

## MHI completes large membrane-type LNG carrier



Mitsubishi Heavy Industries, Ltd. (MHI) completed construction of the *Puteri Intan Satu* (HN: 2165), a large membrane type LNG carrier with a tank capacity of 137,489m<sup>3</sup>, at the Nagasaki Shipyard & Machinery Works on Aug. 29.

MHI has built many MOSS-type LNG carriers. The company received the first order for construction of the membrane type LNG carrier in March 1999. Subsequently, several orders for the membrane types were placed and construction was undertaken at the MHI Koyagi Shipyard, Nagasaki.

The ship naming ceremony of the *Puteri Intan Satu* was conducted in the presence of Dr. Mahathir, the Prime Minister of Malaysia, on May 22. Since then, the final outfitting work and gas tests have been carried out.

The membrane type LNG carrier requires about 700,000 separate materials and components per ship, which includes heat insulation boxes. To handle these items efficiently, MHI has developed the "LOGIQ" system for man-

aging the physical distribution. The total welding length measured approximately 100,000m. For this purpose, automatic welding was widely applied and training given to the young welding workers.

Success in building the membrane type has encouraged MHI to continue construction of LNG carriers of both MOSS and membrane types in the future.

Principal particulars of *Puteri Intan Satu*

Length, o.a.:	Approx. 276.00m
Length, b.p.:	263.00m
Breadth, mld.:	43.40m
Depth, mld.:	25.50m
Design draft:	11.06 (extreme)
Gross tonnage:	93,038t
Tank capacity:	137,489m <sup>3</sup>
Speed, service:	19.5kt
Main engine: Mitsubishi Marine Steam Turbine MS40-2	
Output:	26,800kW x 89rpm
Classification:	LRS



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

## Three Japanese Shipbuilding Companies established

Three new shipbuilding companies have evolved from the previous conglomerates of Japanese heavy industry and marked their restart on October 1. Universal Shipbuilding Corporation resulted from the merger of the shipbuilding divisions of NKK Corp. and Hitachi Zosen Corp., IHI Marine United Inc. was spun off from Ishikawajima-Harima Heavy Industries Co., Ltd., and Kawasaki Shipbuilding Corporation from Kawasaki Heavy Industries, Ltd. (KHI)

### IHI Marine United Inc.



Chairman Ito and President Tsuda (right)

The whole shipbuilding and offshore business of Ishikawajima-Harima Heavy Industries Co., Ltd. (IHI) was divested on October 1, and IHI Marine United Inc. (IHIMU) was newly established.

"The lines of business of the new company will cover the whole shipbuilding and offshore sector including merchant ships, naval vessels, equipment for offshore development projects and floating structures. Our immediate target is to develop five product items in which IHIMU can hold the number one position in three years' time," said Naoteru Tsuda, president of IHIMU, in his message to about 2,000 employees of the new company.

"The shipbuilding and offshore business had been the core competence of IHI in its 150-year history. I am profoundly impressed by this significant start of the second phase of its history. Today, not only shipbuilding and offshore activities but all businesses in the world are borderless, and the business environment is changing very dramatically. Unless we can quickly respond to these changes and reshape ourselves, our business cannot even survive.

"The basis of our business is engineering capabilities, and the human resources who create those capabilities. For Japan surrounded by the sea, shipbuilding will continue to be an

indispensable industry, and engineering capabilities of high standards constitute the lifeline for the survival of our business. Only by supplying products that can fully satisfy our clients, we can make meaningful contributions to society," Tsuda added.

Outline of IHI Marine United Inc.



Chairman: Mototsugu Ito  
 President: Naoteru Tsuda  
 Head Office: MSC Center Bldg., 22-33 23, Kaigan 3-chome, Minato-ku, Tokyo 108-0022, Japan  
 Tel: +81-3-3454-8900  
 Fax: +81-3-3534-8953  
 URL: <http://www.ihimaru.co.jp/ihimaru>  
 Yokohama Shipyard:  
 Shinsugita-cho 12, Isogo-ku, Yokohama 235-8501, Japan  
 Tel: +81-45-759-2643  
 Fax: +81-45-759-2914  
 Kure Shipyard: Showamachi 2-1, Kure, Hiroshima 737-0027, Japan  
 Tel: +81-823-26-2349  
 Fax: +81-823-26-2170  
 Aioi Production Dept.: Aioi 5292, Aioi, Hyogo 678-0041, Japan  
 Tel: +81-791-24-2466  
 Fax: +81-791-24-2410

### Kawasaki Shipbuilding Corp.



President Tadokoro

Kawasaki Shipbuilding Corporation (Kawasaki) incorporates the traditional shipbuilding technology, facilities and business of KHI restarted on October 1 to engage in shipbuilding and related business activities. The lines

of business comprise the design and construction of all types of ships and marine engineering. Kawasaki is exposed to intense competition in this single global shipbuilding market shaken by the turbulent world economic situation, but maintains an edge in advanced technology and a substantial business basis. To make further strides ahead, taking the opportunity of its independence from KHI, the company is aiming at steady development of business and employment. The new organization "promises establishment of a more flexible and speedy style of business management and will facilitate a further leap forward in technological resources and competitiveness," said Shuichi Tadokoro, president of the new company, in his message to the staff. In the past, all Japanese shipbuilding companies were intent on business diversification. By specializing in shipbuilding in the framework of the KHI group instead, Kawasaki is trying to think out a breakthrough concept in shipbuilding.

Outline of Kawasaki Shipbuilding Corporation



President: Shuichi Tadokoro  
 Head Office: 1-1, Higashikawasaki-cho 3-chome, Chuo-ku, Kobe 650-8670, Japan  
 Tel: +81-78-682-5501  
 Fax: +81-78-682-5514  
 URL: <http://www.kawasakizosen.co.jp>  
 Marketing & Sales Division:  
 World Trade Center Bldg, 4-1, Hamamatsu-cho 2-chome, Minato-ku Tokyo 105-6116, Japan  
 Tel: +81-3-3435-2141  
 Fax: +81-3-3436-3038  
 Kobe Shipyard: 1-1, Higashikawasaki-cho 3-chome, Chuo-ku, Kobe 650-8670, Japan  
 Tel: 81-78-682-5501  
 Fax: 81-78-682-5514  
 Sakaide Shipyard: 1, Kawasaki-cho, Sakaide, Kagawa 762-8507, Japan

(Continued on Page 3)

(Continued from Page 2)

Tel: 81-877-46-1473

Fax: 81-877-46-7006

### Universal Shipbuilding Corp. set up by NKK and Hitachi



Chairman Tazawa and President Kamijo (right)



NKK Corporation and Hitachi Zosen Corporation have integrated their shipbuilding operations to begin a new era of efficiency and effectiveness as Universal Shipbuilding Corporation. Universal Shipbuilding Corporation inherits NKK's 90-year and

Hitachi Zosen's 120-year history of experience, knowledge, specialist expertise, and comprehensive service qualities which give both companies a global reputation of excellence in technology and shipbuilding skills. The large docks of Ariake (Nagasumachi, Kumamoto Prefecture) and Tsu (Mie Prefecture) together with the manufacturing facilities of Maizuru (Kyoto Prefecture), Keihin (Kanagawa Prefecture), and Innoshima (Hiroshima Prefecture), uniquely position Universal Shipbuilding Corporation to satisfy diverse vessel requirements.

Outline of Universal Shipbuilding Corp.

Chairman and Executive Director:

Kenzo Tazawa

President and Executive Director:

Takehiko Kamijo

Head Office: 28-1, Oi 1-chome, Shinagawa-ku, Tokyo 140-0014, Japan

Tel: +81-3-5742-4050

Fax: +81-3-5742-4060

URL <http://www.u-zosen.co.jp>

Shipyards

Ariake Shipyard: Ariake 1, Nagasumachi, Tamana-gun, Kumamoto Pref., 869-0113 Ariake Shipyard

Tel: +81-968-65-7100

Fax: +81-968-65-7123

Tsu Shipyard: 1-3, Kumozu-Kokancho, Tsu City, Mie Pref., 514-0398

Tel: +81-59-238-6100

Fax: +81-59-238-6430

Maizuru Shipyard: 1180 Amarubeshimo, Maizuru City, Kyoto Pref., 625-0045 Tel: 81-773-62-8700

Fax: +81-773-62-3007

Keihin Shipyard: 2-1, Suehirocho, Tsurumi-ku, Yokohama City, Kanagawa Pref., 230-0045

Tel: +81-45-500-3300

Fax: +81-45-500-3112

Innoshima Shipyard: 2477-16, Habucho, Innoshima City, Hiroshima Pref., 722-2393

Tel: +81-8452-2-1220

Fax: +81-8452-2-0383

## SHI delivers 1st double acting tanker, "Tempera" to Finnish owner

Sumitomo Heavy Industries, Ltd. (SHI) has recently delivered the first of two Aframax tankers with Ice Class 1A Super, built at the SHI Yokosuka Shipyard, to Fortum Oil & Gas OY of Finland.

The tanker *Tempera* has joined the Fortum fleet to enter service between the North Sea and the Baltic Sea. The *Tempera* is the first newbuilding in the world to utilize the DAT (Double Acting Tanker) concept and the world's largest tanker built in accordance with the ice class 1A Super standards.

The DAT is equipped with a podded azimuthing propulsion unit that can rotate 360 degrees at the stern of the vessel, and is designed to navigate stern ahead in frozen ice conditions and bow first in open water. The *Tempera* can achieve a high level of reliability and safety.

The hull construction and ice breaking performance conform to the Ice Class 1A Super requirements

stipulated by Finnish Maritime Administration (FMA) and LRS. The podded propulsion system also ensures safe navigation in the seas with many islands around Finland.

The *Tempera* recently received an Award at the Shipbuilding, Machinery and Marine Technology (SMM) International Trade Fair in Hamburg in the Tankers Series as the most innovative newbuilding of the year 2002.

Length, o.a.: Approx. 252.00m

Length, b.p.: 230.00m

Breadth, mld.: 44.00m

Depth, mld.: 22.50m

Designed draft, mld.: 14.50m

Scantling draft, mld.: 15.30m

DWT at scantling draft: Approx. 106,000 MT

GT: Approx. 64,200

Service speed, open water: Approx. 15.4 knots (15% sea margin at designed draft)

Service speed, ice condition: Approx. 8 knots (in channel ice at scantling draft)

Main propulsion machinery

Type: Electric motor-driven podded azimuthing propulsion unit

MCR: 16,000kW



## SKDY completes caprolactam carrier Eishu

Shin Kurushima Dockyard Co., Ltd. (SKDY) has built the caprolactam carrier, *Eishu* (HN: 5188), for Procyon Shipholding S. A. The carrier has a unique construction for the coastal transport of caprolactam, which is a nylon raw material.

Caprolactam transport requires constant temperature control at around 80°C (plus/minus 2°C) to maintain caprolactam in the molten state. Contact with air (oxygen), water, oil, and dust must be avoided for ensuring quality. If contaminated with these substances, caprolactam cannot be used for nylon products.

Previous caprolactam carriers had generally used heating pipes in cargo tanks. This method was not effective to maintain an even temperature in the whole tank. Temperature around the heating pipes could be maintained at the required level or higher but was lower at areas distant from the pipes. The resultant heat distribution deviation made the strict temperature control difficult.

Air oxidizes caprolactam, causing changes in quality. To prevent oxidation, the inside of the cargo tanks had been sealed with nitrogen to exclude air. The presence of any projecting outfitings like heating pipes in cargo tanks also causes the formation of air pockets behind the outfitings. There-



fore, it was necessary to minimize items and quantities of internal outfitings. SKDY has developed a unique tank heating system to resolve these problems.

In the new design, the heat insulation is provided inside the cargo holds, and no heat insulation covering cargo tanks was attached, considering the heat transfer of the cargo tanks. Hot air is circulated in the space between the cargo tanks and heat insulation to maintain the temperature evenly. This unique double construction provides flat walls and bottoms for the inside of the tanks, facilitating temperature control at the required level.

The heating system uses a fan room in the upper section of the cargo pump room. In the fan room, fans and air heaters are installed. The air heaters produce hot air, and fans send out the hot air into cargo holds. The heat source for the air heaters is 220°C ther-

mal oil supplied by a thermal fluid boiler that is installed in the engine room.

Ducts are installed between the cargo tank and heat insulation to circulate hot air constantly and evenly, and thermosensors monitor the temperature. The temperature monitoring system also controls the temperature regulating valves for thermal oil supply.

At the open end of cargo tank ventilation system, a seal tank is installed to prevent air penetration. Internal pressure gauges and thermometers are also provided for recording the internal pressure and temperature. Negative pressure and overheat inside the cargo tanks are avoided by safety devices including pump and fan stopping systems.

Principal particulars

Ship type: Caprolactam Carrier  
L (o.a.) x L (b.p.) x B x D x d: 79.97m x  
76.00m x 13.20m x 6.20m x  
4.30m DWT/GT: 1,866.14t/1,865t  
Main engine: Hanshin LH36L  
Speed, service : abt. 12.8 kt  
Classification: NK  
Completion: July 2002

## MHI receives order for UEC43LSII diesel engine from MES

Mitsubishi Heavy Industries, Ltd. (MHI) has received an order for building the first Mitsubishi UEC43LSII diesel engine from Mitsui Engineering & Shipbuilding Co., Ltd. (MES).

The engine consists of seven cylinders with a bore of 43cm, which can develop 7,350kW at 160rpm. The engine has been developed for medium class ships. The UEC-LSII series consists of seven types ranging from UEC33LSII to UEC85LSII with dif-

ferent bore sizes.

The first engine of the UEC43LSII type will be mounted on the *Ginga Maru* as its main engine, which is a training ship being built by MES for the Institute for Sea Training of the Ministry of Land, Infrastructure and Transport of Japan.

The *Ginga Maru* is a 6,100GT ocean-going training ship with the navigation speed of 18 knots. Full complement will be 246. Commencement is scheduled in June 2004.

7UEC43LSII Main Specifications:

Bore:	430mm
Stroke:	1,500mm
Maximum output:	7,350kW
Speed:	160rpm

### To our readers

- Please notify us of any change in address by letter or telefax together with the old mailing label to ensure you continue to receive SEA-Japan.
- We welcome your comments about SEA-Japan. Please address all correspondence to the Japan Ship Exporters' Association (JSEA), or the Japan Ship Centre in London.
- Address (Tokyo): 15-16, Toranomon 1-chome, Minato-ku, Tokyo 105-0001 / Tel: (03) 3508-9661 Fax: (03) 3508-2058 E-mail: postmaster@jsea.or.jp
- Address (London): Ground Floor, 9 Marshalsea Road, London SE1 1EP, UK / Tel: +44 (0) 20 7403 1666 / Fax: +44 (0) 20 7403 1777 E-mail: info@jsc.org.uk URL: <http://www.jsc.org.uk>

## KHI establishes friction-stir welding system for aluminum alloy

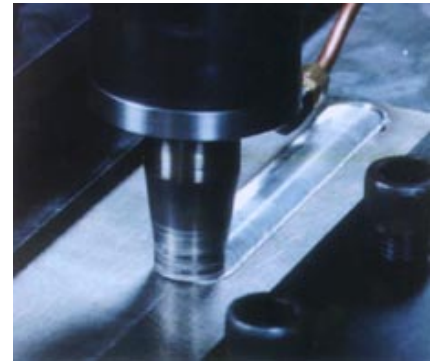
Kawasaki Heavy Industries, Ltd. (KHI) has established a "friction-stir welding" (FSW) method to apply 5083 aluminum alloy plate. FSW was invented at The Welding Institute (TWI) in the UK in 1991, and is a unique welding method to join base metals such as aluminum and magnesium alloys directly without using consumable materials used in the conventional method.

This welding method was first introduced into Japan in the middle of the 1990s, then increasingly applied to the manufacturing of various aluminum alloy structures.

KHI introduced the FSW method from TWI in the latter half of the

1990s and started the study to apply the technology to its own products. The company has also designed welding machines and tools, as well as setting of correct welding parameters necessary for joining various aluminum alloys.

As a result, KHI has established the FSW process applicable to 5083 aluminum alloy plate with a thickness of up to 50mm. The aluminum alloy of this grade is used as structural materials to build the hull of high-speed ships and cargo tanks of LNG carriers. 5083 alloy is known as a difficult material for applying FSW, in comparison to the 6000 series alloys that are used for railcar bodies.



Based on the results, KHI will now use the FSW method for constructing aluminum alloy hulls of high-speed ships such as Jet Piercers and Jet Foils that are now becoming popular in the Kyushu district and Izu Islands. The FSW method will be also used for the construction of cargo tanks for LNG carriers, for which a high level of safety is required.

KHI has also concluded a technical license agreement with Mitsui Engineering & Shipbuilding Co., Ltd. (MES) to supply FSW technology. Both companies have already concluded a business tie-up in shipbuilding for designing, production, and procurement. The transfer of FSW technology from KHI to MES will increase technical exchange between the companies further.

MES has already begun the technical study to apply the FSW method to the Techno Super Liner, a high-speed cargo-passenger carrier. If realized, it will be the first large scale application of the FSW process to a ship in Japan.

## MES develops underwater welder using super water-repellent material

—Construction period and costs reduced—

Mitsui Engineering & Shipbuilding Co., Ltd. (MES) has developed the world's first underwater full penetration welding technology. Underwater welding is now becoming important as construction and maintenance of large offshore structures require welding work below the sea surface.

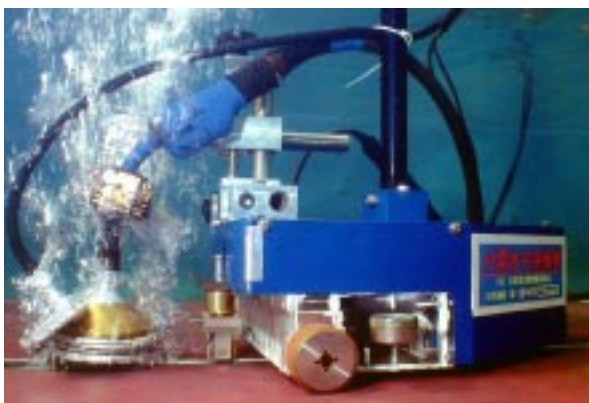
The conventional pressurized and dry welding method is costly since it requires expensive facilities such as a pressure unit to exclude water from the welding spot. So, elimination of expensive facilities has become important.

To commercialize wet-type underwater welding, there are some problems to be solved, i.e., how to prevent

corrosion developing in the gap between the weld and the backing strip as well as deterioration of fatigue strength. Use of a removable backing material made of ceramic had once been considered but the material had absorbency that made the material inappropriate for use.

MES has developed a new super water-repellent material (silica-silicone resin) to improve the performance of the backing material. The newly developed material was coated over the backing material of ceramic for underwater testing. Tests have proved that the new backing material is applicable to underwater welding, and the same welding conditions as welding on land is obtained.

The company has also developed a handy-type automatic welding machine of the self-traveling type that does not require traveling rails. The machine incorporates a CCD camera to monitor the welding spot. This allows a



diver to monitor the welding progress and adjust the welding wire point to the target. Thus, underwater welding is achieved in the same manner as carried out in air.

The combined use of the small welding machine and ceramic backing strip coated with the super water repellent material has established wet-type automatic underwater welding. This technique can eliminate various welding work preparations including necessary equipment installation at the site, and work procedures are simplified, drastically reducing the construction period and costs.

## Front Stratus

**Owner:** Front Stratus Inc.  
**Builder:** Hitachi Zosen Corop.  
**Hull No.:** 4979  
**Ship type:** VLCC  
**L (o.a.) x B x D x d:** 329.99m x 60.00m x 29.70m x 21.50m  
**DWT/GT:** 299,157t/156,916t  
**Main engine:** Hitachi-MAN B&W 7S80MC diesel x 1 unit  
**Speed, service:** 16.0kt  
**Classification:** ABS  
**Completion:** Aug. 22, 2002



## Pegasus Island

**Owner:** Friend Shine Shipping S. A.  
**Builder:** Mitsui Engineering & Shipbuilding Co., Ltd.  
**Hull No.:** 1543  
**Ship type:** Coal carrier  
**L (o.a.) x B x D x d:** 229.00m x 36.50m x 18.50m x 12.80m  
**DWT/GT:** 77,830t/43,321t  
**Cargo hold capacity:** 93,011.4m<sup>3</sup>  
**Main engine:** Mitsui-MAN B&W 5S60MC diesel x 1 unit  
**Speed, service:** 14.5kt  
**Classification:** NK  
**Completion:** July 18, 2002



## Ferry Kyoto 2

**Owner:** Meimon Taiyo Ferry Co., Ltd.  
**Builder:** Mitsubishi Heavy Industries, Ltd.  
**Hull No.:** 1086  
**Ship type:** Car/passenger ferry  
**L (o.a.) x B x D x d:** 167.0m x 156.0m x 25.60m x 8.0m x 6.0m



**DWT/GT:** 4,500t/10,000t  
**Main engine:** Pielstick 18PC2-6V diesel x 2 units  
**Speed, service:** 23.2kt  
**Classification:** JG  
**Completion:** Aug. 31, 2002

## Eliomar

**Owner:** Venus Ocean Navigation S. A.  
**Builder:** NKK Corp.  
**Hull No.:** 219  
**Ship type:** Tanker  
**L (o.a.) x B x D x d:** 274.20m x 48.00m x 22.40m x 15.96m  
**DWT/GT:** 149,991t/78,845t  
**Main engine:** DU Sulzer 6RTA72 diesel x 1 unit



**Speed, service:** 15.40kt  
**Classification:** LRS  
**Completion:** July 18, 2002

## Patriarch

**Owner:** Crusade Shipping Ltd.  
**Builder:** The Hakodate Dock Co., Ltd.  
**Hull No.:** 785  
**Ship type:** Bulk carrier  
**L (o.a.) x B x D x d:** 168.00m x



29.40m x 13.50m x 9.55m  
**DWT/GT:** 31,842t/19,795t  
**Main engine:** Mitsubishi 6UEC52LA diesel x 1 unit  
**Speed, service:** 14.0 kt  
**Classification:** NK  
**Completion:** Sept. 10, 2002

## Ocean Baron



**Owner:** Yamamoto Kaiun Co., Ltd.  
**Builder:** Namura Shipbuilding Co., Ltd.  
**Hull No.:** 237  
**Ship type:** Bulk carrier  
**L (o.a.) x B x D x d:** 224.89m x 32.20m x 19.30m x 13.950m  
**DWT/GT:** 74,193t/38,938t  
**Main engine:** B&W 7S50MC (Mk 6)  
**Speed, max. trial:** 16.35kt  
**Classification:** NK  
**Completion:** Sept. 10, 2002

## Vega Eternity

**Owner:** Venus Ocean Navigation S. A.  
**Builder:** Sanoyas Hishino Meisho



Corp.  
**Hull No.:** 1200  
**Ship type:** Bulk carrier  
**L (o.a.) x B x D x d:** 189.90m x 32.26m x 17.10m x 12.041m  
**DWT/GT:** 52,524t/29,369t  
**Main engine:** MAN B&W 6S50MC-C diesel x 1 unit  
**Speed, service:** 14.5kt  
**Classification:** NK  
**Completion:** Sept. 10, 2002