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Korea monthly shipbuilding magazine

2010. 5  
Marine Tech  
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Magazine



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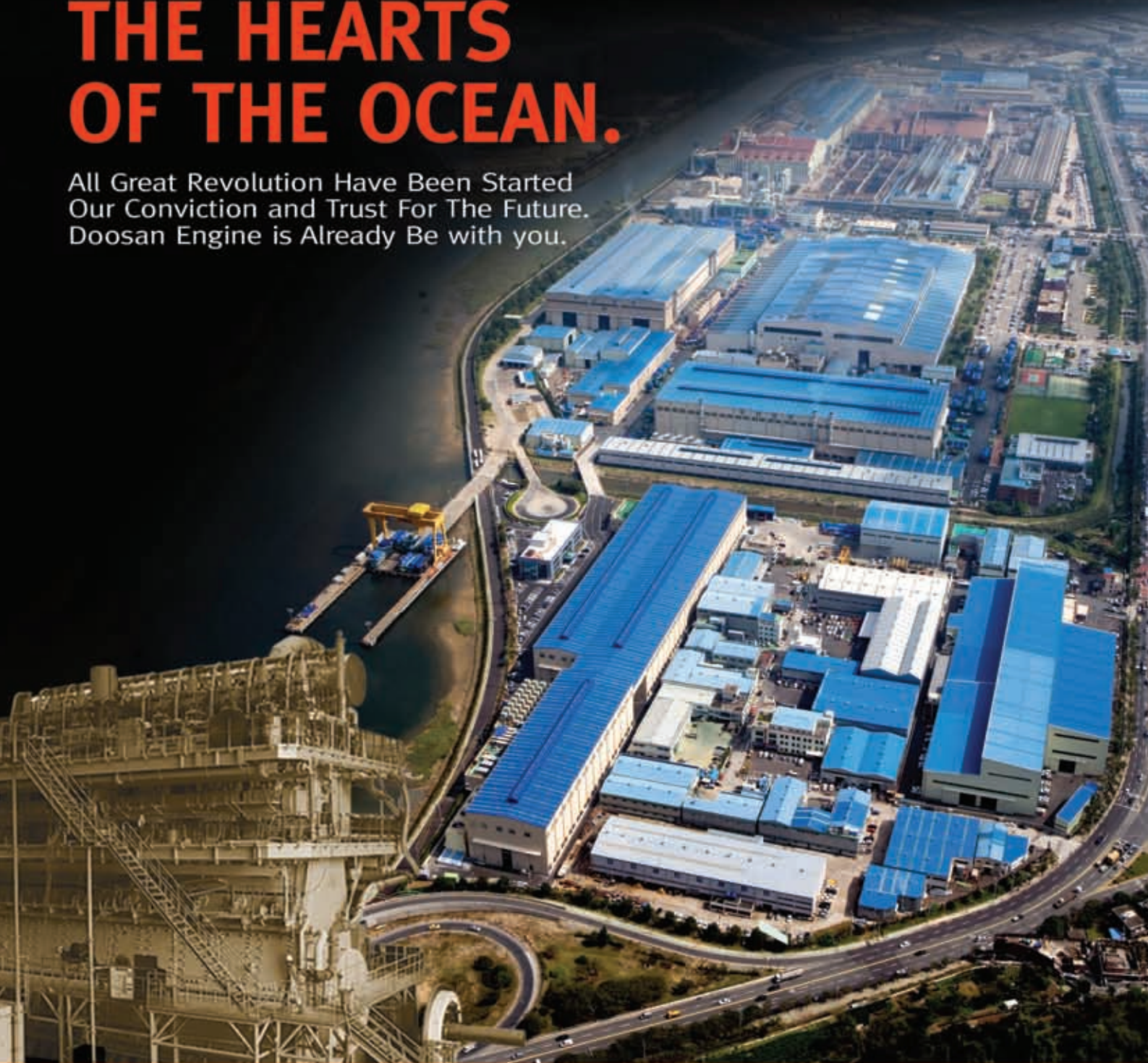


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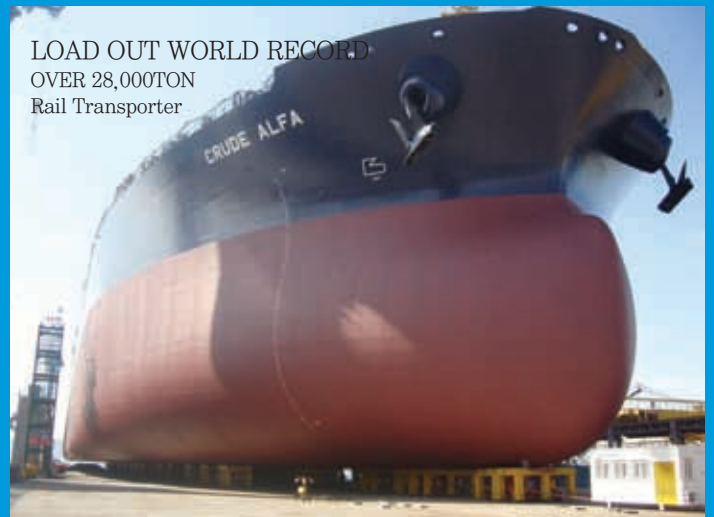
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## Daewoo Shipbuilding & Marine Engineering (DSME) Dispatched Its 3,600-ton Offshore Crane to Recover the Sunken Naval Ship Cheonan.

- DSME's latest model 3600 crane, built in 2006, is expected to be useful very much in lifting the submerged ship



DSME 3600, the offshore crane to be dispatched to the submerged site of Naval ship Cheonan

Daewoo Shipbuilding & Marine Engineering (DSME)'s 3600-ton mega marine crane left the shipyard on April 4 around 05:00PM to help in the recovery of the Naval patrol ship, Cheonan, that sank off Baengnyeong island.

DSME's 3600 dispatched from Okpo Shipyard of DSME, Geoje, Gyeongnam, around 05:00PM will be brought by three tugboats to the site at the speed of up to 4 knots (about 7.4km/hr). The voyage will take about five days.

DSME will dispatch thirty five personnel, three tugboats and one offshore crane anchoring platform supply vessel (PSV) to help recover the submerged naval ship Cheonan.

Measuring 110m in length and 46m in width, Daewoo's 3600 is capable of lifting up to 3,600 ton large-scale structures.

Built in April 2004, it is the latest model crane which has been deployed to lift and support the super block of ship weighing

more than 3,000-ton and offshore plant module in the shipyard. Last year, DSME successfully implemented a one-time setting construction and ring type method using this 3600-ton marine crane. The crane can connect its three offshore cranes and hoist and carry a giant 5,000-ton

Goliath crane at once as well as place super blocks heavier than 3,000-ton directly on the dry dock with ease.

Based on its extensive experience with the recover of sunken structures, "Daewoo 3600" will be instrumental in the recovery of the sunken Naval ship Cheonan. Meanwhile, DSME plans to ensure adequate prior review and preparations in order to minimize the disruption to its production schedule due to its dispatch of offshore crane this time."



DSME 3600, the offshore crane to be dispatched to salvage the submerged naval ship

## Sungdong Shipbuilding & Marine Engineering Hosted the Working Mom Day Event



commemorative photograph

In a sunny spring day during weekends, young housewives came with babies one after another to VIP restaurant inside Sungdong Shipbuilding & Marine Engineering. The moment they greeted one another, the place was alive with chatter and laughter.

The event "Working Mom Day" was held for working moms of Sungdong Shipbuilding & Marine Engineering who gave birth to and raise the children while working at the company."

Working moms of Sungdong Shipbuilding & Marine Engineering are the mothers of the children born after 2007, the year when Sungdong Shipbuilding & Marine Engineering delivered its first ship. Many babies in the bosom of their mothers were 34-month old to 50-month old.

Many working women are struggling with the difficult task of trying to balance a busy working life with the raising of children, and they are very often confronted with the constraint on time. For the working women of Sungdong Shipbuilding & Marine Engineering, the company gave them an opportunity to relax with their babies by doing the exercise together with the help of an invited instructor and relish tasty and nutritious food served by the company, have an





heart-and-heart talk and exchange ideas related to the difficulties that working moms experience.

As working moms of Sungdong Shipbuilding & Marine Engineering are accustomed to saving, sharing, exchanging, and recycling, they pleasantly exchanged goods what might be useful.

The working moms have been pulling their weight in many different fields of Sungdong Shipbuilding & Marine Engineering, regardless of the position. They are the head of purchase department, personnel management team, accounting team, employees of production headquarters, construction department, contract companies, and others.

Particularly, a head of department who led the event handed out free simple baby gift sets that she bought with her personal money.

One of the working mom who participated in the event said, "I have been disheartened because I cannot be a perfect career women and a perfect mom at the same time. But talking with colleagues facing the same situation, I realize that it is not necessary to blame myself for that." She went on saying, "I'd rather become a wise and happy mom, not a super-mom. I hope that many activities will be provided for working moms such as lectures or gatherings which are useful for both work and childcare."

Currently, a total of 294 women working in Shipbuilding & Marine Engineering gave birth to children, which accounts for about 20% out of the total births of 1,492 children in Tongyeong City last year. About 400 employees of Shipbuilding & Marine Engineering married while they were working at the company, a record that will not be broken easily.

## Hyundai Heavy Industries (HHI) Makes Inroads into Defense Market of Middle Eastern and North African Countries

Hyundai Heavy Industries (HHI), the builder of Korea's first Aegis destroyers, is gearing up to make inroads into the defense market of Mid East and North Africa. HHI announced that it would participate in "DIMDEX 2010 (Doha International Maritime Defence Exhibition)", a specializing maritime defence exhibition that opened on May 29 (Monday) in Doha, the capital of Qatar."

DIMDEX 2010, a biennial event, which will open until March 31 (Wednesday), specializes in the international maritime weapons industry, bringing together 135 companies from 35 countries across the globe, including Lockheed Martin of the United States and Fincantieri of Italy. This year, DIMDEX is expected to draw governmental officials and delegations from the navy and mar-

itime police agencies from 39 countries, including the Middle Eastern and North African countries.

In Korea, HHI, will display destroyer, high speed vessel, fast combat support ship, patrol ship, and others in the booth jointly with Samsung Thales during the show.

Particularly, HHI plans to launch joint marketing in collaboration with Samsung Thales, the supplier of combat system for warship as part of effort to elevate the synergic effect, which is expected to draw the attention of visitors to the show more effectively.

Kim Jeong-hwan, senior managing director in charge of the Special Ship Division of HHI said, "Middle Eastern and North African countries have shown an increasing enthusiasm for expanding their



Actual operation of King Munmu Warship, the Korean destroyer (KDX- II ), displayed by HHI during DIMDEX 2010 that opened in Doha, Qatar on March 29 (Monday)



Actual operation of King Munmu Warship, the Korean destroyer (KDX- II ), displayed by HHI during DIMDEX 2010 that opened in Doha, Qatar on March 29 (Monday)

defense capability recently. We will make a foray into this market aggressively using our extensive experiences and technology that we have accumulated so far.”

AMI International, a US Navy consulting company, speculated that the market for about 350 warships worth a total of about \$17 billion would be formed in the Middle Eastern and North African countries by 2020.

HHI advanced into the warship construction sector when it built ‘Ulsan Warship’, the nation’s first warship constructed by domestic technology, and has written a new chapter in the history of Korea’s defense industry when it built the nation’s first 1,800-ton class submarine and Aegis destroyer. Besides, HHI exported warships to New Zealand, Bangladesh, Venezuela and other countries.

In 2009, HHI was awarded the order for one submarine, five patrol ships, three fast combat support ships, etc, in the special ship sector alone, and has successfully made inroads into high value-added submarine material and equipment market when it signed contract with Germany’s Howaldtswerke-Deutsche Werft, a global submarine manufacturer, to supply major parts such as bow and others.

## STX Heavy Industries Reached A Total Production Milestone of 10 Million Horsepower (h.p.) In the Large Size Engines



12K98MC-C, the world's largest engine, which STX Heavy Industries is producing

STX Heavy Industries has reached a total production milestone of 10 million horsepower (h.p.) in the large size engines within the shortest time across the globe.

STX Heavy said on March 24 that it successfully achieved a total production of 10 million h.p. in the large size engines after succeeding the trial operation of 8K90MC-C type low-speed engine with capacity of approximately 50,000h.p. which was carried out on March 24 with the presence of Yeoh Hyuk-jong, the CEO & President of STX Heavy Industries and Wang Dong, President of New Yangzijiang Shipbuilding Holdings at its headquarters located in Changwon, a city in and the capital of South Gyeongsang Province.

Conventionally, large size engines refer to engines with capacity between 13,000h.p. and 99,000h.p.. STX Heavy Industries has achieved the feat of a total production of 10 million h.p. in just five years and six months, the shortest time ever on the planet, since it has manufactured the first large size engine in September 2004.

The engine which was tested successfully

will be loaded in the 4,250TEU container vessel of Germany’s Rickmers Reederei, which is under construction at the New Yangzijiang shipyard, China.

STX Heavy Industries has successfully advanced into the extra-large size engine business by manufacturing 12K98MC-C, the world’s largest engine for the first time last year.

STX is the only company in Korea which can build all kinds of engines from small, medium sized engines to the largest engines suitable for all sorts of ships through its affiliates such as STX Engine, STX Heavy Industries and STX Enpaco.

Yeoh Hyuk-jong, CEO and President of STX Heavy Industries remarked, “STX Heavy Industries is the most prominent low-speed engine market with the annual production capacity of 4 million h.p. and 300 engines, and has attained such a feat within the shortest period of time across the globe by making bold investments into infrastructure and constant efforts for technology development.”





## Korea Has Become the Leader in the Ship's Ballast Water Treatment Technology Worldwide

The Ministry of Land, Transport and Maritime Affairs (Minister: Chung Jong-hwan) said that Korea achieved the feat of acquiring the final certifications for two UV-based ship ballast water treatment (BWT) technologies developed by domestic companies in the 60th Marine Environmental Protection Committee (MEPC) that ran from March 22 to March 26, 2010 in London.

As a result, Korea has acquired four certifications for BWT technologies, which is 30% of all twelve BTW technologies that IMO approved. The new certifications will not only put the country in a better position to win the BWT market expected to be worth a total of approximately 15 trillion by 2016 worldwide but also solidify the fame of the country which the world's largest shipbuilder, a status that it has accomplished through the localization of equipment and facilities.

Ship ballast water refers to the water filled in the ballast water tank for keeping the ship in balance after loading and unloading, and ballast water treatment (BWT) refers to the technology intercepting marine organisms contained in the ballast water.

Newbuilt ships and existing ships are mandated to be installed with IMO-certified ballast water treatment facilities by 2010 and 2016, respectively, in accordance with International Convention for the Control and Management of Ships' Ballast Water adopted in 2004.

With a skyrocketing demand for BWT

being expected worldwide from this year, the certified domestic companies (four companies) which have already succeeded in its commercialization have moved their marketing efforts in full swing to win over 50% of market share.

The Ministry of Land, Transport and Maritime Affairs said that it would provide unsparing support to facilitate the commercialization of the technology by finalizing the type approval procedure with which the government is currently pushing ahead for the two BWT technologies which were certified by IMO this time.

Meanwhile, the 60th Marine Environmental Protection Committee (MEPC) adopted the guideline on the recycling of ships, as well as the measures to reduce greenhouse gas (GHG) emitted from ships navigating at seas across the globe, discussed various issues to promote the protection of marine environment, such as designation of Sulphur Emission Control Area (SECA) around the East and West Coast of the North American continent, and adopted related revisions.

The Ministry of Land, Transport and Maritime Affairs said that it would hold a session in April to explain about the results of the 60th Marine Environmental Protection Committee (MEPC) for domestic ship owners, shipbuilders, etc, and take the required measures swiftly.

※Countries that acquired the certification:

Korea(4), Germany(2), Japan(2), Norway(2), Netherlands(1), South Africa(1)

## Busan City Has Moved into High Gear to Support Shipbuilding Equipment and Material Industry from

## Multifaceted Aspect

Busan City has moved into full swing to revitalize the shipbuilding industry in Busan still reeling from the impact of the global financial crisis.

Busan City will set up T/F Team (comprised of 18 persons) charged with the duties related to the localization of offshore plants, high value-added ship materials and equipments in an attempt to diversity shipbuilding material and equipment industry in response to the feedback during the breakfast meeting (on January 28, 2010) between the industry and the mayor of Busan City which was held to listen to the grievances of shipbuilding material and equipment companies amid the sharp decline in the shipbuilding order intake and explore the ways to stimulate the material and equipment industry.

Besides, the interim meeting will be held on March 26 (Friday) 10:30AM on the third floor of Korea Maritime University for the presentation on the theme "The industrial trend of offshore plant and outsourcing related to the analysis of associated structure" which was outsourced following the discussion in the last meeting (on January 29, 2010) among the experts (10 persons) who were appointed in accordance with the Article 7 under the Act pursuant to the Development of Marine Industry of Busan City.

In the meeting, Professor Doh Deok-hee of Korea Maritime University will give presentation on the aforesaid theme, followed by the presentation on 'the strategy for the localization of offshore plant' by Kim Tae-hyeon, Director of Korea Marine Equipment Research Institute, Q&A and discussion.



Busan City plans not only to reflect the outcome of the discussion in policies but also to use it as the stepping stone for stimulating the localization of offshore plant equipments and materials and facilitating domestic companies to secure foothold in overseas markets in an attempt to vitalize the shipbuilding equipment and material industry.

The T/F Team is comprised of a total of 18 persons, including 10 persons from the industry (5 from shipbuilding sector, 5 from equipment/material sector), 3 persons from academic circles (Pusan National University, Korea Maritime University, Dong-Eui University), 2 persons from Association, and 2 persons from research institutes, led by the leader who is currently the manager in charge of matters related to the key industry in Busan City.

The first meeting is slated for March 26 (Friday) to report on the operation plan of T/F team and details related to the offshore plant industry.

## AIS Is Mandated to be Installed in Ships Weighing Over 50-Ton

**- Maritime Accidents of Cargo Ships Carrying Hazardous Materials and Ordinary Cargo Ships Are Expected to Decline As a Result**

The Ministry of Land, Transport and Maritime Affairs (Minister: Chung Jong-hwan) said that the Ministry would expand the installation of automatic identification system in ships as part of efforts to prevent the maritime accidents such as collision of ships and enable the controlling authorities to identify the location of ships easily.

As a result, cargo ship, etc, weighing upwards of 50-ton navigating beyond the coastal sea will be required to install the automatic identification system (AIS) in phase from July this year, depending on the size of ship. Currently, AIS is mandated to be installed only in tugboat, oil tanker, and cargo ship transporting hazardous materials.

However, all ships, including ordinary cargo ships and authorized ships, will be required to be equipped with AIS which raises the expectation of a major decline in the maritime accidents involving cargo ships, etc, the type of ships prone to accidents at sea.

AIS has been introduced by International Maritime Organization (IMO) from 2002 in accordance with the international convention in an endeavor to increase the safety and security of ships. It enables mutual identification between ships and between ships and onshore control center (controlling center) which are necessary for the prevention of collision and allows the controlling authorities to identify the corresponding ship and provide appropriate guidance on navigation and information.

The Ministry of Land, Transport and Maritime Affairs plans to expand the installation of AIS in phase, as described below, depending on the progress of shipbuilding and the size of ship, in consideration of the period that the ship owner needs to be ready for the adoption of AIS.

The Ministry said that it would encourage AIS to be installed in ships weighing less than 50-ton, the type of ship not subject to the mandated installation, as well as fishing boat, and would negotiate with the related governmental offices (Ministry for Food, Agriculture, Forestry and Fisheries) to

speed up the installation of AIS.

The effective date for the enforcement of the expanded AIS installation is as follows:  
Ships built after the effective date of rule:  
Ships weighing between 100-ton and 500-ton (114 ships) at the point of inspecting the shipbuilding: Until the first regular inspection after January 1, 2011, for ships weighing from 50-tons and 100-tons (186 ships): Until the first regular inspection after January 1, 2012

## Hyundai Heavy Industries Has Reached a Total Production Milestone of 20 Million Horsepower in the Medium Size Engines

Hyundai Heavy Industries (HHI) announced on March 22 that it completed the trial-run of three 4,078 horsepower (h.p.) ancillary ship engines (6H32/40) recently, which would be installed in the 13,100TEU container vessel of Germany's Rickmers Reederei, and reached a total production milestone of 20 million horsepower (h.p.) in the medium size engines in two decades.

Conventionally, medium size engines refer to four-stroke engines with capacity between 600h.p. and 13,000h.p.. STX Heavy Industries advance into this market by producing ten medium size engines in August 1990. Since then, the company accomplished the total production of 5,000 engines and 10 million h.p. by 2007 in just five years and six months through the continued expansion of engine production facilities and improvement of technology. Besides, the company has produced 4,000 engines additionally, reaching the





Hyundai Heavy Industries (HHI) has successfully completed the trial-run of three 4,078 horsepower (h.p.) ancillary ship engines (6H32/40) which would be installed in the 13,100TEU container vessel of Germany's Rickmers Reederei, and reached a total production milestone of 20 million horsepower (h.p.) in the medium size engines.

total production of 9,089 engines and 20 million h.p. in just three years.

It took more than half a century for European makers with over 100-year history, such as German MAN Diesel, etc, to accomplish a total medium engine production of 20 million h.p.. However, HHI attained it in just 19 years and 7 months.

HHI has an annual medium engine production capacity of 1,800, and supplied approximately 25% of all medium engines for ship and power generator produced worldwide last year.

Particularly, HiMSEN engine, one of the company's medium engines, is the first engine developed by domestic technology in 2000 and was named the world's top class product in 2004 by the Ministry of Knowledge Economy. Recently, this

engine has gained a huge popularity as the engine for onshore power generation such as packaged power station (PPS), in countries plagued by power supply problems like Iraq and Cuba.

In addition, HHI provides 14 types of world's top class products in the engine sector alone, including large engines for ship, crankshaft for large engines, medium engines, crankshaft for medium engines, propeller. Currently, HHI has taken up 35% share in the ship engine market since 1988. Last year, it achieved a total production of 90 million h.p. in the large size engines as the top leader in large engine sector worldwide. This year, HHI is expected to achieve a total production of 100 million h.p. in September, a feat that cannot be emulated elsewhere across the globe.

## DNV opens Global Cruise Center in Miami

Long active in the cruise industry in North America, DNV is pleased to announce the opening of a new facility in Miami, Florida. The Global Cruise Center will enable DNV to respond more quickly to local customer

demand and serve as a hub for a network of DNV cruise ship service centers around the world.

With the objective to become the world leader in service delivery for classification

and advisory services to cruise line owners world-wide, DNV's new Global Cruise Center will enable the organization to establish a stronger presence in Miami Florida, home to some of the largest cruise companies in the world.

According to DNV maritime's COO Tor Svensen, the new facility will enable DNV to respond more quickly to customer needs.

"The increasingly global nature of our customers' operations is a key driver behind our decision to establish a stronger presence in Miami," he says. "The Global Cruise Center will enable us to enhance our customers' experience of DNV's global performance and delivery toward the cruise segment."

Svensen notes that DNV's Global Cruise Center will coordinate and facilitate global delivery to customers through a worldwide network of designated Cruise Ship Service Centers, ensuring efficient, high-quality support for our classification activities.

"Unlike some other maritime segments, growth projections for the cruise industry remain positive, and with many company's working to establish their brands in new markets, it is vital that DNV expand our service capacity."

The new Global Cruise Center will also incorporate the new approval unit, where modification and new building projects will be coordinated. DNV's Global Cruise Center will provide a broad range of services, including coordination of surveys for all cruise clients on a global basis, new-building project coordination, compliance management, competence training and advisory services designed to improve client business performance, among other services.

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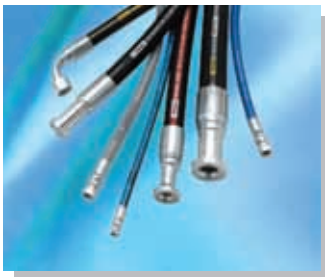
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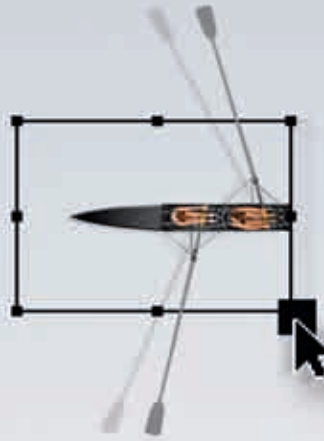
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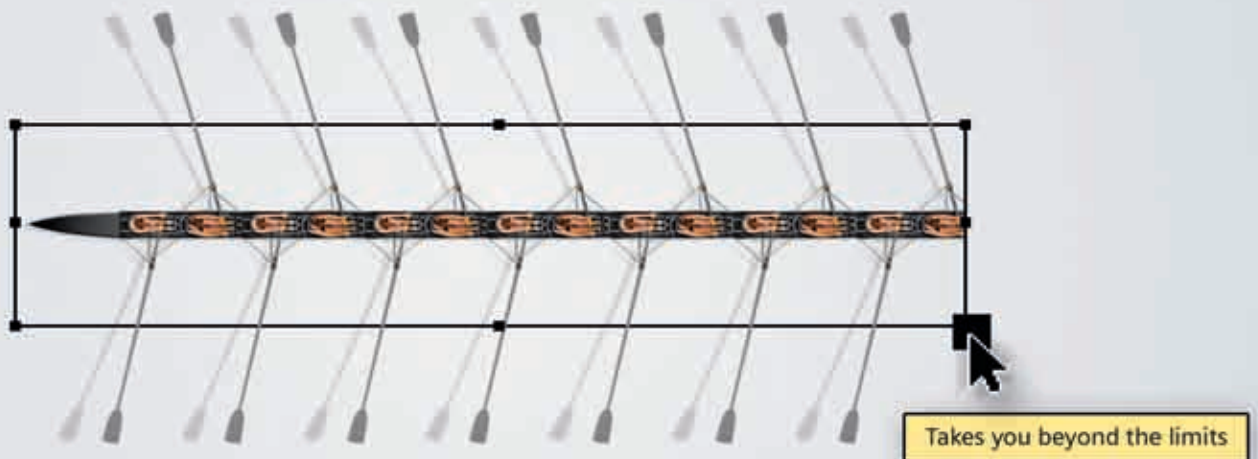
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# Daily News of Marine Tech Korea 2010

(Korea International Shipbuilding and Marine Exhibition)



Monthly Korship, the Korea shipbuilding monthly magazine, will launch daily news service to keep your finger on the pulse of the Marine Tech Korea 2010.

Marine Tech Korea 2010 will be open with great eclat at Changwon Exhibition Convention Center, Gyeongsangnam-do, which is the hub of LNG carrier and offshore plant construction technology, and Monthly Korship will keep you updated with the latest news swiftly during the show as the official media of Marine Tech Korea 2010 and we appreciate your cooperation in advance.

Marine Tech Korea 2010 will run from October 20 to October 23 at Changwon Exhibition Convention Center (CECO).

Our daily news will have a circulation of 6,000 every day during the show.

Contact Monthly Korship or K. Fairs for inquiries or suggestions for the daily news article related to Marine Tech Korea 2010 or advertisement in the print edition. (Deadline Date : September 20th, 2010)

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Korship puts advertising domestic companies in touch with abroad buyers and tries to contribute development and growth of domestic shipbuilding industries by introducing world's new technologies, news, companies and products to superintendents, engineers, Korea branch of abroad companies, domestic shipbuilding companies and all related companies.

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World's up-to-date indispensable informations of shipbuilding companies, products and system technology described to help people who engage in the industry.

## Special Focus

Provide articles deeply focusing on latest shipbuilding industry technologies, logistics and port etc.

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Introduce latest tendency and related news of industry through company interview.

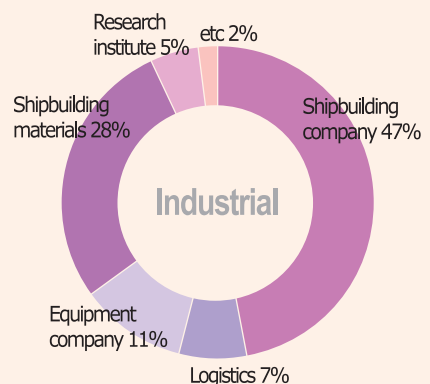
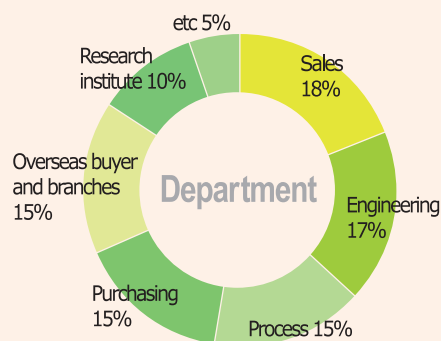
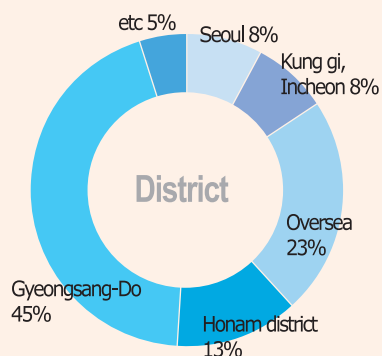
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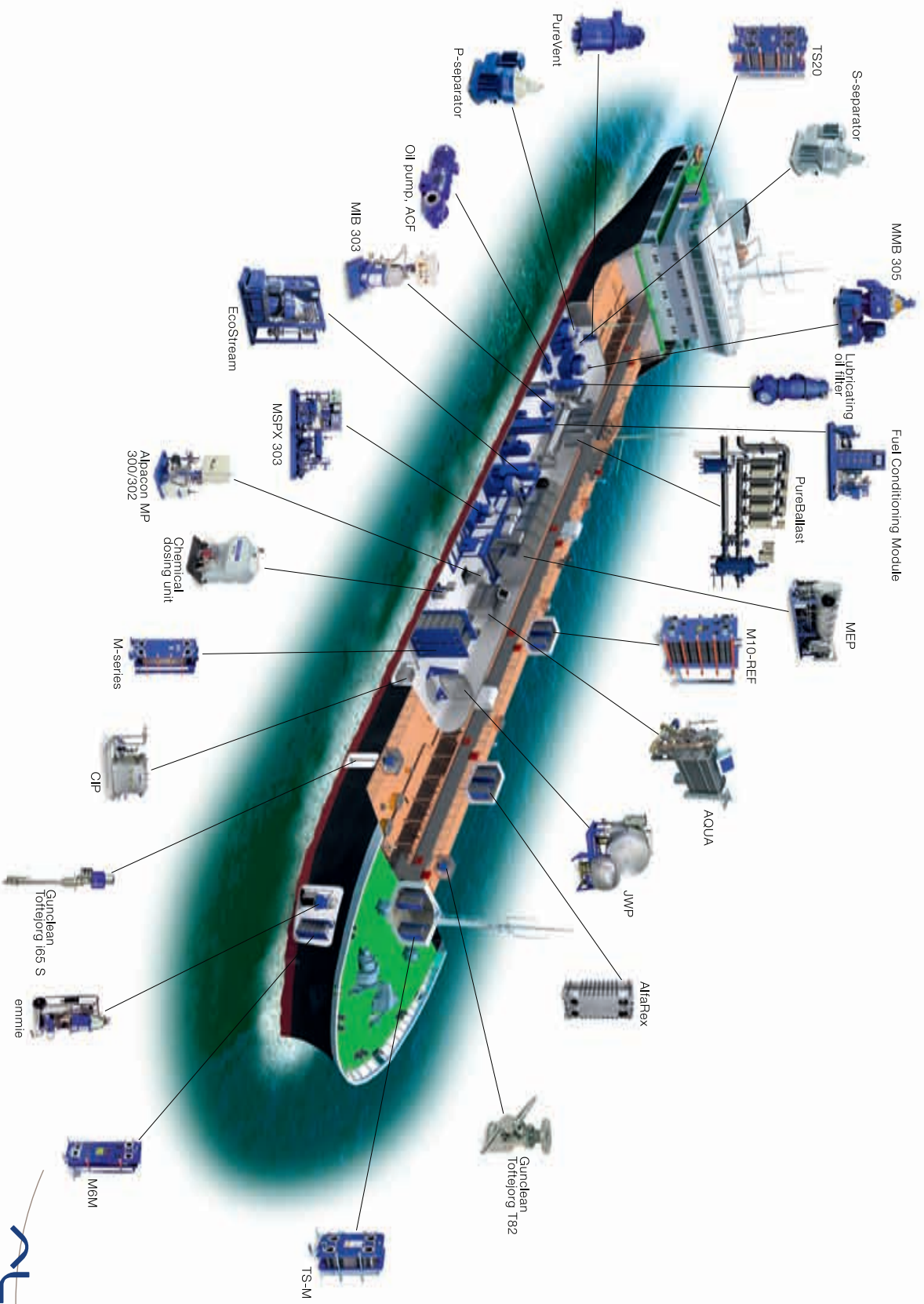
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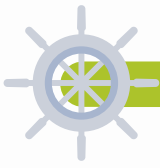
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# Characteristics of Offshore Plant and Trend of Industry (1)

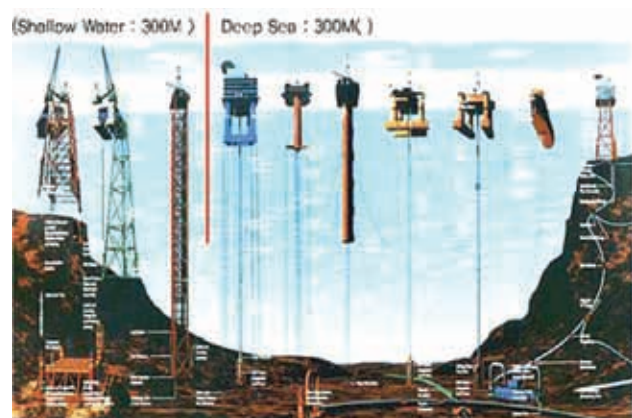
Department of Maritime Engineering, Korea Maritime University Park Han-il

## 1. Overview of Offshore Plant Industry

### 1) Definition of Offshore Plant

- Offshore plant mainly refers to a variety of facilities used for drilling, producing, and transporting oil and natural gas. It includes the rig for developing offshore oil field, Floating Production, Storage and Offloading (FPSO) for producing oil gas, and others.
- Besides, offshore plant includes a vast array of facilities, such as offshore energy (tidal power, wave power, wind power energy, etc) power generation facilities, large ship safety facilities, offshore observation facilities, plants for developing resources in deep sea water like manganese nodules, offshore facilities for developing resources in deep sea waters, offshore leisure facilities like marine hotel, abhorrence facility like marine incineration site or cremation site, marine airport and marine factory and others.
- This session focuses on the plants designed for offshore oil or gas development

### 2) Various Offshore Oil & Gas Development Plant



### 3) Plant for deep sea water mineral resource development





Manganese Nodules



Copper, Nickel

#### 4) Structure of Oil Gas Plant

- Wellhead platform: Located on the upper side of oil field
- Collection & Distribution (Collector or Manifold) Platform : Facility to receive the crude oil or gas from several wellhead platform
- Refining (Process) Platform: It is the most important and refines the crude oil and gas
- Gas injection Platform: It injects the gas, separated by the refining process, into the oil field
- Sea Water Injection Platform: It is the facility for injecting the sea water into the oil field to prevent the oil field from the col-

lapse that is caused by the cavitation.

- Waste Gas Incineration (Flare) Platform
- Residing Platform

#### 5) Importance of Oil & Gas Resource Development

- Offshore Industry - The petroleum industry that explores, recovers, and produces the oil in deep sea waters far from the coast
- The offshore industry has expanded amid the surging demand for oil and the increasing economic efficiency resulting from high oil price
- The demand for oil has increased proportionally to the population.
- The world population is expected to exceed 7 billion in 2010. The daily demand for oil will reach 120 million barrels.
- The demand for oil will never decrease, considering the economic development of China and new emerging economies such as BRICs.
- Tremendous investment has been made to develop substitute energy, but the results have not been sufficient so far.

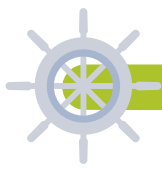
#### 6) Trend of Offshore Oil & Gas Development

- The offshore oil and gas has been carried out in sea waters at the depth of 300 meters or more amid the depletion of oil and gas in shallow waters. New recoverable reserve in deep sea water accounts for approximately 75%.
- As the offshore oil and gas development has shifted from shallow waters to deep sea waters, large drilling facilities have been ordered recently.
- As for the offshore structure designed for deep water drilling, semi-submersible drilling rig has been deployed since 1970s.
- The deployment of offshore plants has been increased in polar region to develop tremendous oil and gas reserves there, as well as deep sea waters.
- The safety against the collision with floating iceberg is the most important aspect for the offshore plants designed to develop resources in polar region.

#### 7) Oil & Gas Reserves in Arctic Sea

Oil & Gas Reserves in Arctic Sea

- The oil reserve in Arctic Sea reaches approximately 90 billion barrels (according to the data of the United States Geological Survey in 2008)



- The natural gas reserve is equivalent to 412 billion barrels of oil.
- 7.3 billion barrels of crude oil and 52 trillion cubic meters of natural gas can be developed from the reserve in the area straddling from Greenland and Canada.
- The competition over the ownership is expected to become very fierce

## 2. Types and Characteristics of Various Offshore Platform

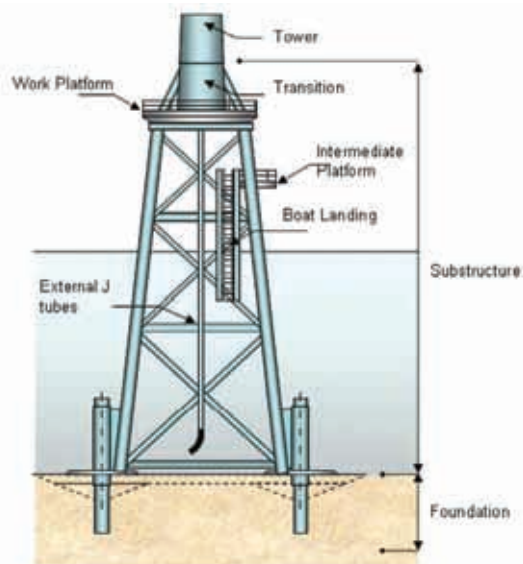
### 1) Classification of Offshore Platform

Classification	Type	Typical Structure
Fixed Type	File fixation type	Jacket structure
	Gravity type	Concrete gravity platform
	Deck elevation type	Jack-up platform
Compliant Type	Tower type	Guyed tower
	Spar Type	Spar buoy
	Tension leg type	Tension leg platform
Floating Type	Semi-submersible type	Semi-submersible
	Barge/ship type	Drilling ship
	Floating Production	FPSO
	Storage and Off-loading	

### 2) Fixed Type

#### (1) File fixed structure (Jacket structure)

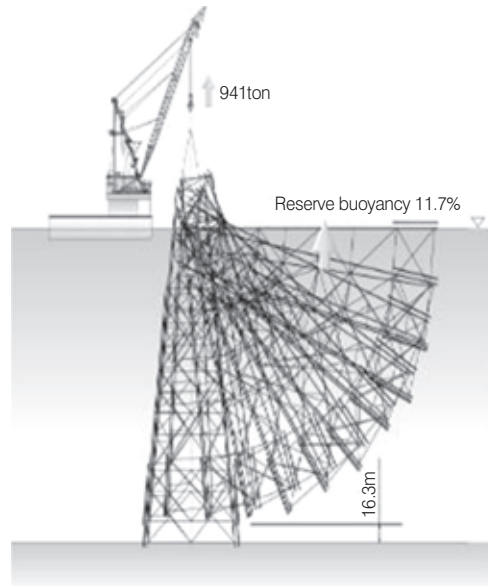
- Truss type steel structure used as the fixed platform for production
- Structure:
  - Super-structure (Deck or Module)
  - Sub-structure (Jacket)



#### (2) Characteristics

- ① Oval truss structure made of cylindrical steel pipe
- ② With the skirt file being interpenetrated deeply in the ocean floor, it provides high stability.
- ③ Ring stiffener is installed to maintain the adequate local and buckling strength.

#### (3) Installation of jacket structure - Erected structure



#### (4) Process of hoisting Jacket Structure Deck



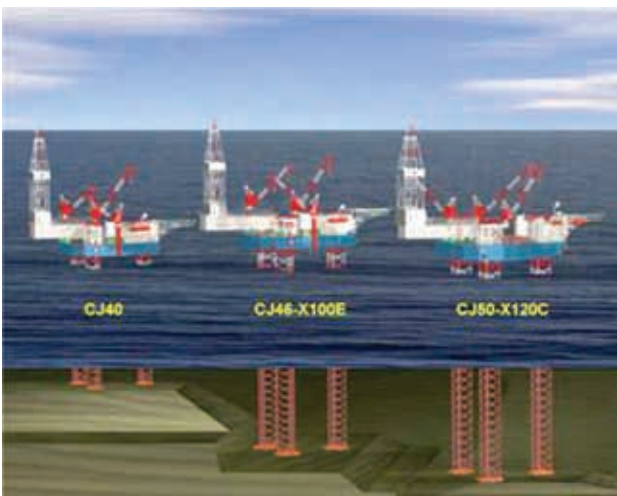


#### (4) Concrete Gravity platform



- Concrete structure designed to withstand the external force of wave by using the empty weight
- It generally has the column structure, and the caisson on the lower side serves as tank for the storage of oil.
- It can be installed shortly and the bedrock zone is the most advantageous for the installation.

#### (5) Jack-up rig



- It is a mobile structure used most commonly in the sea at the depth of about 100m.
- It can move the ship body and leg upward and downward through the boarding device.
- It is used most commonly as marine work platform and for civil engineering as well as the development of oil.

### 2) Compliant Type

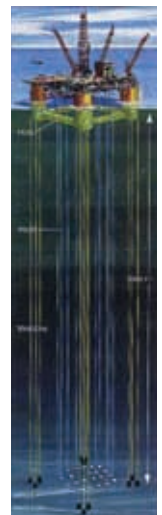
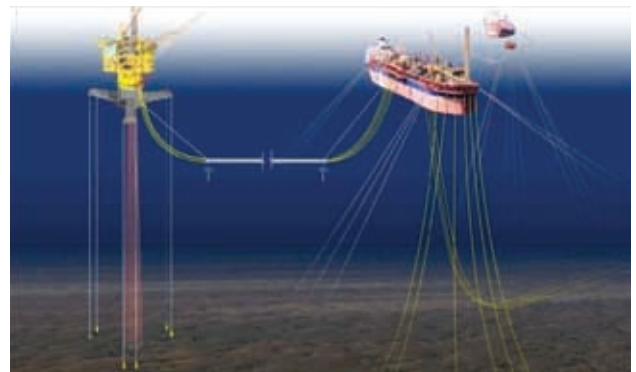
#### (1) Tower Type



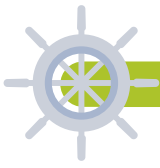
#### Guyed Tower

- It supports the load on the upper side with the tower structure.
- The lateral load such as wave is supported by guy line.
- The weight of steel can be reduced more compared to the jacket type.
- It is designed to tolerate some disruption from the dynamic external force exerted on the platform.

#### (2) Tension Leg Platform



It forms excessive buoyancy in the semi-submersible struc-

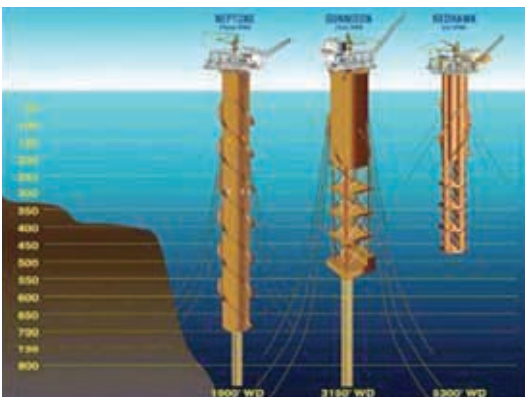
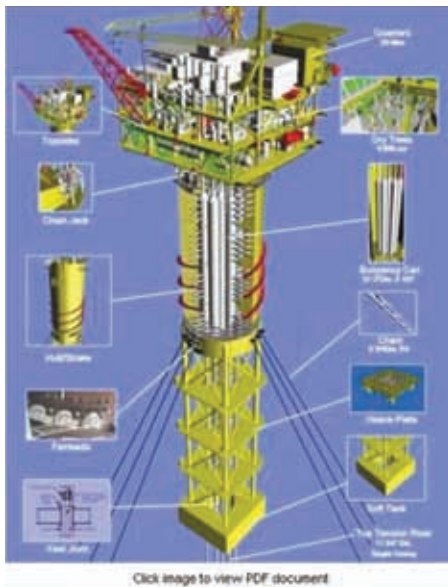


ture which is then transferred to the long pipe (tendon) through tensile force for mooring.

## (3) Spar



- A structure developed for deep sea waters
- Gigantic cylindrical buoy floated vertically
- Capable of both drilling and production
- Higher moving performance with the balance on the lower side and buoyancy space on the upper side



Various forms of spar

- Steel spar completely made of steel
- It has the truss on the lower side and cylinder on the upper side
- Concrete spar completely made of concrete

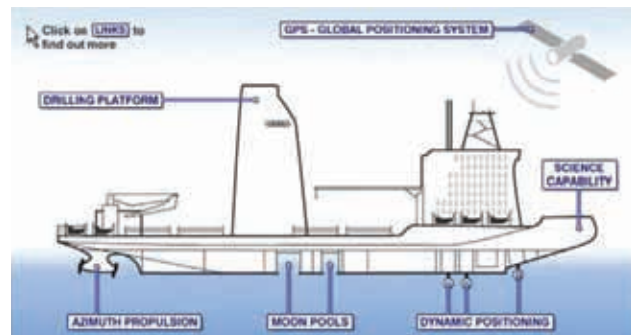
## 3) Floating Type



- (1) Semi-submersible structure
- A semi-submersible offshore structure capable of operation, being floated at sea without deep sea mooring.

- Uses dynamic positioning system to ensure accurate selection and maintenance of position
- Capable of operation in various sea waters at the depth ranging from 150m to 2,000m

## (2) Ship type structure (Drill ship)



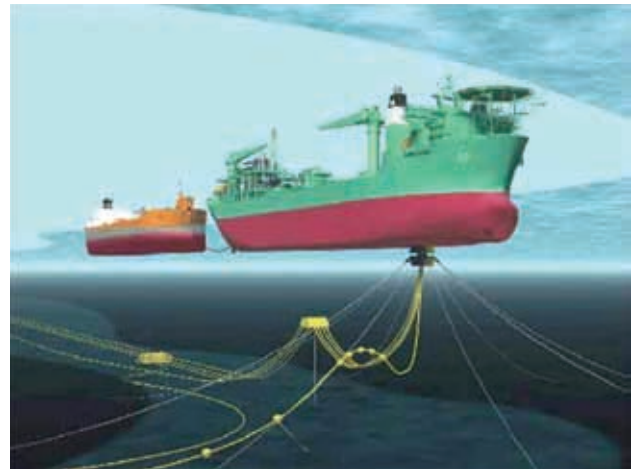
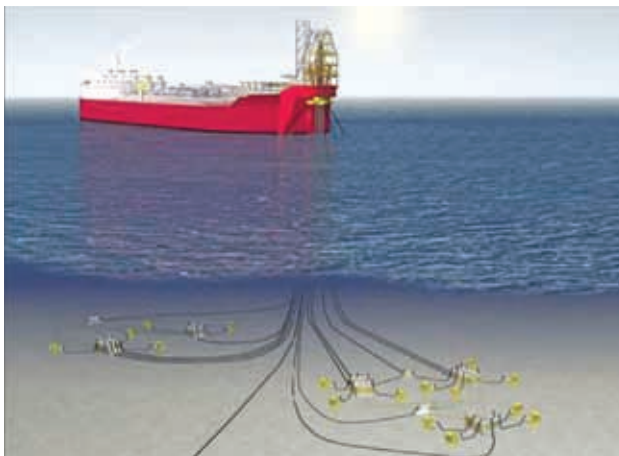




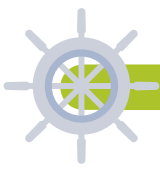
- Drill top structure which is installed on the top of ship is positioned at the center where the movement of ship is the minimum.
- The quadrangular moon pool is located at the center of ship for the drilling from drill top.

### (3) Floating Production Storage and Off-loading (FPSO)

Floating Production Storage and Off-loading



- Floating production, storage, and off-loading facility
- Used for the development of oil reserve in deep sea waters or small oil reserves
- FPSO has come into the greatest limelight among the deep sea water production platforms
- Researches have been conducted vigorously into LNG and LPG FPSO.



## 4) Offshore Structures for Polar Regions

Special characteristics of polar region's environment: Special design method is required.

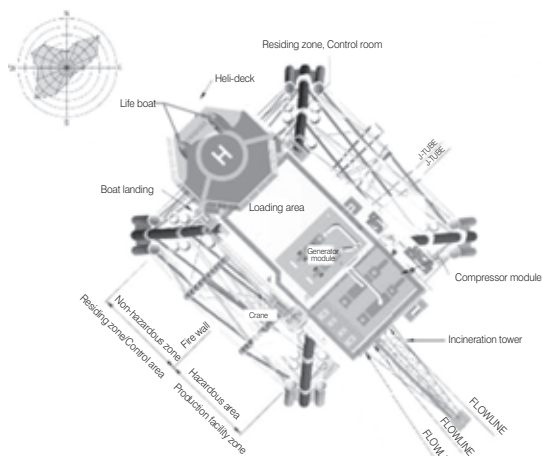
Offshore structures for polar region: Load of iceberg, water depth, and characteristics of offshore soil should be taken into account.

Types of offshore structures for polar region

- Artificial island form
- Fixed structure (pile foundation/gravity foundation structure)
- Floating structure

## 5) Upper area arrangement of offshore plant

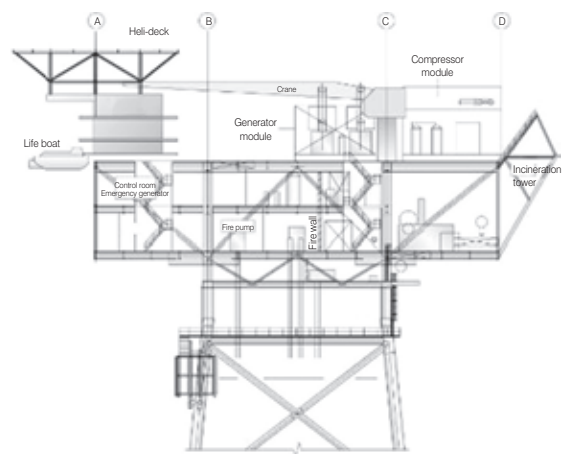
(1) Bird's-eye view of deck



(2) Superstructure plan

Basic direction

- Structural safety
- Connectivity with the jacket, the substructure
- Workability and economic efficiency of production
- Stability and efficiency of shipment and transportation
- Stability and economic efficiency of installation works
- Constraints and hazard associated with installation works
- Minimization of factors



(3) Main function of deck

- Provides the upper area necessary for performing the production works without problem
- Supports a variety of apparatus on the deck and module, live load, and the load during operation, etc, effectively



#### (4) Apparatus arrangement of the upper area of deck

Type	Major apparatus or module
Weather deck	Heli-deck, residing zone, crane, generator module, compressor module, WHRU, life boat, etc
Mezzanine deck	Control room, HAVC, emergency generator, thermal exchanger, fresh water launcher
Cellar deck	Switch room, transformer, fire pump, separator, launcher, coalescer, incineration tower, etc
ESD platform	Seawater caisson, firewater caisson


#### (5) Major safety considerations

Equipment	Risk factor
Incineration tower	<ul style="list-style-type: none"> <li>- The combustion flame may affect the person working on the platform.</li> <li>- The combustion gas may stay in the platform.</li> </ul>
Production facility	<ul style="list-style-type: none"> <li>- The gas that is being processed may leak out and be accumulated in the area around the platform.</li> <li>- The smog arising from the fire may cause suffocation of the evacuating personnel.</li> </ul>
Generator	<ul style="list-style-type: none"> <li>- The high temperature exhaust gas may rarify the air around the helicopter zone, putting the take-off and landing of helicopter at risk.</li> </ul>
Supply line	<ul style="list-style-type: none"> <li>- There is a risk of collision between the jacket and sea current when the power is turned off during the boat landing.</li> <li>- Offshore pipeline may be damaged when the anchor is thrown.</li> </ul>
Crane	<ul style="list-style-type: none"> <li>- Offshore pipeline may be damaged by the heavy load which is fallen.</li> </ul>
Pipes in deep water	<ul style="list-style-type: none"> <li>- There is a risk to the personnel around in the event of fire on the surface of the sea which is caused by the gas leak.</li> </ul>

#### (6) Facility arrangement plan for the upper area of deck

- Separation of facilities for arrangement: The potentially hazardous area and non-hazardous area are separated through the fire wall.
- Residing zone: It is protected from fire, combustion heat emitted from incineration tower, combustion gas accumulation, gas turbine emission, effect of gas, etc.
- Life boat: The residing zone is used as fire wall by increasing the distance from the hazardous area in the event of accident.
- Heli-deck: Located on the upper side of residing zone, good access to the personnel and absence of obstacle to the takeoff and landing of helicopter are ensured.
- Compression module: It is positioned on the area farthest from the residing zone among the weather deck area, the top area of deck.

#### (7) Facility arrangement plan for the upper area of deck

- Generator module: Mounted between the residing zone and compressor module, it protects the residing zone in the event of explosion of the compressor or fire
- Control room: It is protected through the fire wall and can be accessed through internal stairway.
- Incineration tower: The height of incinerator top end and location are determined by considering the radius of maximum flame radiation in emergency.
- Crane: The distance between offshore pipelines and riser are kept sufficient to minimize the risk of damage to offshore pipeline that may be caused when the load falls.
- Boat landing: Prevention of damage to the offshore pipeline which may be caused by the anchor of supply line 

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# Trend of Korean Shipbuilding Market in the First Half of 2010 & Outlook

Shipbuilding market was bogged down in the quagmire of recession in the aftermath of the global financial crisis in 2009.

However, shipyards, whether they are small or large, have announced good news every day since 2010 dawned, including Hyundai Heavy Industries, Daewoo Shipbuilding & Marine Engineering, STX Offshore & Shipbuilding, Sungdong Shipbuilding & Marine Engineering SPP, Hanjin Heavy Industries & Construction, Samjin Shipbuilding Industries, Sekwang Heavy Industries, and others.

The statistical data of Clarkson released in April, 2010, shows that Daewoo Shipbuilding & Marine Engineering overtook Hyundai Heavy Industries which retained its top spot for about two decades, recording the order backlog of 8.34 million CGTs.

Newbuilding orders seem to be picking up for shipbuilders after falling last year. However, the prospects for Korean shipyards are not bright very much.

Domestic shipyards are facing the challenge from the fast-growing Chinese shipbuilding industry and the decrease in global shipbuilding orders, and the financial crisis that began in south Europe has cast clouds over the European shipbuilding finance. Even worse, order cancellations and delays in delivery have become more frequent.

However, domestic shipbuilding industry has not crafted effective strategies to cope with. Here, let's keep our finger on the pulse of the current market condition in the first half of this year and outlook of Korean shipbuilding industry, as well as the overall trend of Korean shipbuilding market. (Editor's Comment)

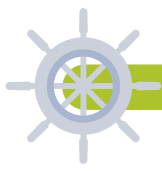




## 1. Order cancellation and delays in delivery are expected to continue until 2012

In 1973, Japan experienced the order drought in the aftermath of the speculative marine and shipbuilding stock market crash. Back then, Japan overtook Europe to become the largest shipbuilding power with the world's highest production capacity. Having secured all time high newbuilding order backlog at shipyards, Japan's shipbuilding industry saw the production climbing for several years despite the collapse of global shipbuilding





industry in 1973. Japan achieved a record production in 1974, but saw the production declining from 1975. The production slowed down until 1980 as new orders were diminishing.

In Korea, the production in the shipbuilding industry has fell down slightly from 2009 since the global financial crisis in 2008. The slide has been faster this time than it was during the crisis in 1970s.

The absolute volume of production is higher compared to the past based on the order backlog, but the production is expected to go down rapidly. Apprehensively the production may fall to the lowest level over the last decade as the order backlog is fulfilled in two to three years to come.

It is hard to expect that new orders will be secured over the long range, and furthermore, it is not sure whether the current order backlogs will be effective. Japanese shipbuilders saw new orders slide by 72.2% in 1974 compared to the previous year, and suffered the plunge in new orders until 1978.

The situation is more serious, given the declining new orders since the onset of the global financial crisis. Shipbuilders are expected to win more orders than they did last year amid the expectation of market recovery from the global financial crisis, buoyed by new orders from some prominent shipping companies and new order intake in the offshore plant sector. However, the steep fall in new orders for merchant ships will be difficult to reverse.

Order backlogs are no more effective today. Right after the outbreak of the crisis, delaying the delivery and cancelling the shipbuilding contract was not easy once the construction on the vessel started. However, cancellation of orders and delays in delivery before construction occurred very often in 1975 and 1976 as Japan experienced.

Production is much faster now than in 1970s. More outstanding orderbook of vessels have been delayed since the second half of 2009, and the cancellation of newbuilding order is expected to increase as a growing number of shipping companies are bogged down this year by the credit crunch, unable to pay for the vessels on order.







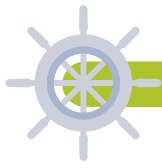
## 2. Major domestic shipbuilders faced the economic slow-down in 1970s right after they broke the ground for ship-yards and overcame the economic downturn in 1980s.

Hyundai Heavy Industries began to build infrastructure and proceed with diversification even amid financial difficulties, and saw its production climbing rapidly after 1990s.

Dae Sun Shipbuilding and Engineering achieved fast growth in sales using its business savviness without expanding production capacity and has achieved KRW 50 billion in sales and a steady growth of about 7% growth in operating profit since 1982.



The extent that the global financial crisis has an impact on the order backlog and new order intake will vary, depending on companies. Hyundai Heavy Industries is expected to address the weakness in the merchant ships by focusing on winning new orders for high value-added ships such as onshore and offshore plants, but the falling orders will erode the sales and profit.



The sales from merchant ship sector are very likely to diminish steadily as the remaining order backlog is fulfilled in two to three years to come. However, the sales and profit will be finally turning around as the diversified business sectors are put back on track.

Dae Sun Shipbuilding and Engineering, a company which specializes in shipbuilding, is expected to see a rapid slide in sales and profit for the time being as the company reduces overcapacity or diverts to other sectors.

### **3. Large shipyards may tread the path toward diversification, while small and medium shipyards will become specialized**

Shipbuilding industry across the globe has been put on the path toward recovery driven by ships incorporating new technologies such as eco-friendly ships, vessels navigating in the Arctic, offshore plants and others.

Hyundai Heavy Industries, Samsung Heavy Industries, Daewoo Shipbuilding & Marine Engineering, STX have the competitive edge in the offshore plant sector in the global market, but still face many challenges considering the monopolistic technologies of advanced countries and resource development that has become more complicated.

In addition to Hyundai Heavy Industries which have achieved relatively higher level of diversification, Daewoo Shipbuilding & Marine Engineering or Samsung Heavy Industries have moved ahead with strategies for diversification to an extent that their offshore plant business accounts for 30% of their overall business.





Besides, they have entered into the cruise ship market which is known to be the stronghold of major European companies. Their advancement into this market is likely to help them make up for the fall in the sales from the merchant ship sector and turn around the profit although the challenges such as the development of core technology, resource exploitation in polar regions, and development of the means for transportation will pull the profit downward over the short-term.

In retrospect, shipbuilders should have made more efforts to advance into the overseas market when the industry enjoyed unprecedented boom. However, they have attained remarkable achievements in the offshore plant sector which was dominated by advanced countries, and it is encouraging very much that they have begun to make foray into the cruise ship market, a market which they have tried to enter one or two decades since before.



## 4. Conclusion

To ensure that domestic shipbuilders maintain their strong position in the global shipbuilding industry, major shipbuilders and government have to do more to play a key role in the enactment of regulations or rules with an increased engagement in the meetings of world's marine organizations. Meanwhile, large shipyards should evolve into specialized heavy industrial companies through diversification, and small-to-medium shipyards should transform into companies specializing in specific ship type or model. ⚓

### Reference :

Weekly of Korea Shipbuilders' Association. Vol. 266 - Issues & Focus  
The statistical data of Clarkson released in April  
STX Offshore & Shipbuilding  
Samsung Heavy Industries  
Hyundai Heavy Industries  
Sungdong Shipbuilding & Marine Engineering  
Daewoo Shipbuilding & Marine Engineering  
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\* Monthly Korship provides up-close look at world's shipbuilding industry building a bright future on the horizon at sea.

\* Monthly Korship, Korea's only shipbuilding magazine in English

**Company & comment** - It is a roundup of news on companies specializing in the shipbuilding equipment and materials, providing overview of the special features of companies, production lines, and flagship products.

**Technology** - It provides detailed overview of the expertise, know-how and products of companies, touting the technological competitiveness of shipbuilding equipment and material companies.

**Application** - It provides explanations on the function, strengths, weakness of products based on their application to ships.





# RINA

## 1. HISTORY

RINA is one of the world's leading classification societies and is recording strong, consistent growth. One of the oldest societies in the world for the classification of merchant ships, RINA was established in Genoa by ship owners and underwriters in 1861.

Ship classification and certification have been RINA's core activity since its establishment. RINA is a founding member of the International Association of Classification Societies (IACS) and is authorized by more than 70 flag administrations.

## 2. GLOBAL SERVICE

They provide services on a global scale but still retain the capability to offer solutions that take into account the specific needs of the client. Today,

RINA classes a high-quality and diverse fleet of over 24 M GT, and has earned a well-deserved reputation for technical excellence.

It is rated by the Paris MOU as one of the top three class societies in Europe.

Owners and shipyards from around the world increasingly choose RINA to class their new buildings.

RINA's new building order book now represents over forty per cent of its classed fleet.

RINA leads the cruise and passenger ship new building market and its order book also includes ro-ro, oil and chemical tankers, bulk carriers and cargo ships.

They serve owners and yards all over the world, with a strong presence in Italy, Korea, China, Turkey, Singapore and Greece. To ensure that customers



receive the rapid service for which RINA is widely known, they have a wide global network of offices. There are now 97 RINA offices in 32 countries, all staffed by local experts who speak the national languages in each country.

Plan Approval Centers have been established in Italy, Korea, Turkey, China, Germany and Greece.

Training Centers have been established to help shipyards and ship owners ensure that their technical staff and crews get the training they need.

A network of centers of excellence is being set up, with the first of these in the UK, focusing on yachts, coatings and LNG. Outside commercial shipping, RINA's special expertise in yachts makes it the global leader in mega-yacht classification and certification.

RINA classification services are performed efficiently and competently all around Asia, through a multicultural staff of managers, surveyors and engineers, who serve the needs of clients, share the same passion and pursue the same goals.

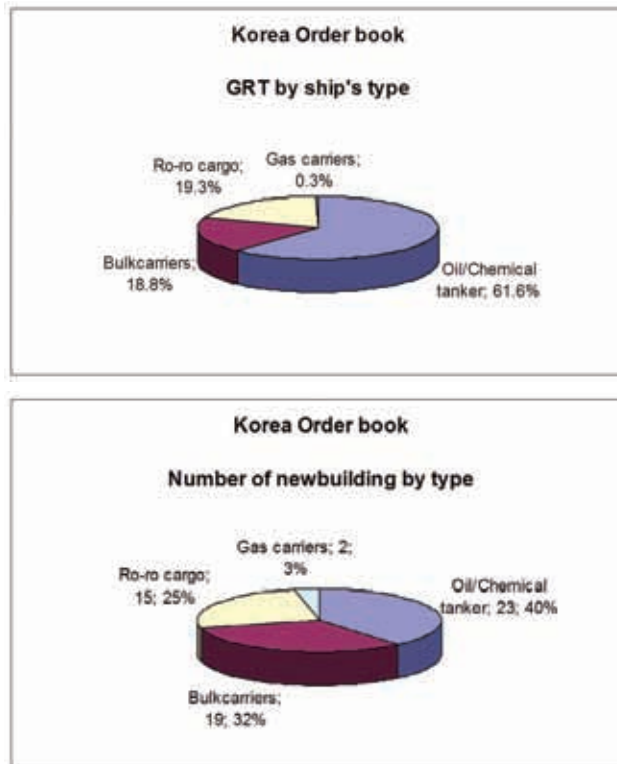
East Asian countries such as Korea, China and Japan are the world's leading shipbuilding nations. The growth of RINA in the Far East new building market has been rapid, with more than 120 vessels delivered in the Far East between 2004 and 2008. For RINA, Korea has historically been the most important shipbuilding market.

### 3. RINA IN KOREA

RINA BUSAN Office was established at first in 1999. RINA's Office and Plan Approval Centre is located in Busan and has many Site offices on Shipyard premises for the best service possible.

Many of RINA's staff actually work for local clients to ensure the best possible service.

The RINA order book in Korea and Japan over the next three years has more than 60 vessels of various types including VLCC, Suezmax oil tanker, ro-ro cargo, chemical tanker and bulk carriers with an aggregate load of 3 million G.T.



This growth is the result of RINA's special expertise in new building services dedicated to shipyards.



Although its new building activities in the region cover all types of ships, RINA has acquired a lead-



ing position in the construction of oil and chemical tankers, ro-ro cargo vessels, bulk carriers and other large scale vessels.

RINA began supervising the construction of the first two ro-ro passenger ferries built in Korea in 2000.

#### 4. PLAN APPROVAL CENTER

The opening of a dedicated plan approval centre in Busan in 2000 has strengthened RINA's reputation as a reliable and professional partner in the Korean market.



RINA enjoys close co-operation with local shipyards, and its rapid response capability has produced a significant number of new building orders in Asia for new and local customers.

The Plan Approval Centre in Korea is staffed by experienced, dynamic and professional personnel who have had consistent and proven success in co-operating with major shipyards.

In addition to traditional plan approval and documentation services, RINA Plan Approval Centre can also provide many other services, among them



- Local consultancy at the pre-contractual stages of new buildings or conversions
- Support to designers on the application of newly adopted international regulations and specific flag requirements (FEM analysis of any type of vessel)
- Assessment of the complete life-cycle of a ship from the initial design phase
- Special expertise in connection with specific vessels, such as LPG, LNG, RO/RO cargo and RO-RO passenger new buildings and conversions
- Re-fitting, and upgrading, including rule framework definition and identification of key aspects
- Training on the most specific and innovative technical and regulatory topics

RINA has established a comprehensive, strategic network of offices and survey stations to provide a prompt and specific response to client requests in Asia.

Good performances during surveys drive RINA to excellent results in PSC scores.





## 5. TESTING & CERTIFICATION

RINA performs testing and certification services in accordance with national and international safety standards and with its own Rules for the Classification of Ships.

As a notified body, RINA also certifies marine equipment and pleasure craft in accordance with relevant European Community Directives (e.g. PPE and MED)

## 6. SERVING EAST ASIAN SHIP- PING

In recent years, the worldwide demand for new ships created by increased globalization has served to fuel the growth of RINA.

RINA has become a multicultural group, providing clients throughout the world with consistent support, advice and service in a way they can understand.

RINA looks for the best people in each country. Those who can absorb RINA's values and deliver




them locally, preserving the integrity of RINA's standards while explaining them in a local context. One of the ways they do this is by investing heavily in local internal training and support.

RINA continually strengthens teams in Korea by selecting and training the best engineers and naval architects.

RINA's experts speak the same language and



share the culture of their clients, and they always adhere to the highest standards both locally and internationally. 



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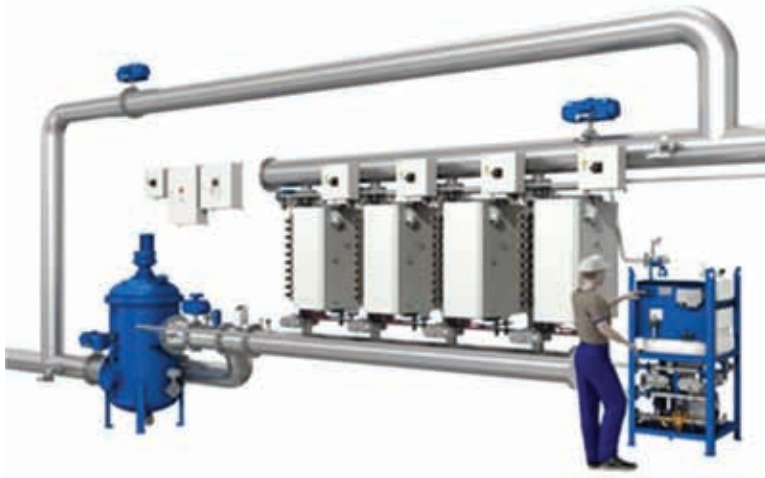
Non-Life Threatening Gas Fire Suppression Systems

Fire and Gas Detection Systems



# PureBallast to stop free riders on 80 ships

*Alfa Laval Korea*



2004. That was the year the IMO Ballast Water Convention (BWC) was adopted by the International Maritime Organization (IMO). Six years down the road and where are we now? With a focus on PureBallast, Alfa Laval takes a look at just how far we've come.

There wasn't a commercial system in sight when the IMO adopted the Ballast Water Convention in 2004. Today there are systems available to address the global threat that the transport of invasive species poses.

As one of the first systems to receive IMO ballast water type approval, the Alfa Laval PureBallast system has by far been the most popular choice among shipowners and shipyards due to its performance, reliability and chemical-free technology. To date, a total of 80 systems ranging in capacity from 250 to 2500 m<sup>3</sup>/h are in service or have been ordered.

## 1. July 2009: A decisive moment

The July 2009 meeting of the IMO Marine Environment Protection Committee (MEPC) marked a decisive moment for many shipowners and

shipyards. The MEPC granted final approval to four ballast water treatment systems in addition to the six systems already approved.

In addition, the MEPC recommended that installation of such systems on board new vessels be encouraged and investigations to retrofit existing ships be conducted. Ship owners, operators and shipyards that may have been waiting to see whether any delay would result from the MEPC meeting received a clear signal that ballast water management remains a high priority on the IMO agenda.

"The old argument that technologies and treatments were not available is now obsolete," stated Dr Anita Mäkinen, WWF's head of delegation to the IMO meeting.

According to the 2009 WWF report, "Silent Invasion," the time to act is now. The global economic cost per tonne of untreated ballast water is 70 USD cents - US\$ 7 billion per year for the 10 billion tonnes of water transported globally each year - compared to the cost of only 4 US cents per tonne of treated water.

Shipowners must shoulder the costs. But as WWF adeptly points out, it is 40% less expensive to equip a new ship with type-approved technology than to retrofit the same ship later. In the coming years, tens of thousands of ships will require installation of an IMO-approved ballast water treatment systems.





## 2. Formidable force

In the Marine & Diesel corridors of Alfa Laval's offices just outside of Stockholm, there is a lot of activity around ballast water treatment systems. Alfa Laval has emerged as a formidable force within ballast water management, thanks to a forward-thinking approach and innovative advanced oxidation technology.

"Alfa Laval has long been at the vanguard of this movement to deliver a reliable and cost-effective ballast water management solution to ship owners and shipyards," says Per Warg, Alfa Laval's Business Manager for PureBallast. "We are fortunate to be asked to participate in most tenders for treatment systems."

## 3. Broad acceptance

Many of these tenders turn into orders, and the success rate is impressive. The PureBallast reference list includes pure car/truck carriers, container vessels, bulk carriers, LPG tankers, bitumen tankers, RoRo vessels and various offshore supply vessels. It also reflects the constitution of the world's fleet, representing many countries and customer types.

A conservative naval customer and a progressive cutting-edge shipyard, for instance, can be found among the ranks. Spanish shipbuilder Navantia Ferrol (link to press release) will be installing PureBallast systems aboard ALHD (Amphibious Landing and Helicopter Deployment) vessels for the Royal Australian Navy, providing Alfa Laval with a foothold in the naval market. Delivery of the first system took place in mid-December last year, with the second system to follow in April 2010. In stark contrast to this specialized naval customer is Norwegian trendsetter Ulstein whose revolutionary X-BOW® offshore supply vessel will carry PureBallast for shipowner Remøy Shipping AS.

Other shipyards around the world - about 20 in all - have also been quick to embrace PureBallast as the ballast water treatment system of choice. It is a veritable Parade of Nations, including shipyards from Korea, Japan, China, Norway, Germany, Netherlands and Spain, and proof of Alfa Laval's ability to provide comprehensive global service and support for design, installation and commissioning. Naturally, shipowners and operators are aware of Alfa Laval's capabilities to provide training, operation and maintenance.

## 4. How it works

Much has been written about the patented chemical-free system that is PureBallast's core technology. It is based on Advanced Oxidation Technology (AOT) that generates radicals that instantly neutralize microorganisms and other organic contaminants. It's easy to use, easy to install and easy to operate and maintain.

## 5. What's ahead

Alfa Laval is now working on an explosion-proof version of PureBallast for use on chemical tankers, oil tankers, gas carriers and special cargo ships. ⚓

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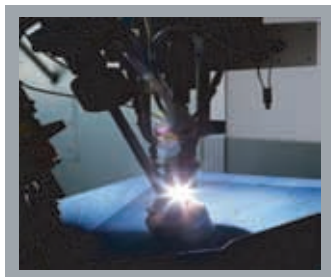
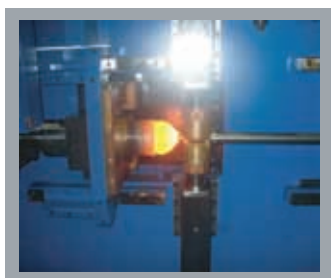
Korea Special Valve

## Establish the Norm of Engine Valve

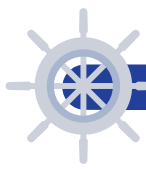
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# Energy Management ? Act now !

*Wilhelmsen Marine Engineering*



Wilhelmsen Marine Engineering (hereinafter refer to WME) is a leading supplier of Energy Management solutions for HVAC (Heating, Ventilation and Air-Conditioning) and Electrical plants for Marine and Off shore installations

We provide products and services aimed at reducing shipping's impact on the environment. WME together with the other sister companies has a strong focus on products that save's the environment where energy management is one important part.

Interest in reducing energy consumption by HVAC and electrical plants onboard is growing rapidly. A major WME strength is their capability to optimise power generation and distribution, from initial assessment to completed installation.

On a large cruise vessel about 30% of the energy consumption is related to air conditioning. WME has developed competitive solutions to achieve considerable energy savings for all type of ships

with main focus on cruise. Solutions include control systems as well as modification of mechanical equipment. The concept has proved its capability by both onboard monitoring as well as good simulation programs.

## 1. Energy Management Solutions

WME workd with energy management within two areas.

- HVAC Plants
- Electrical Plants

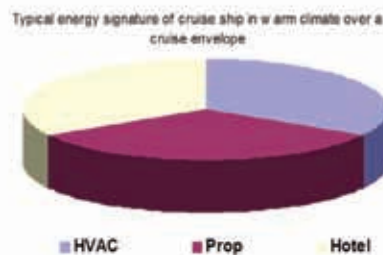






The energy consumption for a passenger vessel can be split into three major systems. Several independent studies show that the distribution is:

- Propulsion
- Air Treatment
- Hotel



## 2. IMO initiatives for energy effectiveness of ship systems

### 1) MEPC 59 - interim and voluntary measures

- Energy Efficiency Design Index for new ships (to stimulate innovative technical solutions)
- Ship Energy Efficient Management plan for new and existing ship
- Ship Energy Efficient Operational Indicator for new and existing ship

### 2) MEPC 60 (March 2010)- refined measures, scope of application and enactment

- Because of the multiple system-nature of ship, no single approach or solution will be superior
- Obvious targets target: "low hanging fruit"
- HVAC (does) can qualify as low hanging fruit

## 3. The saving potential is enormous

### 1) Power system and improvement

- Electrical design and installation
- Main switchboards, incl. PMS
- Emergency switchboards
- Distribution switchboards
- Motor control center
- Shore connection box
- Thruster (frequency converter)
- Soft start method

### 2) Lighting and electrical equipments optimization

Lighting and bulb in accommodation Lighting and equipment load is part of accommodation heat dissipation load for cabin airflow calculation, reasonable lighting bulb and lighting control can be part of power reducing factor for the whole vessel operation.

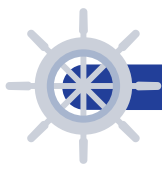
Generally:	Incandescent	Fluorescent
Cabins, etc:	15 w/m <sup>2</sup>	8w/m <sup>2</sup>
Mess & dining room	20 w/m <sup>2</sup>	10 w/m <sup>2</sup>
Gym	40 w/m <sup>2</sup>	20 w/m <sup>2</sup>

### 3) Cold ironing project

This is not just a compliance with today's but future requirements and legislations.

WME recently successfully carried out cold ironing operation at the BP oil terminal in Long Beach with 30 minutes it switched over the electrical system onboard to shore-side power.





### 4. Advantages:

- Absence of noise from diesel engine
- Pumping oil from one of the monsters requires the energy equivalent of a day's worth of driving by 187000 cars. The net savings in emissions, factoring in pollution caused power plants generating the shore-side electricity is 50%.
- Although it is not mandatory, but...  
Some authorities is considering it as regulatory state in mind. In Sweden, there is agreement between Swedish ports and the owners association with the intention of encouraging the use of shore-based electrical power
- WME is working close to further standardize and develop its cold ironing offer into a full-blown commercial concept, many of our switchboards are prepared to handle shore connections

#### 1) Electrical plants

- Process control
  - Pump control by i.e. frequency converters
  - Smart capacity control
  - LW/SW and know-how



- Low energy lighting systems
  - Low energy bulbs
  - Electric ballasts
  - Reduce consumption, prolonged life cycle and less heating
- Power management
  - Control of power generation plant

· HW/SW and know-how

- Propulsion, diesel electric



- HVAC equipment power supply (refer to below 'Ship HVAC and energy conservation')

### 5. Ship HVAC and energy conservation

#### 1) Characteristics of ship HVAC:

- In many ships; the 3rd most important function on board
- A widespread system with multiple consumers
- Utilization factor is often < 50% of max capacity
- Lack of HVAC expertise onshore and on board
- Substantial energy savings potentials

#### 2) Improvement potentials trough:

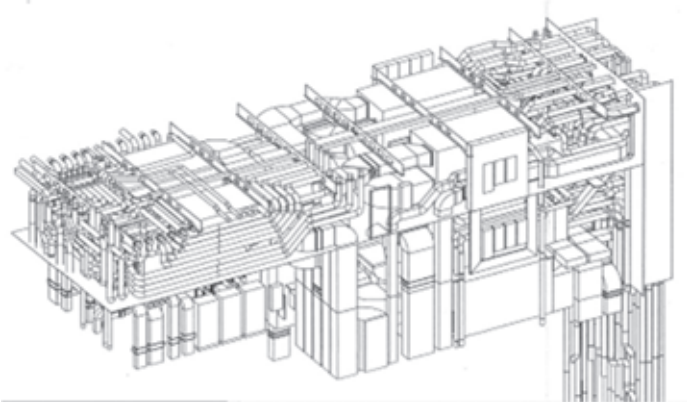
- Modified new building specifications (moderate)
- Improved equipment efficiency (low)
- New improved systems design (moderate)
- New knowledge & technology (high)
- Improved operation (high)
- Combinations (very high)

<Example - improved operation>

Machinery ventilation:

Run 2 fans at half speed instead of 1 at full speed.





Why?

Air volume  $Q \sim n$

Air pressure  $p_t \sim n^2$

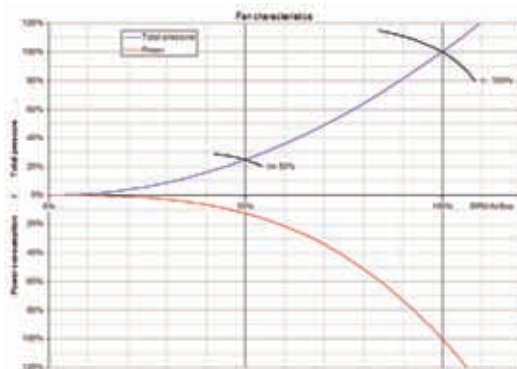
Fan power  $P \sim n^3$

Solution:

Variable speed drives and new control logics

Result:

Reduces energy consumption by 70% for the same function



<Example - new knowledge and technology>

Pax cabins:

Implement dynamic demand control of AHU

Why?

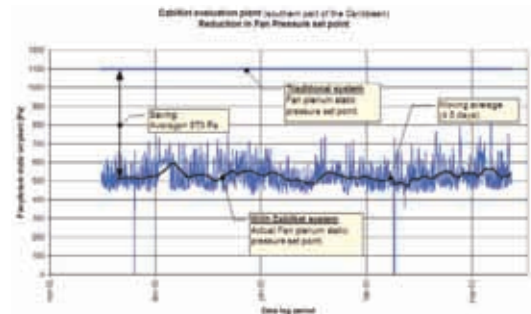
$P \sim p_t \times Q$

Solution:

Feed back of supply air pressure level from each cabin to the AHU controller through smart SW in smart HW

Result:

Reduces fan electric energy consumption by 30-50% for the same function



<Example- Modified ship specification>

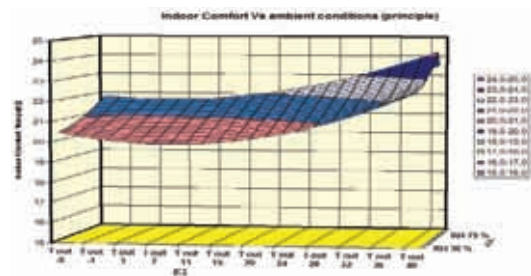
Must we really design for:

- Ambient 32 C / 90 RH
- Inside 23 C
- Maximum sun radiation
- Broadside exposure to sun at 17:00
- Seawater temperature 32 C
- Max inside thermal load

All at the same time?

Solution:

Can we consider designing for perceived climate? Make better specifications aimed at reducing size of HVAC plant and its energy consumption



<Example: - Improved equipment efficiency>

Air handling units (AHU):



- Casing tightness
- Enthalpy recovery
- Filtration losses
- Electric motor efficiency (New std 2010, IEC 60034-30)
- Drives
- Fan aero dynamics
- Heat transfer
- Misc



What to expect?

A 5-10 % improved energy efficiency over 10 yrs except for controls where one can expect larger gains

<Example- Improved system design>

The challenge:

- 100% single duct fresh air systems main pros-and-cons in relation to air recirculation systems (fan coil systems)
- Simpler, safer, much lower maintenance, superior climate, lower health risk
  - But larger foot print, higher energy consumption

Solution:

- Reduce the supply air temperature from 12 to 8 C
- Induce warmer room air before expulsion to room not to violate ISO 7547 (design rules for marine HVAC system)

Result (in warm climates):

- Fan energy consumption reduced by 30 %
- Chiller energy consumption reduced by 10%
- A HVAC plant reduced to 2/3 of the size
- Possibility to increase onboard temp without discomfort due to reduced humidity in ship = further energy savings

- INVENT™, low temp fresh air system (test)



<Example - Combinations (application of multiple solutions)>

HVAC energy conservation upgrading:

Partial upgrading of existing HVAC plant on board the 8 ship CCL Fantasy fleet

- New automation systems with improved functionality and intuitive MMI
- Extensive HVAC energy metering for on line HVAC consumption benchmarking
- Improved HVAC functionality

Primary result / ship (verified):

- A 27 % reduction or  $5 \times 10^6$  kWh/yr
- Fuel savings - > 1000 t / yr

Secondary result / ship:

- Carbon signature: minus 3200 t CO<sub>2</sub>
- Drastically reduced passenger climate claim rate
- An extra chiller on standby

But:

Remaining HVAC upgrading in 2010 - 2011 will yield an additional 7-9% in energy savings. If machinery vent is targeted too, another 13-15 % can be saved. Total potential saving: approx 45-50% from base line





<Example - Combinations (application of multiple solutions) >

Energy conservation upgrading of Ropax:

Partial upgrading of HVAC and machinery sub systems

- Improved control of Machinery ventilation
- Demand control of HVAC for public spaces
- New automation supervision system for HVAC with improved functionality and intuitive MMI
- Improved Machinery ventilation
- Improved control of SW- and LT pumps

Primary result:

- To be verified between Nov-Dec 2009
- Required pay back time typically <1 yr

Secondary result / ship:

- Control of air pressures in machinery space
- Reduced fan noise to outside
- Drastically reduced passenger climate claim rate
- Improved climate comfort
- Reduced wear in water tight door mechanism



WMS is a part of WW ASA, A global maritime industrial group based in Norway, listed on the Oslo Stock Exchange. WME is one part of Wilhelmsen Maritime Services, focus on Electro and HVAC.

It is the old Callenberg Group that was acquired in 2008 originating from companies such as ABB Fløkt, Semco and Callenberg. WME works on a global perspective, with solutions for vessels consisting of the whole chain from design to commissioning and after market with different demands.

"Less bunker = Less pollution = More profit" Get us onboard from the beginning of the vessel design to get those profit. ⚓

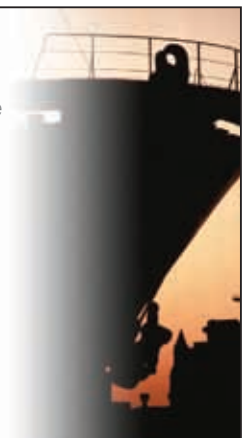
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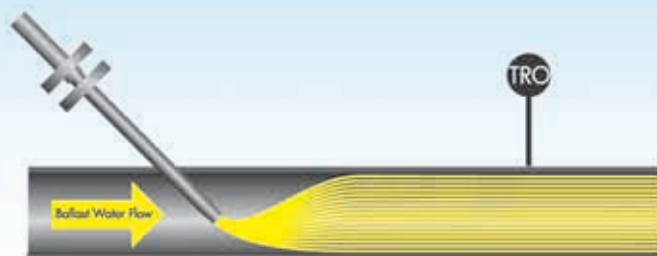
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# JUNJINCSM Co., Ltd held the In-House Launch Show of its Brand New Scissors Lift for Rough Terrain (RT)

*JUNJINCSM Co., Ltd*



JUNJINCSM Co., Ltd had a launch show of the Scissors Lift for Rough Terrain (model name: JS-150RT, JS-180RT) on March 31 at Asan factory of JUNJINCSM. During the show, distinctive features of the new product were unveiled, followed by the demonstration and the exchanges of ideas in relation to the function of this brand new product.

Scissors lift is a type of aerial work equipment powered by electricity or diesel engine, elevating and lowering the work platform vertically to provide the access for the worker to the ceiling or exterior wall of building. In Korea, electricity-powered scissors lift for indoor use is commonly utilized. Scissors lift for rough terrain (RT) has already been recognized as essential equipment in construction sites of advanced countries in North America and Europe, and recently, there has been a surging demand in the domestic market for imported scissors lifts that provide high efficiency.

The scissors lift for rough terrain developed by JUNJINCSM Co., Ltd this time was designed to completely



conform to the CE (Communaute Europeenne) Marking Directive and KCS standard of Korea, the domestic safety standard, from the designing stage of structure and system. With the maximum working height reaching 18m, the overload prevention function - which uses the pressure switch for the two-way expansion working platform carrying up to 4 workers- and the automatic horizontal control function of outrigger ensure safe work in any sites.

Adopting diesel engine and 4-wheel driving system, it boasts powerful driving performance and gradability (hill climbing ability), and the oscillation function ensures safe driving on irregular road surface.

The foam tire installed basically prevents the accident arising from the damage to the tire at the work site. Furthermore, the sliding type engine room and self-diagnosis system ensure easy maintenance and repair without problem.

Lee Jae-hwan, CEO of JUNJINCSM Co., Ltd said, "Our scissors lift for rough terrain is characterized by competitive price, swift delivery, and superb quality and is expected to captivate the heart of customers in domestic market which has been dominated by

imported equipments so far". He revealed his ambition saying, "We will launch the best products that customers want in global market, as well as domestic market, by proceeding ahead with ceaseless R&D and aggressive market strategies."

JUNJINCSM Co., Ltd is the sole maker of aerial work platform in Korea and has specialized in the manufacturing of an whole range of aerial work equipments, such as aerial work platform, aerial platform truck, motor scissors lift, on the basis of its boom production and hydraulic technology. From this year, the company is expected to expand its vast product range that customers want, launching a series of new products such as truck crane, large hydraulic crawler drill, aerial work platform for construction, scissors lift for rough terrain, etc, while making serious inroads into the construction equipment market at the same time. ⚓





Electric motors consume about 30% of the electric energy in the entire world. Full use of AC drives and energy-efficient motors in industry and civil engineering would provide savings of up to 30% in the energy consumption of electric motors. This equals 10% of electricity in the entire world. During their lifespan, Vacon's AC drives save many times more energy than it takes to manufacture them.

Vacon's mission, the principle underlying the business concept is that every electric motor deserves a Vacon AC drive. Vacon's drives optimize the regulation and control of electric motors. They improve process control and save energy. AC drives make production more cost-efficient and reduce the greenhouse effect. That is why every electric motor deserves a Vacon AC drive.

Vacon is the seventh largest manufacturer of AC drives in the world and the largest company concentrating solely on AC drives. Vacon estimates that its share of the global AC drive market (USD 8.3 billion) is almost 5% (IMS 2009). In 2009 Vacon had revenues of EUR 272 million and globally employed 1,200 people.

## 1. Complete portfolio

Vacon has a complete product portfolio in the power range of 0.25 kW to 5 MW, including air- and liquid-cooled units and common DC bus components. Supporting open automation and international standards, Vacon AC drives are delivered to OEM customers, end-users, brand label customers, distributors and system houses (system integrators) throughout the

world.

## 2. Large customer and industry segment coverage

Vacon supplies AC drives to nearly all industry segments and to civil engineering. Typical customer sectors include machine building, water treatment, construction engineering, marine and offshore industry, renewable energy generation, and mining. AC drives are used, for example, in pumps, fans, elevators, escalators, conveyors, wind power plants, and compressors. Vacon's key customers include: Converteam, Eaton, Honeywell, Voith, Hyundai Heavy Industries, Rockwell Automation, Rolls-Royce, Imtech, Konecranes, Wärtsilä, Schindler, The Switch, and many more.

"Our customer coverage is extremely large, and we have operations on all continents," says Heikki Hiltunen, Vacon's Executive Vice President and VP, Products and markets. "Vacon has supplied drives to a wide range of applications, everything from a simple pump drive to demanding system and sectional drives, thus improving processes in terms of runnability, efficiency and quality. In cooperation with our highly skilled partners, Vacon is always able to deliver even the most demanding solutions," he continues.

"Vacon's competitive edge is based on its focus on AC drives, global operations, good customer service, extensive customer coverage, and the team spirit and motivation of its personnel," says Mr Hiltunen.





### 3. Singapore car lift project providing the superiority of Vacon NXC

Vacon Korea delivered to Singapore Hyundai Engineering & Construction 6 sets of Vacon NXC products, which were ordered through Hyundai Heavy Industries in 2009. The first and the second trial run were completed successfully in February 2010. This lift, measuring a total of 120 m in depth, will transport soil at the speed of 100 m/min and move the dump truck and the driver upwards and downwards.

The Vacon NXC product, including an Active Front-End (AFE) and NXI of 1300 A, proved its stability once again by dramatically elevating the efficiency of the production process. The success in this project is a stepping stone for Vacon Korea in clinching additional orders.

On Jurong Island, Singapore, 6 sets of Vacon NXC Drives



### 4. AFE (Active Front-End)

Full Regenerative Front End module

Based on IGBT technology

Same HW than INU, FFE and BCU

AFE included the unit, the LCL filter and the pre-charging circuit

Benefits

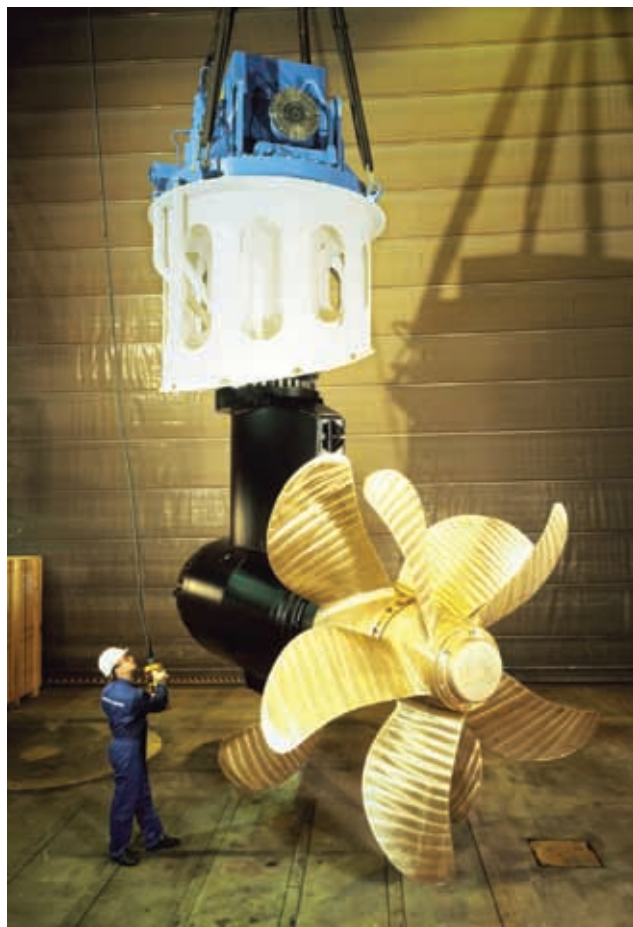
- Regenerative
- Current THDi is extremely low ~3%
- Power factor is almost zero
- Voltage of the intermediate DC circuit can be boosted
- No communication between modules in parallel connection
- Parallel connected units working independently
- Different power sizes can be connected parallel
- Power factor of the supply network can be corrected
- No external measurements

#### AFE - When?

If very low THDi is required  
If regenerative operation is needed

If motor voltage has to be higher than supply voltage  
If 12-pulse solution cannot be used and rectifiers need to be connected parallel ⚓





# Rolls-Royce completes first propeller and gas turbine for Queen Elizabeth class aircraft carrier programme

*Rolls-Royce*

Rolls-Royce, the global power systems company, has completed two significant milestones for the Royal Navy's new aircraft carriers, Queen Elizabeth and Prince of Wales, with completion of the first propeller and the successful testing of the vessels' first MT30 gas turbine.

The propeller, measuring almost seven metres in diameter and weighing 33 tonnes, has completed acceptance tests at the Rolls-Royce facility in Kristinehamn, Sweden.

The Kamewa Adjustable Bolted Propeller is manufactured from nickel aluminium bronze and features five blades mounted on a central hub - there will be two on each of the aircraft carriers.

Rolls-Royce is also supplying shaft lines which will link each of the vessels' two propellers with the power source. Each

propeller will deliver around 50,000 horse-power - the highest power Kamewa propeller ever developed by Rolls-Royce.

The first of four MT30s for the two 65,000 tonne vessels also passed a programme of stringent tests and certification at the Rolls-Royce Marine test facility, in Bristol, where the gas turbine was operated across a range of load conditions up to the maximum power output of 36MW.

Rolls-Royce is part of a 'sub-alliance' team comprising Thales, Converteam and L-3 which has overall responsibility for delivery of the entire power and propulsion system.

Richard Dingley, Rolls-Royce Director Programmes - Naval said: "The delivery of these two major components is a significant achievement for everyone involved in the QE Class programme. The gas turbines will, through an innovative electrical system, provide the power needed to turn the propellers and drive these huge vessels through the water at speeds of up to 25 knots."





"We are extremely proud to be involved in the development of these vessels, working alongside our many partners in the Aircraft Carrier Alliance to supply mission-critical technology and systems."

Tony Graham, head of Capital Ships at the Ministry of Defence, visited the Bristol test facility and gas turbine build line recently to see progress on the project. He said: "The heart of the ship is now beating. These engines will breathe life into the steel hull and are another demonstration of the progress being made."

Matt Pollitt, Rolls-Royce Test Integration and Support Manager and his team carried out the MT30 test. He said: "The gas turbine performed as expected during the tests, which simulated what you would see from the bridge of the ship in a range of different sea conditions."

"We put the engine through rigorous tests including what happens when the ship rapidly demands either large amounts of power or large reductions in power due to propulsion motor trips. The engine coped well with such extreme load characteristics and I'm pleased to say it passed its Lloyd's certification too."

The MT30 is the most powerful available gas turbine in the marine market today and on the carriers will form part of an integrated electric propulsion system which includes the giant propellers and propeller shafts as well as rudders, thrust bearings and low-voltage electrical systems. ⚓

## Industrial Ethernet in Maritime and Offshore

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# The symposium 'Cruise & Passenger Ship Interiors and Measures for Cultivating the Manpower' took place in Renaissance-Seoul Hotel (Diamond ballroom I on the third floor) on 14:00 April 02, 2010.

## KOSHIPA

The symposium titled 'Cruise & Passenger Ship Interiors and Measures for Cultivating the Manpower' was held at the Diamond ballroom I on the third floor of Renaissance-Seoul Hotel, which was organized by the Korea Shipbuilders' Association and sponsored by the Ministry of Labour and Human Resources Development Service of Korea.

This symposium which was held in a bid to explore the measures related to cruise ship synonymous with high value-added ship began with the welcome address by Han Jang-seop, vice-chairman of the Korea Shipbuilders' Association, and the congratulatory address by Cho Yeong-il, director of Human Resources Development Service of Korea.

Gwon Oh-yoon, the director of the Korea Shipbuilders' Association reported on the results of the 'Cruise &

Passenger Ship Interiors and Project for Cultivating the Manpower' and made a presentation on the current progress







titled 'Architect, Cruise Ship, Interior Works: The Dream Comes True?' which was followed by the presentation 'New Challenge for the Interior Works of Large Passenger Ship' which was delivered by Kim Il-seok, general manager of STX Offshore and Shipbuilding. The third presentation was made by Hwang

of the project.

Han Jang-seop, vice-chairman of the Korea Shipbuilders' Association, remarked in his welcome address, "It is considered urgent to build cruise ship, one of the next generation ships, if the Korean shipbuilding industry is going to overcome the external challenges and attain continuous growth. For that, a foundation should be laid for the supply of specialized manpower, as well as the development of technology for the interiors."

He went on saying, "To build cruise ships successfully, we need to ratchet up the competitiveness in various industries, such as interiors, equipments and materials, finishing materials, as well as shipbuilding industry. Among others, we have to secure specialized manpower necessary for the high quality interior works. In relation to that, we will seek the way of building cruise ships with the support of the Ministry of Labor and the supportive project of the Education and Training Innovation Center. I hope that this symposium will provide ample opportunities for exchanging the information and ideas through discussion which comes on the heels of the presentation on the themes by the experts in the interiors of cruise ship, presenting a vision for the cultivation of talented manpower in the field of interiors."

During the symposium, Vittorio de Jorio made a presentation

Seong-bok, director of Gukbo Design, in relation to the 'Measures to Foster Multi-Functional Manpower for Ship Interiors.'

When those three presentations were completed, a panel discussion began, which was presided by Byeon Ryang-seon, a professor at Doowon Technical College, in relation to the theme titled 'Looking Beyond the Cruise Interiors in Korea', and joined by Mr. Vittorio de Jorio of De Jorio Design Int'l, Kim Il-seok, general manager of STX Offshore and Shipbuilding, Han Dong-hoon, director of Daewoo Shipbuilding & Marine Engineering, Lee Chang-geun, President of Uone Design, and Kim Byeong-sik, President of Hong Seong Industrial Co.,Ltd.

The panel discussion was followed by dinner, and this symposium on the 'Cruise & Passenger Ship Interiors and Measures for Cultivating the Manpower' concluded.

The symposium 'Cruise & Passenger Ship Interiors and Measures for Cultivating the Manpower' was instrumental in highlighting the importance of cruise industry and laid a groundwork for the advancement of Korean shipbuilding industry, and furthermore, provided a good opportunity for putting the level of the equipment, material, and finishing material interior sectors of Korea on a par with that of Europe which has dominated those sectors so far. ⚓

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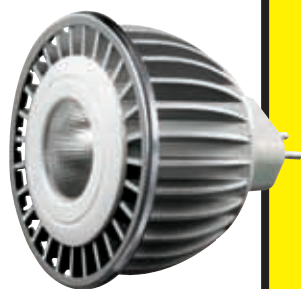
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Monthly Korship, Korea's only shipbuilding magazine in English, serves as the window to the world's shipbuilding industry building a bright future on the horizon at sea.

Monthly Korship provides an up-close look at the products of companies. It is a precious source of information, offering in-depth features related to shipbuilding orders, strength and special advantages of new products, and updates of products that companies are rolling out.

**New Order** - It is a clean roundup of news on orders placed with shipyards. New shipbuilding orders are reported in detail, along with photos capturing the moment of shipbuilders and clients signing contracts and summary illustrations of order backlog.

**Major Performance Gallery** - It provides detailed overview on the specification of products with photos.

**New product** - It provides updates on new products.



# Sungdong Shipbuilding & Marine Engineering Has Won First Order for the Second Quarter

Sungdong Shipbuilding & Marine Engineering said on March 8 that it signed a contract worth a total of \$75 million for building two 82,000-ton bulk carriers from a Taiwanese ship owner.

The bulk carriers that Sungdong Shipbuilding & Marine Engineering will build under this contract are the biggest size which can enter the port Kamsar in Guinea Africa, and will be delivered to the ship owner by 2012.

Sungdong Shipbuilding & Marine Engineering has maintained business relationship with prominent shipbuilding companies nationwide and has various fleets including automobile carriers, chemical product carriers, etc. This contract marks the first time that the company has received any order for bulk carriers over the last decade.

Sungdong Shipbuilding & Marine Engineering established overseas local representative office in Greece in the beginning of this year in an attempt to ensure swift response to the demands of ship owners in Europe, and has chalked out the strategies to use the contract this time as the springboard to expand its sales base in Asia.

An sales team member of Sungdong Shipbuilding & Marine Engineering said, "By achieving excellent order performance, we will show that the Asian market can become a huge market, though the domestic and overseas sales operations have been concentrated in Europe that has a large demand for merchant ship."

Meanwhile, Sungdong Shipbuilding & Marine Engineering has focused on

winning the orders for capesize bulk and kamsarmax bulk in the first quarter, and signed contracts worth a total of \$900 million for both types of vessels which is the nation's third highest order intake followed by Hyundai Heavy Industries (\$2.75 billion) and Daewoo Shipbuilding & Marine Engineering (\$1.44 billion).



Postpanamax (92,000 DWT)

## Sekwang Heavy Industries Signed the Contract to Build Gas Carrier

Sekwang Heavy Industries (President: Roh Jae-kwang), which is highly recognized in the newbuilt special ship sector, announced that it signed a contract worth a total of approximately KRW 175 billion for building five state-of-art 6,500cbm scale liquefied ethylene carrier (cargo temperature: -104°C) (including the optional vessels) with a ship owner in Netherlands last week-ends.

The vessels that Sekwang Heavy Industries are highly energy-efficient and eco-friendly vessels incorporating the cutting-edge technology, and the company has already succeeded in delivering many vessels (about 13 ships) of the same kind.

A source from shipbuilding source said that Isabella Kosan (8,000cmb scale liquefied ethylene carrier), the first ship of the same kind, was named as the 'Ship of Year' in 2008 by Lloyd's List, the leading daily newspaper for the

maritime industry covering all sectors of the shipping world, which reflects the high recog-





dition of Sekwang's superb shipbuilding technology in the global gas carrier market, and the successful contract despite the sluggish newbuilt market is attributed to the close relationship of cooperation that Sekwang has maintained with ship owners.

Market sources says that Sekwang Heavy Industries, which is currently building special platform supply vessel such as large platform supply vessel (PSV), has successfully specialized its business in special ships, gas carriers, stainless chemical product carrier sectors. Thus, the company is expected to win more orders in those sectors this year even amid the declining order intake in the shipbuilding industry nationwide.

An official from a shipyard also said that the company was very likely to be awarded the contract for the special projects which the company is currently negotiating.

Specifically, Sekwang Heavy Industries is expected to complete the trial-run and delivery of the large offshore seismic research vessel this year which the company will build for the first time nationwide under the contract with China National Petroleum Corporation (CNPC). The order awarded to Sekwang Heavy Industries this time will lay the groundwork for the company to find a breakthrough from the recession and solidify its footing as the shipyard specializing in the special ship sector.



Photo of similar carrier (as-built ship):  
10,000cbm Ethylene Carrier(3 pieces)

## STX Offshore & Shipbuilding Has Won Orders for Four Vessels, Including Kamsarmax Bulk Carrier, Special Ship, etc, This Month

STX Offshore & Shipbuilding has remained steady for winning contracts in April since the beginning of this year.

STX Offshore & Shipbuilding announced on April 16 that it won orders of one 80,500-ton Kamsarmax bulk carrier from a ship owner in Singapore.

This vessel measures 229m in length, 32.2m in width and 20.1m in height with the speed of 14.4 knot, and will be built in Jinhae shipyard of STX Offshore & Shipbuilding and is scheduled to be delivered to the ship owner by 2012. Along with that, the company inked a contract with a ship owner in Greece on April 7 for building one Kamsarmax bulk carrier.

Kamsarmax bulk carrier is the large size panamax bulk carrier optimized for the Kamsar Port of Equatorial Guinea in the Western Africa which is the world's largest production site of bauxite (raw material of aluminum). Particularly, Kamsarmax bulk carrier can carry more loads more efficiently compared to the existing panamax (approximately 74,000-ton scale) and is the type of vessel that has grabbed huge attention of ship owners as the bulk carrier transportation market has been rebounding recently.

STX Offshore & Shipbuilding has proceeded vigorously with the marketing campaign focusing on the optimized Kamsarmax bulk carrier that the company developed by itself, which resulted in the company clinching orders for



Kamarmax 81,000-ton bulk carrier to be built  
by STX Offshore & Shipbuilding

a total of four ships this year, including the order for two ships this month. Currently, the company has secured an order backlog totaling about 50 ships.

Meanwhile, STX Offshore & Shipbuilding successfully won orders for two of 24,000-ton spe-



cial purpose vessels (SPV), high value-added vessels, from ship owners in Asia on April 14. The special purpose vessels (SPV) is recognized as high value-added vessels which can be used for carrying various types of freight under the decision of ship owners, and boasts high efficiency compared to the existing merchant vessels that can carry only one type of freight.

An official from STX Offshore & Shipbuilding said, "This year, we not only received orders for 19 vessels worth \$710 million including the performance

of our production base in Dalian, China, but also were awarded the first order for special purpose vessel, diversifying the portfolio of ship. We will step up marketing efforts in preparation for the shipbuilding market's rebound in the near future as the market is put on the path toward recovery."

## HHIC-Phil's Subic Shipyard Inked Contracts for Building Eight Tankers and Bulk Carriers

HHIC-Phil, the overseas corporate unit of Hanjin Heavy Industries & Construction (HHIC), announced on April 7 that it was awarded orders worth a total of \$450 million for building eight very large vessels, including four 160,000-ton oil tankers and four 180,000-ton bulk carriers with Chinese, Singapore and Greek shipping companies.

HHIC-Phil had already won contracts to build two 180,000-ton very large bulk carriers in January and another in February. Thus, it has received orders for a total of eleven very large vessels so far this year. More negotiations are under way, according to the company.

This marks the first time HHIC-Phil signed a contract for building very large Suezmax tankers, laying the cornerstone for advancing into the Suezmax tanker market.

After successfully winning orders for seven capesize bulk carriers consecutively this year, the company's advanced technology and productivity have been recognized highly worldwide. Besides, the company has been able to cut manufacturing costs.

Specifically, HHIC-Phil signed a contract for building four 160,000-ton Suezmax tankers with Tanker Pacific in Singapore, a shipping company specializing in oil tankers, two 180,000-ton bulk carriers with Henghou in China and two 180,000-ton bulk carriers with Star Bulk Carrier Corporation in Greece.

The bulk carriers, the latest type of ship, measure 292m in length, 45m in width, 25m in height with a speed of 15.5 knots, and will be delivered in the second half of 2011.

The tankers which are the latest double-hull tankers measure 274m in length, 48m in width, 23.5m in height with a speed of 15.7 knots, and will be delivered from March 2012 consecutively.

The industry reports show that HHIC-Phil's Subic Shipyard has emerged as a new leader in the very large newbuilt vessels ranging from capesize bulk carrier through large tanker to VLCCs. Yeongdo Shipyard is too small to handle those vessels.

HHIC-Phil's Subic Shipyard's advantages include superb geographical location, large space which measures about 800,000 pyong or 10 times the size of Yeongdo Shipyard, state-of-art facilities and abundant manpower that can operate the shipyard around the clock, and low labor costs. Its production system has been stabilized since its six docks, the world's largest, have been fully operational from last year.

Along with Yeongdo Shipyard which is undergoing a modernization program for building high value-added vessels and platform supply vessel (PSV) and HHIC's R&D Center in Busan, HHIC-Phil's Subic Shipyard will play a crucial role in establishing HHIC as the world's most efficient shipyard.

An official from HHIC-Phil remarked, "We will develop Subic Shipyard built on the world's



View of Subic Shipyard



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most efficient production system into the unrivalled core business in the shipbuilding sector. Meanwhile, Yeongdo Shipyard, which is undergoing a modernization of facilities, will secure price competitiveness and evolve into the most competitive company through the dualization in the production of high value-added ships and platform supply vessel (PSV).

HHIC-Phil's Subic Shipyard is equipped with state-of-the-art facilities includ-

ing a 370m-long Dock 5, 550m-long and 135m-wide Dock 6, the world's largest, 4km-long quay wall facility, four ultra large gantry cranes, and 1,000m-long automated assembly lines. The company has an order backlog worth 2.5 years of work.

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## STX Group Clinched Orders Worth a Total of \$1.31 Billion This Year Alone in the Shipbuilding Sector

To date, STX Offshore & Shipbuilding has won orders to build a total of 17 ships amounting to \$1.31 billion, including nine bulk carrier orders totaling \$260 million, this year.

STX Offshore & Shipbuilding has benefited a lot from the Baltic Dry Index (BDI), the bulk freight index, which broke 3,000 point level and has been propelled upward recently.

Among a total of eleven vessels that STX Offshore & Shipbuilding will build under the contract awarded from ship owners this year, nine vessels are container vessels, which suggests that STX Offshore & Shipbuilding is stepping up efforts to win more orders for bulk carriers, the sector showing fast recovery, than other vessels such as container vessels and LNG carrier.

STX Europe has won consecutive orders last year despite the economic recession that gripped the shipbuilding industry, and has successfully inked a deal for building very large cruise ship on April 1 since it was integrated into STX Group, following the contract for building one platform supply vessel (PSV) in February.

STX Dalian in China which focused on stabilizing production efficiency last

year has signed the contract for building bulk carriers. Particularly, the contract awarded to STX Dalian in China this time is the first one signed with domestic ship fund management corporation, and the company plans to win orders from various clients including ordinary shipping companies.

An official from STX Offshore & Shipbuilding said, "Following the successive intake of orders for merchant vessels from the beginning of the year, STX Offshore & Shipbuilding has won orders for bulk carriers and tankers consecutively. With STX Europe, which is leading the global production network of STX Group, and STX Dalian winning new orders, the shipbuilding market is heading toward full recovery."

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## STX Europe Has Won Orders for Three Special Vessels

STX Europe has received orders for three special purpose vessels (SPV), seeing an uptick in order intake going forward.

STX Europe announced on March 27 that its subsidiary STX Norway Offshore AS signed contracts with an overseas ship owner for building three special purpose vessels.

The vessels are designed to meet general requirements of salvage, rescue and towing operations, as well as fire-fighting and pollution prevention. They are scheduled for delivery in the fourth quarter of 2011, the second and third quarter of 2012. The vessels will measure 86m in length and 17.5m in width.

The hull will be constructed at the STX shipyard in Romania, and then outfit-

ted at the shipyard in Brattvaag, Norway. STX Europe explained that it would not disclose the name of the ship owner and order prices, etc, as requested by the ship owner.

Meanwhile, STX Europe inked a contract with Simon Møkster Rederi to build a platform supply vessel (PSV) last month and signed the letter of intent (LOI) with MSC Cruises for building a 140,000-ton cruise ship earlier this month



## STX Received Orders for A Total of Nine Bulk Carriers in March

STX Group was awarded a \$260 million order to build a total of nine vessels in March alone, which shows that the company is playing a key role in pulling the shipbuilding industry out of recession. Following the orders awarded in January, STX Offshore & Shipbuilding has inked an additional deal for building two optional 58,000-ton bulk carriers with Turkish ship owner Densa.

STX Offshore & Shipbuilding will build a total of four vessels in Jinhae shipyard, including two bulk carriers contracted in the beginning of the year, which are scheduled to be completely delivered by 2012. STX Offshore & Shipbuilding has also clinched orders for three 58,000-ton bulk carriers (including one optional vessel) from Doosung, Korea's mid-sized ship owner, on March 10.

STX's production facility based in Dalian, China, which has moved into full-fledged production following the successful delivery of its first ship, has signed a contract to build four 37,000-ton bulk carriers with Globalmarifin, Korea's ship fund management corporation on March 8.

STX Offshore & Shipbuilding which has won consecutive orders for merchant vessels at the start of the year, as well STX Europe and STX Dalian, have also



58,000-ton bulk carrier to be built by STX Offshore & Shipbuilding

succeeded in winning new orders and stepped up efforts to improve order performance further as the global shipbuilding industry is recovering gradually.

## Daewoo Shipbuilding & Marine Engineering (DSME) Signed A Contract for Building Two Very Large Crude Carriers with a Greek Ship Owner

Daewoo Shipbuilding & Marine Engineering (DSME) clinched orders for two very large crude carriers from Greek Almi Tankers S.A, heralding a good order performance for the remaining period of this year. The contract is worth \$210 million.

The vessels, a very large crude carrier (VLCC) will be 333m in length and 60m in width with a payload capacity of 320,000 tons of crude oil. Both vessels will be built in Okpo shipyard in Geoje, Gyeongnam, and delivered to the ship owner by the end of 2013.

DSME President & CEO Nam Sang-tae said, "Last year, we were buoyed by Almi Tankers S.A for the trust that it gave to us despite the economic slowdown. We will return our favor to Almi Tankers S.A with the highest quality. Almi Tanker S.A. awarded a shipbuilding contract worth a total of 650 million to DSME at the end of last year."

With the order being awarded successfully, the shipbuilding industry expects, albeit carefully, that the industry is put back on track toward recovery.

In fact, the charterage for very large crude carrier (VLCC) rose by about 18% in the first quarter after hitting the bottom in the fourth quarter, according to data

from Clarksons, a global shipping research institute. The fourth quarter average of charter-



Daewoo Shipbuilding & Marine Engineering and Almi Tankers S.A. signed the contract to build two very large crude carriers on March 29 (local time) in Athens, Greece.



age for very large crude carrier (VLCC) jumped to \$37,208 a day in the first quarter this year from \$31,615 a day based on the one-year contract.

Besides, the contract awarded to DSME eliminated the concern over the possibly serious impact of the Greek financial crisis on the Korean shipbuilding industry. Such a concern was persistent because Greece is one of the world's largest shipping nations. Greece's financial tsunami will have only negligible impact on the shipping companies and shipbuilding companies receiving the orders from the country.

Meanwhile, DSME has taken the world's largest share (19%) in the very large crude carrier (VLCC) sector as it has clinched the orders for 37 VLCCs out of

196 VLCCs currently under construction worldwide.

So far, DSME received the orders for fourteen ships and one offshore platform, etc, which are worth a total of \$1.44 billion.

The company is stepping the efforts to win orders for offshore products, special ships, oil tankers, etc, which have been brisk recently, and plans to clinch orders worth a total of \$10 billion this year.

## Daewoo Shipbuilding & Marine Engineering (DSME) Inked the Contract for One Drill Ship Construction Order

Daewoo Shipbuilding & Marine Engineering (DSME) bagged a deal for one drill ship, picking up the speed in the order intake. DSME announced on April 9 that it has been awarded a drill ship order by a South Korean consortium led by the state-run Korea National Oil Corp.

The vessel will be used for the oil exploration in the Zhambyl oil field in Kazakhstan where the consortium is participating.

The vessel will measure 100m in length and 40m in width, and has a maximum 6,000m drilling depth capacity, and have the barge type design suitable for the shallow water as deep as 5m or so.

The vessel's operation area, the Caspian Sea, is surrounded by land on all sides, making it difficult to transport large structures, and is connected to the Black Sea through the canal measuring only 16m in width.

DSME plans to proceed with the construction by actively using its Mangalia shipyard in Romania as well as local shipyards in the Caspian Sea region, considering that the transportation of large structures are complicated for geographical reasons.

DSME explained that the company has been able to obtain the order on the basis of its extensive experiences and know-hows associated with the project, while regarding the most recent success as a tangible achievement of its overseas energy development projects.

The Zhambyl Block is situated on the northwestern part of the Caspian Sea, for which the main contract was executed in May 2008. Currently, physical explorations are carried out and the oil production is expected to begin as early as 2018 if oil is found.

DSME is expecting additional orders for production facilities and plants necessary for the oil exploitation. Obtaining this drill ship order, DSME has received orders for fifteen vessels and two offshore products this year, which totals \$1.59 billion.

Currently, DSME is participating in the similar oil exploitation projects in Nigeria, Indonesia, etc, as well as Kazakhstan, using DSME E&R, its subsidiary specializing in the energy resource exploitation.

Aiming to evolve into a total solution provider for energy development, DSME plans to combine its block development capability and its ability to develop core products such as Floating Production, Storage and Offloading (FPSO), drill ship, etc.



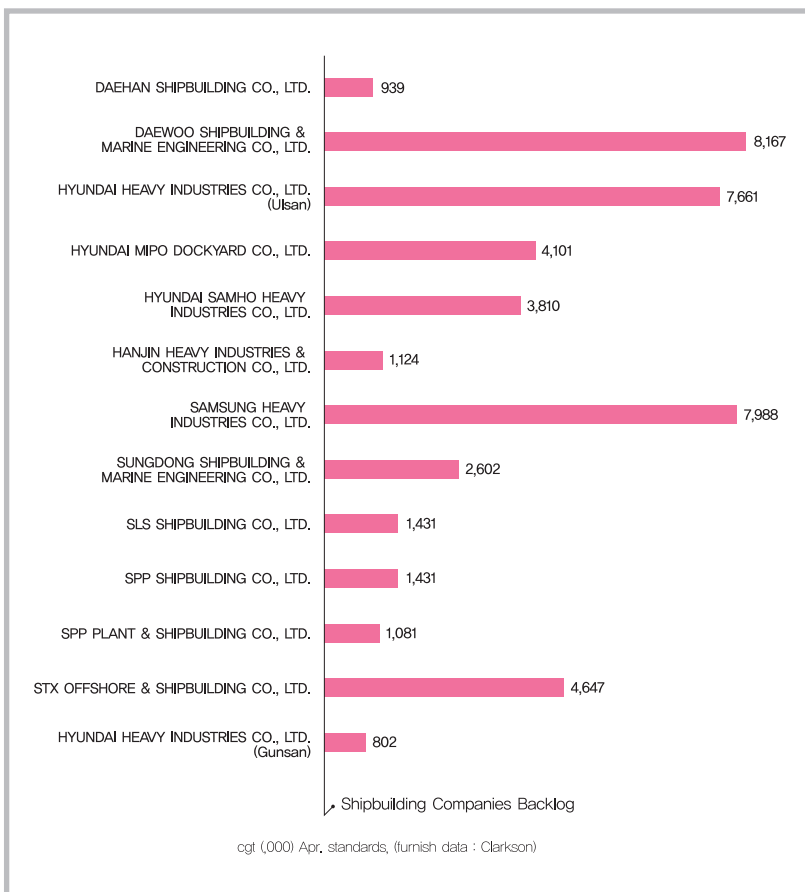
Nam Sang-tae (fourth from the left), President of DSME, and Kang Young-won (third from the left), President of Korea National Oil Corporation (KNOC), including employees of both companies, are posing for photograph after both signed the contract at the headquarters of KNOC to build the drill ship.



## The Shipbuilding Marketshare

*The world economy is showing the sign of recovery gradually as 2010, the Year of Tiger, dawns, and both domestic and overseas shipbuilding market is rebounding, too. As shipyards are reported to be clinching large orders, Korean shipbuilding market is maintaining its world's top position in the global market.*

*According to the statistics of Clarkson, shipyards in Korea have enjoyed the influx of large volume of orders and been placed high in the global ranking. In consideration of that, let's have an up-close look at the order volumes that Korean shipbuilders have won. ⚓*





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# Hyundai Samho Heavy Industries Co.,Ltd

Hyundai Samho Heavy Industries (HSHI) specializes in the shipbuilding, producing vessels and offshore facilities, etc, with the world's fifth largest shipbuilding capacity, built on 3.3 million m<sup>2</sup> in and around Samho subdistrict, Yeongam County, Jeollanamdo, a province in the southwest of South Korea.

HSHI is equipped with cutting-edge automation facilities and its factory and major facilities are designed and positioned to ensure the maximum efficiency of lay-out work under the comprehensive plan.

Besides, HSHI possesses and operates two very large docks capable of building 5.3 million GT every year, and four goliath





cranes that can lift loads of up to 900 tons of blocks are operational on each dock.

Specifically, the goliath crane on the second dock can lift loads of up to 1,720 tons if operated together.

Let's take a look at the specification of ships produced by HSHI, the most prominent company in the southwestern part of the country, and the photos of the shipyard. 🚢













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## DNV introduces a new container ship concept

*DNV Korea*

Quantum is the name of a new container ship concept introduced by DNV. The new concept is based on both technical and market research and innovation and is designed to transport more cargo while using less fuel and with a reduced environmental impact.

The new container ship concept is designed to meet the perceived market needs. It has a design speed of 21 knots, but can operate efficiently at speeds between less than 10 knots and more than 22 knots. If Quantum as it is designed was realised, it would be a 272.3-metre-long ship. A beam of 42.5 metres at the water line gives it good stability and its novel 49.0-metre Widedeck design increases its container capacity to 6,210 TEU. To mention some more examples from a long list of innovative solutions, the need for ballast water is minimized and LNG is

introduced as part of the ship's fuel.

"Even if it would be possible to realise the Quantum within three to five years, this is a concept ship designed to stir up a debate about shipping innovation. All the aspects of the concept design is unlikely to appear in a single ship, but certain aspects will be taken further on a case by case basis. I am convinced of this," says Tor Svensen, the president and chief operating officer of DNV. He adds: "We all know that the shipping industry is facing tough times. But now is the time for innovation and a focus on new solutions. DNV has a strong technical and financial platform. This platform is to be used to solve problems we all are facing, especially the environmental challenges." 

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# Nexans to present innovative cabling solutions and umbilical cables technologies at OTC

*Nexans Korea*



Nexans, global leader in cables and cabling solutions, is using its presence at OTC 2010 to highlight its full range of cabling solutions and its umbilical cables expertise based on innovative technologies that provide reliable solutions for complex oil and gas projects, onshore and offshore, topside and subsea. In the technical session on the morning of Wednesday May 5, Bjørn Roger Slora, Senior Specialist of Nexans in Norway will present a paper on "Qualification of Dynamic Deepwater Power Cable" introducing some new state-of-the-art technology that addresses the implications of subsea processing power distribution on field architecture. He will also be available on the Nexans booth to discuss more in detail this subject after the conference.

Some of the other innovative Nexans technologies on show at OTC will include CRYODYN™ - flexible,

vacuum insulated pipe for LNG offshore loading, HYPRON®, an environmentally friendly alternative to lead-sheathed cable for onshore installations, and ICEFLEX®, the first halogen free marine and offshore full range cable to resist ultra-cold Arctic temperatures down to - 50°C.

Visitors to the Nexans booth will be able to find out more about the company's key reference projects from across the oil and gas sector such as the Prirazlomnaya oil production station in the Barents Sea, Russia, for which Nexans has developed low-temperature and ice-resistant control, instrumentation and power cables that can withstand prolonged exposure to temperatures as low as -50°C. ⚓

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**DSE BEARING CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.dsebearing.com  
Main Products : Metal Bearing  
TEL : +82-51-831-2046

**DSK CO., LTD.**

Head Office : Yeongdo-gu Busan  
Homepage Add. : www.dskworld.com  
Main Products : Piston Crown  
TEL : +82-51-417-7800

**DUYOUNG INDUSTRIAL MACHINES CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Plate-Baffle  
TEL : +82-51-831-2477

**EM SYSTEC CO., LTD.**

Head Office : Sasang-gu Busan  
Homepage Add. : www.emsystec.com  
Main Products : Marine Switch Board, Control Console  
TEL : +82-51-302-8761

**FRIEND CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.thefriend.co.kr  
Main Products : Marine Cable Tray, Mud Box, Strainer  
TEL : +82-51-831-9456

**GEO MAEK SHOT&PAINT CO.,LTD.**

Head Office : Saha-gu Busan  
Homepage Add. :  
Main Products : Deck Machinery Part, Hose Handling Crane  
TEL : +82-51-264-3315

**GEORIM ENGINEERING CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.kangrim.com  
Main Products : Marine Industrial Boiler, Exhaust Gas Boiler  
TEL : +82-51-831-2929

**GISUNG ENGINEERING CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Air Reserovir, Heat Exchanger  
TEL : +82-51-831-4475

**G. M. TEC CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.igmtec.com  
Main Products : Duct Equip't Seat Support  
TEL : +82-51-831-5851

**G.S HIGH-TECHER CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.gshightecher.koreasme.com  
Main Products : Air Vent Head, Pipe Coupling  
TEL : +82-51-832-0456

**G&S PRECISION IND CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Cable Tray, Vent, Hull Outfittings  
TEL : +82-51-831-0849

**HAE DONG METAL CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.hdanode.com  
Main Products : Zinc Anode, Al Anode  
TEL : +82-51-831-3751

**HAE DUK RUDDER & R.STOCK CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.rudders.co.kr  
Main Products : Rudder & R.Stock, Rudder Horn, Rudder Carrier  
TEL : +82-51-831-0101

**HAE SUNG INDUSTRIAL.**

Head Office : Saha-gu Busan  
Homepage Add. : www.hsjs.co.kr/  
Main Products : Cable Tray, Cable Way Fitting, Cable Coaming  
TEL : +82-51-264-8103

**HAEWON INDUSTRIES CO.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : P/Crown, P/Skirt  
TEL : +82-51-831-4600

**HAEWON IND. CO., LTD.**

Head Office : Sasang-gu Busan  
Homepage Add. : www.heawon.net  
Main Products : Copper, Copper-Nickel, Monel Fitting & Flanges  
TEL : +82-51-312-2161

**HAEYANG FAMILY CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : F.P Propeller, C.P Propeller, Propeller Shaft  
TEL : +82-51-831-3550

**HAEYANG METAL CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : F.P Propeller, C.P Propeller, Propeller Shaft  
TEL : +82-51-831-4591

**HAEYANG PROPELLER CO., LTD.**

Head Office : Gangseo-gu Busan



Homepage Add. :  
Main Products : Marine Propeller  
TEL : +82-51-831-4599

#### **HANCHANG TRANS CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.hctr.co.kr  
Main Products : Pole Mounted Transformer, Pad Mounted Transformer  
TEL : +82-51-831-3470

#### **HANJULEVEL.**

Head Office : Sasang-gu Busan  
Homepage Add. : www.hanjulevel.co.kr  
Main Products : Level instrument Etc, Vapour Emission Control Sys.  
TEL : +82-51-303-0537

#### **HANLA IMS CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.hanlalevel.co.kr  
Main Products : Cargo Tank Monitoring Sys. Tank Remote Sounding Sys.  
TEL : +82-51-601-3019

#### **HANLA IND CO., LTD.**

Head Office : Saha-gu Busan  
Homepage Add. :  
Main Products : Oil Filter unit, Gas Blower  
TEL : +82-51-264-2201

#### **HANMAUM KI-GONG CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.hankg.co.kr  
Main Products : Air Cooler Housing, Oil Cooler Housing  
TEL : +82-51-831-5211

#### **HEARTMAN CO., LTD.**

Head Office : Saha-gu Busan  
Homepage Add. : www.heartman.co.kr  
Main Products : Nozzle Tip, Plunger Ass'y, Fuel Injection V/V  
TEL : +82-51-262-8869

#### **H.M.E.**

Head Office : Kijang-kun Busan  
Homepage Add. : www.hyomyungeng.com  
Main Products : Battery Charger, Light Signal Column  
TEL : +82-51-709-9000

#### **HOSEUNG ENTERPRISE CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.hoseung.koreasme.com  
Main Products : Tand Package Unit, Pump Package Unit, Cooler Package Unit  
TEL : +82-51-831-2233

#### **HWAJIN ENTERPRISE CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.hwa-jin.com  
Main Products : Control Box, Gauge Board System  
TEL : +82-512-831-9447

#### **HWAJIN PF CO., LTD.**

Head Office : Saha-gu Busan  
Homepage Add. : www.hwajinpf.com  
Main Products : Butt-Welding Pipe, Fittings Carbon Steel  
TEL : +82-51-204-3001

#### **HWA SHIN PRECISION CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Life Boat Winch  
TEL : +82-51-831-9839

#### **HYOSUNG STEEL TECHNOLOGIES CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Steel plate cutting, Hy Auto or Manual  
TEL : +82-51-831-5093

#### **HYUNDAI HYCRAULIC CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.hhmc.co.kr  
Main Products : TURNING ROLLER, BLOCK LIFT  
TEL : +82-51-831-8611

#### **HYUNDAI ZINC METAL CO., LTD.**

Head Office : Saha-gu Busan  
Homepage Add. : www.hdz.co.kr  
Main Products : Sacrificial Anode, Hot Dip Galvanizing, Ship Manufacture  
TEL : +82-51-266-4788

#### **HYUNJIN MATERIALS CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.hjmco.co.kr  
Main Products : Cross Head, Connecting Rod, Piston Rod  
TEL : +82-51-602-7700

#### **ILDO MACHINE ELECT CO., LTD.**

Head Office : Saha-gu Busan  
Homepage Add. :  
Main Products : Heavy Electric Parts  
TEL : +82-51-266-6066

#### **IL - SUNG INDUSTRY CO.**

Head Office : Sasang-gu Busan  
Homepage Add. :  
Main Products : Silencer, Water Air Filter, Air Intet Trunk  
TEL : +82-51-312-4056

#### **IN SUNG INDUSTRY CO.**

Head Office : Saha-gu Busan  
Homepage Add. :  
Main Products : Profile, Steel Coalming Insulation  
TEL : +82-51-293-7550

#### **JAESEUNG ENGINEERING CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Steel Pipe Spool, Sus Pipe Spool, CuNi Pipe Spool  
TEL : +82-51-831-8838

#### **JEILSANKI CO.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products :  
TEL : +82-51-831-5398

#### **JEONG-AM SAFETY GLASS CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.jeong-am.co.kr  
Main Products : Tempered Glass, Laminated Glass  
TEL : +82-51-831-6161

#### **JEONG HWA ACCOMMODATION SYSTEM CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.jeonghwa21.com  
Main Products : Wooden Furniture  
TEL : +82-51-974-8000

#### **JEONG WOO COUPLING CO., LTD.**

Head Office : Kimhae Gyeongsangnam-do  
Homepage Add. : www.jwcjoint.co.kr  
Main Products : Pipe Coupling, Pipe Repair Clamp  
TEL : +82-55-339-7666

#### **JIN GU ENGINEERING.**

Head Office : Kimhae Gyeongsangnam-do  
Homepage Add. :  
Main Products : Rudder Stock, Stern Tube, Stern Roller, Winch  
TEL : +82-55-343-3414

#### **JIN IL BEND CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products :  
TEL : +82-51-832-1919

#### **JINKWANG ELECTRIC CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Pull Card Switch, Belt Sway Switch, Belt Speed Switch  
TEL : +82-51-831-2571

#### **JINYOUNG METAL CO., LTD.**

Head Office : Sasang-gu Busan

Homepage Add. : www.jymct.co.kr  
Main Products : Multi Core Tube, Welded Stainless, Steel Tube  
TEL : +82-51-313-4001

#### **JMC HYDRAULICS.**

Head Office : Saha-gu Busan  
Homepage Add. :  
Main Products : Hydraulic Motor For Marine, Hydraulic Control Valve  
TEL : +82-51-204-4046

#### **JNC HI-TECHNOLOGIES.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.jnchitec.com  
Main Products : Junction Box, Elect panel bard, Tel Booth  
TEL : +82-51-974-9500

#### **JOKWANG I.L.I CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products :  
TEL : +82-51-602-0200

#### **JONGHAP POLESTAR ENGINEERING CO., LTD.**

Head Office : Youngdo-gu Busan  
Homepage Add. :  
Main Products : Diesel Engine Piston, Cylinder, Valve  
TEL : +82-51-403-5514

#### **JUNG GONG IND. CO., LTD.**

Head Office : Saha-gu Busan  
Homepage Add. : www.jung-gong.com  
Main Products : Ordinary Window Side, Scuttle, Heated Window  
TEL : +82-51-261-2911

#### **JUNG - WOO MACHINERY CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Carrier Housing, Split Bearing, Stock, Up. Lower Sleeve  
TEL : +82-51-831-5394

#### **KANG BACK INDUSTRY CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Electric Control Box, Valve & Similar, Equipment  
TEL : +82-51-831-9025

#### **KANGIL CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Pressure Vessel, Deaerator, Heat Exchanger  
TEL : +82-51-972-5672

#### **KANGRIM HEAVY INDUSTRIES CO., LTD.**

Head Office : Changwon Gyeongsangnam-do  
Homepage Add. : www.kangrim.com/  
Main Products : Marine Industrial Boiler, Exhaust Gas Boiler  
TEL : +82-55-269-7701

#### **K.C. CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.iccp-mgps.com  
Main Products : M.G.P.S, I,C,C,P, System Fe Ion, Generator  
TEL : +82-51-831-7720

#### **KEO HUNG MACHINERY.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Deck Crane, Provision Crane, Hose Handling Crane  
TEL : +82-51-831-6296

#### **KEYSUNG METAL CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.keysungmetal.com  
Main Products : Valve(Cryogenic, Ball), Strainer  
TEL : +82-51-831-3391

#### **KOC ELECTRIC CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Cast Resin Transformer, Dry Resin Transformer  
TEL : +82-51-832-0550

**KOREA HYDRAULIC CO.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.enpos21.com](http://www.enpos21.com)  
 Main Products : Electric Motor Pump, Hand Pump, Single/Double Acting Ram  
 TEL : +82-51-832-1100

**KOREA PHE CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.kphe.co.kr](http://www.kphe.co.kr)  
 Main Products : Plate Heat Exchanger, Tank Cleaning Heater  
 TEL : +82-51-261-2664

**KOREA STEEL SHAPES CO., LTD.**

Head Office : Sasang-gu Busan  
 Homepage Add. : [www.ekosco.com](http://www.ekosco.com)  
 Main Products : Flat Bars, Equal Angles, Unequal Angles  
 TEL : +82-51-323-2611

**KOREA TRADING & INDUSTRIES CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. : [www.kticopper.co.kr](http://www.kticopper.co.kr)  
 Main Products : Copper alloy coil, Plate  
 TEL : +82-51-293-4423

**KORINOX CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.korinox21.com](http://www.korinox21.com)  
 Main Products : Cold Mill Stainless, Steel Coil  
 TEL : +82-51-832-0031

**KORVAL CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. : [www.korval.co.kr](http://www.korval.co.kr)  
 Main Products : Crank Case Relief Valve, Main Starting Valve, Rotary Valve  
 TEL : +82-51-790-9700

**KSP CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.kspval.co.kr](http://www.kspval.co.kr)  
 Main Products : Ship Engine Valve Spindle, Flange, Ring Gear  
 TEL : +82-51-831-6274

**KSV**

Head Office : Youngdo-gu Busan  
 Homepage Add. : [www.ksv-valve.co.kr](http://www.ksv-valve.co.kr)  
 Main Products : Valve Spindle, Seat-Ring for marine Engine  
 TEL : +82-51-415-4466

**KTE CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.kte.co.kr](http://www.kte.co.kr)  
 Main Products : Electrical Equipment (Switchboard & Console)  
 TEL : +82-51-265-0255

**KUKDONG ELECOM CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. : [www.kukdongelecom.com](http://www.kukdongelecom.com)  
 Main Products : Navigation/Signal LT, EX-Plasion Proof LT, Fluorescent LT  
 TEL : +82-51-266-0050

**KUKDONG INDUSTRIAL ENGINEERING.**

Head Office : Sasang-gu Busan  
 Homepage Add. : [www.kdie.co.kr](http://www.kdie.co.kr)  
 Main Products : Exhaust Gas Pipe With Insulation, Fuel Injection Pipe and Bloc  
 TEL : +82-51-303-6900

**KUKJE METAL CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.kjmetal.co.kr](http://www.kjmetal.co.kr)  
 Main Products : Manhole Cover, Portable Tank, EXH. Gas Pipe  
 TEL : +82-51-831-1541

**KUM HAW PRECISION CO.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.khprecision.co.kr](http://www.khprecision.co.kr)  
 Main Products : Coupling Flange, Bellows Flange  
 TEL : +82-51-831-5685

**KUMKANG ENGINEERING.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.kumkang.co.kr](http://www.kumkang.co.kr)

Main Products : Hand Rail, Storm Rail, Platform, Inc. Ladder  
 TEL : +82-51-831-0091

**KUMKANG PRECISION.**

Head Office : Saha-gu Busan  
 Homepage Add. : [www.kkmarine.co.kr](http://www.kkmarine.co.kr)  
 Main Products : Engine Parts, (Air Reservoir) & Valve  
 TEL : +82-51-262-4893

**KWANGIL CORP.,**

Head Office : Sasang-gu Busan  
 Homepage Add. : [www.k-i.co.kr](http://www.k-i.co.kr)  
 Main Products : Stainless Steel, HR Coil  
 TEL : +82-51-324-0006

**KWANG JIN E.N.G CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.kjeng.co.kr](http://www.kjeng.co.kr)  
 Main Products : Pipe Piece, Pipe Spool  
 TEL : +82-51-831-1435

**KWANG JIN IND. CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.kjinind.co.kr](http://www.kjinind.co.kr)  
 Main Products : Part of Heat Exchanger  
 TEL : +82-51-831-4131

**KWANG JIN TECH.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.kjtech.co.kr](http://www.kjtech.co.kr)  
 Main Products : Non Asbestos, Teflon, Rubber  
 TEL : +82-51-973-5566

**KWANG LIM MARINE TECH. CO.,LTD.**

Head Office : Sasang-gu Busan  
 Homepage Add. : [www.klimtech.co.kr](http://www.klimtech.co.kr)  
 Main Products : Window Box, (STEEL, AL, SUS) Vent Hole  
 TEL : +82-51-313-0055

**KWANG SAN CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.kwangsan.com](http://www.kwangsan.com)  
 Main Products : Heating Coil unit, Expansion joint  
 TEL : +82-51-974-6301

**KWANGWOON CO.,LTD.**

Head Office : Youngdo-gu Busan  
 Homepage Add. : [www.kwang-woon.com](http://www.kwang-woon.com)  
 Main Products : Square Window, Side Scuttle, Door, Hatch, Window Wiper  
 TEL : +82-51-414-9494

**KYEONG SIN FIBER CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.ksfiber.co.kr](http://www.ksfiber.co.kr)  
 Main Products : Rudder Bearing Bush, Insulation  
 TEL : +82-51-831-0268

**KYOUNGWON BENDING CO.**

Head Office : Kimhae Gyeongsangnam-do  
 Homepage Add. : [www.bending4u.com](http://www.bending4u.com)  
 Main Products : Hwase Pipe, Chain, Locker  
 TEL : +82-55-313-1277

**KYUNGIL METAL CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.kyungilmetal.co.kr](http://www.kyungilmetal.co.kr)  
 Main Products : Marine Equipment Plating, Head Rest Pipe Plating  
 TEL : +82-51-831-1677

**KYUNGSUNG INDUSTRY CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.e-clamp.com](http://www.e-clamp.com)  
 Main Products : Svs Corner & Anchor, Strip, Clamp  
 TEL : +82-51-831-4960

**LHE CO., LTD.**

Head Office : Kimhae Gyeongsangnam-do  
 Homepage Add. : [www.lhe.co.kr](http://www.lhe.co.kr)  
 Main Products : Heat Exchanger  
 TEL : +82-55-340-0624

**MANZU INDUSTRY. CO., LTD.**

Head Office : Gangseo-gu Busan

Homepage Add. :

Main Products : Phosphate Coat, Pipe & Structure Painting, Special Painting  
 TEL : +82-51-832-0944

**MARINE RADIO CO., LTD.**

Head Office : Youngdo-gu Busan  
 Homepage Add. : [www.mrcradio.co.kr](http://www.mrcradio.co.kr)  
 Main Products : Public Addresser Sys, Common Aerial Sys.  
 TEL : +82-51-414-7891

**MARINE TECHNICAL ENGINEERING CO., LTD.**

Head Office : Sasang-gu Busan  
 Homepage Add. : [www.mtecheng.co.kr](http://www.mtecheng.co.kr)  
 Main Products : Oily Water Separator, Bilge Alarm, Air Dryer  
 TEL : +82-51-831-1118

**MARSEN CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.marsen.com/](http://www.marsen.com/)  
 Main Products : Cargo Tank Monitoring System, Tank High/Overfill Alarm System  
 TEL : +82-51-831-2108

**MAX TECH.**

Head Office : Kimhae Gyeongsangnam-do  
 Homepage Add. : [www.maxtech21c.com](http://www.maxtech21c.com)  
 Main Products : Engine, Shock Absorber, Gasket  
 TEL : +82-55-327-9652

**MCM CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.mcm21.co.kr](http://www.mcm21.co.kr)  
 Main Products : Valve, Junction Box, Switch Cover  
 TEL : +82-51-832-0505

**MI JIN PRECISION.**

Head Office : Sasang-gu Busan  
 Homepage Add. : [www.mjprecision.co.kr](http://www.mjprecision.co.kr)  
 Main Products : Valve, Tube, Vend, Pipe for ship  
 TEL : +82-51-315-3143

**MIJOO INDUSTRY CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.mijooind.co.kr](http://www.mijooind.co.kr)  
 Main Products :   
 TEL : +82-51-831-1588

**MIRAE ENGINEERING CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.miraeship.co.kr](http://www.miraeship.co.kr)  
 Main Products : Hull Block, Steel Outfitting, Pipe Spool/Unit  
 TEL : +82-51-790-5800

**MJ TSR CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.mjtsr.com](http://www.mjtsr.com)  
 Main Products : Rubber Sheets & Hats, All Types of Parts for Shipbuilding & Industries  
 TEL : +82-51-832-0002

**MODERN INTECH CO., LTD.**

Head Office : Sasang-gu Busan  
 Homepage Add. : [www.modernintech.co.kr](http://www.modernintech.co.kr)  
 Main Products : Curtain, Carpet, Upholstery, Mattress for Marine  
 TEL : +82-51-325-0260

**MT.H CONTROL VALVES CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.mthvalve.co.kr](http://www.mthvalve.co.kr)  
 Main Products :   
 TEL : 82-51-974-8831

**MYTEC CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : [www.mytec.com](http://www.mytec.com)  
 Main Products : Heat Exchanger, Pressure Vessel  
 TEL : +82-51-831-7474

**NAMSUNG SHIPBUILDING CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. : [www.namsungshipbuilding.co.kr](http://www.namsungshipbuilding.co.kr)  
 Main Products : Rescue Boat Davit & Winch, Assembly, Line Hauler  
 TEL : +82-51-200-1277



**NAMYANG METAL.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Stair Way Body, Bulk Head Hnlon, Galley Hood  
 TEL : +82-51-832-1721

**NARA CORPORATION CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. :  
 Main Products :  
 TEL : +82-51-790-7505

**NAVUTEC.**

Head Office : Kijang-kun Busan  
 Homepage Add. : www.navutec.com  
 Main Products : Fire fighting & Safety, equipment for marine & Offshore  
 TEL : +82-51-728-5055

**NEW-OHSEUNG CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. :  
 Main Products : Manifold, Spool piece, Chain compressor  
 TEL : +82-51-266-5724

**NK CO., LTD.**

Head Office : Kijang-kun Busan  
 Homepage Add. :  
 Main Products : Ballast Water Treatment System, Co2 System  
 TEL : +82-51-204-2211

**NOKSAN FLANGE CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Flange for ship  
 TEL : +82-51-831-7956

**OBOK ELECTRIC CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Transformer  
 TEL : +82-51-832-1751

**OK KWANG ENG CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.okv.co.kr  
 Main Products : Marine valves, Strainers  
 TEL : +82-51-326-7741

**OK KWANG METAL CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.okkwang.com  
 Main Products : Std Flange, Tube Sheet, Forging Material  
 TEL : +82-51-831-9885

**ORIENTAL PRECISION & ENGINEERING CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.opco.co.kr  
 Main Products : Deck house, Engine room Casing, Life Boat  
 TEL : +82-51-202-0101

**ORIENTAL PRECISION MACHINERY CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.opco.co.kr  
 Main Products : Crane Component  
 TEL : +82-51-831-0202

**O.S.C.G CO., LTD.**

Head Office : Sasang-gu Busan  
 Homepage Add. : www.oscg.net  
 Main Products : Cable grand, Junction box  
 TEL : +82-51-305-3910

**PACO HITEC CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. : www.pacohitec.com  
 Main Products : Hydraulic hose, Fitting  
 TEL : +82-51-266-6994

**PAL MI METAL IND CO., LTD.**

Head Office : Jinhae Gyeongsangnam-do  
 Homepage Add. :  
 Main Products : Valve, Yoke, Fork, Knuckle, Carrier

TEL : +82-55-552-3840

**PANASIA CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.worldpanasia.com  
 Main Products : Hi-level Alarm Sys. Tank level Gauge  
 TEL : +82-51-831-1010

**PI PLUS CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.pharmaidsolutions.com  
 Main Products : Rudder stock, Pintle, Intermediate Shaft  
 TEL : +82-51-831-9338

**POONG JIN METAL CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Emergency Shut-Off Valve, Veneral Bronze Casting Valve  
 TEL : +82-51-831-8510

**PSM CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.psmnc.co.kr  
 Main Products : Ring Flange, Shaft, Nozzle  
 TEL : +82-51-970-3000

**SAEJIN INTECH CO., LTD.**

Head Office : Kimhae Gyeongsangnam-do  
 Homepage Add. : www.saejinintech.com  
 Main Products : Emergency Towing, Arrangement, Universal Swivel Fairlead  
 TEL : +82-55-328-1458

**SAMBOO METAL CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.samboometal.com  
 Main Products : Wheel, Shaft, Hyd-Net, Hyd Coupling Bolt, Flange  
 TEL : +82-51-831-1478

**SAMGONG CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.sam-gong.co.kr  
 Main Products : Oil Purifiers, Ship Accommodation, Ladders  
 TEL : +82-51-200-3040

**SAMJOO ENG. CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. : www.sam-joo.co.kr  
 Main Products : Catering Furniture, Galley Hood, Laundry Equipment  
 TEL : +82-51-264-6677

**SAMJUNG MACHINERY.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Piston Rod, Cross Head, Inter Shaft  
 TEL : +82-51-832-0190

**SAM KWANG HI-TEC CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Rectangle Windows  
 TEL : +82-51-832-0177

**SAMSUNG NONFERROUS METAL CO., LTD.**

Head Office : Kimhae Gyeongsangnam-do  
 Homepage Add. : www.metalsamsung.co.kr  
 Main Products : Bushing, Liner, Sleeve, Pintle Bush  
 TEL : +82-55-329-1067

**SAMYANG METAL IND. CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. : www.cuniship.com  
 Main Products : W-NT 90/10 Flange, Elbow, Tee  
 TEL : +82-51-266-6655

**SAMYOUNG FITTING.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Elbow, Tee, Coupling  
 TEL : +82-51-832-0211

**SDK CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Winch, Hatch  
 TEL : +82-51-832-1882

**SEAPLUS CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.sea-plus.co.kr  
 Main Products : Low Pressure CO2, Fire Extinguishing Sys  
 TEL : +82-51-831-0119

**SEBO METAL CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.sebometal.co.kr  
 Main Products : Pump Tower for LNG, Vent Mast  
 TEL : +82-51-970-0200

**SEBO TECH CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Windwall, Heat Shield, Manual Hatch  
 TEL : +82-51-831-4171

**SEIL SERES CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.seilseres.com  
 Main Products : VRC system, ODME  
 TEL : +82-51-831-1858

**SEJIN BOLT CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Bolt, Nut & Be, Double Nut, Chard Nut, Hinge Bog  
 TEL : +82-51-831-9832

**SEUNG JIN E.N.G.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Pipe Spool (Steel)  
 TEL : +82-51-831-9050

**SEUN STEEL CO., LTD.**

Head Office : Jin-gu Busan  
 Homepage Add. : www.seunsteel.co.kr  
 Main Products : CR, HGL, CGL, EGL  
 TEL : +82-51-639-3200

**SEWOONG PRECISION MACHINERY CO., LTD.**

Head Office : Gangseo-gu Busan  
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 Main Products :  
 TEL : +82-51-831-0595

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 Homepage Add. :  
 Main Products : Water & Oil Strainer, Condensate Chlorination Tank  
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Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Spot Cooler, Heat Exchanger, Pressure Yeses  
 TEL : +82-51-831-7705

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Head Office : Dong-gu Busan  
 Homepage Add. : www.shindong.com  
 Main Products : Navigation Communication, Satellite Communication  
 TEL : +82-51-461-5000

**SHINHWA INTERIOR & TECHNOLOGY CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. :  
 Main Products : Marine Furniture  
 TEL : +82-51-441-1294

**SHINKWANG ACE ELECTRIC CO., LTD.**

Head Office : Kimhae Gyeongsangnam-do  
 Homepage Add. : www.skace.com  
 Main Products : Cable Tray, Accessories

TEL : +82-55-332-3315

#### **SHINMYUNG INDUSTRIAL CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Cable Tray Joint, Hanger  
TEL : +82-51-831-5061

#### **SHIN SHIN HEAVY INDUSTRIES CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Deck Machinery, Hydraulic system, Serface Treatment  
TEL : +82-51-832-0734

#### **SHIN SHIN MACHINERY CO., LTD.**

Head Office : Kijang-kun Busan  
Homepage Add. : www.sspump.com  
Main Products : Centrifugal Pumps, Gear Pumps, Screw Pumps  
TEL : +82-51-727-5300

#### **SHINWOO METAL CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.shinwoometal.net  
Main Products : Flange, Forging  
TEL : +82-51-831-2830

#### **SHIN YOUNG AIR CLUTCH.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.airclutch.co.kr  
Main Products : SY-CB Type, SY-VC Type, SY-E Type  
TEL : +82-51-831-7072

#### **SILLA METAL CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.sillametal.com  
Main Products : PROPELLER(F.P.P), C.PPROPELLER Blade & Hub  
TEL : +82-51-831-5991

#### **SIN HUENG FLANGE CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Flange for ship  
TEL : +82-51-831-6167

#### **SINWEOL GRATING CO., LTD.**

Head Office : Sasang-gu Busan  
Homepage Add. : www.steelgrating.net  
Main Products : Steel Grating for Ship  
TEL : +82-51-323-7000

#### **SM POWER TEC CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.smpt.co.kr  
Main Products : Vacuum Pump for Shipping Bldc, AC,DC Motor & Generator  
TEL : +82-51-973-0267

#### **SNP CO., LTD.**

Head Office : Saha-gu Busan  
Homepage Add. :  
Main Products : Galley Equipment, Cold Chamber, Catering Furniture  
TEL : +82-51-261-7711

#### **STACO CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.staco.co.kr  
Main Products : Wall Panel, Celing Panel, Unit Toilet, Marin Door  
TEL : +82-51-831-7000

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Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Welding Fittings (Butt Welding)  
TEL : +82-51-831-1274

#### **STASB CO., LTD.**

Head Office : Jinhae Gyeongsangnam-do  
Homepage Add. :  
Main Products : Marine Furniture, Door  
TEL : +82-55-544-8070

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Head Office : Saha-gu Busan  
Homepage Add. : www.stauff.co.kr  
Main Products : Hyd' System & Engineering, Hyd' Clamp & Test  
TEL : +82-51-266-6666

#### **STBEND CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.stbend.co.kr  
Main Products : SUS Pipe Fitting, SUS Bend  
TEL : +82-51-831-5131

#### **STEEL KOREA CO., LTD.**

Head Office : Jinhae Gyeongsangnam-do  
Homepage Add. :  
Main Products :  
TEL : +82-55-541-2212

#### **SUHHEUNG ENGINEERING CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.shge.co.kr  
Main Products : Steel Grating  
TEL : +82-51-831-1811

#### **SUNBO IND CO., LTD.**

Head Office : Saha-gu Busan  
Homepage Add. : www.sunboind.co.kr  
Main Products : Tank Top Unit, Engine Room unit, Sater Strainer Silenser  
TEL : +82-51-261-3454

#### **SUNG CHANG CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Non-Asbestos Gasket, Spiral Wound Gasket, P.T.F.E Gasket  
TEL : +82-51-316-6300

#### **SEOUNG HYUP MACHINERY.**

Head Office : Sasang-gu Busan  
Homepage Add. :  
Main Products : White Metal, Piston Lo  
TEL : +82-51-303-4112

#### **SUNG IL CO., LTD.(SIM)**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.sungilsim.com  
Main Products : Pipe Spool Pre-Fabrication, Induction Pipe Bending  
TEL : 82-51-831-8800

#### **SUNG KWANG M/C.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Oil Press, Pipe Vending, Pipe Fitting Unit  
TEL : +82-51-831-0620

#### **SUNGWON ELECTRIC CO.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Cable Tray, Starter, Panel, Cable Way  
TEL : +82-51-831-9230

#### **SUNG WON ENTERPRISE. CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.sungwonent.co.kr  
Main Products : V-Flow Swing Check, Valves, Manifold Unit  
TEL : +82-51-831-2140

#### **SUNIL INSTRUMENT CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.suniltech.co.kr  
Main Products : Tank Level System, Viscosity System  
TEL : +82-51-831-1994

#### **SUN KWANG P.S.P INC. CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Cargo Line, Ballast Line, Engine Room, I.G Line  
TEL : +82-51-831-3777

#### **S&W CO., LTD.**

Head Office : Saha-gu Busan  
Homepage Add. : www.snwcorp.com  
Main Products : Com Shaft, Valve, Seat, Piston Pin, Bolt, Nut  
TEL : +82-51-205-7411

#### **TAE HWA INDUSTRY CO.,LTD (THI)**

Head Office : Secho-gu Seoul  
Homepage Add. : www.thi.co.kr  
Main Products : Reciprocating & Screw, Compressor Unit, Brine/Water Chiller Unit  
TEL : +82-2-598-1126

#### **TAEHWA KALPA SEAL.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.taehwa1.com  
Main Products : TH3000, TH3000W  
TEL : +82-51-831-9944

#### **TAE KWANG INDUSTRIES.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.tkc.co.kr  
Main Products : Boiler, Oil Cooler / Heater, Shell & Tube Heat Exchanger  
TEL : +82-51-831-1801

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Head Office : Gangseo-gu Busan  
Homepage Add. : www.taeshin.co.kr  
Main Products : Co2 / Mag, Mig Arc Welding, Machine, Air Gouging  
TEL : +82-51-831-1100

#### **TAESUNG MACHINERY CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.taesungmc.co.kr  
Main Products : Manufacture of Structures, for Shipbuilding(LNG,LPG) and plant  
TEL : +82-51-971-4006

#### **TAEWON CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.twubc.kr  
Main Products : Flange, Strainer, Pressure  
TEL : +82-51-831-0310

#### **TAEWOONG CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.taewoong.com  
Main Products : Piston Rod/ Crown/ Head, Cross Head Pin  
TEL : +82-51-329-5000

#### **TAEWOONG TECH CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. :  
Main Products : Main Shaft, Connecting Rod, Inter Shaft, Propeller Shaft  
TEL : +82-51-831-6685

#### **TANKTECH CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.tanktech.co.kr  
Main Products : High velocity valve  
TEL : +82-51-979-1600

#### **TK CORPORATION CO., LTD.**

Head Office : Gangseo-gu Busan  
Homepage Add. : www.tkbend.co.kr  
Main Products : Fittings (Elbow, Tee, Reducer, Cap)  
TEL : +82-51-970-6600

#### **TMC CO., LTD.**

Head Office : Kimhae Gyeongsangnam-do  
Homepage Add. : www.besttmc.com  
Main Products : Membrane Sheets, Heavy Steel Corner, Anchor Strip  
TEL : +82-55-340-3000

#### **TYCO MARINE SERVICES KOREA CO., LTD.**

Head Office : Sasang-gu Busan  
Homepage Add. : www.dbefire.com  
Main Products : Fire Fighting System & Equipment  
TEL : +82-51-633-9100

#### **U-YOUNG PRECISION IND. CO., LTD.**

Head Office : Kimhae Gyeongsangnam-do  
Homepage Add. : u-nex.com/  
Main Products : Elec/Hyd. Windless, Elec/Hyd. Winch, Steering Gear  
TEL : +82-55-326-9691



**U-YOUNG & TECH.**

Head Office : Kimhae Gyeongsangnam-do  
 Homepage Add. : u-nex.com/  
 Main Products : Elec/Hyd. Windless, Elec/Hyd. Winch, Steering Gear  
 TEL : +82-55-326-9691

**WON KWANG VALVE CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.wonkwangvalve.com  
 Main Products : Marine Globe Valve, Marine Angle Valve, Marine Gate Valve  
 TEL : +82-51-831-9932

**WOONG CHEON OUTFITTING CO., LTD.**

Head Office : Jinhae Gyeongsangnam-do  
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 Main Products : Ship Component Parts, Painting, Deck Machinery  
 TEL : +82-55-545-2432

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Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Simplex Oil Strainer, Can Water Filter  
 TEL : +82-51-831-1531

**WOORYANG B&P IND CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.wooryangshot.com  
 Main Products : Deck Outside Monting Item, Engine Room Mounting Item  
 TEL : +82-51-831-5000

**Y.C.P CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. :  
 Main Products : Carbon Steel Precision, Tybe for Hydraulic Line

Service  
 TEL : +82-51-264-9300

**YESUNG IND. CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Rudder Carrier Housing, Complete Stern Tube, Rudder Horn  
 TEL : +82-51-831-5246

**YOOWON INDUSTRIES CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. : www.yoowonind.com  
 Main Products : Steering Gear, Deck Machinery, Auto Filter  
 TEL : +82-51-205-8541

**YOOWON M-TECH CO., LTD.**

Head Office : Saha-gu Busan  
 Homepage Add. : www.yoowonmtech.com  
 Main Products : Steering Gear, Windlass, Mooring winch  
 TEL : +82-51-265-1746

**YOUNGIL CNC.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products :  
 TEL : +82-51-831-9547

**YOUNG - IN ELECTRIC INDUSTRIES CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.younginele.com  
 Main Products : Electric Auto Control Panel, Welding Panel  
 TEL : +82-51-831-7910

**YOUNG NAM IND.**

Head Office : Saha-gu Busan  
 Homepage Add. :  
 Main Products : Wire lope drum, BASE PLATE ASS'Y

TEL : +82-51-264-7983

**YOUNGSHIN BEND CO., LTD.**

Head Office : Gangseo-gu Busan  
 Homepage Add. :  
 Main Products : Welding Fittings (Butt Welding)  
 TEL : +82-51-831-0316

**YOUNGSUNG AIR SYSTEM.**

Head Office : Gangseo-gu Busan  
 Homepage Add. : www.ys-airsystem.co.kr  
 Main Products : Heat exchanger, Plant  
 TEL : +82-51-832-0510

**YOUNHAP FASTENERS CO., LTD.**

Head Office : Kimhae Gyeongsangnam-do  
 Homepage Add. : www.younhap.co.kr  
 Main Products : Carbon Steel Precision, Tybe for Hydraulic Line Service  
 TEL : +82-51-264-9300

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Head Office : Gangseo-gu Busan  
 Homepage Add. : www.iyou Sung.co.kr  
 Main Products : Hot Dip Galvanizing of Marine.  
 TEL : +82-51-831-5482

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Head Office : Gangseo-gu Busan  
 Homepage Add. : www.yujincometal.com  
 Main Products : Bolt, Nut, Screw, Anchor, Washer  
 TEL : +82-51-314-0757

**YU KYUNG CO., LTD.**

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 Homepage Add. :  
 Main Products : Pipe Spool, Portable Tank Unit, Heating Coil Unit  
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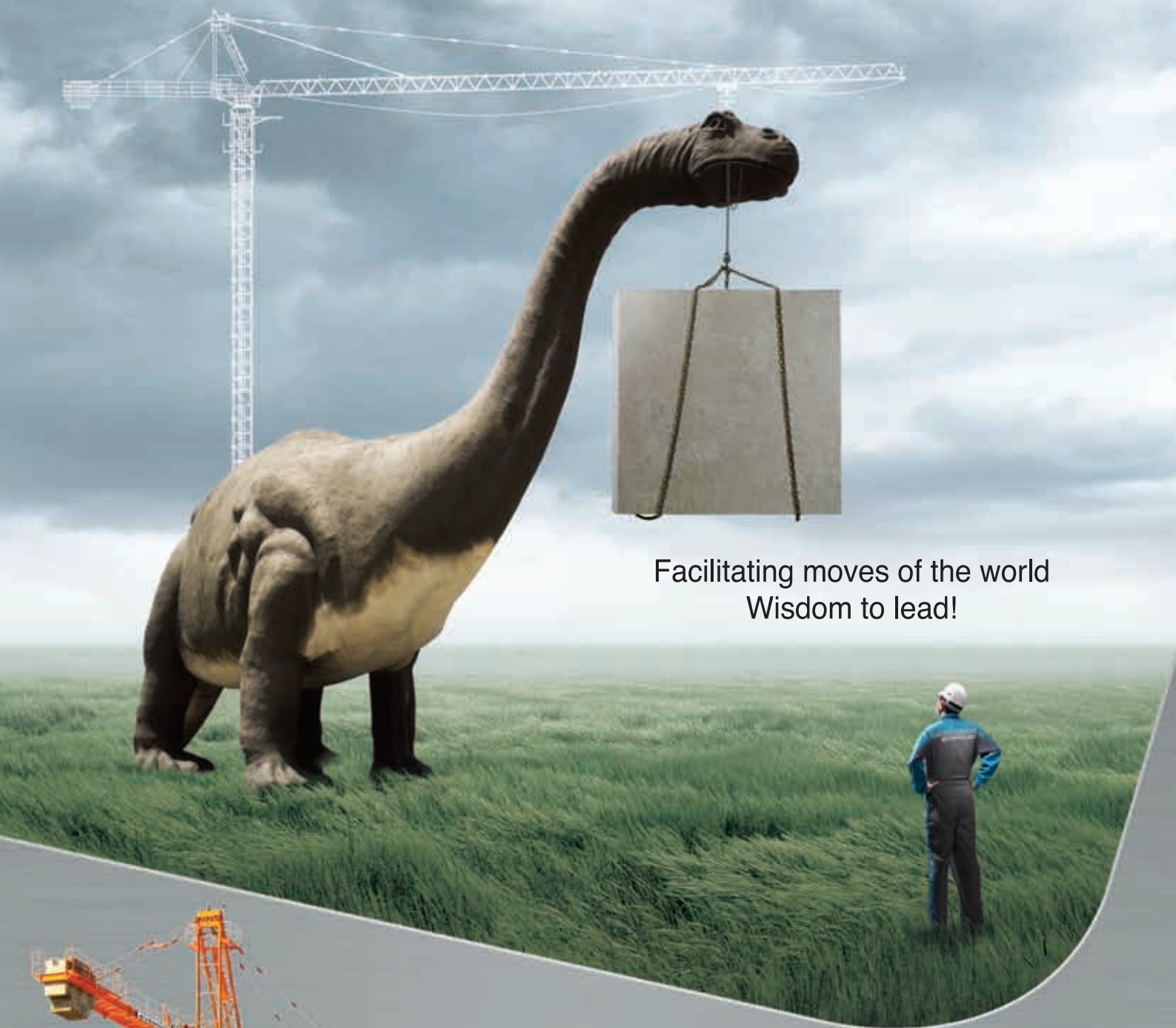
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## Features

- Oil-free compressed air
- Quick and easy maintenance
- Energy efficient design
- 24 / 7 Customer service



Model		SM 2000	SM 3000	SM 4000	SM 5000	SM 6000	SM 7000	SM 8000
Capacity	m <sup>3</sup> /hr	750 ~ 3,000	3,000 ~ 5,500	5,000 ~ 8,500	8,000 ~ 15,000	14,000 ~ 23,000	22,000 ~ 47,000	51,000 ~ 122,000
Motor	HP	125 ~ 20,000						
Discharge Pressure	Bar A	4.5 ~ 25						
Dimension(W x L x H)	M	1.5x2.6 x 1.9	2.1x4.4 x 2.1	2.1x4.7 x 2.2	2.2x5.2 x 2.1	2.3x5.8 x 2.6	4.4x8.0 x 4.3	6.5x13 x 7.0
Weight	Ton	3.4	7	9	12	18	40	140