

Mitsubishi Shipbuilding launches demonstration test ship for Liquefied CO₂ Transport



Conceptual image of the LCO₂ demonstration test ship

Mitsubishi Shipbuilding Co., Ltd., a Mitsubishi Heavy Industries (MHI) Group company based in Yokohama, has held a launching ceremony for a demonstration test ship for transport of liquefied carbon dioxide (LCO₂), to be utilized in conjunction with initiatives by the New Energy and Industrial Technology Development Organization (NEDO) for its demonstration projects (CCUS R&D and Demonstration Related Project/Large-scale CCUS Demonstration in Tomakomai/Demonstration Project on CO₂ Transportation/R&D and Demonstration Project for CO₂ Marine Transportation). The ceremony, conducted in the presence of representatives of the ship's owner Sanyu Kisen Co., Ltd. and other partners, was held at the Enoura Plant of MHI's Shimonoseki Shipyard & Machinery Works in Shimonoseki, Yamaguchi Prefecture.

The Engineering Advancement Association of Japan (ENAA), one of the consignees for the NEDO demonstration projects, will charter the ship from Sanyu Kisen, and install and operate the LCO₂ marine tank system used to

conduct research and development. Three additional project partners, Kawasaki Kisen Kaisha, Ltd. ("K" LINE), Nippon Gas Line Co., Ltd., and Ochanomizu University, will be commissioned by ENAA to conduct R&D on the pressure control and stability of the LCO₂ transported on the ship, and plan demonstration experiments, as well as develop and demonstrate technologies for safe and low-cost CO₂ transport.

Mitsubishi Shipbuilding is in charge of all aspects from the ship design through construction, including the cargo containment system, by applying its gas handling technologies and expertise cultivated through the construction of liquefied gas carriers (both LPG and LNG types). Representatives from Sanyu Kisen, Nippon Gas Line, and "K" LINE attended the launching ceremony. Following outfitting and sea trials, the ship is scheduled to be handed over in the latter half of fiscal 2023.

Carbon dioxide capture, utilization, and storage (CCUS)

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JMU completes G-Series Dunkirkmax bulk carrier, CAPE SUN

Japan Marine United Corporation (JMU) delivered the CAPE SUN, a 181,000DWT bulk carrier at the Ariake Shipyard on April 19, 2023.

This is the 11th vessel of the newly developed G-Series of Dunkirkmax bulk carrier, called G181BC, which is successful in both economic and environmental friendly design. This G181BC conforms with the MARPOL

ANNEX VI NO_x Tier III regulations as well as H-CSR (Harmonized Common Structural Rules).

The vessel has larger deadweight and cargo hold capacity suitable for bulk coal and iron ore in its nine cargo holds, achieved by JMU's expertise and vast experience. The SSD[®] (Super Stream Duct[®]) and SURF-BULB[®] equipped fore and aft of the

propeller, respectively, greatly improve the propulsion performance. The ALV-Fin[®] (Advanced Low Viscous Resistance Fin) equipped fore of the propeller controls stern water flow to gain better propulsive efficiency.

Furthermore, a unique bow shape, LEADGE-Bow[®], can reduce the added resistance due to waves, and the well-refined shape of the superstructure can attain low wind resistance. This vessel is also equipped with a SO_x scrubber to comply with MARPOL ANNEX VI Regulation 14.

Principal particulars

L (o.a.) x B (mld.) x D (mld.) x d (mld.):
292.00m x 45.00m x 24.55m x 18.234m

DWT/GT: 182,436t/93,343

Main engine: MAN B&W 7S65ME-C8.5-HPSCR diesel x 1 unit

Speed: 14.05kt

Complement: 25

Classification: ClassNK



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Demonstration test ship for Liquefied CO₂ Transport is gaining attention as an effective means of achieving a carbon-neutral society. The sources of CO₂ emissions are often located distant from the sites selected for carbon utilization or storage, so demand is expected to increase for LCO₂ carriers able to transport such cargo safely and economically. Mitsubishi Shipbuilding will draw on its experience constructing this vessel to bolster its business for MHI Group's energy transition strategy, and will develop the various technologies for LCO₂ vessels necessary to establish a CCUS value chain.

MHI Group is pursuing strategic measures to strengthen its business for the energy transition. For its part in this initiative, Mitsubishi Shipbuilding, in its "MARINE FUTURE STREAM" growth strategy, has laid out a vision for the decarbonization of the maritime economy through renewable energy and the carbon cycle, along with a safe and secure society through autonomy and electrification, and is working to generate and realize new ideas in marine-related innovation. As part of this effort, Mit-

subishi Shipbuilding will actively pursue development and commercialization of LCO₂ carriers, and as a marine systems integrator, will aim to achieve decarbonization.



Launch ceremony at the MHI Shimonoseki Shipyard & Machinery Works

Vessel overview

Registry:	Japan
Length, overall:	72.0m
Beam:	12.5m
Draft:	4.55m
Tank capacity:	1,450m ³

Kawasaki delivers LPG-fueled LPG carrier, CAPTAIN MARKOS

Kawasaki Heavy Industries, Ltd. has delivered the 84,000m³ capacity liquefied petroleum gas (LPG) carrier, CAPTAIN MARKOS (Hull No. 1755). This is the 70th LPG carrier built by the company. This vessel is a dual-fuel LPG carrier using LPG and low-sulfur fuel oil, and their seventh 84,000m³ LPG carrier adopting a dual-fuel main engine.

Recently, more vessels have adopted liquefied gases as an alternative to heavy fuel oil on a global scale to effectively reduce emissions of greenhouse gases (GHG) from international shipping. This very large LPG carrier is powered by LPG, which reduces GHG emissions and is expected to significantly reduce environmental impact. The design is based on the Kawasaki Group's accumulated knowledge in building LPG and liquefied natural gas (LNG) carriers, and LNG-fueled vessels.

Kawasaki plans to develop and build more LPG-fueled LPG carriers, LPG/NH₃ carriers, and other commercial vessels that meet environmental standards, as well as to develop and offer other eco-friendly marine technologies, to contribute to the establishment of a low-carbon, or decarbonized, society. These products include vessels for transporting liquefied hydrogen, considered to be the next-generation energy source.

Features

1. This LPG carrier operates using both LPG and low-sulfur fuel oil. Use of LPG as fuel greatly reduces emission volumes of sulfur oxides (SO_x), CO₂ and other pollutants compared with use of marine fuel oil. In this way, the new vessel will meet SO_x emission standards^{*1} which were strengthened in January 2020, and EEDI^{*2} Phase 3 regulations which will further strengthen CO₂ emission standards.
2. In order to satisfy restrictions on NO_x Tier III controls^{*3} emissions which is implemented by the International Maritime Organiza-



tion (IMO), the main engine and generator are equipped with a selective catalytic reduction (SCR)^{*4} system, and an exhaust gas purification system to reduce NO_x, which allows the ship to navigate in Emission Control Areas (ECAs).

3. Installation of LPG fuel tanks on the upper deck can load fuel-use LPG separate from the cargo LPG. Moreover, a piping system connecting the LPG fuel tanks and LPG cargo tanks enables transfer of extra LPG to the LPG fuel tanks if necessary.
4. This vessel adopts the Kawasaki rudder bulb system with fins (RBSF) and the semi-duct system with contra fins (SDS-F), which contribute to reducing fuel consumption.

Remarks

- *1 SO_x emission standards: Since January 2015, SO_x emission restrictions in North American and European emission control areas (ECAs) have limited sulfur content in fuels to 0.1% or less. Starting in January 2020, regulations have required ships operating in all other parts of the world to use fuel with sulfur content levels of 0.5% or less, or alternatively use equipment to reduce SO_x in exhaust gases to an equivalent level.
- *2 Energy Efficiency Design Index: Compulsory international regulations requiring energy efficiency compliance in newly built ships

based on EEDI values, which specify CO₂ emissions in grams for transporting one ton of cargo for one mile. EEDI regulation values apply in increasingly strict phases based on the construction-contract conclusion date and finished-ship delivery date. Phase 3 regulations (30% CO₂ emissions reduction compared with baseline levels) will be introduced for certain ship types including large LPG carriers and LNG carriers contracted to be built in 2022 or later.

- *3 The Tier III controls apply only to the specified ships while operating in Emission Control Areas (ECAs), requiring 80% NO_x emissions reduction compared with Tier I controls.
- *4 Selective Catalytic Reduction (SCR): Urea solution sprayed on the hot exhaust gas of a power generation engine is broken down into ammonia, which reacts with NO_x in the exhaust gas via a titanium/vanadium catalyst to reduce NO_x emissions by reduction to nitrogen and water.

Specifications

L (o.a.) x B x D x d:	229.90m x 37.20m x 21.90m x 11.60m
DWT/GT:	55,206t/49,976
Cargo tank capacity:	84,274m ³
Main engine:	Kawasaki-MAN B&W 7S60ME-C10.5-LGIP diesel x 1 unit
Speed:	Approx. 17.0kt
Complement:	29
Classification:	ABS
Registry:	Bahamas
Delivery date:	March 31, 2023

Shin Kurushima Dockyard group obtains ClassNK's GDA for LNG-fueled chemical tanker and FGSS

Shin Kurushima Dockyard Co., Ltd. (SKDY) has received General Design Approval (GDA) for 26,000 DWT-class LNG-fueled chemical tankers as well as the fuel gas supply system (FGSS) from the Nippon Kaiji Kyokai (ClassNK) for contributing to further reduction of greenhouse gases (GHG).

The marine transport industry has been becoming more active to achieve GHG reduction for conservation of the environment. Under such circumstances, SKDY has so far been tackling development of new ships to cope with reduction of GHG, and has built Japan's first LNG-powered pure car carrier (PCC). In use of ammonia as a main fuel, one of next-generation fuels, the company has also obtained AiP for building ammonia-combustion PCC from ClassNK.

In this time, the SKDY group has completed the design of the LNG-fueled

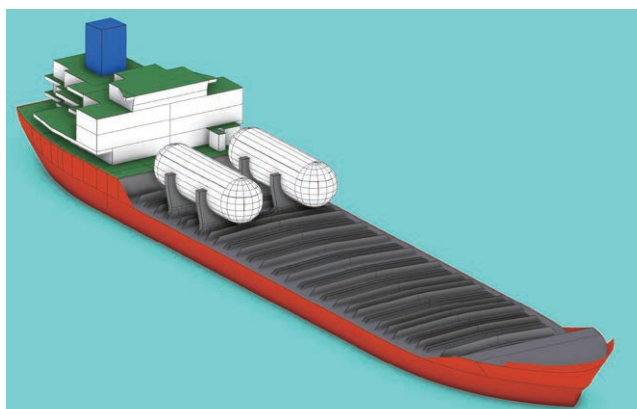
chemical tanker and FGSS by conducting discussions and studies in cooperation with Shin Kurushima Sanoyas Shipbuilding Co., Ltd. (Shin Kurushima Sanoyas), an

SKDY group company and FGSS manufacturer. As a result, ClassNK has granted SKDY and Shin Kurushima Sanoyas the GDAs for the chemical tanker and FGSS, respectively.

Acquisition of the GDA means that SKDY's LNG-fueled chemical tanker and FGSS have been acknowledged as being equivalent to the detailed design condition, differing from AiP conditions. Therefore, this 26,000DWT-class chemical tanker design including FGSS has cleared various problems that would happen in an actual designing process, and smooth actual design work after receiving a shipbuilding order is possible. Thus, the SKDY group can design and construct not only LNG-fueled ships but also a complete FGSS that covers LNG-fuel supply from LNG fuel tanks to consumer installations. This allows SKDY to meet flexibly requirements of ship owners.

The LNG-fueled ship obtained GDA this time is a SKDY's major series of 26,000DWT-class chemical tanker designed in accordance with the design concept of a 49,000DWT chemical tanker provided with AiP in 2020, and has designed to have two LNG fuel tanks on the upper deck, which are the Independent Type C tank without secondary barrier.

In general, chemical tankers have the unique upper deck on which many pipelines are laid extendedly. So, when installing LNG fuel tanks, some problems may arise to arrange appro-



priately the fuel tanks on the deck. In cooperation with Shin Kurushima Sanoyas, SKDY has developed a FGSS-installing procedures provided with the conventional functions as a chemical tanker intact.

In addition, a gas preparation room is arranged between the engine room under the superstructure and the cargo tanks, and this arrangement optimizes reaches of fuel-gas piping from the fuel tanks as well as the bunker station to the engine room, and makes it possible to supply LNG fuel to the main engine, generator engines, and auxiliary boilers without a hitch. Under the gas preparation room, various tanks and a room for ballast pumps are disposed, not to make wasteful space.

The Shin Kurushima Dock group says that they will continue to develop and construct vessels corresponding to increasing requirements for the environment conservation, utilizing the environment-load-reduction technology based on their experiences in engineering and construction of vessels and marine machinery and equipment

Principal particulars

Ship type: Chemical tanker, IMO Type II & III

Dimensions

L x B x D: 149.50m x 28.40m x 14.60m

Draft, summer: 10.25m at full load

Deadweight: Approx. 26,500t

Gross tonnage: Approx. 18,900

Speed, service: Approx. 14.7kt

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NAMURA completes Dunkirkmax-type bulk carrier, AQUAJoy

Namura Shipbuilding Co., Ltd. delivered the AQUAJoy, a 182,082DWT bulk carrier, at its Imari Shipyard & Works on March 17, 2023. The vessel is the eleventh of a series of newly-developed 182,000DWT-type bulk carriers with excellent features.

The principal dimensions have been optimized to satisfy the restrictions of the Port of Dunkirk in France. Further improvement of propulsion performance and fuel saving were achieved by adoption of two energy saving devices, the Namura flow Control Fin (NCF) and the Rudder-Fin

developed by Namura, an electronically controlled main engine, the latest model of high efficiency propeller, and low friction type anti-fouling paint.

For environmental protection, the vessel is equipped with a main engine and generator engines compliant with Annex VI of the MARPOL 73/78 regulations to reduce NO_x emissions, and an air seal type stern tube sealing device to reduce the risk of oil leakage. In addition, the vessel complies with the SOLAS Chapter II-1 Regulation 3-12, Code on noise levels

onboard ships to improve the environment of the living quarters.

The ballast water treatment system to control the quality of ballast water is equipped to protect the marine

environment to comply with the International Convention for the Control and Management of Ships' Ballast Water and Sediments. The vessel has class notation IHM (Inventory of Hazardous Materials) for compliance with the ship recycling convention according to the Guidelines for the Inventory of Hazardous Materials.

The vessel has several storage tanks for appropriate management and discharge of drainage, sewage, rainwater, and water used for cleaning cargo holds to satisfy port restrictions on such discharges.

Principal particulars

L (o.a.) x B (mld.) x d (mld.): 291.92m x 45.0m x 18.2m

DWT/GT: 182,082t/93,719

Main engine: MAN B&W 6G70ME-C9.5-EGRBP diesel x 1 unit

Complement: 25

Classification: ClassNK

Registry: Panama

Completion: March 17, 2023



MES produces 136 units of large marine engines in FY2022

mitsui E&S Co., Ltd. (MES) has announced that its production volume of MITSUI MAN B&W low-speed two-stroke engine manufactured at the Tamano Works in FY2022 was 136 units with 2.83 million horsepower.

Since forming a technical partnership with Danish company B&W (now MAN Energy Solutions) in 1926, MES has become the world's leading manufacturer, producing more than 115 million cumulative horsepower.

Commencing this fiscal year, MES has adopted a new organization as a supplier of marine propulsion systems that develops and manufactures dual-fuelled engines and auxiliary systems based on the strategy implemented by the IMO (International Maritime Organization) to reduce GHG emissions from international shipping. Increased demand for dual-fuelled engines and auxiliary systems is set to continue. Furthermore, two-stroke marine engine is

designated as specified critical materials under the Economic Security Promotion Act. MES is striving to expand its product portfolio and ensure a stable supply that offers customers peace of mind, by continuously improving production facilities and challenging a new development of ammonia-fuelled engine and auxiliary systems that will contribute to achieving zero GHG emissions from shipping.

MES is also pleased to announce its production schedule for FY2023 following the launch of new marine engine company, Mitsui E&S DU Co., Ltd., which was announced on April 3, 2023.

Mitsui E&S DU has been serving a wide range of customers domestically and internationally under the DU brand for the past 75 years, since forming a technical partnership with the two-stroke engine division of SULZER (now WinGD) in 1948. As a licensed partner of WinGD, Mitsui

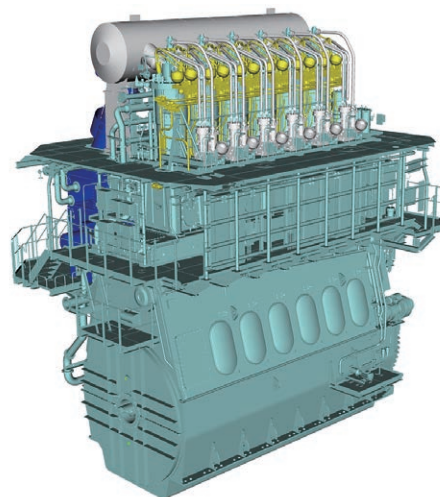
E&S DU is committed to provide its customers with its reliable products and services.

Production volume and production schedule for large low-speed two-stroke engines

FY2022: 136 units, 2.83 mil. hp

FY2023: 160 units, 3.25 mil. hp (incl.

MES DU)



LPG dual fuel engine ME-LGIP

WAN HAI 361

Owner: Wan Hai Lines (Singapore) Pte. Ltd.
 Builder: Japan Marine United Corporation
 Hull No.: 5398
 Ship type: 3,013TEU container ship
 L (o.a.) x B x D x d: 203.5m x 34.8m x 16.60m x 11.5m
 DWT/GT: 36,776t/30,519
 Main engine: MAN B&W 7S70ME-C10.5-HPSCR diesel x 1 unit
 Speed, service: 21.5kt
 Complement: 25
 Classification: DNV
 Registry: Singapore
 Completion: April 27, 2023

**KAGURA**

Owner: Erica Navigation S.A.
 Builder: Oshima Shipbuilding Co., Ltd.
 Hull No.: 11027
 Ship type: Bulk carrier
 L (o.a.) x B x D x d (ext.): 234.996m x 43.000m x 20.050m x 13.853m
 DWT/GT: 99,990t/57,646
 Main engine: Mitsui-MAN B&W 6S60ME-C10.5-EGRBP diesel x 1 unit
 Speed, service: 14.30kt
 Classification: ClassNK
 Registry: Liberian
 Completion: March 9, 2023

**YASA TOKYO**

Builder: Onomichi Dockyard Co., Ltd.
 Hull No.: 782
 Ship type: 37,000DWT bulk carrier
 L (b.p.) x B x D : 174.00m x 30.00m x 15.10m
 DWT/GT: 37,000t/24,000
 Main engine: MAN B&W 6S46ME-B8.5 diesel x 1 unit
 Speed, service: 15.4kt
 Classification: ClassNK
 Registry: Marshall Islands
 Completion: February 8, 2023

**DEFENDER**

Builder: Tsuneishi Shipbuilding Co., Ltd.
 Hull No.: 1619
 Ship type: Bulk carrier
 L (b.p.) x B x D: 229.00m x 32.26m x 20.15m
 DWT/GT: 82,400t/44,000
 Main engine: MAN B&W 7G50ME-C9.6-EGRBP diesel x 1 unit
 Speed, service: 14.0kt
 Classification: ClassNK
 Registry: Marshall Islands
 Completion: May 29, 2023

**Notice:****JSEA Digital Platform**

The Japan Ship Exporters' Association has developed the JSEA Digital Platform (JDP) for exhibitions with a virtual space to supplement local exhibitions such as Posidonia and NOR-SHIPPING. We have so far participated in these exhibitions and recently held a hybrid exhibition with JSEA Digital Platform (JDP). We are now intending to apply the hybrid approach for the next exhibition, NOR-SHIPPING 2023 (June 6th to 9th, 2023) in Oslo, together with JSEA Digital Platform (JDP). For more information, please access the QR code below.

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