



## KHI-built LH2 Carrier, SUIISO FRONTIER, classified by ClassNK



Kawasaki Heavy Industries, Ltd. has obtained the classification for the world's first liquefied hydrogen (LH2) carrier, SUIISO FRONTIER, from Nippon Kaiji Kyokai (ClassNK), with the recognition of compliance with International Maritime Organisation (IMO) standards.

The SUIISO FRONTIER can carry 75 tonnes of liquefied hydrogen in one trip. Liquefied hydrogen is produced by cooling gaseous hydrogen to minus 253°C therefore reducing its volume to 1/800.

The vessel was inspected for its hull structure, machinery, onboard equipment and materials, and more, in accordance with the class rules and the requirements for safe transport of hydrogen by sea, formulated by ClassNK, based on the provisional recommendations of the IMO. The vessel was then added to ClassNK's register on December 3, 2021.

Hydrogen is a clean energy source that emits no CO<sub>2</sub> when burned, and can be used to generate electricity, and as fuel for cars, motorcycles, ships and aircraft. Various initiatives are underway in many countries to build a supply chain for the widespread use of hydrogen.

In order to realize a future in which hydrogen is used as widely as oil and natural gas, Kawasaki plans to build a supply chain that produces, stores, transports and uses hydrogen in cooperation with various partners. (Related topics on Page 2)

### Principal particular

Ship owner:	CO <sub>2</sub> -free Hydrogen Energy Supply-chain Technology Research Association (HySTRA)
Length overall:	116.0m
Length between perpendiculars:	109.0m
Breadth, mld.:	19.0m
Depth, mld.:	10.6m
Draft, mld.:	4.5m
Gross tonnage:	8,000t
Tank cargo capacity:	1,250m <sup>3</sup>
Propulsion system:	Diesel electric propulsion
Sea speed:	13.0kt
Complement:	25
Classification:	ClassNK
Registry:	Japan



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## JAPAN SHIP EXPORTERS' ASSOCIATION

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## World's 1st LH2 carrier, SUIISO FRONTIER, enters Hastings Port

The world's first liquefied hydrogen (LH2) carrier, SUIISO FRONTIER, built by Kawasaki Heavy Industries, Ltd. arrived at the Port of Hastings, Australia, on January 20, 2022. This is the first voyage to load 1,250 cubic meters (about 75 tons) of LH2 at the port. The LH2 carrier received the classification of ClassNK last December, and then left Hy Touch Kobe, a LH2-unloading terminal in Japan, for Australia to conduct verification tests on large-scale marine transport of LH2 between Australia and Japan. The SUIISO FRONTIER will leave the Port of Hastings after completing inspection of the various equipment related to LH2, and return to Japan by the end of February.

Six Japanese companies including

Kawasaki celebrated the arrival of SUIISO FRONTIER to Australia by inviting officials concerned from the Australian government and Japanese Embassy to Australia on January 21.

The six Japanese companies are now participating in verification tests to develop an international hydrogen supply chain including the three following components: liquefaction of hydrogen extracted from lignite produced in Latrobe Valley, Victoria; marine transport of LH2 from Australia to Japan; and unloading of LH2 at a LH2-receiving termi-



nal in Japan.

These verification tests will tackle problems likely to occur in the development of the supply chain, which will enable development of new technologies necessary for mass production as well as bulk transport of hydrogen.

## Shin Kurushima Sanoyas completes Panamax bulker EVER ZENITH

Shin Kurushima Sanoyas Shipbuilding Co., Ltd. delivered the Panamax bulk carrier, EVER ZENITH, at its Mizushima Shipyard. This is the ninth vessel of the series of the newly developed Sanoyas 82,000DWT type Panamax bulk carriers.

The EVER ZENITH applies the latest rules such as CSR B&T, NO<sub>x</sub> Tier III regulations and SO<sub>x</sub> emission regulations, and has the equivalent level of deadweight with shallower draft than the previous design. Reduction of CO<sub>2</sub> emissions exceeds 20% to satisfy the IMO EEDI (Energy Efficiency Design Index: grams CO<sub>2</sub> per ton nautical mile) regulation in ad-

vance and is close to the 30% reduction that will apply to ships with the building contract placed on or after 2025.

For improvement of propulsion efficiency, the vessel is equipped with a low-speed & long-stroke electronically controlled main engine combined with a high-efficiency propeller and rudder appendages. Furthermore, patented energy saving devices such as the STF (Sanoyas-Tandem-Fin) and ACE DUCT (Sanoyas Advanced flow Controlling and Energy saving DUCT) are applied. These energy saving devices have achieved about 8% reduction of energy consumption and CO<sub>2</sub> emissions.



Eco-friendly features include various countermeasures such as the main engine with SCR compliant with the NO<sub>x</sub> emission Tier III limit for the prevention of air pollution, dedicated low sulphur gas oil tank to cruise in ECAs (Emis

sion Control Areas), and classification code "Inventory of Hazardous Materials (IHM)" are applied. In addition, countermeasures such as the ballast water treatment system and independent holding tanks for rainwater on the upper deck are provided for protection of the marine environment.

Furthermore, for improvement of maintenance, access trunks are arranged to allow access from the upper deck to double bottom even under the laden condition. Accommodation compliant with the latest IMO noise reduction regulation improves the comfortable working and living environment for officers/crews in the vessel.

### Principal particulars

Hull No.:	1378
L (o.a.) x B (mld.) x D (mld.) x d (ext.):	229.000m x 32.240m x 20.150m x 14.594m
DWT/GT:	81,987t/43,453
Cargo hold capacity:	97,019m <sup>3</sup> (grain)
Classification:	ClassNK
Complement:	24
Speed, service: about 14.2kt (at C.S.O. with 15% sea margin)	
Delivery:	November 12, 2021



# Mitsubishi successfully separates and captures CO<sub>2</sub> from exhaust gas in World's 1st marine-based CO<sub>2</sub> capture system project

— Captured CO<sub>2</sub> has purity greater than 99.9%, demonstrating performance in line with plan —

- Engineers from Mitsubishi Shipbuilding began verification testing on the ship in August, and currently the ship crew is operating the CO<sub>2</sub> capture system.
- Project conducted jointly by Mitsubishi Shipbuilding, “K” Line, and ClassNK as a MLIT-backed project for research and development of technological advancements in marine resource development.

Mitsubishi Shipbuilding Co., Ltd., a part of Mitsubishi Heavy Industries (MHI) Group, has successfully separated and captured carbon dioxide (CO<sub>2</sub>) from the exhaust gas emitted from the engines of a ship equipped with a small-scale CO<sub>2</sub> capture demonstration plant, as part of the “Carbon Capture on the Ocean” (CC-Ocean) project<sup>(Note 1)</sup> for verification testing of a marine-based CO<sub>2</sub> capture system, conducted in cooperation with Kawasaki Kisen Kaisha, Ltd. (“K” Line) and Nippon Kaiji Kyokai (ClassNK). The captured CO<sub>2</sub> had a



*Verification test of Marine-based CO<sub>2</sub> Capture System on the ship*

purity<sup>(Note 2)</sup> of more than 99.9%, achieving the planned performance.

This project is conducted aboard the CORONA UTILITY, a coal carrier for Tohoku Electric Power Co., Inc. operated by “K” Line. The data provided will be used as a benchmark for practical application of marine-based CO<sub>2</sub> capture systems. The small-scale CO<sub>2</sub> capture demonstration plant installed on the ship is a system for onshore plants that was adapted for marine use. The success in achieving the planned CO<sub>2</sub> capture performance in

a marine environment enhances the potential for practical application of marine-based systems.

In early August, after the small-scale CO<sub>2</sub> capture demonstration plant was installed on the ship, engineers from Mitsubishi Shipbuilding remained on the vessel to operate and maintain the system. They also instructed the ship crew on the operation of the plant, as well as conducted measurements and analysis of the exhaust gas and captured CO<sub>2</sub>, and evaluated the system performance. From mid-September through the end of fiscal 2021, the ship crew will continue to operate the system and take measurements in the world's first trial of CO<sub>2</sub> capture by nonspecialists during commercial operation of a marine vessel. Mitsubishi Shipbuilding will confirm the safety and operability of the system based on knowledge gained from these verification tests, and work to develop an actual commercial system.

MHI Group is pursuing a range of strategic measures to strengthen businesses related to energy transitions, and establishing this CO<sub>2</sub> ecosystem is a key part of this effort. Carbon dioxide capture, utilization, and storage (CCUS) is considered to be effective to achieve a carbon neutral society. Mitsubishi Shipbuilding, in response to these demands, is continuing its efforts to reduce greenhouse gas (GHG) emissions from ships and other types of marine equipment, to contribute to environmental conservation, and the realization of a carbon neutral society on a global scale.



*Measurement of the exhaust gas emitted from ship's engines*

(Note 1) This project is being conducted with support from the Maritime Bureau of Japan's Ministry of Land, Infrastructure, Transport and Tourism (MLIT), as part of its assistance project for research and development of technological advancements in marine resource development.

(Note 2) Purity of the CO<sub>2</sub> captured by the CO<sub>2</sub> capture system. CO<sub>2</sub> with purity of more than 99.9% can be used in a wide range of applications, including chemical processes to enhance production of fertilizer or methanol, general use such as dry ice for cooling, and enhanced oil recovery (EOR) to increase crude oil production. Measurement of the exhaust gas emitted from the ship's engines



*Operation of Marine-based CO<sub>2</sub> Capture System by the ship crew*

## JMU completes J-Series 82,400DWT bulk carrier, FJ CAMELIA

Japan Marine United Corporation has delivered FJ CAMELIA, a J-Series 82,400DWT bulk carrier, at its Tsu Shipyard on November 12, 2021. This is the 7th vessel of the Panamax bulk carrier of the J-Series, called J82BC, which has proved its economical and environmental friendly design. This J-Series applies the MARPOL ANNEX VI NO<sub>x</sub> Tier III and SO<sub>x</sub> emission regulations, in addition to the CSR BC&OT (Common Structural Rules for bulk carriers and oil tankers).

These regulations/rules increase the environmentally friendly features and make hull structure more secure, but have negative impacts in economical design due to decreased cargo hold capacity and deadweight, and increased fuel oil consumption. However, the latest JMU technology has overcome these negative impacts on the design and achieved more cargo capacity, larger deadweight, and lower

fuel consumption, compared with the previous series called G81BC which was categorized as Phase 1 of the Energy Efficiency Design Index (EEDI). J82BC is categorized as Phase 2 of the EEDI.

The J82BC series has larger deadweight and cargo hold capacity suitable for carrying grain, coal, and iron ore in seven cargo holds, and has been developed with JMU expertise and experience.

The SSD<sup>®</sup> (Super Stream Duct<sup>®</sup>) and SURF-BULB<sup>®</sup> equipped fore and aft of the propeller, respectively, greatly improve the propulsion performance. In addition, the ALV-Fin<sup>®</sup> (Advanced Low Viscous Resistance Fin) equipped fore of the propeller con-



trols stern flow to get better propulsive efficiency. Furthermore, the well-refined shape of the superstructure has low wind resistance.

### Principal particular

L (o.a.) x B (mld.) x D (mld.) x d (mld.):	229.0m x 32.26m x 20.20m x 14.55m
DWT/GT:	82,501t/44,318
Main engine:	MAN B&W 6S60ME-C8.5-EGRBP diesel x 1 unit
Speed:	14.4kt
Complement:	28
Classification:	ClassNK

## Hakodate completes 1st 40,000DWT type Handy-size bulker CENTURION LUCILLA

The Hakodate Dock Co., Ltd. (Hakodate) delivered the 40,000DWT type log/bulk carrier, CENTURION LUCILLA, built at its Hakodate Shipyard on November 16, 2021. The vessel is the first of the "HIGH BULK 40E" series jointly developed with Namura Shipbuilding Co., Ltd.

By adopting all advantages of the previous generation of the HIGH

BULK 34E series, this design was developed with the concept of more competitiveness in maximizing the volume of cargo capacity for grains, coals, steels, logs, etc. and more eco-friendly operation by reducing fuel consumption with optimized hull form and energy-saving devices.

Various measures for the energy and fuel saving efficiency are adopted

in addition to the hull form such as the newly developed vertical shaped bow and three energy saving devices, the Namura flow Control Fin (NCF), the Rudder Fin (R-Fin), and the NAMURA Pre-swirl Stator fin (NAPS) attached to the stern which improves propulsion performance and fuel saving efficiency.

Semi-box shaped cargo holds with larger cargo hatch covers are adopted for serviceable and safer operations in cargo handling work. The double hull construction is adopted for security against unexpected occurrences such as collision damage and cargo leakage. Four deck cranes on the upper deck in the centre line and the collapsible type stanchion on the upper deck for log loading are equipped.

### Principal particulars

L (o.a.) x B (mld.) x D (mld.) x d (mld.):	182.94m x 31.60m x 14.80m x 10.37m
DWT/GT:	40,054t/24,472
Complement:	24
Classification:	ClassNK
Registry:	Marshall Islands





## Sasaki completes 8,015DWT general cargo ship, KIZUNA 21

Sasaki Shipbuilding Co., Ltd. completed construction of the 8,015DWT general cargo ship, KIZUNA 21 (Hull No. 714), and delivered the vessel to its owner, Konoike Transport Co., Ltd. (contractor: Venus Marine Co., Ltd. S.A.), on December 17, 2021.

One set of twin-type hydraulic deck

cranes is installed at the midsection of the vessel, which covers the fore and aft side cargo holds and allows hoisting a maximum cargo load of 80 tons with twin-crane operation.

Stern fins installed on the stern frame of the vessel control good water flow to the propeller to improve pro-

pulsion efficiency and reduce fuel consumption, which are the patented proprietary technology of Sasaki. The vessel also complies with EEDI phase III and has reduced environ-

mental impact.

Ship vibration is suppressed as much as possible for crew comfort by conducting adequate analysis at the initial design stage, and low noise and good stability has been achieved.

### Principal particulars

Ship type: General cargo ship  
L (o.a.) x L (b.p.) x B (mld.) x D (mld.)  
x d (mld.): 104.970m x 98.800m x 18.400m x 11.800m x 7.623m  
DWT/GT: 8,015t/6,267  
Cargo hold capacity: 11,195m<sup>3</sup> (bale)  
Main engine: Hitachi-MAN B&W 5L35MC6.1 diesel x 1 unit  
MCO: 2,750kW x 178rpm  
Speed, service: abt. 13.0kt  
Classification: ClassNK  
Completion: December 17, 2021



## TSUNEISHI builds hybrid-propulsion limestone carrier combining LNG-fueled engine and lithium battery

TSUNEISHI SHIPBUILDING Co., Ltd. will construct a limestone carrier installing a hybrid-propulsion system consisting of an LNG-fueled main engine and a 2,847 kWh lithium battery. This hybrid-propulsion system is the first attempt for the Japanese shipbuilding industry. The limestone carrier will be the successor to the predecessor, SHIMOKITA MARU, and is scheduled to start coastal transport service in February 2024.

The main engine will use Japan's first LNG-fueled engine to be built by Kawasaki Heavy Industries, Ltd., and an LNG-fuel tank constructed with 7% nickel steel developed by Nippon Steel Corporation. The use of 7%

nickel steel for the marine LNG tank will also be the first in Japan.

During normal navigation of the carrier, the main engine will output propulsion force and supply inboard electric demand. Therefore, the carrier will store high power and cruise for long distances over many hours. However, the lithium battery will supply electric power for propulsion and inboard demand during entry and exit from a port, or at anchor. Thus, operation of the carrier aims at the Zero Emission target.

Employment of the hybrid-propulsion system will reduce CO<sub>2</sub> emissions by 23.56% (about 30% at normal output) compared with the conventional

ship type. Almost no SO<sub>x</sub> will be contained in the engine exhaust gas, and NO<sub>x</sub> emissions will be less than the requirements of NO<sub>x</sub> Tier III regulations. Moreover, the ship will be operated at Zero Emission between the loading port of Shiriya Misaki, Aomori Pref., and the unloading port of Muroran, Hokkaido.

### Principal particulars

L (o.a.) x B (mld.) x D (mld.): about 93.8m x about 18.2m x about 9.9m  
DWT: about 5,560t  
Propulsion units: LNG-fueled engine (8L30KG) plus lithium battery hybrid propulsion system  
Completion, scheduled: Early February 2024  
Main navigation route: Shiriya Misaki Port and Muroran Port

## MET-MBII Turbochargers in Operation on Ship

Mitsubishi Heavy Industries Marine Machinery & Equipment Co., Ltd. (MHI-MME) began delivery of MET-MBII Series turbochargers in 2020 and the first unit will start operation on board. All the MBII Series has obtained approval from MAN ES (MAN Energy Solutions) and WinGD (Winterthur Gas & Diesel Ltd.).

The series has already achieved a

favorable reputation in the market based on its technical advantages, especially in compact design as well as ease of maintenance and lifecycle cost management.

Adding the MET-MBII to the MET-MB Series already in the product portfolio as an axial flow turbocharger, the turbocharger line is expanded to provide the most optimized units for

engines.

MHI-MME will continue to provide turbochargers to meet market needs and ensure customer satisfaction.



**LIN MIARAK**

Builder: Tadotsu Shipyard Co., Ltd./  
Imabari Shipbuilding Co., Ltd.  
Ship type: 100,000DWT type bulk  
carrier  
L (o.a.) x B x D: 249.99m x 43.00m x  
18.70m  
DWT/GT: 100,987t/57,963  
Main engine: 6S60ME-C10.5 diesel x  
1 unit  
Speed service: 14.0kt  
Classification: ClassNK  
Completion: November 18, 2021

**KUROTAKISAN  
MARU III**

Owner : Caribstar Shipping, S.A.  
Builder: Oshima Shipbuilding Co.,  
Ltd.  
Hull No.: 10989  
Ship type: Bulk carrier  
L (o.a.) x B x D x d (ext.): 234.960m x  
38.000m x 20.050m x 13.765m  
DWT/GT: 89,999t/51,793  
Main engine: J-ENG 6UEC60LSE  
Eco-A2-EGR diesel x 1 unit  
Speed, service: 14.00kt  
Classification: ClassNK  
Registry: Panama  
Completion: December 2, 2021

**PACIFIC KOHINOOR**

Owner: Michiko Shipping Inc.  
Builder: Onomichi Dockyard Co., Ltd.  
Hull No.: 772  
Ship type: Product/chemical tanker  
L (b.p.) x B x D : 175.00m x 32.20m x  
19.05m  
DWT/GT: 49,999t/29,513  
Main engine: MAN B&W 6S50ME-  
B9.5 diesel x 1 unit  
Speed, service: abt. 15.1kt  
Classification: ClassNK  
Registry: Liberia  
Completion: November 10, 2021

**MAPLE HARVEST**

Owner: Panamanian owner  
Builder: Shin Kurushima Dockyard  
Hull No.: S-6113  
Ship type: Bulk carrier  
L (b.p.) x B x D : 196.50m x 32.26m  
x 19.40m  
DWT/GT: 64,282t/36,757  
Main engine: Mitsu-MAN B&W  
6S50ME-C9.6-EGRBP diesel x 1  
unit  
Speed, service: 14.0kt  
Classification: ClassNK  
Registry: Panama  
Completion: November 30, 2021

**LOWLANDS SAGE**

Owner: CLdN Cobelfret Pte. Ltd.  
Builder: Tsuneishi Shipbuilding Co.,  
Ltd.  
Hull No.: 1608  
Ship type: Bulk carrier  
L (b.p.) x B x D: 229.00m x 32.26m x  
20.15m  
DWT/GT: 82,300t/44,000  
Main engine: MAN B&W 6S60MEC-  
10.5 diesel x 1 unit  
Speed, service: 14.30kt  
Classification: ClassNK  
Registry: Singapore  
Completion: November 18, 2021

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from JSEA**

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