



Kawasaki completes 145,000m³ LNG carrier *Energy Frontier*



Kawasaki Shipbuilding Corporation delivered the first 145,000m³ class LNG carrier, *Energy Frontier* (HN: 1520), to Tokyo LNG Tanker Co., Ltd. The LNG carrying capacity is 10,000m³ larger than the conventional 135,000m³ class LNG carrier.

Kawasaki designed the carrier to have a larger capacity based on similar dimensions to those of the conventional carrier to provide the capability to visit various LNG terminal ports worldwide.

The carrier has four units of the MOSS type independent spherical tank for LNG transport. The total LNG containment capacity is 145,385m³. The LNG tank insulation applies the Kawasaki Panel System for higher efficiency of thermal insulation to achieve 0.10% boil-off rate per day.

The cargo tank compartments are protected by double hull structures (double side shell and bottom), and the LNG tanks are installed inside the double hull structures. This prevents direct damage to the LNG tanks if the hull is damaged in an accident. The LNG tanks are thus ensured to be safe.

The wheelhouse is fully equipped with advanced electronic navigation equipment, which are integrated in one corner to allow centralized operation of navigation equip-

ment. This allows more easy operation than the previous arrangement of navigation equipment distributed in the wheelhouse.

The wheelhouse has 360-degree visibility due to windows provided around the wheelhouse. One-man control navigation is possible in open sea. The cargo monitoring and controlling room is provided just before the accommodation quarters below the bridge, where

good visibility is possible to watch over the vast cargo handling area.

The cargo handling control room is equipped with a newly developed integrated monitoring and control system (IMCS). The system allows monitoring and controlling of cargo handling as well as the engine operation status. IMCS is designed based on opinions and experiences of operators for improved operability.

Principal particulars

Length (o.a.):	289.50m
Length (b.p.):	277.00m
Breadth (mld.):	49.00m
Depth (mld.):	27.00m
Draught (mld.):	11.404m
Gross tonnage:	119.381t
Deadweight:	71,642t
Cargo tank capacity:	145,385m ³ (at -163°C, 98.5%)
Main engine:	Kawasaki UA-400 steam turbine x 1 unit
MCR:	26,900kW x 80rpm
Speed, service:	about 19.5kt
Complement:	43
Classification:	NK
Completion:	Sept. 16, 2003



For further information please contact:

JAPAN SHIP EXPORTERS' ASSOCIATION

15-16, Toranomon 1-chome, Minato-ku, Tokyo 105-0001 Tel: (03) 3508-9661 Fax: (03) 3508-2058 E-Mail: postmaster@jsea.or.jp

MHI launches large cruise ship, *Sapphire Princess*, for P&O

Mitsubishi Heavy Industries, Ltd. (MHI) has launched the 113,000GT cruise ship, *Sapphire Princess* (HN: 2180), for P&O Princess Cruises International plc at the Koyagi Shipyard.

The launching ceremony at the shipyard was attended by Mr. and Mrs. Micky Arison, the Chairman and Chief Executive Officer of Carnival Corporation & plc and his wife, and Mr. Peter G. Ratcliffe, Chief Executive Officer of P&O Princess Cruises International plc, as well as Mr. Kazunori Ohta, Managing Director of Mitsubishi Heavy Industries, Ltd. About 900 people including schoolchildren observed the launch.

The *Sapphire Princess* is the sister ship of the *Diamond Princess* to be delivered to the same owner from MHI in February 2004. These ships are the largest cruise ships ever built in Japan. The *Sapphire Princess* is now moored at the outfitting pier of the



Koyagi Shipyard for delivery in May 2004. These ships will enter service on routes in North America including Alaska.

Principal particulars

L (o.a.) x B x D x d: 290.0m x 37.5m x 41.3m x 8.05m

Gross tonnage: abt. 113,000t

Speed, service: 22.1kt

Diesel generators: 9,450kW x 2 units, 8,400kW x 2 units

Gas turbine-generator 25,000kW x 1 unit

Propulsion motors: 21,000kW x 2 units

Fixed pitch propellers (FPP) x 2 units

Side thrusters: 3 units each for bow and stern

Passenger cabins: 1,337

Passengers: 3,100 (max.)

Complement: 1,238

Completion: May 2004

Imabari Shipbuilding Co., Ltd. completed the container carrier, NYK Phoenix (HN: 2148), for Japanese owner at Koyo Dockyard Co., Ltd., a company of the Imabari group on October 3, as the second of a series of two ships constructed by the Koyo Dockyard. The ship can carry 6,586TEU containers.

For increasing container loading capacity, the ship is designed and employed girderless construction to the hold parts. Thus the cargo hold midship has high loading efficiency to

Imabari completes 6,586-TEU container carrier, *NYK PHOENIX*

accommodate nine tiers and 14 rows.

The lashing bridge is adopted to allow loading of seven tiers on the hatches. Loading of 45 feet containers is also possible. 500 plugs for reefer containers are provided, 400 plugs for the hatches and 100 plugs in the cargo holds.

Two bow thrusters are provided to ensure ship maneuvering for berthing and unberthing. The main engine is a DU-SULZER 12RTA96C diesel, which has

the world's largest class output securing high-speed navigation. A water-tube boiler (380cSt/50°C) is used, which has high reliability during navigation or cargo handling.

Other machinery includes a waste gas economizer [5,500kg x 0.7MPa], four units of generators [3,500KVA (2,800kW) x 720rpm,] and an emergency generator [325KVA (260kW) x 1,800rpm].

Principal particulars

Ship Type: 6,586TEU Type Container Carrier

L (o.a.) x L (b.p.) x B x D x d: 299.95m x 287.00m x 40.00m x 24.00m x 14.00m

DWT/GT: 80,270t/76,199t

Main engine: DU SULZER 12RTA96C diesel x 1 unit

MCR: 64,200kW x 100.0rpm

NOR: 54,570kW x 94.7 rpm

Speed, service: 25kt

Classification: NK

Complement: 36

Endurance: abt. 18,000 miles



World's first fuel cell underwater vehicle successful

—Deep-sea exploring robot *Urashima* of JAMSTEC—

Mitsubishi Heavy Industries, Ltd. (MHI) has succeeded in the sea trial of a completely closed cycle fuel cell system installed as a power source on an Autonomous Underwater Vehicle (AUV) called *Urashima*.

Urashima has been developed by Japan Marine Science and Technology Center (JAMSTEC) for exploring the deep sea.

The sea trial conducted by the JAMSTEC was the world's first achievement. Tests on the *Urashima* were carried out in Suruga Bay in August 2003. The *Urashima* first dived down to 300m deep. At that level, the acoustic communication system was tested, and subsequent tests were conducted on cruising using the fuel cell. The total trial subsea cruise range was approximately 2.5km.

The fuel cell of the *Urashima* is the polymer electrolyte type and is contained in a titanium alloy container with a cocoon-like appearance. Oxygen is charged into the cell from a high-pressure oxygen container and hydrogen from metal hydride contained in a high-pressure container.

Hydrogen is discharged from the alloy with the thermo control system, and this method is safer than the use of a high-pressure tank in handling hydrogen.

The hydrogen-occlusion alloy can occlude hydrogen at 20°C and discharge below 60°C. Water generated in the process of electricity generation is stored in a tank mounted on the vehicle to avoid weight loss. Thus a completely closed fuel cell system is provided.

Fuel cell specifications

Type: Closed polymer electrolyte fuel cell

Rated output: 4kW

Rated voltage: 120V

Urashima specifications

Length: Approx. 10m

Weight in air: Approx. 10t

Max. diving depth: Approx. 3,500m

Max. speed: Approx. 4kt

Cruising speed: Approx. 3kt



The fuel cell container is shown below with the top cover opened



Water ingress alarm system installed on ship during cargo handling work

Oshima Engineering Co. Ltd. (OEC), a subsidiary of Oshima Shipbuilding Co., Ltd., has mounted a water ingress alarm system on a bulk carrier during cargo handling work for the first time. The system was in-

stalled on a 51,000DWT Handymax bulk carrier built by Oshima Shipbuilding when the vessel called at Tokuyama Port.

Installation work demonstrated the device can be easily installed on a ship without hot work (no need for welding, etc.), and disturbing the other work on board the ship. It was completed in three days including the certifying inspection by the American Bureau of Shipping. The inspection was completed three hours before the ship departure.

The system called WIN-OSY System, which uses a capacitance type alarm sensor, has a simple mechanism and procedure for setting up on board the ship. The crew can install during navigation or loading/unloading work. Other shipyards can install the system with only necessary information (e.g. length of wire) and installation procedures provided by OEC for shipyards.

The WIN-OSY System has advantages including "installation by the crew during navigation or cargo handling," "no hot work (welding and gas cutting)," "cheaper than installation work in a dock," and "less time required for work." OEC has already received WIN-OSY system orders for over 200 ships, including potential and provisional inquiries.



Alarm board attached to the wheel house wall (left) and hold sensor attached to the cargo hold (seen along the ladder)

MES completes large double hull VLCC *Selene Trader*

Mitsui Engineering & Shipbuilding Co., Ltd. (MES) has delivered the 300,000DWT class double hull VLCC, *Selene Trader* (HN: 1558), to Regulus Lines S. A. of Panama at the Chiba Works. The carrier is the second ship of the Malaccamax type developed by MES.

The cargo tank capacity is 352,606m³, the largest among VLCCs, which is achieved by a draught design deeper than the conventional VLCCs operated by Japanese operators. The cargo tanks employ the segregation system, and three cargo pumps with a capacity of 5,000m³/hr are installed for efficient and simultaneous cargo handling. One COW (cargo oil wash) pump is installed for cleansing the cargo tanks.

New developments are employed to achieve the most efficient propulsion performance for a VLCC, which include a new bulbous bow and stern

form, efficient propeller, and RBS-F energy saving device. Electric power generation uses a turbo generator using an engine exhaust gas recovery system. Fuel consumption by the electric power generator has decreased, lowering emissions of CO₂, NO_x, and SO_x, and contributing to preserving the environment.

Ship navigation is ensured by installation of a GPS navigation system, and differential GPS navigation system.

Electronic chart display and information system (ECDIS) and automatic ship identification system (AIS) ensure safe navigation and ship operation.



Principal particulars

L (o.a.) x L (b.p.) x B x D x d: 333.00m x 320.00m x 60.00m x 29.65m x 20.879m DWT/GT: 299,991t/159,912t

Cargo tank capacity: 352,606m³ (100%)

Main engine: Mitsui-MAN B&W 7S80MC-C diesel x 1 unit

MCR: 27,160kW x 76rpm

Complement: 30

Classification: NK

Completion: Sept. 30, 2003

Shin Kurushima Dockyard Co., Ltd. (SKDY) completed the 13,927GT roll-on/roll-off cargoship, *Musashi Maru*, for Kyushu Kyuko Ferry Co., Ltd. at the Onishi Shipyard in September 2003. The *Musashi Maru* is one of the largest coastal Ro-Ro ships in Japan, and can accommodate 160 units of 12.00m chassis length and 120 cars.

The main engine is a 16,920kW B&W 12L50MC-C diesel engine, and a controllable pitch propeller (CPP) and PBCF (Propeller Boss Cap Fin) are used. This arrangement can develop 23.0-knot navigation speed. Adoption of energy-saving fins

Roll-on/roll-off cargoship completed by Shin Kurushima

achieves reduction of required power and fuel consumption. Measures are provided to decrease emission of NO_x and dioxins for preservation of the environment.

Fin stabilizers are installed to suppress the rolling motion of the ship to maintain stabilized navigation at high speed. Ship maneuvering during

berthing and unberthing can easily be performed using a joystick controller that regulates the bow thruster, stern thruster, rudder, main engine and CPP simultaneously. This also displays superior

performance in navigation or when entering port. The shore ramps consists of a stern quarter ramp (starboard) and a stern ramp. Three movable ramps are provided inboard to facilitate loading and unloading work.

Complement is 24 including eight passengers, for which four passenger cabins, each with two beds, are provided.

Principal particulars

Ship type: Roll-on/roll-off cargoship

Length (o.a.): 166.03m

Length (b.p.): 158.00m

Breadth (mld.): 27.00m

Depth (at bridge deck): 22.50m

Depth (at main deck): 11.80m

Draught (extreme): 7.017m

DWT/GT: 6,389t/13,927T

Main engine: B&W 12L50MC-C (Mark 6)

MCR: 16,920kW x 148min⁻¹

Speed, service: 23.0kt

Complement: 24

Classification: NK

Vehicle carrying capacity

160 units (12.00m long chassis)

120 cars (4.565m length)



MES delivers AUV "r2D4" to University of Tokyo

—Sea bottom observation carried out off Sado Island—

Mitsui Engineering and Shipbuilding Co., Ltd. (MES) has delivered "r2D4", an autonomous underwater vehicle (AUV) for exploring the seabed, to the University of Tokyo. MES took charge of the design and manufacture of "r2D4".

MES and the University of Tokyo jointly conducted observation of the seabed off Sado Island in the Japan Sea using "r2D4" from 15th to 19th July 2003. "r2D4" dived down and performed to scan the seabed along a fault line using the

side scan sonar, maintaining the attitude 30m from the seabed. "r2D4" passed exactly through each waypoint as pre-programmed, and succeeded in scanning acoustic images and CTDO measurements.

The research vessel, "Tansei Maru", owned by the university was used as a support vessel of "r2D4", and Niigata Shipbuilding & Repair, Inc., an MES affiliate, carried out logistic supply and various supports.

The University of Tokyo has developed various autonomous underwater vehicles since 1984 and succeeded in development of "R-One Robot" (in collaboration with MES) and achieved great results. The university, based upon the past achievements, has launched a five-year project called "R-Two Project" in fiscal year 2001. In this project, "r2D4" has been developed and observation of a hydrothermal vent system will be made using this AUV.

The goal of this project is as follows: At first to research



and develop a highly intelligent and reliable robot, then to make observation of phenomena occurring in the hydrothermal vent system using the robot. Technical feedback through these activities will lead the project to the final goal of development of a new seabed observation system mainly focused on the activity of AUVs.

In addition to observation of hydrothermal vent system, the advent of "r2D4" enable to ease the seeking of the lost property in seabed, observation of submarine vol-

canoes, swimming marine creatures, seawater environment, and co-operative survey with seabed observation stations.

For the reference, this project program is now being carried out as part of R&D of Deep Sea Intelligent Robot promoted by the Japan Society for the Promotion of Science.

Specification of "r2D4"

Overall length: 4.4m

Body height: 1.08m

Body width: 0.81m

Weight in air (without payload): 1.506t

Weight in air (with payload): 1.63t

Operating depth: 4,000m

Cruising range: 60km

Power source: Lithium ion secondary batteries

Speed(max): 3kt

IHIMU completes D/H VLCC *Eneos Breeze*

IHI Marine United Inc. (IHIMU) has delivered the 301,013DWT double hull crude oil carrier, *Eneos Breeze* (HN: 3161), to Liberian Jerboa Trans-



ports, Inc. of Liberia at its Kure Shipyard. The *Eneos Breeze* is the second of IHIMU's latest design of VLCC with the maximum hull form and maximum draft to pass the Straits of Malacca, Malaysia, the so-called Malaccamax type. After delivery, the vessel entered crude oil transport service between the Middle East and Japan.

Principal particulars:

L (o.a.) x L (b.p.) x B x D x d: 333.00m
x 324.00m x 60.00m x 29.00m x
20.529m

DWT/ GT: 301,013t/159,909t

Main engine: DU-Sulzer 7RTA84TB
diesel x 1 unit

MCR: 27,160kW x 74.0rpm

Speed, service: 16kt

Classification: NK

Completion: Sept. 18, 2003

Berge Nice

Owner: Bergesen Dy Shipping AS
Builder: Kawasaki Shipbuilding Corporation
Hull No.: 1523
Ship type: LPG carrier
L (o.a.) x L (b.p.) x W x D x d:
 204.915m x 200.45m x 32.20m x
 20.20m x 12.00m
DWT/GT: 44,639t/35,000t



Cargo tank capacity: 59,343m³
Main engine: Kawasaki-MAN B&W 5S60MC-C diesel x 1 unit
Speed, service: 16.55kt
Classification: DNV
Completion: Sept. 30, 2003

PAOLA I

Operator: Augustea Ship Management S. R. L.
Builder: Namura Shipbuilding Co., Ltd.
Hull No.: 234
Ship type: Tanker
L (o.a.) x L (b.p.) x W x D x d:
 241.03m x 232.00m x 42.0m x



21.20m x 14.923m
DWT/GT: 105,817t/58,477t
Main engine: Sulzer 7RTA58T diesel x 1 unit
Speed, trial max.: 14.88kt
Classification: ABS
Completion: Sept. 11, 2003

Sea Lady

Owner: Artemis Shipping UK Limited
Builder: Sumitomo Heavy Industries Marine & Engineering Co., Ltd.
Hull No.: 1295
Ship type: Tanker



L (o.a.) x L (b.p.) x W x D x d:
 239.00m x 229.00m x 42.00m x
 21.30m x 14.85m (Scant.)
DWT at scant./GT: abt. 105,250mt/
 56,204t
Main engine: DU-SULZER 6RT-FLEX58T-B diesel x 1 unit
Speed, service: 15.2 kt
Classification: LRS
Completion: Aug. 28, 2003

Kaminesan

Owner: Astral Shipping Navigation S.A.
Builder: Universal Shipbuilding Corp., Ariake Shipyard



Hull No.: 4995
Ship Type: VLCC
L (o.a.) x B x D x d: 332.98m x
 60.00m x 29.40m x 21.024m
 (Scant.)
DWT (Scant.)/GT: 303,896t/159,813t
Main Engine: HITACHI ZOSEN
 MAN B&W 7S80MC-C diesel x 1
 unit
Speed, service: 15.75kt
Classification: NK
Completion: July 31st, 2003

Red Iris

Owner: F. J. Lines Inc.
Builder: Sanoyas Hishino Meisho Corp.
Hull No.: 1210



Ship type: Bulk carrier
L (o.a.) x L (b.p.) x W x D x d:
 225.00m x 217.00m x 32.26m x
 19.30m x 13.994m
DWT/GT: 75,730mt/38,871t
Cargo hold capacity: 89,250m³
Main engine: MAN B&W7SsOMC-C diesel x 1 unit
Speed, service: 14.5kt
Classification: NK
Completion: Aug. 26, 2003

Maritime Sirinant



Owner: Silver Star Ship Line S. A.
Builder: The Hakodate Dockyard Co., Ltd.
Hull No.: 792
Ship type: Bulk carrier
L (b.p.) x W x D x d: 168.00m x
 29.40m x 13.50m x 9.56m
DWT/GT: 32,039t/19,738t
Main engine: Mitsubishi 6UEC52LA diesel x 1 unit
Speed: 14.0kt
Classification: NK
Completion: Oct. 10, 2003

Opal Stream



Owner: Opal Stream Shipping S. A.
Builder: Oshima Shipbuilding Co., Ltd.
Hull No.: 10344
Ship Type: Bulk carrier
L (o.a.) x B x D x d: 225.00m x
 32.26m x 19.39m x 14.12m
DWT/GT: 76,500t/39,000t
Main Engine: KAWASAKI MAN
 B&W 5S60MC-C x 1 unit
Speed, trial max: 14.5kt
Classification: NK
Completion: Sept. 24, 2003