety Berthing/Unberthing Assistance System will contribute to significant improvements in the efficiency and safety of these challenging in-port vessel operations. Moreover, the system can be installed on any type of vessel. Kawasaki has applied for Approval in Principle (AiP) from Nippon Kaiji Kyokai (ClassNK) for the system, and approval is on going.

## Chart: Vessel Specifications

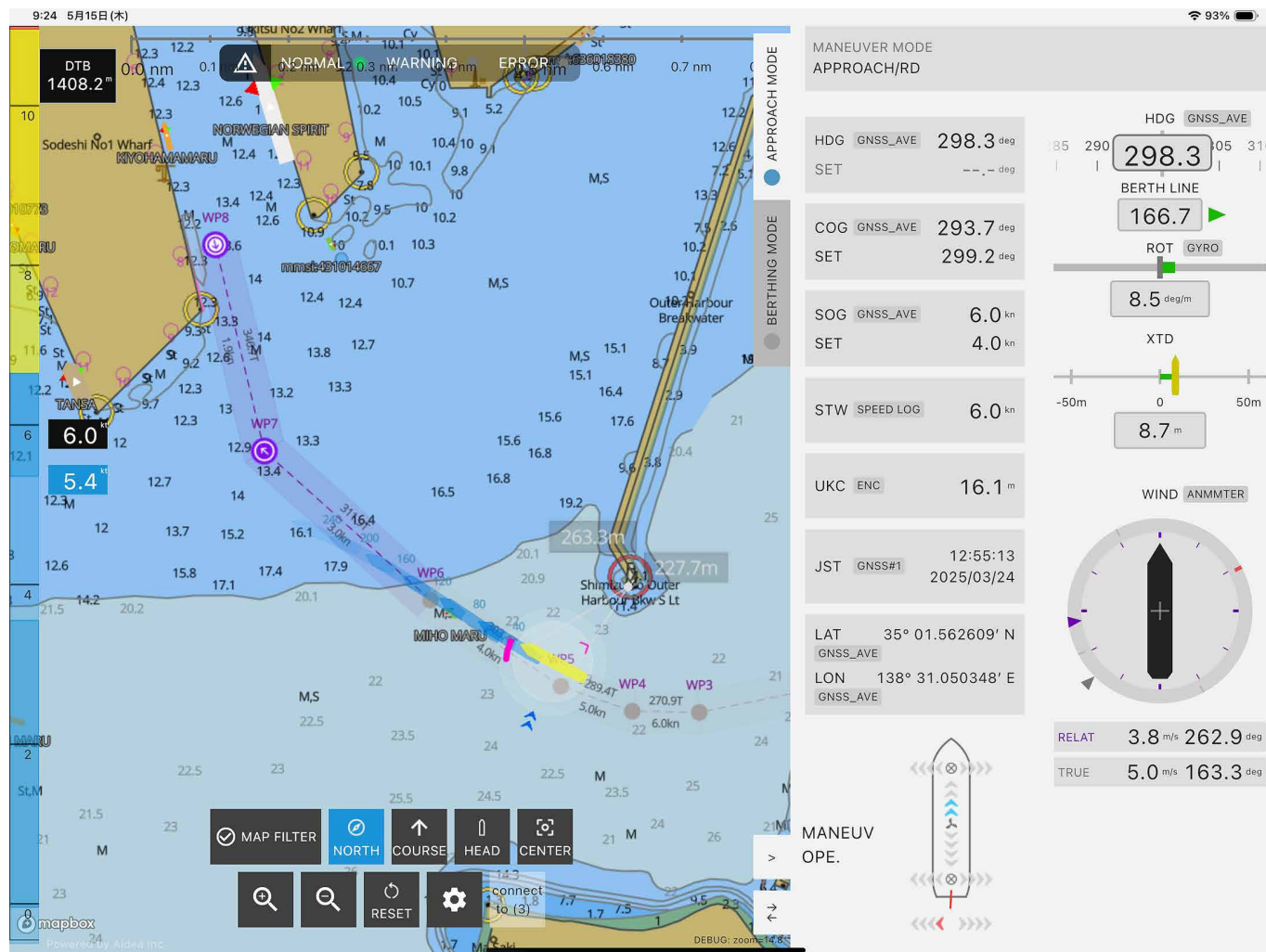
Length overall: 173.34 m  
Molded breadth: 26.6 m  
Gross tonnage: 13,950 tons

Kawasaki is Japan's only domestic manufacturer involved in engineering for everything from ship propulsion to mooring systems, and works with propulsion equipment, a dynamic positioning system (DPS)\*<sup>4</sup> for automated ship control, steering gear, deck machinery and more. The company will continue making improvements to the Advanced Safety Berthing/Unberthing Assistance System, supporting all operational areas from berthing and unberthing to ship mooring and mooring



# Kawasaki Successfully Completed Verification of Automated Berthing and Unberthing Operations with Advanced Safety Berthing/Unberthing Assistance System

Safety and Efficiency Improvements for In-Port Vessel Maneuvering, Berthing, Unberthing and Mooring Operations 5



On-screen display for "Advanced Berthing/unberthing Assistance System - Display Unit"

management, while deploying the system in an increasing range of real-life applications, in order to drive further advances in the marine shipping industry.

**\*1 Automated berthing and unberthing operations:** A ship maneuvering method in which the captain sets vessel speed only, after which the system carries out automated navigation along a preset course to the berthing quay, automatically controls headings, and maintains the ship facing parallel to the quay during berthing. The system is also equipped with features that enable automated deceleration, stopping and heading change operations in response to quay and stopping point distances.

**\*2 Ship Maneuvering Support Information Display System:** A system that provides ship movement prediction information relating to the future course, speed, stopping position and so forth through utilization of ship movement prediction models and the latest sensing technologies. This system provides ship movement predictions with wind effects factored in, as well as ultra-precise information on distances between the ship and quay (down to the centimeter) and berthing speeds during berthing and unberthing operations. Kawasaki has applied for and is awaiting the results of ClassNK Products & Solutions (P&S) certification for this system.

**\*3 Ship Maneuvering Support Control System:** A system that optimally controls ship speed and attitude in response to constantly changing weather conditions, sea conditions and other external factors based on ship movement prediction information. It enables automated maintenance of attitude, positioning and course adherence to ensure that actual ship operations match the operator's defined course and speed settings, supporting the entire ship maneuvering operations up to berthing. The system can also be used in berthing and unberthing operations in coordination with tugboats, and in berthing operations using integrated control of propulsion and mooring equipment.

**\*4 A dynamic positioning system, or DPS,** utilizes vessel position measurement equipment such as GPS to measure vessel positions in real time, and provides automated control of propulsion systems and rudders to prevent the ship's straying from its intended position.



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By Builder



By Ship Type

# Joint Study on the Construction Scheme for Liquefied Hydrogen Carriers 6

 **Kawasaki**  **IMABARI SHIPBUILDING CO., LTD.**

 **JMU Japan Marine United**

June 02, 2025

Kawasaki Heavy Industries, Ltd.

Imabari Shipbuilding Co., Ltd.

Japan Marine United Corporation

## Joint Study on the Construction Scheme for Liquefied Hydrogen Carriers

Kawasaki Heavy Industries, Ltd. (Kawasaki), Imabari Shipbuilding Co., Ltd., and Japan Marine United Corporation are due to commence a joint study (Study) to establish a construction scheme for liquefied hydrogen carriers.

This Study examines the feasibility of a collaborative construction scheme that efficiently utilizes their respective resources, such as facilities and human resources, for the construction of liquefied hydrogen carriers following the first commercial carrier to be designed and built by Kawasaki.

Liquefied hydrogen carriers are expected to play an essential role in the establishment of a liquefied hydrogen supply chain by enabling the transport of large volumes of hydrogen.

This Study will reinforce the cooperative relationship between each company for the commercialization of a liquefied hydrogen supply chain who will work toward the realization of a carbon-neutral society.



# Ammonia Fueled LPG/Ammonia Carrier Vessel Granted Approval in Principle 7



# Ammonia Fueled LPG/Ammonia Carrier Vessel Granted Approval in Principle 7



DAiP certification

Kawasaki Heavy Industries, Ltd. announced that in collaboration with MITSUI E&S Co., Ltd., a supplier of ammonia fuel engines and ammonia fuel supply systems, it has been granted Approval in Principle (AiP) from Nippon Kaiji Kyokai (ClassNK) for a LPG/ammonia carrier that can use liquid ammonia as the ship's fuel.\*1

Ammonia is a green fuel\*2 that emits no CO<sub>2</sub> when burned, and like hydrogen is attracting interest as a next-generation fuel at a time when the International Maritime Organization (IMO) is strengthening restrictions on gas emissions from ships. With regard to the ammonia fuel supply system, safety has been evaluated by a HAZID risk assessment meeting of experts and necessary measures have been taken. When they confirmed the design safety of the carrier to be compliant with ClassNK criteria, the AiP was granted.

In pursuit of carbon neutrality by 2050, Kawasaki is developing and supplying environmentally-friendly ship technologies, such as LPG-fueled LPG carriers, LNG-fueled vessels, and equipment linked to the attractive new energy sources hydrogen and ammonia, that comply with stricter global environ-

mental regulations, to help bring about the transition from a low carbon to a decarbonized society.

The main advantages of the ammonia fueled LPG/ammonia carrier are as follows:

1. The fuel is drawn from the liquid ammonia cargo, so the installation of dedicated fuel tanks is not required.
2. Ammonia gas released into the atmosphere during maintenance or other work on the fuel supply system can be rendered harmless by pollution control equipment installed on the ship.
3. By reinforcing the ship's construction, full tanks of ammonia can still be transported despite the fuel being denser than LPG.

\*1 **Compliant with the general requirements of the ClassNK guidelines stipulating safety requirements for ships using alternative fuels (Part C-2), and for additional safety measures (Part C-3).**

\*2 **Assuming the CO<sub>2</sub> emission per unit of energy obtained from fuel oil is set as 1.0, LPG has an approximate value of 0.85. In contrast, ammonia, like hydrogen, does not emit CO<sub>2</sub> when burned, so the CO<sub>2</sub> per unit energy is 0.**



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By Builder



By Ship Type

# Mitsubishi Shipbuilding Receives Order for Ammonia Fuel Supply System for Ammonia-Powered Marine Engine

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Delivery Scheduled in 2025, Together with Ammonia Gas Abatement System

Tokyo, April 10, 2024 - Mitsubishi Shipbuilding Co., Ltd., a part of Mitsubishi Heavy Industries (MHI) Group, has received an order from Japan Engine Corporation (J-ENG) for an ammonia fuel supply system (AFSS) and ammonia gas abatement system (AGAS).

The AFSS will supply ammonia fuel to ammonia-powered marine engines developed by J-ENG, and the AGAS will safely treat any surplus ammonia. The newly ordered AFSS and AGAS are remotely controlled automatically by an integrated control system. Mitsubishi Shipbuilding will deliver the modules to J-ENG in 2025.

Conversion from fossil fuels to environmentally sustainable fuels is indispensable for achieving net zero greenhouse gas (GHG) emissions by the global maritime industry by or around 2050, the goal set by the International Maritime Organization (IMO). Because ammonia emits no CO<sub>2</sub> when combusted, adoption of ammonia fuel is expected to contribute to the development of decarbonized infrastructure in the maritime industry.

Going forward, Mitsubishi Shipbuilding, aligning with MHI Group's strategy of advancement of the energy transition, will bring together its technologies and expertise in ammonia handling accumulated through its history of building transport carriers, and as a shipboard ammonia handling systems manufacturer the company will supply products of maximum safety and reliability. Additionally, as a maritime system integrator, through provision of shipbuilding engineering services for ammonia-fueled vessels, plus construction support and other



Ammonia Fuel Supply System (High-pressure and Low-pressure AFSS module)

services meeting customer needs, Mitsubishi Shipbuilding will continue contributing to the further development of marine logistics and to reducing the maritime industry's environmental impact on a global scale.

URL : <https://www.mhi.com/news/24041002.html>

# Mitsubishi Shipbuilding Acquired Approval in Principle (AiP) from Classification Society for the Basic Design of an Onboard Carbon Capture and Storage System 9

Tokyo, April 10, 2025 - Mitsubishi Shipbuilding Co., Ltd., a part of Mitsubishi Heavy Industries (MHI) Group, has acquired Approval in Principle (AiP) (Note) from Nippon Kaiji Kyokai (ClassNK) for its Onboard Carbon Capture and Storage system (OCCS) developed to capture and store CO<sub>2</sub> emitted from ships.

The OCCS subject to the AiP captures, liquefies, and stores CO<sub>2</sub> after pretreatment of the exhaust gas emitted from ships. It is attracting attention as a solution to promote decarbonization of ships.

Mitsubishi Shipbuilding has developed the system by utilizing CO<sub>2</sub> capture technologies of MHI, which has a wealth of experience with onshore facilities, as core technology, and combining it with exhaust gas pretreatment, CO<sub>2</sub> liquefaction, storage, and handling technologies in order to establish an onboard system. Going forward, Mitsubishi Shipbuilding will accelerate the development of this system to bring it into market.

MHI Group is currently pursuing strategic measures to strengthen its business for the energy transition. In conjunction with this initiative, Mitsubishi Shipbuilding is making efforts to contribute to the advancement of the maritime industries in Japan and around the world by utilizing its shipbuilding-based marine engineering technologies in addition to the conventional shipbuilding.

Mitsubishi Shipbuilding will actively contribute to the decarbonization of ships continuing their effort to reduce greenhouse gas (GHG) emissions from ships, which faces an increasingly urgent priority around the world.



AiP Presentation Ceremony Held at Nippon Kaiji Kyokai

(Note)

Approval in Principle (AiP) indicates that a certification body has reviewed the basic design of the subject equipment and confirmed that it meets technical requirements and relevant safety standards. The inspection of the basic design for the OCCS system was conducted in accordance with ClassNK's "Guidelines for Shipboard CO<sub>2</sub> Capture and Storage Systems."

About MHI Group's CO<sub>2</sub> capture technologies

MHI Group has been developing the "KM CDR Process™" (Kansai Mitsubishi Carbon Dioxide Recovery Process) and the "Advanced KM CDR Process™" in collaboration with the Kansai Electric Power Co., Inc. since 1990. As of April 2025, the Company has delivered 18 plants adopting these processes. The "Advanced KM CDR Process™" adopts the "KS-21™" solvent, which incorporates technological improve-



AiP Certificate

ments over the amine-based "KS-1™" and offers superior regeneration efficiency and lower deterioration than the "KS-1™", and it has been verified to provide excellent energy saving performance, reduce operation costs, and result in low amine emissions.

Further information on MHI Group's CO<sub>2</sub> capture plants:  
<https://www.mhi.com/products/engineering/co2plants.html>

URL : <https://www.mhi.com/news/25041001.html>

# Mitsubishi Shipbuilding Receives Additional Order for 2 Units of LNG Fuel Gas Supply System (FGSS) 10

To be Delivered continuously with LNG Fuel Tanks from Summer 2025 for LNG-fueled Bulk Carriers to be Built by Imabari Shipbuilding



FGSS modules

Tokyo, June 5, 2024 - Mitsubishi Shipbuilding Co., Ltd., a Mitsubishi Heavy Industries (MHI) Group company based in Yokohama, has received an order from Imabari Shipbuilding Co., Ltd. for 2 additional units of its Fuel Gas Supply System (FGSS) (Note), a liquefied natural gas (LNG) fuel gas supply system for high-pressure dual-fuel marine engines. The FGSS units for 2 LNG-fueled bulk carriers to be built by Imabari Shipbuilding will be continuously delivered with LNG fuel tanks from summer 2025.

The FGSS ordered by Imabari Shipbuilding feature an optimized cargo space layout utilizing a modular design for exceptional space-saving and maintenance access, shortened con-

struction schedule at shipyards, and a proprietary control system that can be customized according to customer needs, contributing to both excellent operability and safety. Mitsubishi Shipbuilding previously received orders for a total of 18 high-pressure FGSS units, including units for “SWEET PEA LEADER” and “DAISY LEADER”, both of which are LNG-fueled car carriers built by Imabari Shipbuilding Group and have already entered into service respectively in October 2023 and in March 2024. With this additional order, Mitsubishi Shipbuilding will supply a total 20 units (15 car carriers and 5 bulk carriers) to Imabari Shipbuilding Group. Mitsubishi Shipbuilding, as part of MHI Group’s strategic



LNG fuel tank

initiatives for energy transition, will provide FGSS units to a broad range of customers involved in the construction of LNG-fueled vessels, enhancing the added value and competitiveness of ships. Further, by helping to reduce greenhouse gas (GHG) emissions through the widespread adoption of LNG-fueled vessels, Mitsubishi Shipbuilding, as a maritime system integrator, aims to further the decarbonization of the marine industry, support the realization of a carbon neutral world, and reduce environmental impacts on a global scale.

URL : <https://www.mhi.com/news/24060501.html>



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By Builder



By Ship Type

# Approval in Principle (AiP) Acquired from Two Classification Societies for Low-Pressure Type Liquefied CO<sub>2</sub> Carriers undergoing Pursuit of Standardization toward Realization of Large-Scale International Transportation from 2028 onwards

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Mitsubishi Shipbuilding Co., Ltd., a part of Mitsubishi Heavy Industries (MHI) Group; Kawasaki Kisen Kaisha, Ltd. (“K” LINE); Mitsui O.S.K. Lines, Ltd. (MOL); Nihon Shipyard Co., Ltd., a joint venture for ship design and sales between Imabari Shipbuilding Co., Ltd. and Japan Marine United Corporation; Nippon Yusen Kabushiki Kaisha (NYK Line); Mitsui & Co., Ltd.; and Mitsubishi Corporation have jointly acquired Approval in Principle (AiP)(Note1) from the American Bureau of Shipping (ABS) and Nippon Kaiji Kyokai (ClassNK) for two types of low-pressure type liquefied CO<sub>2</sub> (LCO<sub>2</sub>) carriers under their joint development. A presentation ceremony took place on September 17 at the George R. Brown Convention Center, the venue of Gastech 2024, a major international conference on global energy and environmental issues, including natural gas, liquefied natural gas (LNG), and hydrogen, held in Houston, Texas.

Demand for LCO<sub>2</sub> carriers is expected to grow in tandem with various CCS (Carbon dioxide Capture and Storage) projects involving the transportation of CO<sub>2</sub> captured in Japan to storage sites located oversea. Recently, Mitsubishi Shipbuilding, Nihon Shipyard, Mitsui & Co. and Mitsubishi Corporation have collaborated to achieve standardization of LCO<sub>2</sub> carriers suited for use by multiple projects, and to establish a supply chain in order to build and supply LCO<sub>2</sub> carriers consistently within Japan, which would contribute towards the realization and improvement of economic efficiency of CCS value chains. These initiatives have led to the acquisitions of two AiPs in collaboration with three major Japanese shipping companies:



Low-pressure Type Liquefied CO<sub>2</sub> Carriers

“K” LINE, MOL and NYK Line.

The two LCO<sub>2</sub> carriers that received AiP certifications are low-pressure type 50,000m<sup>3</sup>-class and 23,000m<sup>3</sup>-class vessels developed for long-distance ocean voyages. The AiP certifications assume the use of appropriate cargo tank material as a replacement for the nickel steel previously considered. Additionally, post welding heat treatment (PWHT)(Note3), one

of critical issues in establishing the cargo tank manufacturing, may be omitted by the Engineering Critical Assessment (ECA) (Note4) approach is included.

MHI Group is pursuing strategic measures to strengthen its business for the energy transition. Mitsubishi Shipbuilding, for its role in this initiative, efforts to contribute to the advance of the maritime industry in Japan and around the world by utiliz-





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By Builder



By Ship Type

## Approval in Principle (AiP) Acquired from Two Classification Societies for Low-Pressure Type Liquefied CO<sub>2</sub> Carriers undergoing Pursuit of Standardization toward Realization of Large-Scale International Transportation from 2028 onwards 11



AiP presentation ceremony held at Gastech 2024 (ClassNK)

ing its shipbuilding-based marine engineering technologies in addition to conventional shipbuilding. Mitsubishi Shipbuilding will actively promote the development of LCO<sub>2</sub> carriers and establishment of CCS value chain through collaboration with various domestic/overseas companies.

(Note1)

Approval in Principle (AiP) indicates that the certification body has reviewed the basic design and approved it as satisfying the technical requirements and safety criteria. The assessment was conducted in accordance with the IGC Code (Note2) and the American Bureau of Shipping (ABS) and Nippon Kaiji Kyokai (ClassNK) classification rules

applicable to vessels transporting liquefied gas in bulk.

(Note2)

IGC Code (The International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk) is an international regulation stipulating conditions to ensure the safety of vessels that transport liquefied gases (LCO<sub>2</sub>, LNG, etc.) in bulk.

(Note3)

In post welding heat treatment (PWHT), structural materials are reheated to a set temperature after welding and held at that temperature for a specified amount of time. This process aims to lower residual stresses generated during welding and improve the quality of welding joints. PWHT is generally performed by placing structural products into a dedicated furnace. When the products are of large



AiP presentation ceremony held at Gastech 2024 (ABS)

size, furnace size may cause bottlenecks in the manufacturing process.

(Note4)

Engineering Critical Assessment (ECA) is a method for evaluating the safety of welded structural components. Using micro initial defects in the welding joints and the estimated stress history together with characteristics of the material, the ECA confirms that no major quality issues will occur during the product's service life.

URL : <https://www.mhi.com/news/24091801.html>