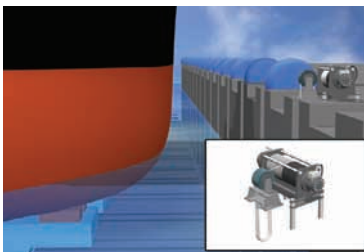
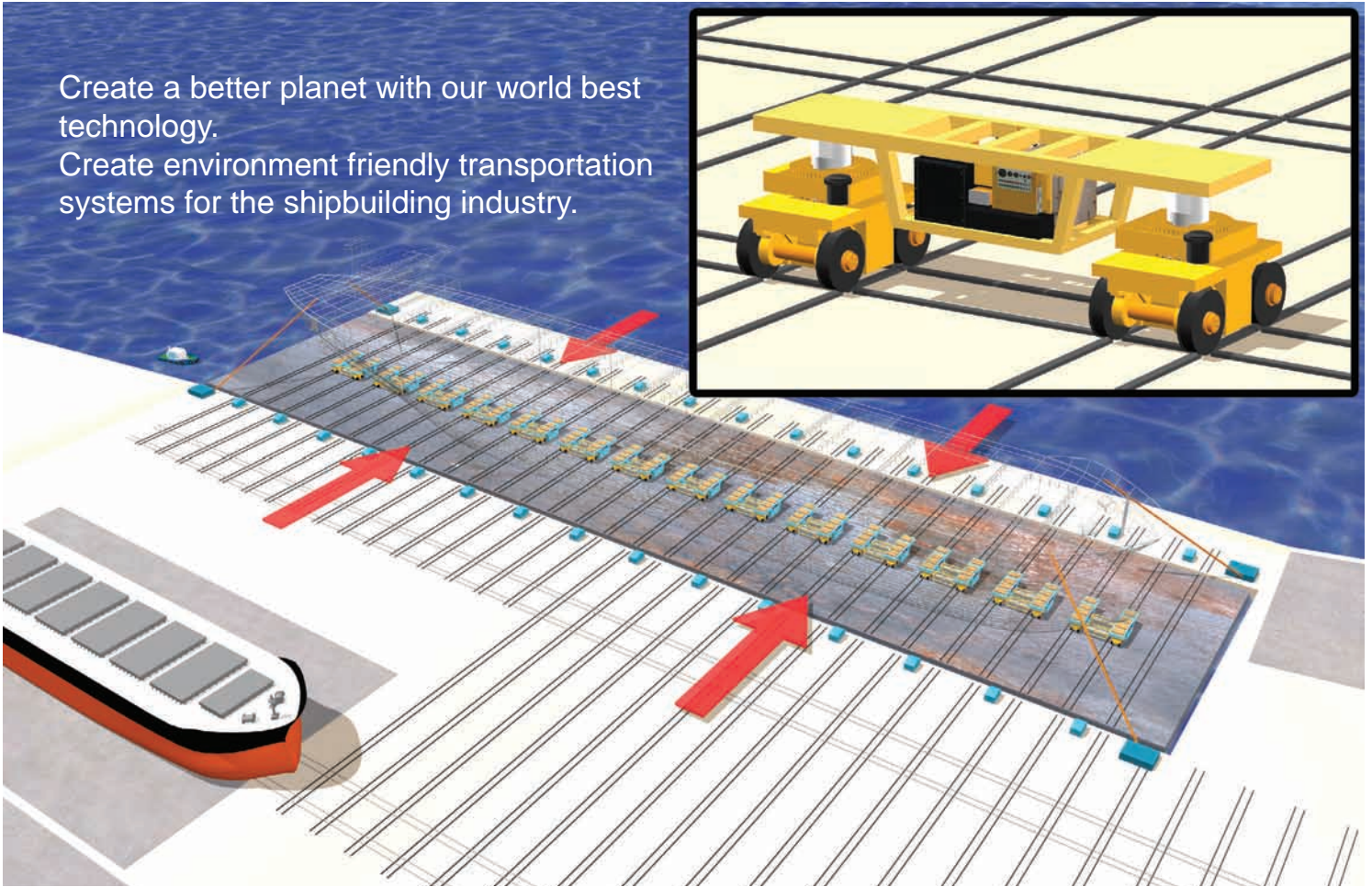
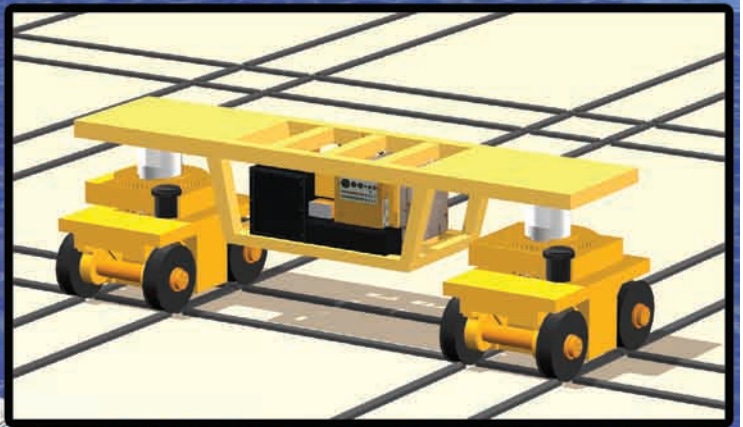


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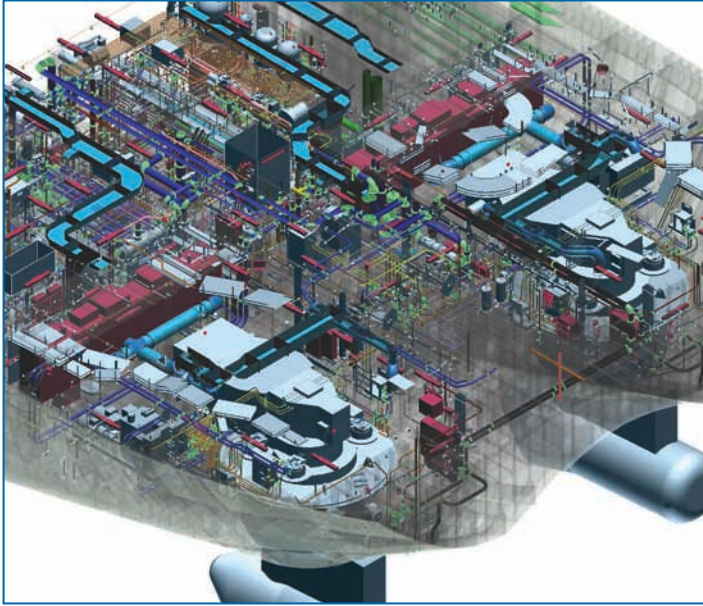
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KORMARINE 2011 will be open with great eclat at Busan Exhibition & Convention Center (BEXCO) , and Monthly KORSHIP will keep you updated with the latest news swiftly during the show as the official media of KORMARIE 2011 and we appreciate you cooperation in advance.

KORMARINE 2011 will run from October 26 to October 29 Busan Exhibition Convention Center (BEXCO) .

Our daily news will have a circulation of 10,000 every day during the show.

Contact Monthly KORSHIP or K. Fairs for inquiries or suggestions for the daily news article related to KORMARINE 2011 or advertisement in the print Edition. (Deadline Date: September 20th 2011)

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- Apr. 2006 Developed the world first GTS (Gripper-jacks Translift System)
- Aug. 2001 Established





HHI launched the 2,300-ton next-generation frigate

The frigate 'Incheon' was launched, which is a 2,300-ton next-generation guided-missile frigate (FFG) of Republic of Korea Navy (ROKN).

Hyundai Heavy Industries (HHI) held the launch ceremony on April 29 at its Ulsan headquarters for the new frigate no. 1, which was attended by many prominent officials, including HHI President & CEO Lee Jae-sung, Chief of Naval Operations Admiral Kim Sung-chan and his wife Moon Eun-sook, government and military officials from ROKN and DAPA (Defense Acquisition Program Administration), and about 150 people related to the construction of the new warship.

The new frigate christened Incheon on the same day was actually named after the Incheon Metropolitan City and launched at the dock of HHI by Mrs. Moon Eun-sook.

The frigate Incheon is the next-generation warship with enhanced attack and defense capabilities in anti-aircraft, anti-ship, and anti-submarine operations and is armed with short-range missiles, rapid-fire guns, long-range anti-ship missiles (LRASM), gun systems, anti-submarine helicopters, torpedoes, etc.



Frigate 'Incheon', a 2,300-ton next-generation warship built by HHI

In addition, all major equipments of this frigate were developed by domestic technology, including the combat system, cutting-edge three-dimensional radar system, main gun systems, anti-ship missiles, sonar and others, dramatically boosting the ability to detect and kill enemy submarines.

In addition, this frigate incorporates the stealth technology to minimize the exposure electromagnetic waves, infrared signature, and underwater radiated noise and increased the strength of hull to better protect the vessel from enemy attack or external impact.

Frigate Incheon measures 114m in length, 14m in width, and 25m in height, and has a maximum speed of 56km/h and a cruising range of about 8,000km.

Importantly, frigate Incheon is the first warship that will replace the existing fleet of frigates and corvettes after the launch of the first HHI-built frigate 'Ulsan' in 1980.

This frigate, commissioned by DAPA in December 2008, began to be built in March 2010 and is scheduled for delivery to ROKN by December 2012, and will carry out various missions such as the sea patrol mission, surveillance mission, maritime defence and security mission, sea route protection and others.

Meanwhile, HHI has successfully constructed a total of 57 warships, including 2 Aegis Destroyers, 3 KDX-II destroyers, 5 convoys, 3 submarines, 24 patrol/rescue ships, etc, since its delivery of Ulsan, the nation's first warship, in December 1980.

KMERI was renamed to KSMERI

Korea Marine Equipment Research Institute (KMERI) was renamed to Korea Shipbuilding & Marine Equipment Research Institute (KSMERI) on May 26.

That represents part of a broader effort to diversify into the marine market such as the offshore plant market, etc, including the existing shipbuilding market, and turn itself into a specialized research institute dedicated to the shipbuilding and marine equipment industry.

The KMERI's board of directors voted at a regular meeting in February, 2011, in favor of renaming the research institute. Following the vote, KMERI was renamed to MSMERI with the final approval of the Minister of the Ministry of Knowledge Economy (MKE), a branch of the Korean government, on April 4.

The offshore plant sector has been catapulted into the limelight as new blue ocean in the shipbuilding/marine industry recently amid the fossil fuel depletion and oil price hikes and was designated by MKE as one of the nation's 6 major leading industrial sectors. To ensure success, precise future strategies need to be mapped out and pushed forward at a national level.

To keep up with the current trends, KSMERI is poised to complete the Center for the testing & certification of marine and offshore equipments within Obi Industrial Complex in Geoje, and has made multi-faceted efforts to build competitiveness in the shipbuilding/marine industry including the existing merchant ship sector.

An official from KSMERI said, "We will proceed with advanced R&D, tests and certifications as technical and policy partner of



shipbuilding/marine industry in our endeavor to provide wider range of services to customers in shipbuilding/marine industry.”

The Oman ship repair yard of DSME delivers its first repaired vessels

Daewoo Shipbuilding & Marine Engineering (DSME) successfully returned the first 2 repaired vessels on May 7 to the state-owned Oman Drydock Company (ODC) currently being operated by DSME under the contract entered into for the operation and management of the ship repair yard in Oman.

ODC started its operations with the repair of 2 units of 6,000-ton vessels (Split Hopper Vessels) of Jan De Nul Dredging on April 25. These vessels were repaired for 12 days in the dock and quay wall of ODC, and ODC set off on the right foot completing the repair and the delivery within the time agreed upon with the ship owner.



The photo shows the SANTIAGO, a 6,000-ton ship of Belgium's Jan De Nul Dredging, repaired by DDC for the first time, before its repair.

ODC is a joint venture formed under the agreement signed between DSME and the Omani government in September 2006 to undertake the operation and management of Oman's ship repair yard. ODC became fully operational in April this year as originally planned after about 4 and a half years of construction and preparation, which is the first ship repair yard operated by any Korean shipbuilder in the Middle East.

ODC is an ultra large repair yard equipped with 2 units of 410m-long and 95m-wide dry docks occupying around 1.3 million m², which can accommodate Ultra Large Crude Carrier (ULCC) size, and residual oil (sludge) treatment facility and others.

This shipyard aims to develop into a large shipyard complex manufacturing offshore and onshore facilities, seizing the significant growth opportunities amid the increasing oil and gas field development projects in the Middle East, as well as ship repair and modification.

Located in Duqm, Oman, the center of Middle East, this ship repair yard is geographically well-positioned. Thus, the global shipping industry experts speculate that ODC will play a crucial role in creating a promising hub for the ship repair shipyards in the Middle East in the period ahead.

Nam sang-tae, CEO & President of DSME, was awarded Taylor Management CEO Prize



Nam sang-tae,
CEO & President of DSME

Nam sang-tae, CEO & President of Daewoo Shipbuilding & Marine Engineering (DSME), was awarded 'Taylor Management CEO Prize' in the International Symposium on the Business Philosophy in East Asia which was jointly organized by the Korean Academy of Business Historians and the Japanese Academy of Business Historians.

Kim Shin, Chairman of the Korean Academy of Business Historians, said, "We awarded this prize in recognition of his significant contribution to the creativity and innovation, the driving force behind DSME's leading global position notwithstanding the global financial crisis, based on the indigenous business model integrating Taylor's scientific management and the business philosophy of East Asia."

This prize was established in commemoration of the centennial of the Business Administration & Management Studies that had its beginning with the publication of Frederick Taylor's Theories of Scientific Management.

NI extends CompactRIO platform with new systems

Recently, National Instruments (NI) announced the release of the new NI cRIO-9075 and cRIO-9076 integrated chassis and controllers, which lower the cost of the NI CompactRIO platform for embedded control and monitoring applications. CompactRIO is powered by reconfigurable I/O (RIO) and NI LabVIEW FPGA technologies and combines an open embedded architecture with a small footprint, extreme ruggedness and a wide breadth of analog, digital, motion and communication I/O modules.

The new integrated systems combine an industrial 400MHz Freescale real-time processor and four-slot chassis with an embedded, reconfigurable Xilinx Spartan-6 field-programmable gate array (FPGA) for custom timing, control and signal processing capabilities. These NI RIO systems are programmable with LabVIEW graphical system design tools and combine the ease of use of commercial off-the-shelf (COTS) systems with the performance of custom hardware. By combining these new low-cost CompactRIO systems with the power and productivity of LabVIEW, engineers and researchers can prototype and deploy custom embedded control

and monitoring systems faster and at a lower cost without the need for large engineering design teams. The cRIO-9075 and cRIO-9076 are ideal for embedded control and monitoring applications within industries such as energy, medical and robotics that require a short time to market, advanced control algorithms and high-speed analog and digital I/O.

The new systems extend the NI RIO technology platform offering, which includes CompactRIO, PXI and PC hardware and features a shared standard embedded hardware architecture. By combining the platform's powerful floating-point processors, reconfigurable FPGA and I/O modules, NI RIO systems help improve time to market and lower development costs of machines and embedded devices. The combination of the NI RIO hardware platform with LabVIEW graphical system design software provides design teams with an easily reconfigurable embedded system, eliminating the need to design custom hardware for higher volume deployments and OEM applications. Additionally, engineers and researchers can further reduce time to market and improve system reliability by reusing the

same LabVIEW code in between prototyping and deployment phases. Offering a lower cost to the RIO platform, these new cRIO-9075 and cRIO-9076 systems help design teams not only get to market faster but also deploy at higher volumes more cost effectively.



NI cRIO-9075/9076

Marine equipment manufacturers in Busan, Ulsan, South Gyeongsang are poised to tap into foreign markets

The export plaza organized by Busan, Ulsan, and South Gyeongsang provincial government is slated for June 15 to 16, which aims to help marine equipment manufacturers tap into foreign markets and gain firm foothold. The event will be attended by the invited officials representing the 4 major Asian shipyards.

The export plaza was conceived by South Gyeongsang provincial government during the '7th Economic Officials Meeting of Busan, Ulsan, and South Gyeongsang provincial government (on November 10, 2010)' regularly held by the aforesaid 3 metropolitan governments and was launched as part of South Gyeongsang province's promotional campaign targeting foreign markets after Busan and Ulsan metropolitan governments joined in this endeavor. This is the first time that the 3 metropolitan governments join hands to help small and medium-sized businesses carve out new markets.

The export plaza will serve as a platform to introduce marine equipment parts of excellent shipyards to around 40 invited officials in charge of the purchase and design of marine equipments, as well as provide the export counseling, and thus can lead to tremendous export opportunities.

The export plaza for Chinese shipyards will open at the Haeundae Grand Hotel in Busan on June 16 to ensure ample opportunities for the participating companies based in Busan, Ulsan, and South Gyeongsang to discuss extensively with



the shipyards of respective countries.

The export plaza for the shipyards of Japan, India, and Singapore will open separately at Changwon Convention Center on June 16.

This export plaza will be co-organized by Busan, Ulsan, South Gyeongsang Provincial government, supervised by the Busan, Ulsan, South Gyeongsang regional offices of Small & medium Business Corporation (SBC), and sponsored by Busan Marine Equipment Corporation.

FLIR Systems Korea participated in the International Smart Grid and Electric Power Device Exhibition

FLIR Systems Korea captivated the audience with its excellent thermal imaging cameras during the 2011 International Smart Grid and Electric Power Device Exhibition held in Seoul from May 18 to 20. Specifically, FLIR Systems Korea unveiled

Thermal imager, Infrared Camera, etc, along with a broad range of new and old models such as 'FLIR i3/i5/i7', 'FLIR E40/E50/E60', 'FLIR T335/T/425', etc, and showcased demonstrations to prove the superiority of its products.

FLIR Systems is a world leader in the design, manufacture and marketing of thermal imaging, and develops and produces a vast array of imaging applications including the border and maritime patrol, manufacturing process control, navigation safety, environmental monitoring, etc.

On May 18, the first day of the event, Korea Electric Power Corporation (KEPCO) and MDS Technology examined the power distribution system using the thermal imaging camera of FLIR Systems and gave presentations in relation to the examples of success involving the applications of the thermal imaging cameras to the monitoring of fire on conveyor belts.

FLIR Systems Korea will plans to actively participate in exhibitions related to the electricity, security, etc, and constantly offer

examples of success involving the application to various industrial fields in a bid to stress the superiority of its products.

Technology Exchange Center of shipbuilding/maritime and IT convergence was launched

Gyeongnam Techno Park IT convergence project group and GyeongnamU-IT Association held the opening ceremony for the Technology Exchange Center of shipbuilding/maritime and Information Technology (IT) convergence in Gyeongnam Regional Small and Medium Business Administration on May 2.

The Technology Exchange Center was organized in March to promote convergence between shipbuilding/maritime industry and IT. It aims to transform the shipbuilding industry, the key industry of Gyeongnam, into a high value-added industry through the convergence with IT and revitalize the local economy.

Additionally, Technology Exchange Center announced that it would embark on full-fledged activities such as the market research on the market related to the convergence of shipbuilding/maritime and IT, information exchange, survey on the trend of technology and customers' needs and preferences, promotion of friendship, etc.

This event was attended by around 40 people, including Professor Kim Yeong-hoon at Kyungnam University, Chairman of the Technology Exchange Center, and officials from Gyeongnam Techno Park, STX Engine, Postech, Hyosung Good Springs, and others.

Professor Kim Yeong-hoon remarked in his greeting address, "The Technology Exchange Center needs to take a leading role in developing the future engine of growth through the convergence between the key industry of Gyeongnam and IT in



Booth of FLIR Systems Korea at the 2011 International Smart Grid and Electric Power Device Exhibition



line with the recent trend towards inter-industrial and technological convergence which has emerged as a new paradigm for the advancement of industries. By doing so, Gyeongnam Province will become the key driver for the nation's economic

growth."

During the event on the same day, Kim Hyo-jung, Chairman of GyeongnamU-IT Association, gave a presentation on the measures for the collaboration between large companies and SMEs (small and

medium-sized companies) and direction of shipbuilding and IT convergence in the period ahead, which revolved around the theme 'convergence of shipbuilding/maritime and IT in large companies'.

MLTMA approved the establishment of 'Northeast Asia no. 38 Ship Investment Company'

Ministry of Land, Transport and Maritime Affairs (MLTMA) approved the establishment of 'Northeast Asia no. 38 Ship Investment Company', the private ship fund, on May 18.

This fund will raise approximately KRW 33 billion to purchase 1 unit of 57,000-ton bulk carrier (shipyard: STX Dalian) and charter it to Postech for 5 years on the BBCHP (Bare Boat Charter with Hire Purchase) condition. 60% of the purchase amount will be bor-

rowed from the National Federation of Fisheries Cooperative (Suhyup Bank), and another 30% will be paid out of the private equity fund invested by domestic institutional investors. The remaining 10% will be paid by Postech to protect investors from the declining ship prices in case that the market conditions worsen.

Postech plans to enter into a subcharter contract with blue-chip shipping companies such as STX Pan Ocean, etc, for a

period exceeding that of fund's existence (5 years) at a level where overall costs, such as the high priority principal and interest, low priority dividends, ship management costs, etc, can be guaranteed.

The investors in the fund will be paid out 8.6% in fixed dividend until maturity.

Northeast Asia no. 38 Ship Investment Company will be operated by Korea Marine Fund Corporation.

Siemens PLM Software introduces next generation of social product development built on Microsoft technology

Siemens PLM Software, a business unit of the Siemens Industry Automation Division and a leading global provider of product lifecycle management (PLM) software and services, recently announced that the community collaboration capabilities built into its Teamcenter software now support Microsoft SharePoint 2010, further expanding popular social networking concepts into the product development process.

Through its strong alliance with Microsoft Corp. and its own internal development, Siemens PLM Software is introducing the next generation of social product development and helping manufacturers enhance collaboration among their employees, sup-

pliers and customers to streamline the introduction of new products using corporate social networks.

"Working side-by-side with our own development team, Siemens PLM Software has done an outstanding job of weaving Teamcenter into the fabric of SharePoint 2010 in a way that feels seamless and natural to the end user," said Sanjay Ravi, managing director, Worldwide Discrete Manufacturing Industry, Microsoft. "As a result, manufacturing companies using Teamcenter with SharePoint 2010 can boost productivity in all departments - not just engineering - while they use social networking technology to collaborate with

clients."

As the world's most widely used PLM system, Teamcenter manages the product and process data for many of the manufacturing industry's most sophisticated products. Through its long standing alliance with Microsoft, Siemens PLM Software has been able to progressively integrate Teamcenter capabilities into its customers' standard desktop environment, significantly expanding its usability into all departments throughout a wide variety of industry segments.

"Companies are applying the concepts and lessons learned from social networking to connect people and enhance busi-



ness interaction,” said Jim Brown, president and founder of Tech-Clarity, an independent research and consulting firm. “This shift towards corporate social networks promises significant business value, particularly as social computing technologies are applied to PLM.” With the release of the Teamcenter community collaboration capabilities on SharePoint 2010, Siemens PLM Software

and Microsoft continue to expand the value of PLM in a digitally connected world. For example, teams can increase their productivity by coordinating their daily activities through shared project workspaces enhanced with social networking tools such as wikis, blogs, profiles, surveys and more.

“Siemens PLM Software and Microsoft have been helping product development

organizations share data and collaborate for years,” said Steve Bashada, vice president of Teamcenter Applications, Siemens PLM Software. “With today’s announcement, we are further harnessing the power of corporate social networking concepts, and helping our customers transform the challenges of working with globally distributed product development teams into a competitive advantage.”

STXOS delivered its first drillship

STX Offshore & Shipbuilding (STXOS) successfully constructed its first drillship. STXOS held an hand-over ceremony for its drillship christened ‘Noble Globe Trotter’ at the STX Dalian Shipbuilding Complex in China on May 18, which was attended by Jang won-gab, Vice-Chairman of STX Dalian, Hans Deul, Vice-President of Noble Drilling Holdings, and related officials. This drillship is the first order awarded to STXOS in 2008 and the first offshore plant built at STX Dalian shipyard. This newbuild drillship which measures 189m in length, 32.2m in width, 18.9m in height can accommodate 180 people and has a maximum speed of 12 knots. This drillship can operate at a maximum water depth of 10,000 feet with the drilling capacity of 40,000 feet.

Outfitted with the DP 3 class Dynamic Positioning System (DPS) which is compliant with the requirements of International Maritime Organization (IMO), this drillship meets the highest safety standards.

With the successful delivery of this drillship, STXOS has gained firm foothold in the offshore plant sector that require advanced technologies and is expected to win addi-

tional orders in the drillship sector as the demand for drillships have been pushed up amid soaring oil prices.

Meanwhile, STXOS received an order for a drillship, the same type of vessel delivered this time, from Noble Drilling Holdings in August last year, which is currently under construction in STX Dalian shipyard.

Hans Deul, Vice-President of Noble Drilling Holdings, said, “I am delighted at the successful completion of the first drillship project undertaken by STXOS, and anticipate

close cooperative relationship.”

Jang won-gab, the Vice-Chairman of STX Dalian, said, “Using the successful delivery of drillship this time, we expect even closer relationship of cooperation with Noble Drilling Holdings. STXOS will exert more efforts to deliver the highest quality ships of all kind to ship owners, including merchant ships, offshore plants, etc, by leveraging our global production network that connects Korea, China, and Europe.”



STXOS held an hand-over ceremony for its first drillship at the STX Dalian Shipbuilding Complex in China on May 18. The photo shows Hans Deul (second from the left in the front row), Vice-President of Noble Drilling Holdings, and Jang won-gab (third from the left in the front row), Vice-Chairman of STX Dalian.

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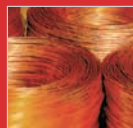
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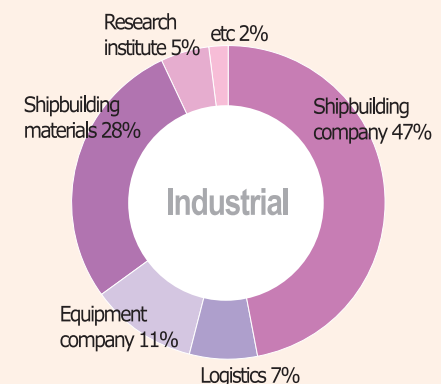
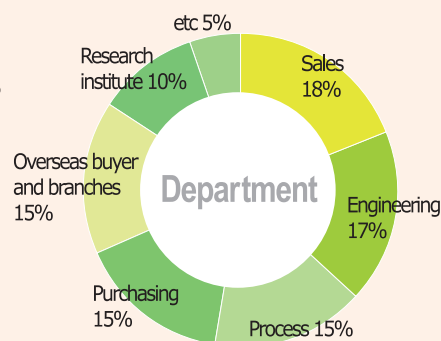
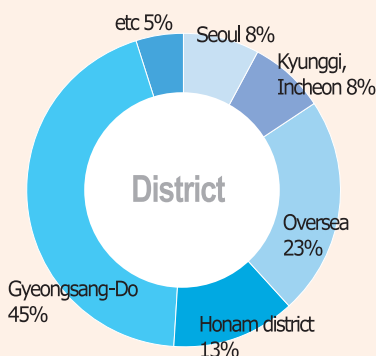
Product

New shipbuilding industry products overview

Business News

Issues and news articles from global shipbuilding companies and organizations

Detailed area breakdown





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Major domestic shipyards enjoy strong tailwind of green growth in the wind power market (2)

Hyundai Heavy Industries (HHI) won an order last month to build a wind farm in Finland with a combined capacity of 16MW and has become the first domestic company that successfully entered the European market. Subsequently, it has added fresh momentum to its advancement into Chinese market, the world's largest wind market.

Daewoo Shipbuilding & Marine Engineering (DSME) is also making steady progress into the wind power market as DeWind, its subsidiary, clinched an order for 5 units of 2MW wind turbines from Wind Energy Institute of Canada (WEICAN), Canada's largest research institute dedicated to the wind power sector.

Major domestic shipyards have expanded into the wind power industry, the future growth engine, since around 2008 and have actively moved ahead with their business, striving to evolve into comprehensive heavy industrial companies.

Key factors behind domestic shipbuilding heavyweights' drive into the wind power market is its tremendous growth potential large enough to eclipse shipbuilding market in future and the inter-connection between the shipbuilding and wind turbine technologies.

Domestic shipyards - which have built strong competitive advantage in offshore facility sector through their several decades of works in shipbuilding and offshore plant construction, etc - are poised to capitalize on new opportunities created in field of offshore wind power recently in the spotlight as effective option to overcome the limit of onshore wind power.

DSME aggressively targets North American market through its subsidiaries

As the New Year 2011 dawned, Daewoo Shipbuilding & Marine Engineering (DSME) announced in its New-Year's address that it set a target of a total of KRW 40 trillion in sales in 2020 and would evolve into a comprehensive heavy industrial company. For that, DSME indicated that it would focus on modular centric onshore plants, power generation systems built with CO₂ capture technology, and wind power industry, the core business of future.

DSME has been slightly slower in entering the wind power market compared to other shipyards. To catch up with them, DSME has made drastic investments like acquiring DeWind, a U.S.-based wind turbines manufacturer, in August 2009 and building a wind turbine manufacturing plant in Canada.

DeWind, a subsidiary of U.S.-based Composite Technology Corporation, has specialized in the design of wind turbines, development of technology, and marketing since it was established in 1995 in Hamburg, Germany, the hub of the world's largest wind power industrial cluster. In 2006, DeWind relocated to the United States to target the U.S. market.

DeWind developed wind turbines with the power capacity of 750W, 1.5MW, and 2MW, and has an extensive track record of having sold and installed 710 wind turbines with an combined capacity of 760MW in Europe, China, Latin America, United States, etc.

Technology development and market validation in power industry is costly and time-consuming. However, DSME has shortened the duration of market validation that usually lasts



View of the wind farm in Little Pringle LL located in the Texas Panhandle. DeWind supplied 10 units of 2MW wind turbines to this region in July 2010.



D8.2, the 2MW wind turbine installed in Cuxhaven located in Niedersachsen, Germany

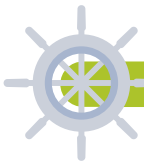
5 to 6 years with the acquisition of DeWind and possesses independent technology. Therefore, DSME could secure major supply chains without facing regional constraints when entering the market.

Subsequently, DSME established DSTN (DSME Trenton), a joint venture dedicated to the development of wind turbines, in March 2010 with Nova Scotia Province of Canada with an investment of CAD 40 million. DSME holds a 51% stake while Nova Scotia Province holds a 49% stake in the joint venture.

DSTN acquired a rail car plant of TrentonWorks located at Pictou County northeast from the Halifax, the capital city of Nova Scotia, and has been remodelling the plant into a wind turbine manufacturing plant.

When this plant begins full-scale production upon completion of remodelling in May, it will have an annual production capacity of up to around 600 units of blades for wind turbines and about 250 wind towers which can generate a total of CAD 230 million in sales.

Previously, this plant manufactured rail cars until 2007 and therefore can be operated without having to separately make large-scale investment in facilities. Furthermore, this plant is



DSME acquired DeWind, a U.S.-based wind turbine manufacturer. The photo shows Nam Sang-tae, President & CEO of DSME, and Benton H Wilcoxon, Chairman & CEO of CTC, in a ceremony to sign the acquisition deal held in Los Angeles in October 2009.



DSME signed a contract with Nova Scotia Province of Canada on March 5 to establish a joint venture for the production of wind turbines. The photo shows Nova Scotia Premier Darrell Dexter, the second from the left.

situated at a location ideal for wind turbine manufacturing plant with easy access to onshore/offshore transportation networks such as railroads, ports, etc.

Along with that, DSME entered into a Memorandum of Understanding (MOU) with Nova Scotia Power Inc. (NSPI) to supply wind turbine systems, thus gaining a stable market with steady demand. The focus of this MOU is to ensure:

- The new joint venture between DSME and Nova Scotia Province is the priority purchaser of the wind turbine systems that NSPI needs.
- Both companies jointly build a wind farm along the Atlantic Coast
- Both companies also cooperate on the tidal power generation by taking advantage of the characteristics of this region with great difference in water level between high and low tide.

By entering into the MOU, DSME gained a stable market with steady demand and can capitalize on wide range of business opportunities related to renewable energy in the North America. Particularly, the North America is a promising market expected to achieve an annual average growth rate of 17%.

DSME plans to expand further into other international markets such as Europe and China, propelled by the momentum of success in leveraging the synergy between DeWind and new venture created with Nova Scotia Province to lay the groundwork for stable business in the North America. On that basis, DSME plans to become one of the world's top 10 wind tur-

bine manufacturers by 2015 and join the rank of the world's top 3 wind power manufacturers with a global market share of 15% by 2020.

Meanwhile, DeWind has continued smooth sailing, winning USD 30 million order for wind turbines from the U.S.-based Little Pringle LLC in March 2010 and another order for 5 wind turbines from the Wind Energy Institute of Canada (WEICAN) in April this year.

Moreover, DeWind plans to supply a total of 50 wind turbines by the second half of 2012. Of the 50 units, 10 units will be sent to Frisco wind farm in Texas, United States, and the remaining 40 units will be delivered to Novus wind farm in Oklahoma, United States.

Currently, DeWind has an order backlog of 55 wind turbines worth approximately USD 130 million. DeWind will have a track record of supplying a total of 65 wind turbines if the 10 units headed to the Little Pringle in Texas upon acquisition of DeWind in September 2009 are included. That marks the most extensive track record of supply among Korean turbine manufacturers.

The 2MW-class D8.2 model that DSME supplied to Little Pringle has a simplified power transmission system to generate electricity without converter and therefore can be operated in extreme or harsh environments such as highlands located at an altitude of over 4,000m or low temperature regions.

An official from DSME said that by changing the power transmission system DSME's sales operation will not be influ-

enced by GE which holds the largest number of patents related to the wind power in the United States.

Nam Sang-tae, President & CEO of DSME, remarked, "Winning a series of orders consecutively in the wind power market recently and fully-prepared to begin full-scale operation of the wind turbine manufacturing plant in May, DSME has laid the cornerstone for development into one of the most prominent wind turbine manufacturers in the North America. DSME has also laid the stepping stone for taking a giant step forward in transforming into a comprehensive heavy industrial company by 2020 and successfully advanced into the energy sector at the same time."

Meanwhile, an official from DSME said, "By 2020, the global wind power market is expected to reach approximately 55,000MW, of which DSME plans to produce 8,300MW. Particularly, DSME will lead the offshore wind power market, bolstered by its extensive experience that it has amassed while constructing the world's largest floating facilities in the offshore sector."

Wind power which generates high quality power has great potential for growth and is expected to play a pivotal role as future growth engine if combined with the advanced offshore technology of DSME.

Meanwhile, DSME established the Future Research Center in 2008 and has proceeded with researches related to renewable energies including offshore wind power.

STX expects synergic effect among its subsidiaries

STX Group has moved forward with green business since late 1990s and played a leading role in constructing Haengwon wind farm in Jeju province since 1999. In 2008, STX Group supplied 5 units of 3MW wind turbines to Hangyeong wind farm of Korea Southern Power in Jeju province, which marked the first supply of 3MW wind turbine in Asia.

SXT has brought its extensive experience in Engineering, Procurement and Construction (EPC) in presently carrying out the second phase of installation in Seongsan wind farm in Jeju province, and in the process, STX will supply 4 units of 2MW wind turbine systems to Korea Southern Power.

In May 2009, STX announced its mid to long-term vision of management with an aim to turn green industry into a pivotal growth engine and achieve KRW 6 trillion in sales from related field by 2015, fully embarking on the quest to go green.

Specifically, STX put forth 'Value Creative Green Pioneer', its mid to long-term vision of green industry, and will press ahead with the new vision until 2015. Furthermore, STX has placed its primary focus on renewable energy and green business such as solar power, wind power, water treatment, low carbon technology and others.

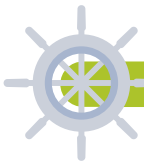
In July 2009, STX acquired the entire stake of Harakosan Europe B.V (renamed to STX Wind Power in October 2009), a Netherlands-based manufacturer of wind turbines for power generation, for around KRW 24 billion, thus laying the corner-



STX acquired Harakosan Europe B.V, a Netherlands-based wind turbine manufacturer, on July 29, 2009. The photo shows STX Heavy Industry President Yeo Hyeok-joing (right) and Harakosan Europe B.V. CEO Masakatsu Sonoda.



STX signed a MOU with a MOU with a Polish wind power consortium to develop wind farm with a combined capacity of 220MW worth EUR 300 million in the Eastern Europe in just 6 months after its advancement into wind power sector.



stone to become the world's leading wind power company. Harakosan Europe B.V, established in 1979, is a wind turbine manufacturer which has developed original technologies for wind power generation and holds essential patents related to wind power generation. Furthermore, Harakosan Europe B.V operates R&D center in Netherlands and therefore is expected to create huge synergic effect with STX in the field of technology development and marketing.

Using its acquisition of STX Wind Power as springboard, STX plans to secure original technology related to onshore and offshore wind turbines and lay the groundwork to become the domestic leader in wind power sector by leveraging its wind turbine installation and maintenance/repair technology that it has amassed so far. Particularly, STX is poised to focus on research into offshore wind turbines in a bid to acquire patent right to corrosion-prevention technology, etc, necessary for

installing wind turbines that suit offshore power generation and plans to install 1 offshore wind turbine off the coast of Jeju province in 2011.

As a result, STX has completed establishing an appropriate level of value chain that enables participation in entire area of wind power business encompassing the parts, equipments, installation, and operation. Besides, STX Energy supplied 1 wind turbine with a capacity of 2MW to a wind farm in Wolryeong-ri, Jeju province, in July last year, currently operated by private-sector.

Additionally, STX plans to invest over KRW 100 billion in the construction of plants and R&D in order to pave the way for its transformation into a global leader in the wind power industry.

Meanwhile, STX is showing strong performance in international wind power market, as well as domestic market.



Wind turbines installed by STX Heavy Industries in Saemangeum Industrial Complex



2MW wind turbine produced by STX Wind Power



Wind turbine in Wolryeong-ri, Jeju province, which has been in commercial operation by STX Energy since July last year

In December 2009, STX signed a contract with Atra Eco, Romania's independent power producer (IPP), to supply 6 units of 2MW wind turbines, the first contract that STX clinched after its acquisition of Harakosan Europe B.V.

The 6 units of 2MW wind turbines ordered to STX are large facilities with blades measuring 70m and 80m-long towers and were installed off the coast of the Black Sea in the Constata region of Romania in late 2010.

Following that, STX entered into a Memorandum of Understanding (MOU) in December of the same year with a wind farm consortium - comprised of the Poland-based BCG (Business Consulting Group) and Green Energy, etc - to build a wind farm with a combined power capacity of 220MW.

By signing the aforesaid MOU, STX will consecutively supply and install a total of 140 units of the latest gearless 2MW and 1.5MW wind turbines in Eastern European countries such as Poland, Romania, Czech, and Bulgaria from 2010 to 2013.

This wind farm development project aims to build independent wind farms in Eastern Europe, which consist of wind turbines of various capacities ranging from 40MW to 120MW. Particularly, the latest wind turbines of STX ensure high efficient power generation even in the low wind speed area and simplify repair and maintenance and therefore have been touted as suitable for weather conditions of the Eastern Europe where the annual wind speed is in the range of 6 to 7m/s.


In January 2010, STX entered into a MOU with Main Wind, a Netherlands-based wind farm developer, on a turnkey project for the supply 25 units of 2MW wind turbine systems to Turkey, Netherlands, and Iraq, including the maintenance

and repair.

Under the deal, the wind turbine systems will be delivered on a staggered basis from the 4th quarter of 2010 to late 2011. Particularly, the wind turbines with a combined capacity of 12MW to be installed in Iraq are part of wind power pilot project driven forward by the autonomous government of Iraq's Kurdistan region and the first wind power systems that will be installed and operated in Iraq.

Thus, STX has looked beyond the Romania and Eastern European markets and tapped into new markets in Turkey and Iraq, successfully entering the global wind power market. STX plans to leverage the synergic effect among its subsidiaries, such as STX Heavy Industries, STX Wind Power, etc, - which specialize in renewable energy sector such as wind power and solar power - to build up global competitiveness in the green business which STX is vigorously developing as new growth engine for the STX Group.

Particularly, an official from STX stressed, "STX will diversify its business portfolio by developing wind farms abroad, exporting wind turbines, and advancing into offshore wind power sector, and evolve into the world's 7th largest wind power company raking in sales of KRW 1.5 trillion from the wind power sector alone in 2015."

Meanwhile, STX Wind Power has accelerated its development of 3MW and 5MW offshore wind turbines, along with high efficiency 2MW wind turbine, a new model capable of high efficient power generation even in the low wind speed area. 

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Honeywell conquers the marine market with innovative control technologies

Joe Spirito, Sales Director, Honeywell Asia Pacific

Honeywell with a long history dating back to 1886, has been a leader in the industrial automation sector providing automation control solutions and applications that enhances productivity, safety, and economic efficiency. Recently, Honeywell has been in the limelight recently as it ramps up efforts to provide even wider range of offshore applications and services built on its innovative measurement and control technologies.

Q : Please provide a short overview of Honeywell.

A : Honeywell Marine is a part of Honeywell Process Solutions, a pioneer in the field of industrial automation. For more than 30 years we have specialized in delivering leading-edge process control solutions, equipment and services designed to optimize customers' business performance.



Founded in 1886, Honeywell today employs more than 122,000 people across 870 direct offices in over 100 countries.

Q : How has Honeywell pushed ahead with its business in the shipbuilding sector? What was the background that led Honeywell to be interested in the shipbuilding sector?

A : Companies involved in marine and offshore operations are increasingly faced with rising fuel costs, unforeseeable safety and security hazards, and a host of compliance issues. Understandably, these challenges create an extreme environment for the engineer to develop a sound operating strategy. As a global leader in advanced technology products and services, we entered this business because we saw the opportunity for us to provide marine owners and operators with solutions that enable them to improve productivity and safety, lower operating costs, and capitalize on key business opportunities.

Q : What are the solutions and products offered by Honeywell in the shipbuilding sector? And please elaborate on their features.

A : Honeywell Marine offers a number of solutions that can be supplied either as individual applications or as integrated solutions. Our customers benefit from a wide range of resources and technology that include:

- **Level gauges:** For more than 40 years Honeywell Marine has specialized in precision level measurement systems for marine applications. Our HERMeTic series includes world-class portable tank gauges for calibration and verification of

automatic gauging systems, as well as thermometers, valves and accessories.

• **Samplers:** HERMetic portable gauging and sampling equipment is an important tool for inventory control and cargo inspection during custody transfer.

• **Valves:** HERMetic compact valves are specially designed to support all portable HERMetic equipment with advanced, quick-connect features. They ensure safe and reliable operation of all portable HERMetic units certified for use in classified areas.

• **Thermometers:** Designed for use in hazardous environments, the HERMetic OneCal is an intrinsically safe, portable digital thermometer for custody transfer, inventory control and verification of automatic systems. Typical applications are found on tankers and barges.

• **Accessories:** Customers can choose from a variety of accessories to help fulfill IMO requirements for tanker safety and pollution prevention, including portable hand dipping, gas sampling and gas pressure measurement devices.

• **Measuring and gauging systems:**

-Radar level gauging which can be used on all vessels

-CARLA system for cargo tank high level alarm and overfill protection

-PRAPA system for protecting pump bearing rooms, as well as the pump room atmosphere

-GASBAL system for in-line analysis of explosive gas concentration in ballast tanks and void spaces

-VAPMA system for oxygen and pressure monitoring in cargo tanks

-VECPA system for vapor return line monitoring

-WIDS system for water ingress detection in cargo holds or void spaces

• **Fire and safety systems:** We offer decentralized or centralized fire and smoke detection solutions for small or large installations. Customers can purchase a single hardware and software package tailored to their unique requirements, including analog fire alarm systems with new intelligent alarm evacuation and environment adjustments.

• **Gas detection systems:** Our latest sensor solutions provide reliable detection of toxic gases, combustibles and oxygen hazards. Portable, fixed and standalone gas detectors are designed for ease of use, intuitive operation and low cost of ownership.

• **Security management systems (CCTV):** Honeywell Marine offers security management solutions integrating

access control, video surveillance and intrusion detection, as well as network protection and control systems. As a result, security breaches or safety incidents are reported simultaneously to offshore platform operators, security personnel and onshore security offices. Applicable to anti-pirate measures.

Q : What is the track record of Honeywell in the development and deployment of applications targeted to the shipbuilding and maritime sector?

A : Honeywell Marine is an experienced solutions provider across the entire maritime industry with a portfolio that includes projects spanning LNG onshore liquefaction, re-gasification, carriers, and floating production assets. We have executed more than 150 Main Automation Contract projects on time and on budget and maintained customers' systems for over 30 years.

Our solutions and technologies aside, the global availability of suitable and experienced Honeywell engineers, project managers and support personnel has also been a significant contributor to both our growth and our success. At present, Honeywell Process Solutions is executing projects globally worth over USD 2 billion.

Q : What were the achievements of Honeywell in the shipbuilding and maritime sector in 2010?

A : I am proud to share that in 2010, Nautical Control Solutions appointed Honeywell Marine as an official distributor of its FuelTrax marine fuel management system. The growing demand for accurate fuel monitoring and accounting led us to search for an industry leading solution to add to our portfolio. FuelTrax is an excellent addition to our existing tank management systems that will allow us to provide even greater benefits to our customers.

Q : What is outlook for the market and your growth target/marketing strategy to achieve that goal in 2011?

A : More than ever before, marine owners and operators today require solutions that not only allow them to control and monitor their assets, but also ensure that they remain compliant with regard to security, safety, commercial, regulatory and environmental functions. To that end, throughout the industry, we are increasingly witnessing widespread recognition and understanding of the vast array of benefits that automation technologies can deliver to shipbuilding operations.



Nevertheless, we are not resting on our laurels just yet. Through our combination of expertise and innovation, we remain dedicated to helping our customers further improve productivity and safety, lower operating costs, improve asset utilization, and boost profitability.

Q : How much importance does the shipbuilding sector take in the major business of Honeywell and what is your strategy for growth in the period ahead?

A : The shipbuilding sector is a major component of Honeywell Marine's business. As we developed our strategy for continued growth within this sector, we made sure to align it with the fundamental concerns of both ship builders and owners. For the former, they are forced to respond to increasingly tougher competition. Owing as such, we remain relevant through the provision of one-stop solutions that improve their business performance and bottom-line results by minimizing vendor relationships.

We are also continually developing solutions to emerging applications such as LNG FPSO. With ship owners, we stay competitive by innovating to help them minimize operation costs, ensure regulatory compliance and reduce human error, respond to market opportunities, manage aging assets, and integrate their businesses and systems.

Q : What do you think are the trend and outlook of automation technologies applied to shipbuilding recently? Does Honeywell have counter measures to cope with those changes?

A : With regard to growth and capital projects, competition from low-cost shipyards is definitely on the rise. There is also a greater prevalence of modular, global construction methods, as well as new vessel types and fuels. On the safety front, new security threats and the ISPS code influence the maintenance of safety records. Across the board, we are experiencing heightened demand for reliability so as to allow shipbuilders to reduce operating expenses while improving availability.

Efficiency, needless to say, is an evergreen goal, and we are working towards minimizing shipping fuel costs and improving production processes via remote operations. Lastly, enhanced sustainability is an immediate concern as we face depleting gas supplies and fields alongside emissions regulations and carbon taxes.



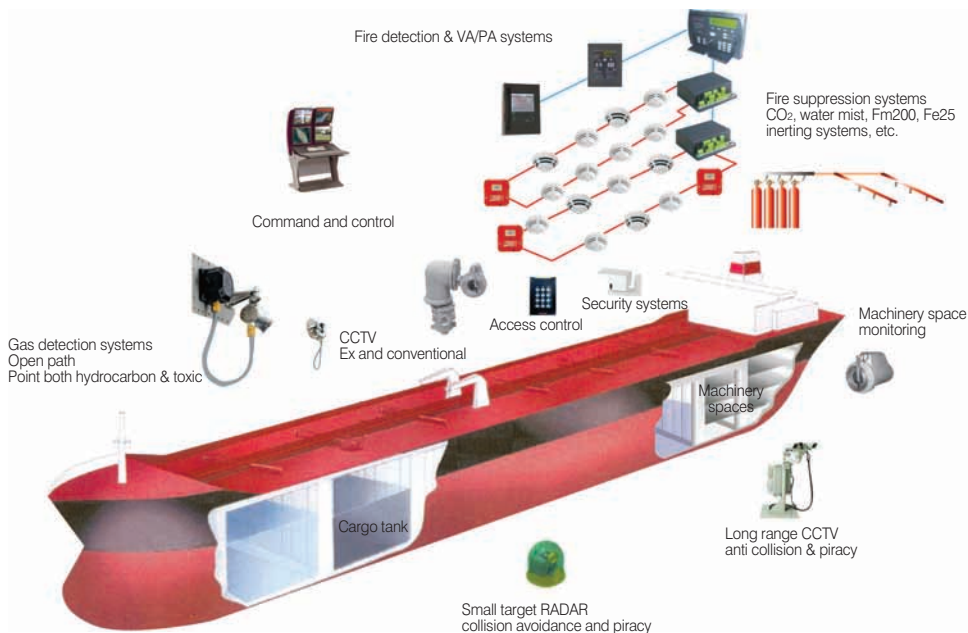
Q : What do you think is the current pattern of competition in the market and what is the competitive advantage of Honeywell compared to its competitors?

A : Like most industries, competition within the maritime sector is constantly increasing. That being said, I believe that there are five key areas where Honeywell differentiates itself from its competitors:

•**Field-proven technology:** By implementing Honeywell's solutions, users are able to reap the inherent synergistic benefits that accompany having both the safety and automation components of one's system come from the same company. In addition to a proven integrated subsea control solution, we are also able to offer fully segregated control and safety networks with a cyber-security response. Finally, Honeywell has obtained Marine Type Approval for PCS, ESD, PSS and F&G with many of the maritime industry's classification societies.

•**Project execution:** As a direct result of our experience and relative size, we have been able to put in place a field-proven cost-effective execution model. Just to add, our available workload capacity is further enhanced by experienced project teams and experts that have acquired their collective experience on similar type projects. And for added convenience, project staging areas are located worldwide, including third-party integrated FAT.

•**Long term support:** As important as great technologies are, they cannot exist in isolation. Possessing a proven lifecycle



vices.

Q : What is the current challenge faced by shipyards in Korea and what can Honeywell Korea offer?

A : For Korean shipyards, shipbuilding has been a core business for a long time. However, they have been facing excessive competition in the construction of commercial vessels in the last few years. Hence, major shipyards in Korea are trying to diversify their business by focusing on offshore business. Major shipyards in Korea are

moving forward preparations to set themselves up into heavy machinery builders away from shipbuilders. They are shifting focus to clean energy fields such as wind and solar power generation, and industrial plant-related areas where strong growth in demand is expected in emerging countries. In particular, offshore structures are widely seen as the prime mover for growth for the years to come.

•Long term solution provider: Honeywell is able to provide potential other solutions, be it now or in the future, such as simulation, wireless and fixed F&G detectors, natural gas metering, industrial security, personal protective equipment, instrumentation, environmental and energy solutions, advanced process control, simulations, and MES/SCM.


•Financial stable company: The advantages that come with dealing with a company that possesses a healthy cash flow cannot be emphasized enough, as it means that our customers are able to benefit from our strategic acquisitions, launches of R&D programs, as well as geographical expansions.

Q : What is the plan for the upcoming period?

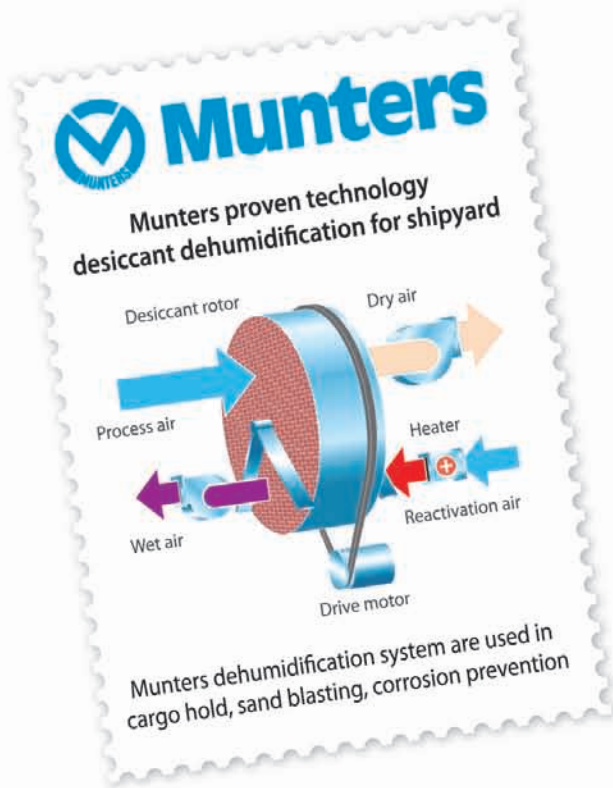
A : Having supplied equipment to more than 7,000 tankers, barges and tank farms to date, Honeywell Marine certainly has no intentions of stopping there. As we continue to serve owners, operators and yards in the merchant, cruise and ferry, offshore, military, and special vessel markets, our plan is to keep on combining our process automation knowledge with innovative measurement and control technologies to reduce capital investment risks through complete system engineering, installation, commissioning and support ser-

vice.

Korean yards expect increased demand for floating production, storage and offloading (FPSO) units and floating storage and regasification units (FSRUs) for LNG. With such a strategic change in marine business, Honeywell Korea has been collaborating on the floating LNG solutions with yards in Korea. Honeywell Korea has installed a total of 8 IAS in Regasification Vessel (RV) business and this is the world's largest installation in RV and FSRU market. Honeywell Korea had a first order for Automation Control System for LNG FPSO from Samsung Heavy Industries. At the end of last year, Honeywell was also awarded an order for OTS (Operator Training System) for LNG FPSO from Korea Marine Equipments Research Institute (KOMERI), and this is also the first simulator order for LNG FPSO.

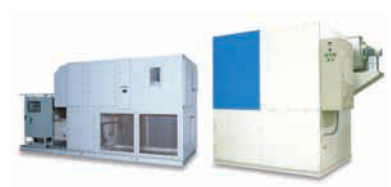
In conclusion, at Honeywell, with our extensive wealth of experience and proven solutions that deliver greater safety, reliability, efficiency and sustainability, we believe we are in a very strong position for successful collaboration with the marine industry in Korea. 

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Harbor on the move

Mobile harbor is a means of maritime transportation which allows the fast and precise loading/unloading of containers after being tied to the containership at sea. KAIST has pushed forward with the mobile harbor project since 2009 and demonstrated the new technology that enabled the automated docking of large ships on the sea.



Mobile harbor



Mobile harbor is a ship built around the concept of 'harbor on the move' and connects large containership - which is mooring out of port in deep water - to the shallow water port. It allows ships to unload containerships at sea and transport the containers to the destination such as small and medium-sized harbor regardless of water depth. In particular, mobile harbor incorporating unique technologies represents new means to transport container cargoes and has attracted huge attention both at home and abroad.

Mobile harbor is the brainchild conceived by Seo Nam-pyo, President of Korea Advanced Institute of Science and Technology (KAIST), who in 2009 put forth the idea of a ship functioning as harbor might move to the moored containerships and unload cargoes from containerships to transport them to a port. On the same year, KAIST received government fund secured from the revised supplementary budget

and has pushed ahead with the development and commercialization of mobile harbor as part of the new growth engine smart project. The R&D associated with this project has been undertaken by Mobile Harbor Project Group, while the commercialization of mobile harbor has been driven forward by Mobile Harbor Corporation.

As the container traffic continues to grow, a mobile harbor needs to have an annual container handling capacity 4 to 5 times higher than that of Busan Port and the recent trend toward large containerships is expected to gain momentum in the wake of increased capacity of the Panama Canal after its expansion project is completed in 2014. Additionally, mobile harbor must have the ability to effectively handle large containers, and importantly, its ability to be used for transshipment of cargoes is expected to take on added importance.



Demonstration of automated ship-to-ship docking

Mobile harbor catapulted into the international limelight

Hyundai Wia pledged to invest KRW 7.5 billion in the Mobile Harbor Project Group for 2 years from January 2010 in a bid to facilitate the joint research and commercialization of mobile harbor. In addition, Daewoo Shipbuilding & Marine Engineering (DSME) disclosed intention to invest KRW 20 billion in Mobile Harbor Corporation for the product engineering and commercialization of the mobile harbor.

Besides, Bando Hoist Crane Corporation and Shinan Heavy Industries expressed intention to invest KRW 5 billion and KRW 10 billion, respectively, and other prominent domestic companies showed interest.

Amid the growing interest abroad, Mobile Harbor Corporation received the Letter of Intent (LOI) in July 2009 from UCW America which has the operating rights for the Port of Ponce in Puerto Rico, a Latin American country. UCW America and

Mobile Harbor Corporation concluded a deal to place an order for A-600 type capable of unloading 5,000TEU containership within a day and A-1200 type capable of unloading 10,000TEU containership within 2 days.

The Puerto Rico government is posed to introduce the mobile harbor in order to double the container handling capacity of the Port of Ponce which is planned to be developed into the hub of the Central and Latin America bordering the Caribbean Sea after 2014 when the expansion project of Panama Canal is completed.

Simulation in water tank in December 2009

KAIST conducted the first onshore demonstration of mobile harbor through the simulation of offshore environment in August 2009, and showed the cargoes being loaded and unloaded from containerships in a simulated sea at high tide in December of the same year.



Demonstration of Mobile Harbor Corporation, held on April 26 at the sea in front of Korea Maritime University in Busan

The simulation perfectly reproduced the 1/25 life size mobile harbor loading or unloading cargoes on or from a ship, installed in a water tank simulating the sea surface condition (Sea State 3) with the wave height of up to 2 to 3m.

The simulation also showed the unhindered operation of image processing algorithm based high speed unloading system controlling the accurate position of containers to be hoisted while the inclined angle of mobile harbor crane was being measured to stabilize the position of trolley and spreader.

During the simulation, the mobile harbor which incorporates the docking/mooring technology automatically docked and moored at the containership by using the docking system consisting of robotic arms, wench, and fender.

By conducting the public demonstration in a water tank simulating the offshore environmental conditions, KAIST validated the fundamental technology of mobile harbor and took major step towards commercialization of mobile harbor. The key to the mobile harbor technology is the high performance 35 to 37m-high arm of crane mounted on the mobile harbor in the rolling sea, which is capable of precisely and safely lifting and lowering up to 65-ton container in the narrow space.

Among the major technological elements are included the floating body system, automated ship berthing/mooring system, high speed unloading system, quay wall unloading system, system design, logistics network and others.

Success in the automated ship-to-ship docking at sea

KAIST carried out the demonstration of new mobile harbor technology enabling the automated maritime docking of large ships in the rough sea on April 26, which took place at the sea in front of Korea Maritime University in Busan.

The automated docking system, developed as part of the key components for the mobile harbor, connects two different ships swiftly and safely while preventing the collision of ships at the waving sea. Unfortunately, the technological constraints have prevented the commercialization of the automated docking system although its necessity has been highlighted worldwide.

During the public demonstration on the same day, the barge functioning as mobile harbor approached the cargo ship and automatically docked at the ship, followed by the mooring maneuvers and the process to cope with emergencies.

Automated ship-to-ship docking is essential for the commercialization of mobile harbor. For unloading large container-ships unable to come alongside the berth in shallow water, mobile harbor must move to the containership floating on the sea and dock onto the side of the ship.

As the two floating structures are continually on the move under the influence of wind and waves, it is a daunting task to keep the two floating structures docked onto the side in a swift and safe fashion and keep them at a certain distance apart. The conventional method involved sailors tying the two different ships together using the rope, which was not only extremely time-consuming but also increased the risk of accident and made it difficult to respond quickly in emergencies.

The mobile harbor research team of KAIST developed the



A demonstration of mobile harbor took place on December 15, 2010. The simulation showed the containership being loaded and unloaded with cargoes at the waving sea.

automated docking technology - based on the robot technology - which could overcome the tough marine environment in collaboration with Mirae Industrial Machinery Corporation, a shipbuilding/marine equipment manufacturer, and Ocean Space, a marine facility design specialist.

The mobile harbor represents new technology that allows two different ships to carry out the loading and unloading operations, notwithstanding the wind and the waves, and is an integrated and complex system consisting of robotic arms, vacuum attachment pads, and wench.

Mobile harbor is a new concept means of transportation which is tied to the containership at sea, load/unload the containers quickly and precisely, and then carry them to the port. KAIST has pressed ahead with the mobile harbor as part of future growth engine project since 2009.

Mobile harbor technology breaks down the technical stumbling block involved in loading/unloading operations at sea and the ship-to-ship moorage in the maritime industry.

Large spillover effect on other industries


KAIST plans to conduct a public demonstration of mobile harbor on June 29, which integrates the automated docking system and the stabilized crane technology for loading/unloading containerships at sea in a precise and safe manner. This demonstration is expected to draw large number of people including the senior researchers from the U.S.-based ONR (Office of Naval Research) and officials from abroad who have shown interest in the commercialization of mobile harbor, as well as domestic and overseas profession-

als.

KAIST expects that the practical application and commercialization of mobile harbor will gain momentum from its successful onshore demonstration that was preceded by the validation demonstration of the related fundamental technology in the water tank in late 2009.

Gwak Byeong-man, President of Mobile Harbor Project Team, stressed, "Mobile harbor will create economic value as a new means of maritime transportation that can carry containers to the destinations without need for installing or expanding harbors, and will play a pivotal role in the low carbon green growth. Various technologies incorporated in the mobile harbor will have applications in other industries including the shipbuilding and maritime industries, as well as wide spillover effect."

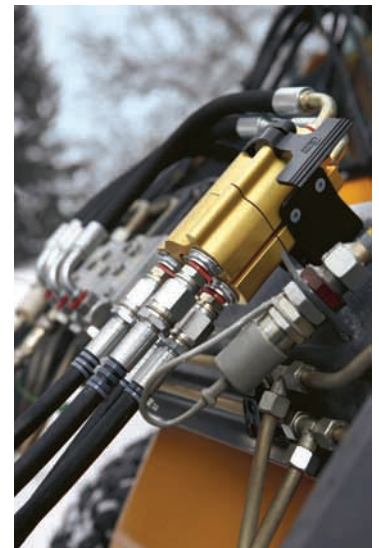
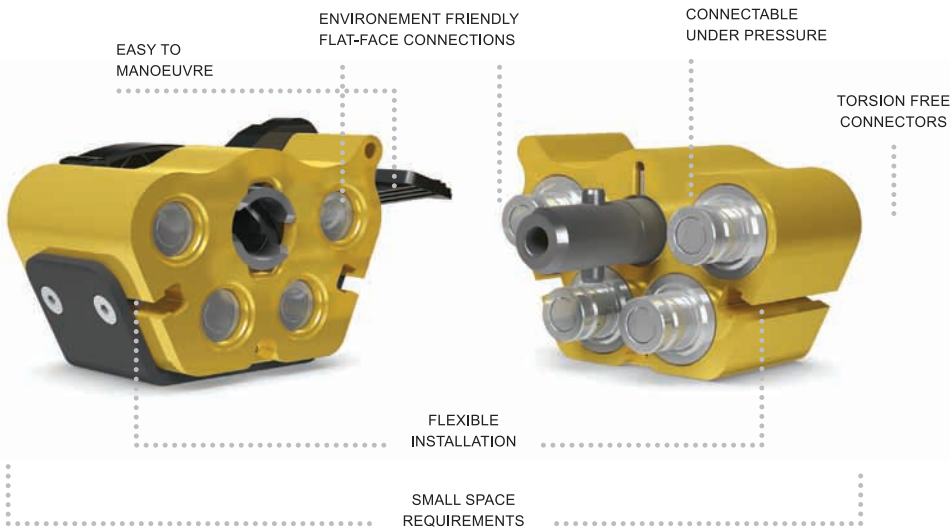
Meanwhile, mobile harbor can be useful in the security sensitive regions, ports vulnerable to terrorist attacks, regions wrecked by disaster, warring regions, as well as the region where the port expansion is difficult, shallow water area, Panama Canal, region with low traffic volume or inadequate infrastructures.

Mobile Harbor Corporation plans to push forward in its marketing strategy targeting the port-related officials and shipping companies East Asian countries, Africa where the port infrastructure remains inadequate and Middle East where the traffic volume is expected to rise amid the surge in the post-war restoration plant projects after the Iraq war, as well as in Korea. 



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IEC TC65 Global Industrial Automation Forum

'IEC TC65 Global Industrial Automation Forum' opened to much fanfare at Seoul President Hotel on May 18, in which attendees actively exchanged ideas and discussed latest issues related to the safety of functionality, wireless technology, EMC, etc.

Experts in international standards related to industrial automation gathered to discuss on the latest trend of technology, current progress of standardization, and measures to expand the application of information technology (IT) to industries.

IEC TC65 Korea Technical Committee (led by Chairman Hong Seung-ho, professor at Hanyang University) and ICN hosted the 'IEC TC65 Global Industrial Automation Forum' at the Schubelt Hall of Seoul President Hotel on May 18, which drew around 200 experts from Korea and abroad.

The event took place in commemoration of '2011 IEC TC65 Seoul International Standardization Meeting' held from May 9 to 20 in Seoul which attracted about 150 experts in international technical standards related to industrial automation and

smart grid.

IEC TC65 International Standardization Meeting which opened for the first time in Korea is convened to discuss and establish international technical standards in the field of industrial automation and smart grid, and is held in rotation among the member countries. Experts in international industrial automation who attended the 2011 IEC TC65 Seoul International Standardization Meeting also actively engaged in Global Industrial Automation Forum which provides a unique platform for discussing global standard issues and sharing the information associated with the latest technology and current status of standards.

IEC TC65 is a technical committee (TC) under the International Electrotechnical Commission dedicated to the



IEC TC65 Global Industrial Automation Forum held on May 18

establishment and revision of international standards related to the system and component technology applied to the industrial process measurement, control and automation.

Introduction of international technical standard

This event brought together the chairmen of respective working groups, including the chairmen and managers of IEC TC65 International Committee, and provided an overview of international standards to those representing the industries, academic circles, and research institutes in the field of domestic industrial automation and discussed related issues. Specifically, the discussion touched on a variety of issues related to the security of industrial facilities, safety of product functions, smart grid, digital factory, EMC matters, industrial wireless technology, etc, which have emerged as key issues in the industrial automation and plant recently. Among the subjects that attracted attention were included the measures for successful installation and operation related to the industrial automation, as well as the trend of international standard. A series of presentations were given, implementation/application of RAPIEnet international standards, application of IEC62591 (WirelessHART), trend and application of POWER-LINK/openSAFETY, introduction of CLPA(CC-Link Association), safety of industrial automation products, security of automation industry, current status of product information standardization in automation industry, modelling for digital factory, energy efficiency of industrial automation, EMC

and EMF considerations for automation facilities, automation language project, wireless environment of automation industry, and others.

The unending questions and discussions of the attendees of the forum reflected huge interest and enthusiasm towards the technical standard for industrial automation. A wide range of issues were discussed, including how the device safety (e.g., restrictions on in-flight use of wireless devices), security, and safety in industrial wireless facilities can be categorized and accepted.

Hong Seung-ho, professor at Hanyang University and Chairman of IEC TC65 Korea Technical Committee, who played a leading role in hosting 2011 IEC TC65 Seoul International Standardization Meeting in parallel with the Global Industrial Automation Forum, remarked, "This forum brought together experts in technical standards related to the international industrial automation and served as a venue for the exchange of ideas and discussions with regard to the latest technologies in the field of industrial automation and smart grid."

TC65 puts the safety of functionality as top priority issue

Roland Heidel, Chairman of IEC TC65 International Committee, introduced IEC TC65 International Committee, saying, "IEC TC65 has been dedicated to the international standardization in the field of the industrial process measurement, control and automation for over 4 decades. It has around 800 representatives worldwide who participate in 36 working groups. IEC TC65 International Committee has conducted discussions on a broad range of issues with regard to standardization in many different fields covering the steel, food and beverage, automobiles, and others, as well as the chemical field added recently."

He indicated that TC65 put an added emphasis on the safety of functionality, industrial wireless application, and smart grid technology standards recently. He went on saying, "TC65 was restructured 3 to 4 years ago and has been striving to set up various subcommittees and ensure that technical standards can be discussed at the early stage of lifecycle of new plants."

Preparation to cope with international standards

Ahn Jong-il, manger of new industrial standard department at



Commemorative photograph of IEC TC65 Global Industrial Automation Forum. The photo shows Hong Seung-ho, professor at Hanyang University, who is Chairman of IEC TC65 Korea Technical Committee, Roland Heidel Chairman of IEC TC65 International Committee, Ahn Jong-il, manager of new industrial standard department at the KATS under the MKE, and Bernard Dumortier, secretary of IEC TC65 International Committee (from the left).

the Korean Agency for Technology and Standards (KATS) under the Ministry of Knowledge Economy (MKE), said, “We find that the field of automated process technology, the core technology of manufacturing industry, has made a long way since Ford Motor began automating the production process about a century ago and is currently at a turing point as the

information technology application’s footprint has expanded to cover many manufacturing industries such as automotive, shipbuilding, aircraft industries, etc. With an increasing the emphasis on the compliance with international standards related to safety of industrial communication and integrated systems, IEC TC65 has taken on increased importance as the world’s leading organization for the preparation and publication of international standards for systems used for industrial process measurement, control, and automation, including the aforesaid fields.”

He added, “LS Industrial Systems’s RAPIEnet, the domestic IT protocol for industrial automation, was successfully adopted as IEC standard amid the fierce competition over international standards which have taken on added significance in overcoming international technical barriers.”

He expressed his hope that this forum would heighten the interest of domestic industries in international standard and be useful for exploring measures to effectively cope with the fierce competition.”

The Global Industrial Automation Forum was sponsored by IEC TC65 International Committee, LS Industrial Systems, KoreaCC-Link Association, Emerson Process Management Korea, B&R Korea, Honeywell Korea, Korea Ethernet Forum, Posco ICT, ACNT, EtherCAT Technology Group Korea, Monthly Industrial Communication Network (ICN Web), and others. ⚓

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KORMARINE, bound for success!

An introduction session for exhibitors took place at BEXCO on May 3 to ensure the success of KORMARINE (Korea Marine and Shipbuilding Exhibitions). The introductory session was attended by about 270 people from 175 companies who showed huge interest in the trade show, and included Q&A time.

As the KORMARINE (Korea Marine and Shipbuilding Exhibitions) is 6 months away, an introductory session for exhibitors was held at BEXCO (Busan Exhibition and Convention Center) on May 3 to ensure the success of the trade show, officially sponsored by KORSHIP.

The event was attended by around 270 people representing 175 companies, including those operating representative offices in Korea among domestic and overseas exhibitors, as well as the organizers of the trade show such as Busan Metropolitan City, Korea Marine Equipment Association (KOMEA), K.Fairs, BEXCO, and major vendors (transportation companies, booth suppliers, hotels).

The introductory session was divided into two parts. The first part was dedicated to laying out the vision of KORMARINE and suggesting the method of preparation and support for the upcoming trade show, while the second part consisted of the explanation on the booth design/marketing and Q&A.

So far, exhibitors from 39 countries have booked space. Companies from 12 countries such as Germany, U.K., China, Singapore, Finland, Norway, Denmark will be represented in the national pavilions at the upcoming trade show, but were

not present in this introductory session held in Korea.

The introductory session took place before June to ensure seamless preparation and effective marketing because all booths occupying an area of 22,800m² were already booked by exhibitors in February.

“Harmony Between IT and Eco-Friendliness”

KORMARINE 2011 will be differentiated from the previous shows. First, the trade show exhibit design will revolve largely around the theme of “Harmony Between Information Technology (IT) and Eco-Friendliness”. The official structure of KORMARINE will be built only with renewable materials and feature state-of-art IT systems of Korea, the global information technology leader. To increase convenience for visitors, robot humans and touch screen enabled EDMI bulletins will be placed throughout the show area, where wireless internet access is also available.

Second, KORMARINE 2011 will be transformed into a trade show fully dedicated to the offshore industry. KORMARINE has expanded its boundaries to include offshore plant and offshore energy sectors since 2005. However, constrained by



KORMARINE introductory session held at BEXCO on May 3



the shortage of exhibition space, those new sectors could not be represented. For that reason, KORMARINE has been recognized as one of specialized exhibitions mainly dedicated to the shipbuilding and marine industry. However, KORMARINE will engage in vigorous promotional campaigns from this year onwards to attract as many as about 10,000 people from a variety of related fields by leveraging the extensive human network of the Korean Shipbuilders' Association (KOSHIPA) which will become one of the co-organizers of the trade show for the first time and includes the nation's 3 major exporters of plants, such as Hyundai Heavy Industries (HHI), Samsung Heavy Industries (SHI), and Daewoo Shipbuilding & Marine Engineering (DSME). This year, KORMARINE is expected to draw about 37,000 visitors, 10% up from the previous year.

Third, the booth space applications for KORMARINE 2013 must be made prior to the opening of KORMARINE 2011. KORMARINE has laid the groundwork for a major leap forward. BEXCO has pressed ahead with an expansion plan to add 20,000m² new exhibition hall set to open in 2012 in an attempt to attract a growing number of first-time exhibitors. The exhibition space revolving around the existing concepts which KORMARINE has held onto until 2011 will be rearranged from 2013, which will make it unavoidable to rearrange the floor plan and relocate exhibitors. As a result, the organizer has announced that it would negotiate with exhibitors prior to the opening of the trade show to avoid any possible confusion in KORMARINE 2011.

The organizer expects that in 2013 the exhibition space will increase by approximately 13,000m² from current 32,800m² to 46,000m². In 2013, the exhibition space will be large enough to accommodate first-time exhibitors from Japan,

Vietnam, Sweden, United States, etc, and global shipbuilding/maritime countries which have sought to participate in KORMARINE.

Forth, World Ocean Forum will be held in parallel with KORMARINE 2011. World Ocean Forum, the nation's largest forum dedicated to the maritime industry, is one of the major convention events nationwide. It will be attended by about 1,000 domestic and overseas prominent figures and officials representing related industries and has a significant impact on the promotions of exhibitors.

In addition, KORMARINE 2011 will provide more innovative platform to showcase future-oriented technologies than previous years, including SCR system of engine machine industry and ballast water treatment system of Hyundai Heavy Industries (HHI), in parallel with Marine Digital IT Conference, ISMT 2011, and KOMEA Forum.

Greater satisfaction for exhibitors and visitors

Companies that attended the introductory session expressed huge interest in the booth arrangement and marketing and asked many questions. Many companies suggested that they were willing to allocate more budget than previous years to effectively showcase their products and services along with demonstrations.

Lee Joon-woo, team leader of K.Fairs who conducted the introductory session for exhibitors, said, "KORMARINE, designated as Korea's top brand trade show in 2011, has drawn huge attention across the country, and we will do our utmost to ensure the best satisfaction of both exhibitors and visitors." 



Marine seminar hosted by Emerson Process Management Korea, packed to overflowing with attendees from major domestic shipyards

Emerson, the undisputed leader in offshore process control sector

Emerson Process Management Korea held a seminar revolving around the theme 'Discover Your Total Solution' applicable to offshore sector at Busan Lotte Hotel on May 28. The event was held on a grand scale, attended by officials from around 10 major domestic shipyards.

Emerson Process Management Korea (Emerson Korea) hosted a seminar titled 'Discover Your Total Solution' at Busan Lotte Hotel on May 28.

This seminar was attended by many officials representing about 10 shipyards such as STX Offshore & Shipbuilding (STXOS), Daewoo Shipbuilding & Marine Engineering (DSME), Samsung Heavy Industries (SHI), which drew huge attention even before it opened.

Comprehensive automation is essential

Final users, operators, engineering companies, and shipbuilders are redesigning the construction, operation, and maintenance of oil production facilities as a growing number of challenging projects are being launched recently amid the discovery of new energies, application of new production processes, new business environment, etc. As a result, comprehensive automation of oil production facilities is essential to the success of business, and the new automation technology is the key to resolving problems.

In this seminar, Emerson Korea showcased the examples of



Customers are listening to the explanation on the wireless demonstration which attracted the greatest attention during the demonstration of the systems installed at the seminar site.



Patrick Deruytter, General Manager of Emerson Process Management Korea, is giving an introduction of Emerson's offshore business before the seminar begins.

its support for companies on their lookout for maritime applications and related total solutions, along with demonstrations. That aimed to integrate and simplify the total automation solution that would allow customers to derive the results of projects even faster.

Innovative marine total solution

Patrick Deruytter, General Manager of Emerson Korea, said in his opening speech, "Emerson has been widely recognized worldwide as a leading provider of innovative solutions for many process industries, including the maritime sector. For many years, Emerson has developed and rolled out a plethora of innovative new products that can help integrate and simplify the process automation. Many shipyards, plant builders, and final users have speeded up their projects and programs and achieved optimization using the solutions of Emerson."

Following his speech, 6 speakers received a hearty round of applause when they presented Emerson's unique maritime solutions that could remove all the worry of those in the maritime industry such as Emerson's One Stop Solution, the true total solution, Analyzer Application Solution, the new analyzer application that has grabbed the attention of maritime industry in relation to the protection of environment, Bunkering Solution based on Coriolis mass flowmeter, Custody Transfer Metering Solution, Conditioning Orifice Flow Solution, Marine Wireless & Electronic Marshalling Solution, and so forth. After the demonstrations were complete, a brief Q&A session was

held.


Global reach and breadth of Emerson

Emerson's marine and offshore solutions built on the world's first digital automation system are perfect integrated automation solutions that can gain ground in the global offshore market.

Using its extensive experience accumulated over many years of working on offshore projects, Emerson supplies the system that can provide information to customers anytime and anywhere in a fast and accurate manner, including the integrated asset management, remote diagnosis of mechanical facilities and process equipments and many more.

Emerson's PlantWeb architecture and AMS application programs ensure the maximum uptime and the shortest processing time anywhere around the globe even under challenging conditions involving difficult on-board process, deep-water regions, environmental accident prone regions, unskilled workforce, etc.

Emerson's extensive track record in project management worldwide and highly skilled workforce add strengths to its global position, although it entered the Korean marine offshore sector relatively recently.

Emerson Korea is expected to make huge strides in the marine offshore market in the period ahead as it has built deep trust with Korean customers and seen its orderbook increasing year after year. 



High Pressure Fuel Gas Supply system (left), developed independently by DSME, and MAN Electronic Gas-Injection Engine (right) of MAN Diesel & Turbo

Eco-friendly large ship engine was developed

Daewoo Shipbuilding & Marine Engineering (DSME) and MAN Diesel & Turbo completed the development of eco-friendly ship propulsion system fueled by high pressure natural gas, which can deliver remarkable reduction in greenhouse gas emissions, and conducted a demonstration of the system in Copenhagen, Denmark on May 18.

Daewoo Shipbuilding & Marine Engineering (DSME) completed the development of eco-friendly ship propulsion system fueled by high pressure natural gas and is poised to launch full-fledged sales operation.

DSME completed the development of eco-friendly LNG-fueled ship propulsion system with MAN Diesel & Turbo and conducted a large-scale demonstration in Copenhagen, Denmark on May 18.

This event showcased the High Pressure Fuel Gas Supply

system (HP-FGS) supplying high pressure natural gas to power the engine, developed independently by DSME, and unveiled the next-generation MAN Electronic Gas-Injection Engine (ME-GI) of MAN Diesel & Turbo.

Specifically, the HP-FGS is fueled by LNG, not bunker C oil. This LNG-fueled system can reduce CO₂ emissions by 23%, NO_x emissions by 80%, and SO_x emissions by over 95%, compared to the diesel engine of the same power output.

In addition, the per million British thermal unit (USD/mmBTU¹)

of LNG is USD 8, more than twice lower than that of bunker C oil (approximately USD 16). Thus, LNG is considered more eco-friendly and cost-effective than conventional fuels, and LNG-fueled engine technology will be the key driver of ship propulsion market in the period ahead.

This High Pressure Fuel Gas Supply has a significant difference from conventional LNG-fueled propulsion systems. Conventional LNG-fueled propulsion systems are fitted with small and medium-sized gas engine connected to an electric generator which relays the power ultimately to the propeller, and are hardly suitable for large merchant ships because multiple engines have to be combined together due to low propulsion efficiency and low engine output.

By comparison, the ME-GI engine which was unveiled this time is based on high-output and high-efficiency direct propulsion. In particular, the HP-FGS developed independently by DSME can be operated using only 5% of power compared to the conventional systems built by major equipment manufacturers of Europe and thus considered the most suitable for ME-GI engine. DSME has acquired 8 patent rights to the core technology of high-pressure natural gas supply system in advanced countries such as United States and Europe.

Furthermore, large ships powered by LNG is expected to cause a sea-change in the shipbuilding industry, considering that the world's focus is shifting toward clean energy in nearly all industries amid increasingly stringent environmental regulations in the wake of the UN Framework Convention on Climate Change (UNFCCC).

The demonstration attracted huge attention, drawing hundreds of officials from related industries, including major international oil companies such as Exxon-Mobil, Shell, Chevron, etc, and major classification societies such as ABS, BV, DNV, as well as world's prominent ship owners such as A.P Moller-Maersk, MSC, CMA CGM, VELA, and KOTC.

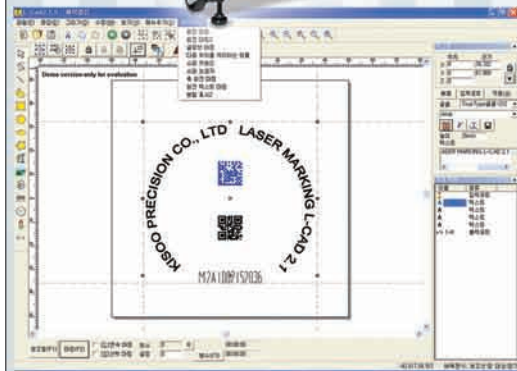
Lee Yeong-man, DSME Vice-President & General Manager of Okpo Shipyard, said, "The eco-friendly ship propulsion system developed this time represents a good example of our ongoing effort to fend off competition from emerging shipbuilding countries such as China based on steady R&D efforts for cutting-edge technologies. We will embark on full-scale commercialization of the LNG-powered ships while strengthening the equipment technologies to cement our position as leader in the global shipbuilding and marine equipment market." 

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Steel plate piling management system of STXOS

Steel plate piling management system in place

STX Offshore & Shipbuilding (STXOS) has recently completed the installation of the state-of-art Information Technology (IT) integrated Steel Plate Management System capable of real-time monitoring of steel plate piling status, injecting fresh momentum into its construction of smart shipyard.

STX Offshore & Shipbuilding (STXOS) is speeding up the construction of smart shipyard which integrates the cutting-edge Information Technology (IT) providing real-time access to the information related to the works inside and outside the ship under construction.

STXOS has recently completed the steel plate piling management system that allows the operators to monitor real-time piling status of steel plates, the most important raw materials for shipbuilding. Thus, STXOS has become the first domestic shipyard to integrate the IT into the production process and the material status monitoring, although the IT applications in shipbuilding have been widespread such as Enterprise Resource Planning (ERP) system, wireless internet access environment within shipyard, etc.

The key capability of this steel plate piling management system developed by STXOS Research Center is automatically tracking the motion/movement of steel plates while checking the crane operations at the steel plate piling site in real time. For that, cranes and steel plate piling site facilities are fitted with various sensors capable of transmitting the information associated with the motion/movement of cranes and the steel plates to the Information Recognition System installed at the site.

The data collected through the Information Recognition System is transferred to the central server via the wireless communication network. The central server analyzes the received data with the crane motion recognition algorithm and displays the rendered images through the monitoring program built around the

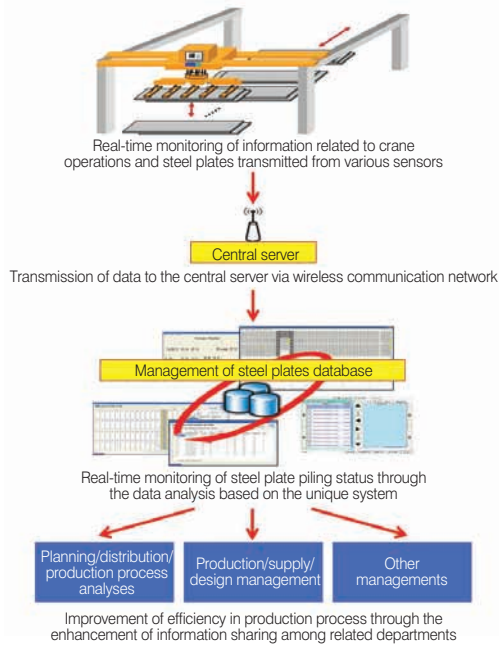


Diagram of steel plate piling management system

overall layout of the steel plate piling site. This program allows the workers to check the current operation status of cranes and steel plate piling

in real time.

In addition, workers can have access to the information related to the current locations of cranes and the steel plates from inside via the display screen, which helps ensure accuracy of crane operations.

With this system, STXOS can determine the stockpile size/location of steel plates and the task preparation in real time, as well as having real-time access to the status of operations within the steel plate piling site and the piling condition of individual steel plates, thereby eliminating the possibility of delay in production process, etc.

Furthermore, the wireless communication system allows the operator to monitor the ever-changing situation of the site in real time and make swift responses.

Leveraging this system as a stepping stone, STXOS plans to complete the monitoring system by 2015 which enables the automatic management of major raw materials, production process, distribution, workforce, etc, in a bid to turn its Jinhae shipyard into a smart shipyard with the world's best productivity.

Huh Joo-ho, Director of STXOS Research Center, said, "This steel plate piling management system will automate the production process which was carried out manually before. It will definitely help shorten the duration of construction and increase productivity as a result. Furthermore, it will enable strict and thorough management of all steel plates, thus helping strengthen the trust with ship owners."

Meanwhile, STXOS completed the registration of domestic patent rights to the steel plate piling management system. ⚓

Alfa Laval expands its product portfolio for niche applications

Alfa Laval acquires the Italian niche company Olmi S.p.A. Olmi is a leading designer and manufacturer of customized shell-and-tube heat exchangers and air coolers for specialized applications in the refinery, petrochemical, power and oil & gas industries.

The acquisition of Olmi expands the Alfa Laval product portfolio and enables Alfa Laval to offer unique know-how in specialized application areas. Consolidated into Alfa Laval from December 6, 2010, Olmi is being integrated as a competence centre, nurturing their area of expertise further. Olmi is a renowned producer of customized solutions, such as process shell-and-tube and process air heat exchangers, for the refinery, petrochemical, power and oil & gas industries.

Lars Renström, President and CEO of the Alfa Laval Group, commented on the acquisition, "The acquisition of Olmi will substantially strengthen our capabilities into the high pressure, high temperature heat exchanger market. At the same time, Alfa Laval's strong global presence allows us to take the offering to new geographical markets and customers."

The innovative solutions developed by Olmi have gained a tremendous track record over the years in fulfilling unique requirements for extreme conditions. With the merger, customers will benefit from the combined experience and expertise of Alfa Laval and Olmi, giving them the advantage of customized solutions, a full product range and the widest offer available on the process and power markets.



Seminar on fundamental technology for cruise ship

A seminar organized by the Korea Shipbuilders' Association (KOSHIPA) was held at Busan Paradise Hotel from April 21 to 22, which revolved around the theme 'the development of fundamental technology for cruise ships and manpower development'. This seminar showcased fundamental technologies for cruise ship interiors and a range of related technologies.



A seminar was held at Busan Paradise Hotel for 2 days from April 21 to 22, which revolved around the theme 'the development of fundamental technology for cruise ships and manpower development'.

A seminar was held at Busan Paradise Hotel for 2 days from April 21 to 22, which revolved around the theme 'the development of fundamental technology for cruise ships and manpower development'. This event was organized by the Human Resource Development Council for Shipbuilding Industry under the Korea Shipbuilders' Association (KOSHIPA) and co-sponsored by the Ministry of Knowledge Economy (MKE), the Ministry of Employment and Labor (MEL), Korea Industrial Manpower Public Corporation (KIMPC), Korean Evaluation Institute of Industrial Technology (KEIT).

Recently, domestic yards dethroned China to retake the number one spot in global shipbuilding orders and has continued smooth sailing, but absolutely need to build cruise ship, one of the next-generation high value-added vessels, to cement their global top spot and ensure sustained growth.


Cruise ship construction brings high profit per unit compared to other ships (containerships, LNG carriers, FPSO, etc). Furthermore, the market for cruise ship has great growth prospects as the average annual domes-

tic growth rate of tourists (9.5%) hovers above the average annual global growth rate of tourists (3.9%) (based on the estimation of WTO).

The key to the successful construction of cruise ship is building up competitiveness and attracting professional manpower from various industries related to the interior works, equipments, finishing materials, etc, as well as from shipbuilding industries.

Han Jang-seop, Vice-Chairman of KOSHIPA, said, "This seminar provides a platform to review the fundamental technologies of cruise ship and achievements of manpower development so far. I hope that this event will also provide a unique opportunity for domestic shipyards to explore ways to achieve excellence in the construction of cruise ship and reach a consensus on that."

The seminar began with the presentation on the 'achievements and challenge of manpower development program designed to nurture professionals in the field of cruise ship interiors', followed by a series of presentations given by officials from major domestic shipyards, Korea Marine Equipment Research Institute (KMERI), Doowon Technology University College, which touched on a broad range of issues related to the fundamental technologies for the interiors and marine equipments, performance analysis, low vibration/noise technology, safety system technology and others.

This seminar was attended by around 150 people representing the shipyards and interior industries who showed huge interest in cruise ship construction. 

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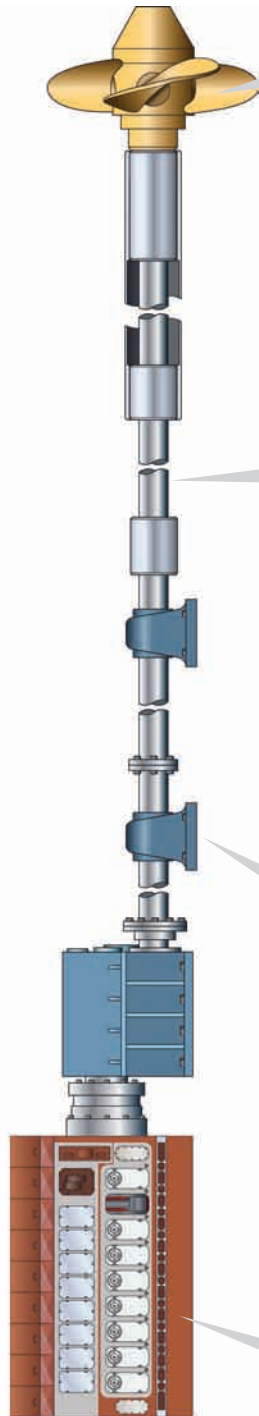


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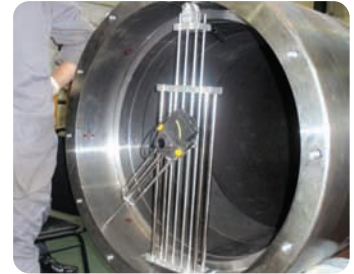
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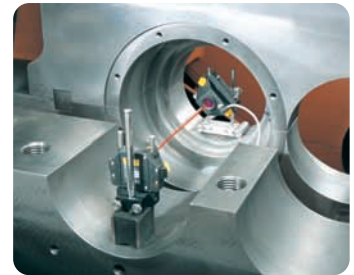
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(unmounted shaft)



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Small and medium-sized shipyards in crisis

The polarization among the shipbuilding heavyweights and small/medium-sized shipbuilders nationwide is widening. Large domestic shipyards consecutively won newbuilding orders from the beginning of the year and have registered high growth in the first quarter of 2011, while many small/medium-sized domestic shipyards are faced with shrinking orderbook.

The gap among the large shipbuilders and small/medium-sized shipbuilders is widening in Korea. Large shipyards in Korea have shown strong performance, winning a consecutive waves of newbuilding orders for large containerships, LNG carriers, offshore plants from the beginning of the year and reached a large proportion of their targets for the first quarter of 2011.

The orderbook of Hyundai Heavy Industries (HHI) currently stands at 39 ships, including 7 drillships, worth a total of USD 10.1 billion (including the total order intake of Hyundai Samho Heavy Industries), approximately 51% of its annual target in the shipbuilding, offshore, and plant sectors.

Samsung Heavy Industries (SHI) has won orders for a total of 31 ships so far this year - including 7 drillships, 8 LNG carriers, 13 containerships, 1 FPSO, 1 Platform Supply Vessel (PSV) - worth a total of USD 8.5 billion, approximately 71% of its annual target (USD 11.5 billion). Daewoo Shipbuilding & Marine Engineering (DSME) has received orders for a total of 14 ships valued at

USD 3.95 billion in all so far this year, including 10 containerships and 4 drillships, meeting 36% of its annual target (USD 11 billion). Specifically, these shipyards have accomplished a high double-digit year-on-year growth in the operating profit and current net profit, as well as in sales, according to the public announcements. By contrast, a majority of small/medium-sized domestic shipyards, except Sungdong Shipbuilding & Marine Engineering (SSME) and SPP Shipbuilding, have showed mediocre growth in the first quarter of this year.

Trends of small/medium-sized domestic shipyards

Small/medium-sized domestic shipyards are the 22 shipyards currently operating, except the 7 shipbuilding giants (3 affiliates of Hyundai Heavy Industries, Samsung Heavy Industries, Daewoo Shipbuilding & Marine Engineering, STX Offshore & Shipbuilding, Hanjin Heavy Industries & Construction).

The orderbook of small/medium-sized shipyards fell sharply in 2008 and 2009 before rising slightly in 2010, but have varied greatly, depending on individual shipyards.

The total orderbook increased slightly to 2.2 million CGT in 2010

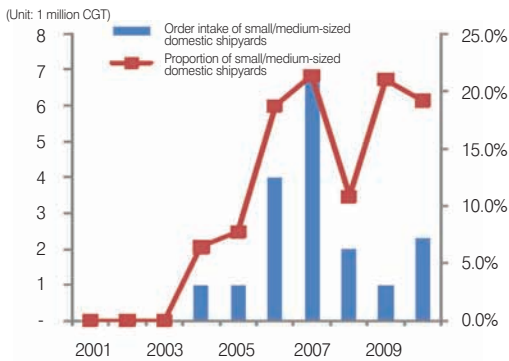


Fig.1 Order intake of small/medium-sized domestic shipyards

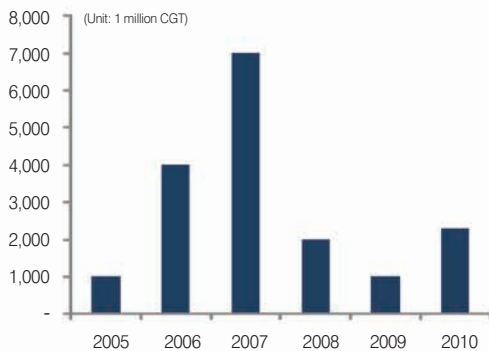


Fig.2 Outlook of order backlog of small/medium-sized domestic shipyards

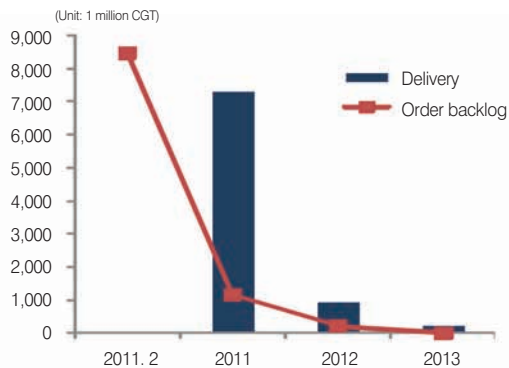


Fig.2 Outlook of order backlog of small/medium-sized domestic shipyards

after sliding from 7 million CGT in 2007 to 1 million CGT in 2009, but stands at as low as 0.7 million CGT if the total orders placed at the top 2 small/medium-sized shipyards (Sungdong Shipbuilding & Marine Engineering, SPP Shipbuilding) are excluded. The proportion of newbuilding orders placed at small/medium-sized domestic shipyards fell from 21.3% in 2007 to 10.8% in 2008, at a far faster rate compared to large

domestic shipyards.

The proportion of orders for bulk carriers, one of the major products of small/medium-sized domestic shipyards, has been declining since the second half of 2010. The proportion of bulk carrier orders placed at domestic shipyards in 2010 dwindled from 55% in the first half of 2010 to 33% in the second quarter of the same year while that of containerships rose from 1% in the first half of 2010 to 20% in the second quarter of the same year.

First quarter performance of small/medium-sized domestic shipyards

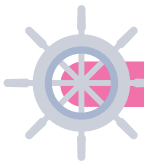
The growth in the bulk carrier and small/medium-sized tanker market, the major market of small/medium-sized shipyards, slowed down compared to the previous quarter. The global orderbook for bulk carriers (below the Capesize-class) fell 58% year-on-year to approximately 1.45 million CGT and shrank by 52.5% compared to the previous quarter. The total orders for tankers (below Aframax-class) placed worldwide decreased 51.2% year-on-year to approximately 14.6 million CGT and diminished by as much as 72.6% compared to the previous quarter.

The data released by the Export Import Bank of Korea (EXIM Bank) showed that the orderbook of small/medium-sized domestic shipyards decreased 6.7% year-on-year to 662,000 CGT in the first quarter of this year. Although the domestic shipbuilding industry registered remarkable growth in the first quarter of this year, the orderbook of small/medium-sized domestic shipyards shrank amid the sluggish market for universal ships. In particular, no single order for tanker, the major product of small/medium-sized shipyards in the past years, was received in the first quarter of this year.

The total value of order slid 33.0% year-on-year to USD 1.22 billion. Particularly, the proportion of orders placed at small/medium-sized domestic shipyards fell below 10% for the first time after 2006.

The order backlog stands at 7.64 million CGT as of March 2011, 9.1% down from the previous quarter. The order backlog has been declining as the orderbook shrinks. The current order backlog is estimated to be equivalent to less than 2 years of work in view of the shipbuilding ability of small/medium-sized domestic shipyards.

The volume of ships built by small/medium-sized domestic shipyards in the first quarter of this year stands at 2.25 million DWT, 5.5% down from the same period of last year. The volume of tankers built has been decreasing constantly, and that of bulk carriers built has slid compared to the previous quarter. Consequently, the volume of ships built at small/medium-sized domestic shipyards is on the decrease.



Current status of small/medium domestic shipyards

First, small/medium domestic shipyards face a very poor profitability amid the shrinking order backlog and declining price of new-builds.

The order backlog of bulk carriers in late 2010 reached 52% of capacity, leaving small room for additional order intake. Furthermore, idle facilities are expected to occur after 2013 along with the decrease in the operation ratio as 87% of current order backlog are scheduled for delivery in 2011.

The prices of bulk carriers and tankers fell by 37% and 32%, respectively, and are expected to take a considerable time to recover to the previous level in light of the trend of the forward industry and the ships scheduled for delivery in the period ahead.

Second, the financial structure has changed in the wake of the declining order intake.

Small/medium domestic shipyards face the credit crunch, an increase in interest payments and other problems as the shrinking orderbook, cancellation of contracts, etc, have resulted in the decreased liquidity, soaring debt, and change in the financial structure.

Third, small/medium domestic shipyards which will continue to build universal ships are expected to face even stiffer competition from China.

New orders for bulk carriers placed at small/medium domestic shipyards account for 59% as of late January in 2011 based on the order backlog, which comprise 90% if the tank carrier orders are included.

China has increased market share by focusing on the construction of bulk carriers and tankers which do not require high technology.

Besides, the difference in labor costs between domestic shipyards and Chinese rivals is expected to put domestic shipyards at a competitive disadvantage against China, despite the negligible gap in technology.

Outlook and strategies for the development of small/medium domestic shipyards

The analysis report of the Export Import Bank of Korea (EXIM Bank) showed that any sign of turnaround for the depressed small/medium domestic shipyards would be difficult to see for the time being because the sluggishness of small/medium-sized domestic shipyards is attributed to the overcapacity in the market for bulk carriers and small/medium-sized tankers, their flagship products, and the expected glut of bulk carriers in the market would continue until next year which will make the prospect of increase in charterage over the short period quite unlikely.

The report stressed the need for small/medium-sized domestic shipyards to develop strategies to diversify their business portfolios and strive more to build up technological capabilities as part of effort to keep themselves aloof from sluggishness.

In summary, the report indicates that small/medium-sized domestic shipyards need to expand into the market for high-value vessels such as small/medium-sized containerships, LPC carriers, offshore special purpose vessels, etc, to tide over the sluggishness in the bulk carrier and tanker markets, and for that, they need to make special efforts to build up technological competi-

Table 1. Comparison of order backlog among Korea, China, and Japan

(Unit: USD 100 million)

Type	Korea				China		Japan	
	Large shipyards		Small/medium-sized shipyards		Proportion (%)	Proportion (%)	Proportion (%)	Proportion (%)
		Proportion (%)		Proportion (%)				
Bulk carriers	5.0	14	5.0	59	28.8	55	11.1	53
Tankers	10.4	29	2.7	32	7.9	15	3.6	17
Containerships	13.0	36	0.6	7	5.3	10	0.8	4
Specialized ships	4.0	11	-	-	1.3	2	0.8	4
Others	3.4	10	0.2	2	9.5	18	4.5	22
Total	28.4	100.0	8.3	100.0	42	100.0	15.5	100.0

Source: Clarkson (as of Late January, 2011)

Note: Large shipyards are 3 affiliates of Hyundai Heavy Industries (HHI), Samsung Heavy Industries (SHI), Daewoo Shipbuilding & Marine Engineering (DSME), STX Offshore & Shipbuilding (STXOS), Hanjin Heavy Industries & Construction (HHIC).



tiveness.

Also, the Korea Development Bank Research Institute (KDBRI) recently opined, "Shipbuilding industry will not see major turnaround over the short-to-medium term due to the shipbuilding overcapacity arising from the excessive investment in facilities during the boom period (from 2003 to 2007). Particularly, small/medium sized domestic shipyards, faced with shrinking orderbook since the outbreak of global financial crisis in 2008, need to map out strategies that will enhance their competitiveness to beat the competition from China."

Specifically, KDBRI suggested that a master plan should be established to stimulate the growth of small/medium sized domestic shipyards at a policy level in line with the trends of shipbuilding industry, along with the market-oriented self-initiated strategies such as M&A, business conversion, rationalization of facilities, attraction of investment and others.

The measures that can help stimulate the growth of small/medium-sized domestic shipyards can be summarized as follows:

First, master plan must be established at a policy level. In fact, the Ministry of Knowledge Economy (MKE) plans to conduct comprehensive analysis of current condition and problems of shipbuilding industry until July 2011 as part of effort to take necessary measures to build up competitiveness of shipbuilding industry. Appropriate step must be taken in the right direction for stimulating the growth of shipbuilding industry according to the master plan at a policy level in view of mid-to-medium term industrial structure. However, criteria for selective support must be specified through multifaceted evaluation on technological competitiveness, ability to meet the shipbuilding and delivery schedules, ability to cooperate with large shipyards, possibility of business conversion, etc, as well as financial criteria such as the credit risk evaluation criteria.

Second, small/medium-sized domestic shipyards must put their business back on track by attracting foreign investment.


Small/medium-sized domestic shipyards focusing on the construction of universal ships which pose low risk of leakage of technology or know-how must attract investment from emerging shipbuilding countries. In addition, they must vigorously attract investment to put their business back on track because the shrinking orderbook may result in the decreased liquidity after the delivery of existing orders.

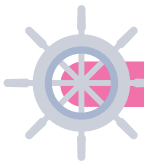
Third, small/medium-sized domestic shipyards must push ahead with the diversification of their business portfolios which is the increasing trend in the shipbuilding industry.

Large domestic shipyards have taken steps to align themselves with the new trends and diversified into sectors closely related to their existing business. Small/medium-sized domestic shipyards need to be engaged in the part manufacturing, etc, which are related to the new business of large domestic shipyards such as the offshore plants and new type ship construction, etc. Additionally, small/medium-sized domestic shipyards need to seek the support and cooperation of financial institutes, government, large domestic shipyards in a bid to add momentum to their business conversion and launch of new business by leveraging their relationship with large shipyards.

Large domestic shipyards can benefit from their involvement in the R&D projects of small/medium-sized equipment manufacturers for localization and commercialization of marine equipments which bring about the cost-saving and help them maintain the leading position in the market. In fact, advanced shipbuilding countries in Europe and Japan, etc, have made their own brands of marine equipments and created high value-added so far.

Fourth, the efficiency of inter-shipyard collaboration among adjacent regions must be enhanced.

To take the shipbuilding industry to the next level, large domestic shipyards, government, local autonomous bodies, financial institutes, etc, need to work closely to increase the efficiency of inter-shipyard collaboration among key regions by means of M&A, facility rationalization, business conversion and others. 



Global power elite cultivation project

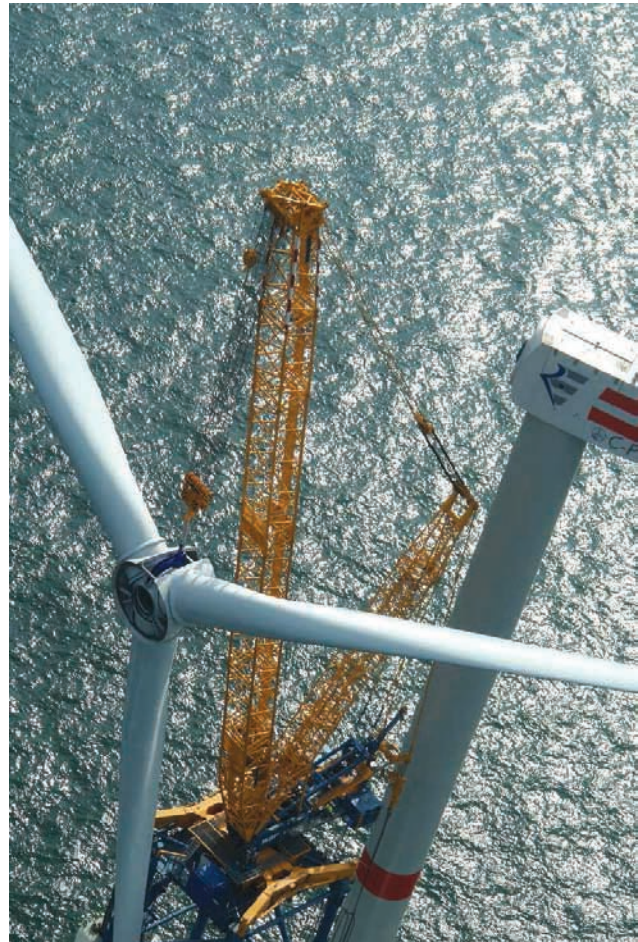
Recently, the Ministry of Knowledge Economy (MKE) announced new manpower development plans for 2011 to build human resource capacity of energy industry and nurture professional R&D manpower and will push ahead with support for the offshore wind power and the next-generation energy storage system (Post LIB chemical cell) sectors this year.

The Ministry of Knowledge Economy (MKE) unveiled a new manpower development roadmap on May 9 to help seed the nation's talent pool for the energy industry for 2011 as part of effort to bolster human resource development and nurture professional R&D manpower.

MKE will expand the manpower development programs closely tailored to the needs of companies, including the support of the university-industry driven fast-track curriculum designed to build the pool of basic skilled manpower for energy sector and the complex curriculum offered in conjunction with the energy policy. Besides, MKE plans to proceed with new manpower development programs (with the injection of KRW 13.6 billion from the government coffers) which offer scholarships to outstanding talents pursuing advanced degrees abroad and support organizations specializing in the manpower development, along with the GET-Future (Green Energy Technology-Future) program designed to nurture key talents for the nation's energy industry and the manpower exchange program to increase the export marketing capabilities of energy industry.

These manpower development programs responsive to the demands of industry are expected to produce a talented workforce of around 3,600 persons annually, including 450 persons with bachelor's degree, 150 persons with master's and doctoral degree, and 3,000 industry-ready specialized persons.

MKE introduced the fast-track curriculum system last year to ensure flexibility in the supply of manpower to the urgent industry needs and rectify the mismatch between required manpower of companies and supplied one from universities. The fast-track curriculum composed of a set of courses that companies prefer can be offered without having to establish new department when companies and universities form a consortium to participate in projects with the objective of developing competent manpower for energy industry. Moreover, companies can be directly involved in the man-



power development (by offering expert lectures, practical training, etc) to increase the employability of graduates.

Cultivation of key talents holding the key to future

The crucial centerpiece of MKE's manpower development roadmap is GET-Future program designed to nurture the world's best experts in the field of innovative energy technology required to create new engine of growth over the long-

Each phase of GET-Future project

1st phase(1 year)	2nd phase (3 years)	3rd phase (3 years)	4th phase (3 years)
Planning and pilot project (single lab)	Fundamental technology (single lab)	Application technology (Companies can participate.)	Commercialization (Collaboration with company is allowed.)
3 times the number of labs finally selected (KRW 200 million or less annually)	2 times the number of labs finally selected (KRW 200 million or less annually)	Labs selected finally (KRW 1 billion or less annually)	Labs selected finally (KRW 1 billion or less annually)

term exceeding 10 years.

GET-Future program will provide long-term support to the designated laboratory of university with an aim to develop highly competent talents in related fields. The government plans to provide support for laboratory research projects in 2 different fields every year which are deemed to hold great prospect for companies to carve out significant share in the global market and build up competitiveness over the mid to long-term.

In 2011, the first year of the program, the government will support the laboratory research projects in 2 fields which are the offshore wind power and the next-generation energy storage system (Post LIB chemical cell). The number of candidates selected in this stage will be about thrice the number of laboratories to be designated finally, and KRW 200 million or less will be granted to each laboratory.

In the second year, the number of candidates selected will be about twice the number of laboratories to be designated finally, and KRW 500 million or less will be granted to each laboratory over the period of 3 years. And the laboratory selected finally in each field will be granted KRW 1 billion or less over the 6 years.

Manpower development tailored towards the industry demand

The government plans to support around 20 new projects in its endeavor to narrow the gap between the industry demand and the supply of right manpower, including the fast-track curriculum designed to equip undergraduates with the necessary knowledge and skill, the complex curriculum offered in conjunction with energy policy, and so forth.

In particular, the complex curriculum offered in conjunction

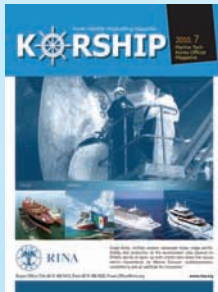
with the energy policy will become an effective tool in nurturing high quality talents equipped with the ability to meet industry needs and demands in the field of strategic application/common component technology. Besides, the interdisciplinary collaboration involving the technology, liberal arts, society, etc, will play important role in nurturing experts related to energy policy and international collaboration.

Additionally, the government plans to nurture nuclear power experts to better cope with various manpower demand from nuclear power industry as nuclear power plant export has become the nation's strategic business in the wake of the UAE nuclear power contract, and build a global human source network which can be leveraged to boost the exchanges of manpower and marketing export capabilities of energy industry.

An official from MKE said, "The manpower development innovation program for the energy sector in 2010 laid the groundwork for a full-fledged innovation of manpower development strategy to nurture talents capable of meeting the needs and demands of companies and address the mismatch between required manpower of companies and supplied one. This year, we will diversify the manpower development programs to actively meet various requirements of companies."

He also said that MKE would build the database of manpower produced by the new manpower development programs, monitor and analyze the supply/demand of manpower to accelerate the pace of resolving the mismatch between the industry demand and the supply of right manpower.

For more details related to the new manpower development programs for 2011, visit the www.ketep.re.kr, the official website of the Korea Institute of Energy Technology Evaluation and Planning (KETEP). 



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The Holland America Line cruise ship ms Zuiderdam is equipped with shore-to-ship power technology, helping to make residential life in harbors more liveable.

Onshore and onboard

Looking at the shore-side and shipside technologies and the case for standardization in shore-to-ship power

The environmental footprint of port areas is under scrutiny. Governments, port authorities and ship owners have explored different solutions to reduce emissions from ships while they are engaged in port operations.

One solution to this problem has been identified as connecting ships in port to an onshore power supply, where electricity from the shore-based grid is used to power ships' infrastructure used for hosting crew and passengers while docked, and for cargo-handling activities. With the impending standardization of shore-to-ship power, implementation of the solution is sure to expand, helping port authorities and shipowners to reduce portside emissions.

Lutz Thurm/ Ismir Fazlagic/ Thorsten Harder/ Knut Marquart

ABB Ltd.

A case has been made for shore-to-ship power supply (Fig.1). The environmental profile of electricity generated by power plants on land versus ships' diesel engines running on bunker fuels is one of the main advantages of this technology. Through shore-based power¹, regulators can respond to a specific, local problem (pollution) with a specific, local solution (power connection from shore). For ports, the ability to supply power to ships at berth enables them to establish a more efficient and powerful overall electrical supply as a utility. In addition, the investment in infrastructure is sustainable over decades with long-term revenues. For the port area community, there is an additional benefit of reduced noise and vibration in harbor areas. And with standardization of shore-to-ship power supply, investment in the technology becomes more worthwhile.

Shoreside technology

The technology required to provide onshore power to ships at berth is not novel equipment. Engineers today can use proven technology in order to develop a reliable infrastructure to transfer the power, with rigorous technical attention to

issues such as safe cable management. Costs for the equipment vary widely, depending on the specific needs of the port and the power it will provide. Additional investments stem from construction and installation at the quay and potential needs related to strengthening the port's electricity grid.

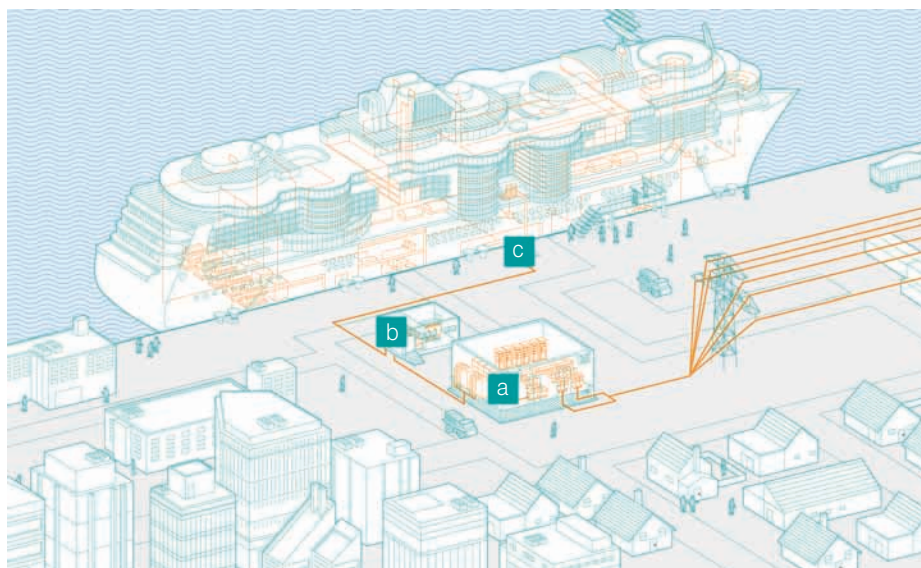
Power supply in ports is typically equivalent to that of a small factory, with electricity needed to power shoreside loading and unloading infrastructure such as cranes, belts and gantries, cooling, heating as well as incidentals. Most ports have access to enough power to run these consumers, with an additional 2 to 3MW for secondary needs.

Given that a vessel's power needs while in port may be as much as 10MW depending on the type of vessel, the electrical infrastructure at many ports will be insufficient to handle significant shore-to-ship power connections without a major improvement to their grid. This may involve investing in a new substation or installing a new incoming power line with more power; both of these actions would involve negotiation with the port's power provider.

Onshore power solutions often comprise the entire chain from the incoming substation and include transformers and

frequency converters to match the grid power voltage and frequency to the ship's onboard power system. These allow several vessels to be connected simultaneously and enable the supply of 50 and 60 Hz power regardless of the local grid frequency. They also comprise the connecting cables and berth terminals.

For each shore-based power connection point, the port or terminal must have a dedicated transformer, which serves two purposes. First, it provides the required galvanic separation (a nonmetallic direct connection between the onshore power supply grid and the ship's inter-



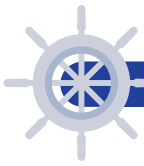
1a Transformer and switchgear

1b Converter

1c Connector

Fig.1 General overview of shore-to-ship power supply

1. Shore-to-ship power is also known as cold ironing, onshore power supply, alternative maritime power (AMP) or shore connection, among others.
2. IEC is the international Electrotechnical Commission; ISO is the International Organization for Standardization; IEEE is the Institute of Electrical and Electronics Engineers.



a ABB's PCS100 static frequency converter



b ABB's PCS6000 static frequency converter

Fig.2 ABB's static frequency converter portfolio for shore-to-ship power applications ranges from 120kVA (PCS100) to multiple MVAs (PCS6000).

nal system), so that an earth fault in the ship's electrical system will not endanger the port grid or vice versa. Second, the transformer steps down the power supply from a voltage level optimized for distribution (eg, 20kV) to one of the two voltage levels standardized for shore-to-ship power connections: 11 or 6.6kV as required by the ship.

Each shore-based power connection point also requires medium-voltage (MV) switchgear with an automated earthing

switch. In essence, the switchgear interrupts the power supply and the switch ensures that there is absolutely no power in the cables between the ship and shore while they are being handled and connected. As the highest risk associated with shore-based power connections is injury to personnel manipulating the cables and systems, this switchgear is critical.

A static frequency converter is required for most shore-based

power connections (Fig.2). The majority of ships operate with a 60Hz supply, whereas local power grids in many parts of the world use 50Hz (Fig.3). As a result, most shore-based power connections will require a frequency conversion. Static frequency converters provide an economical solution to connect any ship to any grid independent of the required frequency. Depending on the port's layout, a centralized solution with one converter may serve multiple ships and berths. Thanks to their small footprint, the converters can fit into any substation building or container along with the compact switchgear and transformers. In addition, the frequency converters improve the overall power quality of the port grid by improving the power factor

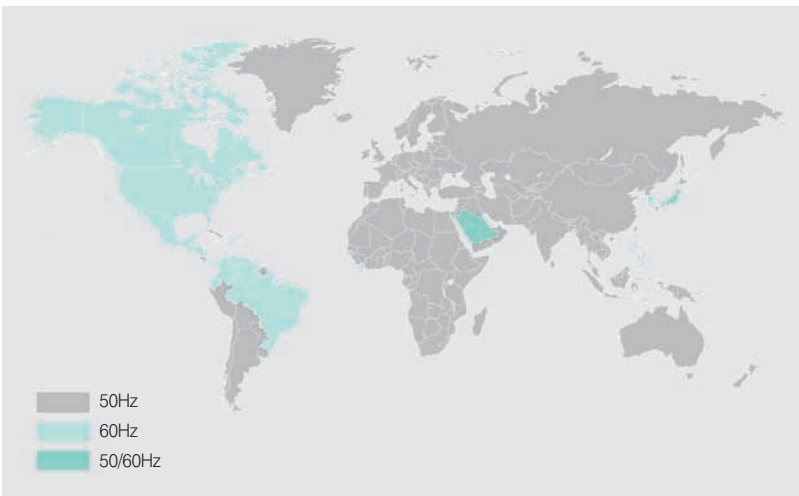


Fig.3 Frequencies throughout the world. Such differences necessitate frequency converters for shore-to-ship power.

and stabilizing voltage and frequency. Depending on the project requirements, low-voltage PCS100 or medium-voltage PCS6000 converters are used (Fig.2).

Finally, the shoreside infrastructure for a shore-to-ship power connection must include an automation and communications system, which allows personnel to coordinate the connection of cables and synchronize the ship's electrical load to the shoreside supply. This is possible with two RTUs (remote terminal units) - one onboard and one onshore - that have Ethernet communication via a fiber-optic cable.

The shore-based power connection system need not occupy much precious quayside space. The incoming substation can be conveniently located as far as 10km from the quayside transformer and MV panels that directly supply the vessel with electricity. At the quayside, there is only a small and secure room-sized container that houses the power transformer, the MV switchgear with an automated earthing switch, protection and control devices, and the operator interface. The major benefit of a compact shoreside infrastructure is that it ensures smooth dockside operations and can also be made mobile.

Shipside technology

To use power from the shore-based electricity grid, ships must be either built or retrofitted with equipment that enables the connection to shore, synchronizes the power changeover from shore to ship and connects the incoming power supply to the ship's auxiliary power system. Ships can be safely retrofitted in a relatively short time while in operation or dry docking, without major interruption of operations.

First, the shore-based power must get onboard via cables (Fig.4, 5). In some cases, particularly with container ships and roll-on/roll-off car carriers, the cable is installed on the ship and lowered via a spool or drum to the quay, where it is connected. On cruise ships, the cable is always shoreside, with a small integrated hydraulic arm to guide it.

When the cable-management system is onshore, the electrical connection is received shipside by a shore connection panel (Fig.6). This panel must generally be located close to the hull and in convenient reach of the heavy shoreside cables. The shore connection panel contains a circuit breaker, a protection relay, the physical electrical connection (plugs and grounding cable), and a control interface with the ship's integrated automation system, or power management sys-

tem. These systems allow the incoming power to be synchronized with the ship's diesel auxiliary engines before the load is transferred. ABB shore connection panels include two cabinets, the dimensions of which vary depending on the power rating. This MV equipment must be installed in a dedicated room.

On ships that use conventional mechanical propulsion (in which the diesel engines directly power the ship's propellers, as opposed to diesel electric propulsion), the ship's low-voltage auxiliary power system - typically 400 to 690V - requires a transformer to receive the 11 or 6.6kV power supply from shore. This transformer is relatively large and bulky, but - unlike the shore connection panel - it can be installed in the engine room or any other suitable location onboard.

The process of connecting and disconnecting a ship to the shore-based power supply takes between five and 30 minutes. Onboard, the chief engineer or a trained staff member experienced with the ship's power management system handles the power transfer. Cable management can be done either by ship or shore personnel with adequate training in handling MV equipment. At least one company has begun investigating an automated system for plugging the cables into the ship to improve safety and save time.

Currently, the majority of ships equipped with the infrastructure to receive shore-based power are container vessels, and many ship designers are either including this infrastructure in their designs or are setting aside space for it. Many of today's ships with shore connection equipment have been retrofitted (ie, the equipment is added to an existing vessel), rather than built with the equipment installed.

While little of the technology installed onboard ships for onshore power supply is new, usually the



Fig.4 Connection cables on Holland America Line's Vista-class ms Oosterdam vessel

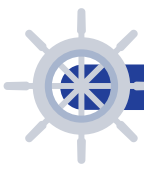


Fig.5 ABB shore-to-ship power connection in Gothenburg, Sweden



Fig.6 ABB shore connection panel

entire system must be engineered on a case-by-case basis for each installation. Even if the connection is standardized, ship design is not, meaning that questions of space, accessibility, interfacing with the power management system and the diesel engines all need to be surveyed and assessed prior to installation. ABB has developed turnkey solutions covering the entire scope of delivery, with minimal interruption of ship operations.

Standardizing shore-to-ship power connection systems

In order for shore-to-ship power supply to make sense for ports and shipowners, the nature and arrangement of power connections must be standardized. Neither a port owner nor a shipowner can justify investment in expensive equipment to enable a shore connection system without assurance that such a system will be functional across many jurisdictions and for a defined period of time.

Work on a common standard for onshore power supply for ships at berth began early in 2005. Major players in this effort have included technology suppliers, governments, port authorities, shipowners (particularly cruise line, tanker and container ship companies), classification societies and others. The IEC, ISO and IEEE² joined forces to create a standard that will enable onshore power connections to effectively have a water-tight global basis.

The standard applies to the specification, installation and testing of onshore power systems and plants and addresses:

- The onshore distribution system
- The shore-to-ship connection

- Transformers/reactors
- Semiconductor converters and rotating converters
- Ship distribution systems
- Control, monitoring, interlocking and power management systems

The purpose of the standards work was to define requirements that “support, with the application of suitable operating practices, compliant ships to connect quickly to compliant high-voltage shore power supplies through a compatible shore-to-ship connection”^[1]. This should eliminate the need for ships or port operators to adapt or adjust their infrastructure to enable connections.

The initial goal of creating a single, global connection standard for all ships at all ports was abandoned out of necessity. The power needs and capacities of ships differ so much that a single standard would be unfeasible. As a result, four separate, but linked, standards were created - one for ro-ro ships, one for container ships, one for cruise ships and another for tankers. In addition, there are two main standard voltages for connection - 11kV and 6.6kV.

With a global standard in place, investment in shore-to-ship power connection systems by ports and shipowners is due to take off. The final standard is on the verge of ratification. ⚓

Reference

[1] IEC/PAS 60092-510. Edition 1.0 (2009, April). Electrical installations in ships - Part 510: Special features - High-voltage shore connection systems. Retrieved September 20, 2010 from http://webstore.iec.ch/preview/info_iecpas60092-510%7Bed1.0%7Den.pdf.

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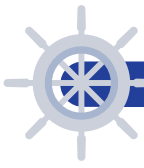
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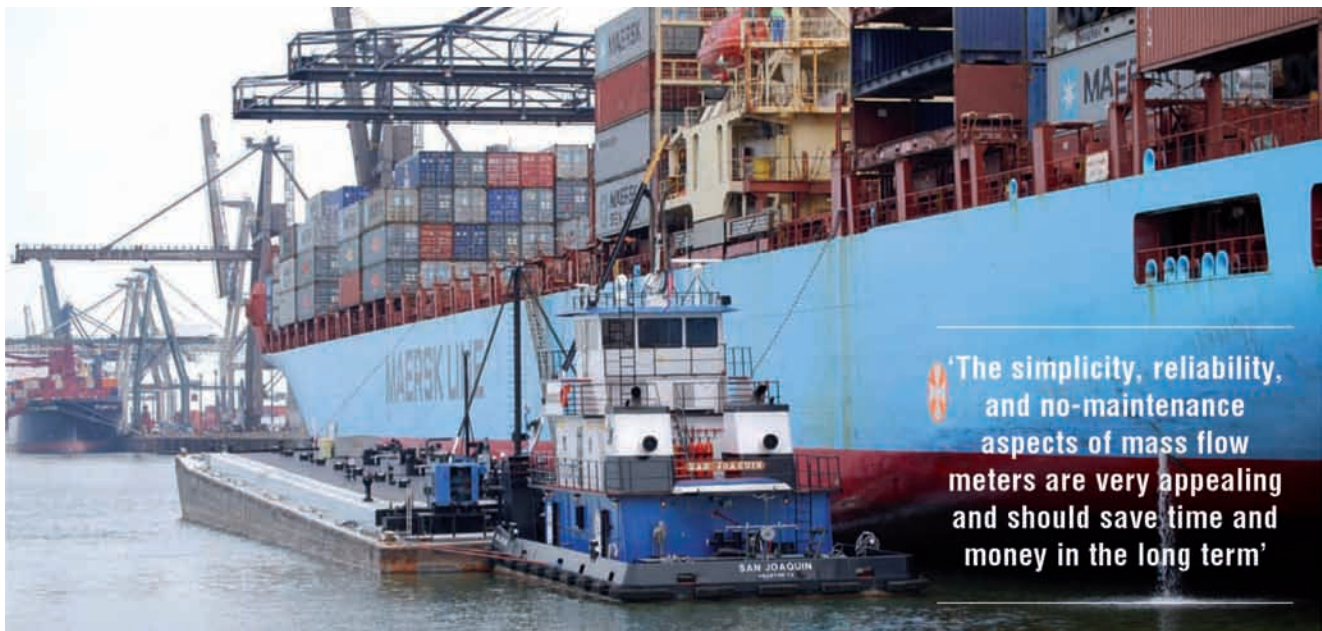


Accurate, automated bunkering

Steve Jones of Emerson Process Management and Robert Blakeney of Nautical Control Solutions report on how a new marine fuel delivery system is utilizing modern technology to provide 'unprecedented accuracy, reliability, and maintainability'

Steve Jones

Emerson Process Management Micro Motion Division



Over the last eight years, Emerson Process Management has made major investments in its Micro Motion Coriolis mass flow meter technology to meet the specific demands of the global bunkering industry. The decision by A. P. Moller-Maersk to install Micro Motion Coriolis meters for bunker measurement has been previously detailed in this magazine (see KORSHIP, May, page 59). However, this is only part of the story. More players are beginning to reap the rewards of this technology and not just at the vessel end of the supply chain.

In the spring of 2007, Emerson Process Management's Micro Motion division, based in Boulder, Colorado, and Nautical Control Solutions (NCS) of Houston, Texas, manufacturer of

the FuelTrax marine fuel management system, first combined engineering talent and advanced technology to address the overall concerns of the bunkering industry: that is, irrefutable confidence in fuel mass delivered, increased process efficiency, and improved safety. The result of these combined efforts is the Coriolis-based bunker-metering solution outlined later in the article.

As background, the initial design outlined two eight-inch - 20cm - diameter Coriolis meters in parallel to handle a bunker flow rate of 1,500 metric tonnes (mt) an hour. A portable skid was developed to hold the two meters plus a FuelTrax-based electronics unit utilising a touch screen user interface. The original goal was to be able to move the skid from barge to

barge. The prototype skid, electronics, and software were tested with water by a third party certification company at the Port of Houston and were declared accurate.

The next step was a field test and barge operator Buffalo Marine Service Inc. agreed to provide industry expertise and a barge for field-testing. Established in Houston in 1935, Buffalo has grown to become the premier bunker transportation company at the Port of Houston.

“We have a very large positive displacement meter on one barge that we have attempted to use through the years,” said Chuck King, Vice President of Buffalo. “For it to work reliably, we had to add it to our routine maintenance schedules. For air entrainment, we had to add an air eliminator and for particulates we had to add a strainer, which also has to be serviced. Additionally, we must pay a third party company to frequently test and certify the meter. The simplicity, reliability, and no-maintenance aspects of mass flow meters are very appealing and should save us time and money in the long term.”

Anthony George, CEO of NCS, commented, “As we advanced development on the prototype it became clear that one appropriately sized Coriolis meter could handle the anticipated flow rates in most delivery scenarios and the skid idea was set aside as more appropriate for a terminal installation.” He went on saying, “Discussions with the US Coast Guard (USCG), which has jurisdiction over the safe installation of electronics on fuel-carrying barges, identified certain restrictions and roadblocks in the skid design that would prevent approval. The final design removed the skid entirely and piped the Coriolis meter directly into the barge’s discharge header. Additionally, we moved the electronics, printer, and user-friendly touch-screen to the tug wheelhouse to solve several operational and engineering hurdles which then also supported the Class I Division II safety certification required by the Coast Guard for electronics. In the end, the production version is simple and elegant.”

Commercial version and first bunkering

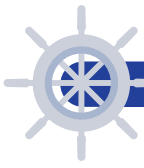
With the new design in hand and a green light from Buffalo, Micro Motion and NCS established a production and delivery schedule on Buffalo 401k, a 90.5m double-hulled barge with a capacity of 30,000 barrels. Installation of the meter was straightforward and took four workdays at one shift per day. The FuelTrax electronics cabinetry and bunker delivery receipt printer were installed on-board the San Joaquin, a



23m tug rated at 2,000 horsepower (hp).

The first field test of this automated metering system took place on 26 August at the Port of Houston. The Maersk Wyoming, a 292m container ship, pulled into Barbour's Cut at 13:00 hours. The Buffalo 401k was waiting with an order of 1,500 mt of 500 centistoke (cst) fuel oil. After properly connecting the supply boom hose, the barge crew began pumping at the rate of about 250 mt per hour, as shown live by the FuelTrax monitor in the wheelhouse. Mass, volume, density, and temperature readings from the Micro Motion Coriolis meter were being displayed simultaneously on the touch screen monitor. When all the fuel had been delivered, the crew of the San Joaquin touched the 'print' button on the screen, the bunker delivery receipt was printed, and the event was completed.

The ship was crucial to the success of this first test. At the Bunkering Symposium in Antwerp in December 2008, Maersk announced that it had begun installing Micro Motion Coriolis meters on some of their ships, including the Maersk Wyoming. The model and specifications were identical to the one installed on Buffalo 401k. So how did the results compare? Both meters were within 0.1% of each other; a difference so small that all involved considered it insignificant. The Maersk Wyoming's Chief Engineer, Michael E. Buckley III, was pleased to see that he was getting the fuel he ordered and commented: 'Real-time, accurate tracking of our bunker operations made all the difference, giving me instant accuracy of soundings and flow rates, which in the past was relied on by manual soundings and calculations. Eliminating this manual process, and using precise Coriolis measurement,




meant the company paid for the fuel it received.' Buffalo was pleased to be able to meet its customer needs and at the same time provide an accurate, timely service with no complaints on the amount delivered.

Pat Studdert, President of Buffalo, put it this way, "Historically, chief engineers and terminal managers have always been wary of bunkering accuracy. The supplier is convinced he or she loaded every barrel ordered and the Engineer aboard the vessel receiving bunkers is convinced that the ship will be short changed if the crew does not double check every step of the transfer process. FuelTrax provides Buffalo crews with a fail safe way to meet the customer's bunker orders. Moreover, Buffalo bunker barges can reliably deliver multiple orders from the same barge; thereby eliminating the one-job-one-load inefficiencies inherent with the old way of conducting business. In short, FuelTrax provides precise measurements, simple back-up documentation in the form of a meter ticket and overall satisfaction that every drop of bunker fuel that has passed through the meter is aboard the vessel."

Buffalo's system utilises geosynchronous positioning and Iridium satellite antennas on the San Joaquin for electronics

and Coriolis meter diagnostics during the field-testing phase of this project. Uploading of the bunkering event information to the NCS data centre for review by all parties represents the next phase in commercial deployment. FuelTrax customers can already review fuel management data on a vessel using the FuelNet web portal, so adding bunkering events provides access to the transaction for review and approval in a total end-to-end business solution. The terminal, bunkering agent, and shipowner would each review the transaction, verify that it was accurate, and provide an electronic signature online. No paperwork at the ship would be needed, unless physical signatures are required.

Summary

Emerson's Micro Motion division continues to work with numerous customers to prove the flow meter's performance in all major ports around the world, for ship, barge, and terminal installations. Additionally, work with internationally accredited weights and measures agencies and port authorities is on-going, with the goal of achieving an 'irrefutable' bunker measurement. 



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SSME won the first order for offshore plant

Sungdong Shipbuilding & Marine Engineering (SSME) clinched an order for 1 Floating, Storage, and Offloading (FSO) from Petro-Vietnam Technical Services Company (PTSC), a subsidiary of the state-owned Vietnam National Oil and Gas Group (PetroVietnam), from May 16, paving the way for SSME to make a full-fledged inroads into the offshore facility market. This is the first newbuilding order placed at SSME in the offshore sector.

FSO, typically barge or ship-shaped, is an offshore facility with pipes connected to the lower hull to store and transfer the crude oil produced in the subsea oil fields to the tanker.

The newbuild will measure 171.5m in length and 32.4m in width and can accommodate 50 people. It has a storage capacity of 350,000 barrels of crude oil and is scheduled for delivery by early 2013.

Having consecutively won newbuilding orders in the offshore sector, SSME has successfully expanded its portfolio. SSME won an order for shuttle tanker, a specialized vessel for transporting the crude oil from offshore oil field installations to onshore terminal, in late March, apart from the new order for FSO this time.

That will add fresh momentum to the efforts of SSME to diverge into the offshore sector, a high value and high technology field, and lay the groundwork for SSME to accomplish advanced business structure and create new engine of future growth.

In particular, SSME is expected to win additional orders amid growing demand for offshore oil field development facilities such as FSO, etc, as high oil prices has led to development of more offshore oil fields worldwide.

SSME is the fifth domestic shipyard that has advanced into the global offshore market, following Hyundai Heavy Industries (HHI), Daewoo Shipbuilding & Marine Engineering (DSME), Samsung Heavy Industries (SHI), and STX Offshore & Shipbuilding (STXOS).

An official from SSME said, "SSME's rapid expansion into the offshore sector beyond the ultra large ship sector is attributed to its unceasing efforts to build up strong technological positions and competitiveness bolstered by constant investment in the latest facilities and R&D related to the integration of infor-

mation technology (IT) to production process over the last 5 years."

He added, "The offshore and shipbuilding markets, which remained sluggish in the aftermath of global financial crisis, currently undergo shift towards large and high-value ships. To keep pace with these new trends and developments, SSME plans to pursue advanced ship portfolio, diversification, and expansion into the market for offshore drilling and production facilities including FPSO and drillship."

PTSC which entered into a contract with SSME for the first time takes top spot in a national ranking of both private and state-owned companies, generating huge amount of sales revenue that accounts for 24% of Vietnam's gross domestic product (GDP). PTSC, in which the Vietnamese government holds a 60% stake, is a subsidiary of Petro-Vietnam National Oil and Gas Group (PVN) ranked around 70th among international oil companies and specializes in the marine port services, offshore oil and gas drilling service, etc.

SSME has become the first domestic shipyard that received the offshore facility order from PTSC. The newbuild will be deployed immediately upon its delivery for the oil field development in the southeastern region of Vietnam as part of the USD 800 million 'Bien Dong 1 Project'.

SPP Shipbuilding received an order for 4 units of 1,700TEU containerships

SPP Shipbuilding was recently awarded an order for 4 units of 1,700TEU containerships from the Greece-based Eastern Mediterranean Maritime. These vessels are priced at around USD 30 million per unit and are scheduled for delivery from late 2012 to 2013 on a staggered basis.

This marks the second such award granted to SPP Shipbuilding which had

signed a newbuilding contract for 1 unit of 82,000-ton Kamsarmax bulk carriers and 4 units of 35,000-ton Handysize bulk carriers early this year.

SPP Shipbuilding, which focused on medium-

sized product carriers and bulk carriers, has also successfully advanced into the market for small and medium-sized containerships, clinching an order for 4 units of 3,600TEU containerships from the Greece-based Metrostar late last year and another order for 1,700TEU containerships this time.

In addition, the 1,700TEU containerships to be built by SPP Shipbuilding can carry more containers than the same class vessels. They are eco-friendly and fuel-efficient vessels designed to be capable of navigating in shallow waters and expected to dominate the newbuild market for the same class vessels.

SPP Shipbuilding delivered its 100th ship in November last year and handed 114 ships (worth a total of USD 4.9 billion) over to the ship owners so far in a timely manner. According to the statistical data of Clarkson released in March, 2011, SPP Shipbuilding has the order backlog of 133 vessels (approximately 2.38 million CGT) which is the 10th largest among the shipyards worldwide.

SHI received orders for 2 drillships

Samsung Heavy Industries (SHI) announced on April 19 that it won a USD 1.216 billion order for 2 drillships from the Greece's Ocean Rig.

The newbuilds will measure 228m in length, 42m in width, 19m in height and is the same model as the existing drillships that SHI has been constructing. In particular, These drillships will have broad width to increase stability of operation in rough waters such as the North Sea, Russian Sea, etc.

The newbuilds are scheduled for delivery by October 2013.



Drillship of SHI

Nexans was awarded a EUR 4.8 million contract to supply infield umbilical

Recently, Nexans signed a contract with Norske Shell to supply the 6.5km infield umbilical to be used for the Ormen Lange North Field project. The contract is valued at approximately EUR 4.8 million. The Ormen Lange natural gas field situated on the Norwegian Continental Shelf began production in 2007.

In the Ormen Lange project, the 4th subsea production template (C) will be added to the place located about 6km to the north of the current production facilities that include 3 templates (A, B, C). The Nexans infield umbilical will connect the template C and B by supplying the hydraulic fluid, electrical power, and fiber optic signals necessary to operate the subsea production systems installed at about 850m under water.

Under the contract, Nexans undertakes the engineering, procurement and construction (EPC) of the infield umbilical which will be manufactured at its plant in Halden, Norway. These products will be delivered in the first half of

2012.

"In 2004, Nexans supplied the 125km main umbilicals and infield umbilical currently operating successfully in the subsea systems at Ormen Lange. In that regard, we are very delighted to work with Norske Shell again on one of Europe's most important gas field development projects. This contract attests to the wide recognition of the proven ability of Nexans in terms of the design, on-time delivery, cutting-edge technology of umbilicals applicable to the oil and gas sector." said Ragnvald Graff, Sales & Marketing Director, Energy Division of Nexans.



DSME won an order for 1 deepwater drillship

Daewoo Shipbuilding & Marine Engineering (DSME) announced that it won an order for a deepwater drillship from Vantage Drilling, a U.S.-based offshore drilling company providing drilling services worldwide, on May 9 (local time).

The signing ceremony held at the headquarters of Vantage Drilling in Huston, United States, was attended by many high-ranking officials of both companies, including Nam Sang-tae, President & CEO of DSME, and Paul A. Bragg, Chairman & CEO of Vantage Drilling.

The drillship will be constructed at Okpo shipyard of DSME and delivered by late May, 2013. The value of the contract has not been revealed in accordance with mutual agreement. Besides, the contract includes an option for 1 more additional vessel, in addition to the 1 firm order.

This drillship will measure 238m in length and 42m in width and will adopt the DSME-12000 model. Fitted with the state-of-art equipments, this drillship can operate in water depths up to 12,000 feet (approximately 3,600m) and has a

total vertical drilling depth capacity of 40,000 feet (approximately 12,000m).

Furthermore, this drillship will be outfitted with technologically advanced features, such as dynamic positioning system (DPS) for maintaining stable position, Blowout Preventer (BOP) for safe drilling operation, and others.

Vantage Drilling, the ship owner, is expanding its boundary of business and its fleets. In particular, Vantage Drilling has built solid cooperative relationship with DSME and deployed the drillship - incorporating the DSME's unique design and delivered by DSME in November last year - for the offshore operations in the Indian Ocean and has expressed great satisfaction over the successful drilling operations. Based on such positive result, Vantage Drilling placed another newbuilding order with DSME this time.

Having secured this order, DSME has won 4 drillship orders and 10 supertanker orders so far this year. Specifically, DSME received 1 drillship order in January, 2 drillship orders in March, and 1 drillship order in May, respectively, showing strong performance in the drillship sector.

Nam Sang-tae, President & CEO of DSME, said, "We anticipate more newbuilding orders for offshore drilling facilities such as drillship amid record high oil prices. We will make vigorous efforts to increase our sales in the market for high value-added vessels such as offshore plants and accomplish USD 11 billion target this year."



Nam Sang-tae (right), President & CEO of DSME, and Paul A. Bragg (left), Chairman & CEO of Vantage Drilling, are shaking hands after signing the contract in Vantage, Huston on May 9 (local time).

Nexans signed a contract to supply DEH system for the Fossefall Dompap oil and gas field

Nexans entered into a EUR 20 million contract with Statoil. This contract aims to design and manufacture the Direct Electrical Heating (DEH) system for the submarine pipelines used in the Fossefall Dompap oil and gas field situated

on the Norwegian Continental Shelf. The Fossefall Dompap oil and gas field will be tied back to the Norne FPSO (Floating,

Production, Storage and Offloading) in which Nexans delivered the DEH system for pipelines linked to Urd and Alve.

This contract covers the supply of DEH system, including DEH Riser Cable consisting of 4 power cores, External Feeder Cables, a 25km-long Piggyback Cable and all related accessories used for the connection between the Norne FPSO and the subsea facilities of Fossekall Dompap and the installation of pipelines.

The Piggyback Cable is a new integrated protection system developed by Nexans to protect electric wires from mechanical impact of trawling and others.

DEH is a special technology developed to ensure safe transportation of oil and gas to the platform via the pipelines. The Alternating current (AC) transmitted from the DEH cable flows through the steel in the pipe heated by its own electric resistance. As a result, the pipelines are operable at a low cost and in an environmentally safe way.

“The latest contract for Fossekall Dompap attests to Nexan’s safe, eco-

friendly, and cost-effective innovative technology for ensuring stable flow in subsea production pipelines. Nexans installed the first DEH system in the Åsgard field of Statoil in 2000. The DEH system has already been operational from the Norne FPSO where we previously delivered the DEH system for pipelines linked to Urd and Alve.” said Ragnvald Graff, Sales & Marketing Director, Energy Division of Nexans.

The cables to be used for the Fossekall Dompap DEH system will be manufactured at the Nexans plant in Halden, Norway and are scheduled for delivery in April, 2012.

STXHI entered into a KRW 3 trillion contract to build diesel power plants in Iraq

STX Heavy Industries (STXHI) received a KRW 3 trillion contract to build diesel power plants with a combined capacity of 2,500MW in Iraq.

The contract was formalized in a signing ceremony at the official residence of the Iraqi Prime Minister, located in Baghdad, on May 18 (local time) to build diesel power plants worth a total of KRW 3 trillion, which was attended by Iraqi Prime Minister Nouri al-Maliki, Iraqi Minister of Electricity Raad Shallal Saeed, STXHI CEO & President Lee Chan-woo, and related officials.

STXHI signed a Memorandum of Understanding (MOU) in April with Iraqi Minister of Electricity Raad Shallal Saeed who accompanied the Prime Minister Nouri al-Maliki during the visit to Korea, which aimed to pave the way for formal agreements.

Under this contract, STXHI will build 25 diesel power plants with a combined capacity of 100MW in all parts of Iraq including Baghdad and Basra which suffer from acute shortage of power.

This project will be carried out on an Engineering, Procurement & Construction (EPC) basis covering the design, procurement of equipments, and overall constructions for the completion of power generation facilities and power supply. The power plants will be completed by June in 2012.

To ensure that the project is finalized successfully, STX Group plans to harness the diesel power plant production capabilities of STXHI, STX Engine, STX Metal and the plant construction capabilities of STX Construction, there-

by maximizing the synergistic effects among its affiliates.

STX Group’s affiliates in the engine sector are



STXHI signed a contract with the Iraqi Ministry of Electricity at the official residence of Iraqi Prime Minister, located in Baghdad, on May 18 (local time) to build diesel power plants. A commemorative photograph was taken to celebrate the contract signing. The photo shows STXHI CEO & President Lee Chan-woo (third from the left) and Iraqi Minister of Electricity Raad Shallal Saeed (fourth from the left).



expected to reap huge sales and profits as STX Engine and STX Metal will supply 500 units of 4MW and 7.8MW diesel power facilities, the container type developed independently by STX.

An official from STXHI said, "The award of this large-scale contract can be attributed to our unceasing interest and effort to tap into Iraq's market on the basis of strong competitiveness of STX Group in the diesel power plant sector. Furthermore, this contract has laid the groundwork for successful completion of the network for Iraq's government and local network."

Meanwhile, Iraqi Prime Minister Nouri al-Maliki who attended the signing ceremony expressed his hope to see the formal agreements concluded within a month for the construction of the USD 3 billion plant for which

MOU was signed early last year.

He said, "I hope that the final contract will be signed with STX Group chairman Gang Duk-soo in Iraq within a month through the negotiation between Iraq and STX for the construction of 3 million-ton assembly line steel complex and 500MW gas-fired power plant."

Meanwhile, STXHI expects that this contract will add fresh impetus to its efforts to participate in Iraq's post-war restoration projects.

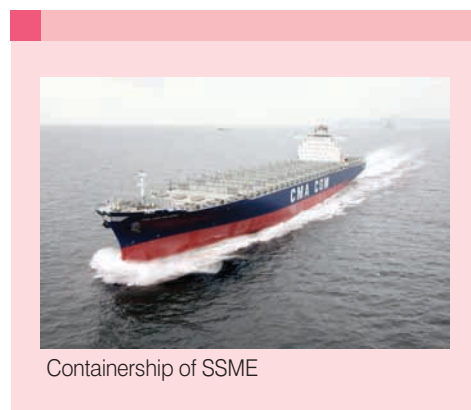
SSME clinched orders for 9 vessels including containerships

Sungdong Shipbuilding & Marine Engineering (SSME) announced that it received newbuilding order for 5 Post-Panamax containerships and 4 Kamsarmax bulk carriers from an European ship owner on May 11.

The containerships are 8,800TEU-class large-size containerships which measure 300m in length, 48.2m in width, and 24.6m in height and will be delivered on a staggered basis from the first quarter of 2013. Costamare, the ship owner, is the largest owner and provider of containerships in Greece for charter and has a fleet of 58 containerships with a total capacity of around 320,000TEU. In late January this year, Costamare ordered the same type of vessel to SSME. These newbuild vessels will be chartered over the long-term to Evergreen, a Taiwan-based shipping company, immediately upon their delivery.

The bulk carriers are 82,000DWT vessels, the biggest size which can enter the port Kamsar in Guinea Africa, measure 229m in length, 32m in width, 20m in height and will be delivered on a staggered basis from 2013.

SSME has seen its orderbook recovering. SSME has won orders for a total of 32 ships (including 6 optional vessels) worth USD 2.09 billion so far this year, all of which are high-end and large ships in line with the current market



Containership of SSME

demand.

Recently, SSME received most of newbuilding orders from new ship owner clients, which raises the prospect that SSME will garner more contracts in the period ahead.

SHI secured an order for 1 FPSO

Samsung Heavy Industries (SHI) announced that it received a USD 636 million (KRW 690 billion) order for 1 Floating, Production, Storage, Offloading (FPSO) from Norway-based Teekay Petrojarl on May 9.

This FPSO will have a storage capacity of 800,000 barrels of crude oil and will be delivered by mid 2013.

Teekay Petrojarl operates as a subsidiary of Teekay Corporation, one of the world's largest provider of oil and gas marine services, and operates offshore

facilities deployed in the North Sea.

Having secured this newbuilding order, SHI has won orders for a total of 26 vessels worth USD 7.5 billion, approximately 65% of its annual target of USD 11.5 billion.



The shipbuilding market in 2011 is set to register strong growth in new orders for offshore facilities as the projects are being rolled out after postponement along with the surge of newbuilding orders for high value-added ships such as container ships or LNG carriers and a sizable increase in crude oil prices.

South Korean shipbuilders, which maintain strong position in those 2 sectors, clinched large-scale orders for container ships and offshore facilities one after another from the beginning of this year and have continued their smooth sailing.

According to Clarkson data released in March, South Korean shipyards regained status as world's top winner of monthly new orders in 4 months by beating China by a wide margin. As a result, the gap in order backlog between the South Korean shipyards and their Chinese rivals has narrowed considerably.

Here, we take a close look at the performance of South Korean major shipyards, the world's leading players with strong growth in new orders as shown currently in the Clarkson data, such as Hyundai Heavy Industries (HHI), Daewoo Shipbuilding & Marine Engineering (DSME), Samsung Heavy Industries (SHI), STX Offshore & Shipbuilding (STXOS), and others based on the order backlog data. ⚓

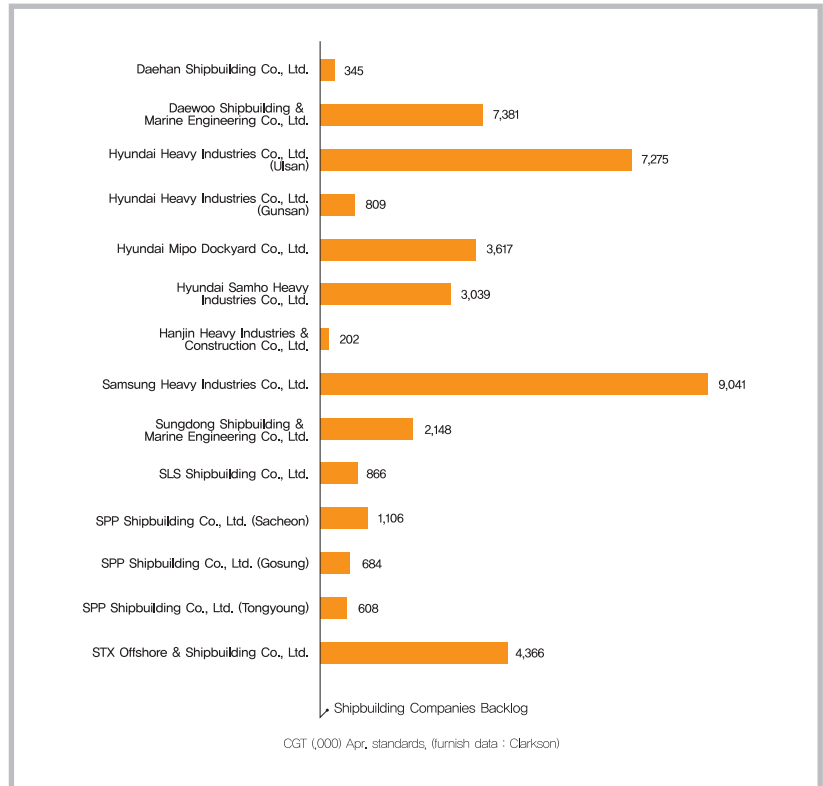


Photo: Samsung Heavy Industries Co., Ltd.





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Containership

The container ship market is rebounding amid the increasing shipbuilding contracts in the second half of 2010 breaking the order drought for almost two years after the outbreak of global financial crisis. The market for containerships definitely took a positive turn when the German-based Hapag-Lloyd awarded an order to Hyundai Heavy Industries (HHI) for the construction of 10 units of 13,100TEU containerships in December 2010.

Clarkson has analyzed in its report that the newbuild merchant ship order tally in 2011 will stand at 26.9 million CGT, a level similar to that recorded in 2010, among which the order-book for newbuild containerships is expected to increase twofold year-on-year to 6.7 million CGT. As a matter of fact, prominent shipping companies worldwide began to place massive orders for container ships from the beginning of 2011.

Domestic shipyards are expected to benefit the most from

the ship owners' recent inclination toward acquiring large vessels and their ongoing replacement of current fleets with new ship types in view of the continuous growth in container traffic and the surge in the demand for green ships as the world economy recovers.

In fact, domestic shipbuilding heavyweights - Hyundai Heavy Industries (HHI), Daewoo Shipbuilding & Marine Engineering (DSME), Samsung Heavy Industries (SHI), Hyundai Samho Heavy Industries (HSHI), Sungdong Shipbuilding & Marine Engineering (SSME) and others - won large-scale orders from the beginning of the year and have continued smooth sailing.

HHI received a total of 22 newbuild container ship orders and DSME set a new record by winning approximately KRW 2 trillion order for the construction of as many as 10 units of 18,000TEU, as of late March. ⚓

• Hyundai Heavy Industries (HHI)



Cosco Guangzhou, a 9,500TEU container ship



Mearsk Edinburgh, a 13,100TEU container ship



- | | |
|---|---|
| 1 | 2 |
| | 3 |

1. Colombo Express, a 8,600TEU container ship
2. CMA CGM Hugo, 8,200TEU container ship
3. Hamburg Express, 7,506TEU container ship

Astrid Schulte, a 7,000TEU container ship





•STX Offshore & Shipbuilding



13,000TEU supersize eco-friendly containership



'STX YOKOHAMA', a containership currently operated by STX Pan Ocean

•Hanjin Heavy Industries & Construction



CMA CGM Excellence, a 3,400TEU container ship



Mearsk Kowloon, a 6,200TEU container ship



COSCO New York, a 5,100TEU container ship

•Hyundai Samho Heavy Industries



MSC SOLA, a 11,700TEU container ship



13,100TEU containership currently under construction

•Hyundai Mipo Dockyard

2,800TEU container ship



3,450TEU container ship





Major Performance Gallery

• Daewoo Shipbuilding & Marine Engineering



CMA CGM Vela, a 13,300TEU container ship



MSC Danit, a 14,000TEU container ship



CMA CGM Magellan, a 13,300TEU container ship



Maersk Tanjong, a 7,450TEU container ship

Hanjin Korea, a 10,000TEU container ship



• Samsung Heavy Industries



- 1
- 2
- 3

1. Xin Los Angeles, a 9,600TEU container ship
2. CSCL Europe, a 8,100TEU container ship
3. MSC Pamela, a 9,600TEU container ship



Multi purpose versatile cutter and others

Bosch Power Tool Division

The power tool division of the Bosch, a global leader for portable electric power tools, recently unveiled the versatile and powerful cutter 'GOP 250 CE' and 'SKIL 18V lithium ion cordless drill driver 2888-21', which ensure continuous working.

Versatile cutter with powerful performance

Professionals in the interior fitting trade often face different and difficult adjustment, trimming and repair jobs, etc, such as s cutting, sawing, sanding, scrapping, etc. GOP 250 CE is a versatile tool with various accessories that oscillate fast with a range of 1.4 degree on left/right for removing silicone joints and putties and enables fast surface edge treatment. In addition, 250W motor applied to this product offers the most powerful performance among the products of same kind, and the Bosch Constant Electronic for constant speed under load also ensures continuous work progress.

The slim handle enables comfortable work in different positions and reduces fatigue of hand when carrying out works such as cut-

ting, sawing, etc, which require accuracy. GOP 250 CEI causes the accessory to perform oscillating motion with a range of 1.4 degrees on left/right. The oscillation speed selection enables the tool to be set to suit different accessories and materials and helps ensure precise cutting of workpieces without tearing or any damage.

An integrated ball type socket prevents the cable from breaking in tough work environment and ensures great flexibility in every work situation for the best results.

New and various accessories of GOP 250 CE even make it possible to work on insulation material and on silicone or acrylic. Besides, the universal adapter enables GOP 250 CE to be used with other accessories available on the market, as well as with the extensive Bosch range of accessories, and thus can be used for all works that require high precision.



'GOP 250 CE'



'2888-21'

New
Product



Example of work

The major specification is as follows:

- Rated power input: 250W
- No-load speed: 8,000-20,000rpm
- Oscillation angle on left/right: 1.4°
- Length: 280mm
- Width: Max. 61mm/Min. 45mm
- Height: Max. 59mm/Min. 50mm
- Handle circumference: 180mm
- Weight: 1.8kg

Drill driver enabling comfortable working

SKILL 18V lithium ion cordless drill driver '2888-21' has ergonomic slim handle that enables fatigue-free, effective and comfortable working. Therefore, this tool is ideal for working overhead and in tight areas, and for all works that performed using the cordless tools.

The 2-gear motor applied to 2888-21 enables perfect working on a wide range of materials. It provides powerful performance and is suitable for all interior-related works, and can be useful very much even for electric technicians and car repair/maintenance. Additionally, 13mm keyless chuck makes it possible to fix and replace the beats, and the torque adjustable in 25 stages provides the torque optimized for any kind of screw driving works, ensuring precise and neat finish.



2888-21 adopts the battery indicator which allows the user to see how much battery life is available before and during the work. Besides, the lithium ion cordless lantern enclosed in the package is another feature that makes the product differentiated from others.

The major specification is as follows:

- Voltage: 18V
- Battery capacity: 1.3Ah
- No-load speed: 0-400/0-1,250 rpm
- Max. torque: 40 Nm
- Torque setting: 25+1
- Quantity of battery: 1
- Lithium ion cordless lantern: 0
- Charging time: 1hour

-TEL: +82-80-955-0909

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head office : Gimhae Gyeongnam
 homepage add : www.bycontrols.com
 main products : control valves, hydraulic & pneumatic actuator,
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 TEL : +82 55-345-6110

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 homepage add : www.bcinternational.co.kr
 main products : water jet power pump, marine tape, petro tape,
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 homepage add : www.cmrkorea.com
 main products : Marine Telephone, Marine CCTV, Anemometer,
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 homepage add : www.capeind.com
 main products : cylinder liner-man b&w, sulzer(wartsila)
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head office : Saha-Gu, Busan
 homepage add : www.emersonprocess.com/marine
 main products : Valve Remote Control Systems, Tank Level
 Gauge Systems, Marine Tank Management Systems
 TEL : +82 51-602-5555

DAEYANG INSTRUMENT CO., LTD.

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 homepage add : www.daeayang.co.kr
 main products : precision instrument-anemometer rudder angle
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head office : Gangseo Busan
 homepage add : www.daejinqc.co.kr
 main products : aluminium/steel/wooden furniture, catering
 furniture, fire & gas damper a60
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DAE JIN DAMPHA CO., LTD.

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 homepage add :

main products : ceiling panel, wall panel
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 homepage add : www.daechun.co.kr
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 room, center frame
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 main products : marine gear box, hyd. steering system, power
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 homepage add : www.dh.co.kr
 main products : e/r heater & cooler, plate cooler, fresh water
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 homepage add : www.doosanengine.com
 main products : marine diesel engine, diesel power plant
 TEL : +82 55-260-6000

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 homepage add : www.dmcrcrane.co.kr
 main products : hose handling crane, hose handling crane,
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 TEL : +82 55-720-3001

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 main products : KVM Sealing Compound, Mangana Retaining
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 main products : lighting fixture, main switch board, fan, precision
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 main products : heat exchanger, gas cooler, oil cooler, air cooler,
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 main products : Instrumentation Fitting & Valve-Compression
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head office :
 homepage add :
 main products : rudder, block, bolster
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 homepage add : www.epmp.net
 main products : parts for marine engine, shaft systems for ship,
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 Equipment
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main products : Air Conditioning System, Refrigeration Plant, Package A/C, Ventilation Fan
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main products : ups & rectifier sys. hull stress monitoring sys. waste compactor
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homepage add :
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main products : Accommodation ladder, Wharf ladder, Window wiper
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homepage add : www.jungsan.com
main products : Bolt & Nut (Exhaust valve, Cylinder cover, Connecting-rod, Main bearing & etc.)
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main products : ceramic back-up tape
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homepage add : www.komeco.net
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KEYSUNG METAL CO., LTD.

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main products : valves for marine & offshore plant, cryogenic vlaves, strainer
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K. C. LTD.

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homepage add : www.iccp-mgps.com
main products : I.C.C.P. System, Anti-fouling System(M.G.P.S.), Shaft Earthing Device
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KOKACO CO., LTD.

head office :
 homepage add :
 main products : Exhaust Valve & Valve Seat Grinding Machine, Nozzle Lapping Machine
 TEL : +82 51-403-4114/6

KONGSBERG MARITIME KOREA LTD.

head office :
 homepage add : www.km.kongsberg.com
 main products : IAS, DP, K-Chief 500, Auto Chief c20, K-Gauge, K-Bridge, MIP, MBB
 TEL : +82 51-749-8600

KEYSTONE VALVE(KOREA) LTD.

head office : Anseong Gyeonggi
 homepage add : www.tycovalves.com
 main products : Butterfly Valve, Ball Valve, Safe Valve
 TEL : +82 31-670-2500

KEON CHANG IND. CO., LTD.

head office :
 homepage add : www.keonchang.co.kr
 main products : marine equipment, ladle turret, roll stand assy, side trimmer & chopper, bloom c c, screw conveyor, etc.
 TEL : +82 51-203-0161

KWANG SAN CO., LTD.

head office :
 homepage add : www.kwangsan.com
 main products : heating coil, sus spool, air vent head, expansion joint
 TEL : +82 51-974-6301

KEUMYONG MACHINERY CO., LTD.

head office : Buk-gu, Daegu
 homepage add : www.keumyong.com
 main products : exhaust valve complete with valve spindle, axial vibration damper
 TEL : +82 53-608-8110/6

KWANG SUNG CO., LTD.

head office :
 homepage add : ikwangsung.com
 main products : t-girder, panel, stair, handrail, inclined ladder,
 TEL : +82 55-338-9973

KUK DONG ELECOM CO., LTD.

head office : Saha-Gu, Busan
 homepage add : www.kukdongelecom.com
 main products : marine & offshore light fixtures, explosion-proof lights, flood & search lights, mgf packing system
 TEL : +82 51-266-0050

KYUNGSUNG INDUSTRY CO., LTD.

head office : Gangseo Busan
 homepage add : www.e-clamp.com
 main products : clamp, sus corner, anchor strip
 TEL : +82 51-831-4960

LS CABLE LTD.

head office :
 homepage add : www.lscable.co.kr
 main products : marine shipboard & offshore cable, bare conductor wire, (pvc/pe/xlpe/rubber) power & control cable
 TEL : +82 2-2189-9114

LEE YOUNG INDUSTRIAL MACHINERY CO., LTD.

head office : Ulju Ulsan
 homepage add : www.leeyoung.co.kr
 main products : engine casing, corr. bhd, upper deck, built-up longitudinal, chain locker, lashing bridge
 TEL : +82 52-231-5800

MIN SUNG CO., LTD.

head office : Sasang Busan

homepage add : www.minth.co.kr
 main products : cable tray, hatch, electric cable box
 TEL : +82 51-305-8862

Mt.H CONTROL VALVES CO., LTD.

head office :
 homepage add : www.mth.co.kr
 main products : crankcase relief valve, main starting valve, pneumatic control valve, safety relief valve
 TEL : +82 51-974-8800

MSL COMPRESSOR CO., LTD.

head office : Pocheon Gyeonggi
 homepage add : www.mslcomp.com
 main products : breathing air compressor, h.p air compressor, n2 gas booster
 TEL : +82 31-853-7000

MYCOM KOREA CO., LTD.

head office :
 homepage add : www.mycomkorea.com
 main products : screw compressor unit, reciprocating compressor unit, condensing unit, brine chiling unit
 TEL : +82 55-294-8678

MYCOM KOREA CO., LTD.

head office :
 homepage add : www.mycomkorea.com
 main products : screw compressor unit, reciprocating compressor unit, condensing unit, brine chiling unit
 TEL : +82 55-294-8678

Myung Sung Engineering Co., Ltd.

head office : Mokpo Jeonnam
 homepage add :
 main products : rudder & rudder stock, rudder horn, stern roller
 TEL : +82 61-276-7650

Marine Radio Co., Ltd.

head office :
 homepage add : www.mrcorea.com
 main products : public address system, auto tel. exchanger sys. communal aerial sys. marine clock system
 TEL : +82 51-414-7891

NK CO., LTD.

head office :
 homepage add : www.nkcf.com
 main products : ballast water system, co2system, deck foam system, dry power system
 TEL : +82 51-204-2211/3

ORIENTAL PRECISION & ENGINEERING CO., LTD.

head office :
 homepage add : www.opco.co.kr
 main products : deck house, funnel & engine room casing, life boat davit, engine room crane
 TEL : +82 51-202-0101

OSCG CO., LTD.

head office : Sasang Busan
 homepage add : www.oscg.net
 main products : cable gland(eexd & e), adapter / reducer, flexible connectors
 TEL : +82 51-305-3910

PANASIA CO., LTD.

head office : Gangseo Busan
 homepage add : www.pan-asia.co.kr
 main products : cargo monitoring sys. tank level gauge sys. high & overflow alarm sys.
 TEL : +82 51-831-1010

SARACOM CO., LTD.

head office : Yeongdo Busan
 homepage add : www.saracom.net
 main products : gmdss, ship sound signal appliances, navigation equipment, fire detection system
 TEL : +82 51-600-9000

SAMGONG Co., Ltd

head office :
 homepage add : www.sam-gong.co.kr
 main products : oil purifiers, ships accommodation ladders, ships

windows
 TEL : +82 51-200-3040/1

SAMYOUNG MACHINERY CO., LTD.

head office : Daedeok Daejeon
 homepage add : www.sym.co.kr
 main products : cylinder head, cylinder liner, piston
 TEL : +82 42-625-4064

SAMYUNG ENC CO., LTD.

head office :
 homepage add : www.samyungenc.com
 main products : ais(si-30)-auto. identification sys. dsc vhf radio telephone(str 6000a)-gmdss equipment
 TEL : +82 51-601-6601

SUH HAN INDUSTRY CO., LTD.

head office :
 homepage add : www.suhhani.co.kr
 main products : cable tray others-steel, galvanized steel, stainless steel, aluminium
 TEL : +82 51-204-1920

SEOHAE MARINE SYSTEM CO., LTD.

head office :
 homepage add : www.seohae-ms.com
 main products : hatch-pontoon type, folding type, side rolling type, etc. lashing equipment-2/3tier
 TEL : +82 51-204-8408

SUNBO INDUSTRIES CO., LTD.

head office :
 homepage add : www.sunboind.co.kr
 main products : tank top unit, engine room unit, package unit
 TEL : +82 51-261-3454

SUNG KWANG BEND CO., LTD.

head office :
 homepage add : www.skbend.com
 main products : pipe fittings-butt. welding / socket welding / thread type/ flange
 TEL : +82 51-3300-200

SUNG MI CO., LTD.

head office :
 homepage add : www.sung-mi.co.kr
 main products : fire retarding doors, fire retarding wall, ceiling panel
 TEL : +82 55-329-1117

SUNGSIN INDUSTRIES CO., LTD.

head office :
 homepage add : sungsin.koreasme.com
 main products : hatch coaming, t-bhk block, fore mast & port, water separator
 TEL : +82 54-776-6441

SUNG IL CO., LTD. (SIM)

head office :
 homepage add : www.sungilsim.com
 main products : pipe spool fabrication, induction pipe bending, marine engine pipe
 TEL : +82 51-831-8800

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 homepage add : www.esab.co.kr
 main products : welding consumable, welding equipments
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 homepage add : www.seunelectric.co.kr
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SE JIN IND. CO., LTD.

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homepage add : www.sejin89.co.kr
main products : piping, h.f.o supply unit, purifier module each kind
TEL : +82 55-239-4700

SPECS CORPORATION

head office :
homepage add : www.specs.co.kr
main products : system division-oil mist detector, portable level temp/oil
TEL : +82 31-706-5211

SHIN DONG DIGITECH CO., LTD.

head office :
homepage add : www.shindong.com
main products : satellite tv sets-satellite communication equipments, draft buoy(1m, 1.6m, 2.4m discus buoy)-ocean information technology division
TEL : +82 51-467-5001

SIL LA METAL CO., LTD.

head office :
homepage add :
main products : propeller(f.p.p.), c.p. propeller blade & hub, propeller shaft, inter shaft
TEL : +82 51-831-5991/8

SHINMYUNG TECH CO., LTD.

head office :
homepage add :
main products : air & electric winch-0.2ton ~ 10ton, air motor-1p ~ 25p, davit (all)-0.2ton ~ 5ton
TEL : +82 55-363-7091

SHINSUNG DIESEL KIKI CO.

head office :
homepage add : nozzle.koreasme.org
main products : for marine engine-nozzle, plunger assy, delivery valve assy
TEL : +82 51-264-8829, 262-8869

SHIN SHIN MACHINERY CO., LTD.

head office :
homepage add : www.sspump.com
main products : centrifugal pumps, gear pumps, screw pumps, submersible pumps
TEL : +82 51-727-5300

SHINA METALTECH CO., LTD.

head office :
homepage add : www.shinamet.com
main products : white metal bearings-marine metal bearing, automotive metals
TEL : +82 52-298-2100/4

SHIN YOUNG HEAVY INDUSTRIES CO.,LTD

head office :
homepage add : www.syhico.com
main products : oil & gas system, hydraulic system
TEL : +82 61-800-3700

S & W CORPORATION

head office :
homepage add :
main products : cam & camshaft, valve spindle & seat ring, piston pin
TEL : +82 51-205-7411

S.A. MART CO., LTD.

head office :
homepage add : www.samartkr.com
main products : control lever, control cable, hydraulic steering system, auto pilot system, stern drive system
TEL : +82 32-815-6314

STX ENGINE CO., LTD.

head office :
homepage add : www.stxengine.co.kr

main products : marine diesel engine, military diesel engine, gas engine, gas turbine
TEL : +82 55-280-0114

SIMULATION TECH INC.

head office : Geumcheon Seoul
homepage add : www.simulationtech.co.kr
main products : Emergency Shutdown System, Grease Extractor/de-Oiler, Operator Training Simulator
TEL : +82 2-3281-0960

SHINHAN MACHINERY CO., LTD.

head office :
homepage add : www.shinerpia.com
main products : deck house, engine casing & funnel, fore/after-end block & others
rudder, living quarters
TEL : +82 52-231-3525

SAMGONG INDUSTRIAL CO., LTD.

head office : Pyonghaek Gyeonggi
homepage add : www.samgong.com
main products : inflatable rubber products
TEL : +82 31-654-4805/6

SIN YOUNG ENTERPRISE CO., LTD.

head office : Gimhae Gyeongnam
homepage add : www.sy-ind.com
main products : main hole, access hatch, bollard
TEL : +82 55-346-0034

SUNG JIN GEOTEC CO., LTD.

head office : Namgu Ulsan
homepage add : sgtkor.co.kr
main products : bulbous bow, stern block, hull block, module, lng/lpg tank
TEL : +82 52-228-5801

STACO CO., LTD.

head office : Gangseo Busan
homepage add : www.staco.co.kr
main products : Wall Panel, Ceiling Panel, Unit Toilet, Cabin Door, Furniture,
TEL : +82 51-831-7000

STX ENPACO CO., LTD.

head office :
homepage add : www.stxenpaco.co.kr
main products : turbocharger, diesel engine parts, marine equip.
TEL : +82 55-282-1131

SEOUL ELECTRIC CABLE CO., LTD.

head office : Eum-seong Chungbuk
homepage add : www.seoulcable.com
main products : offshore & shipboard cables, travelling cables, high voltage power cables
TEL : +82 43-879-7200

SMECO

head office :
homepage add :
main products : piston, piston liner, piston skirt
TEL : +82 41-864-3030

SURO PROPELLER & MACHINERY CO

head office : Yeongdo Busan
homepage add : www.suropump.co.kr
main products : Propeller(d : 2500mm), Shaft (l : 6m), Pump
TEL : +82 51-415-0444

SHIN-A ENTERPRISE CO., LTD.

head office : Saha Busan
homepage add : www.shina-ent.com
main products : navigation equipment, communication equipment, monitoring system equipment
TEL : +82 51-204-6221/5

TK CORPORATION

head office :
homepage add : www.tbend.co.kr
main products : Elbow, Reducer, Tee, Cap
TEL : +82 51-831-6550

TAE YOUNG TRADING LTD.

head office : Junggu Seoul

homepage add : www.marine-material.com
main products : Receptacles & Wire Accessories, Floodlight, Deck Light, Reflected Lamps
TEL : +82 2-2272-1960

TANKTECH Co., Ltd.

head office :
homepage add : www.tanktech.co.kr
main products : High Velocity P/V Valve, Local Fire Fighting Sys. Tank Cleaning Machine
TEL : +82 51-979-1600

TECHMARINE S/W CO., LTD.

head office :
homepage add : www.techmarine.net
main products : Loading Computer System
TEL : +82 51-467-7003

FRIEND CO., LTD.

head office : Gangseo Busan
homepage add : www.tsdream.co.kr
main products : cable tray, heating coil, strainer
TEL : +82 51-974-7900

TMC CO., LTD.

head office : Cheonan Chungnam
homepage add : www.tmc-cable.com
main products : marine cable, optical fiber cable
TEL : +82 2-771-3434

WARTSILA ACCOMMODATION SYSTEMS KOREA, INC.

head office : Goseong Gyeongnam
homepage add : www.waskorea.co.kr
main products : unit toilet, unit cabin, wall panel, ceiling panel, door
TEL : +82 55-673-7315

WOOCHANG IND. CO., LTD.

head office :
homepage add :
main products : steel door, ventilator, mooring fitting, h/c fitting, hand rail
TEL : +82 55-331-1651

WHA YOUNG CO., LTD.

head office : Miryang Gyeongnam
homepage add : www.whayoung.co.kr
main products : Supply Unit Assy, Collector Block Assy, Fuel & Exh. Movement, Fuel Pump Assy
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WILSON WALTON CORRPRO KOREA

head office :
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main products : i.c.c.p system, m.g.p.s, s.g.d
TEL : +82 51-831-0131

YOUNG KWANG MACHINE CO., LTD.

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TEL : +82 51-205-8541

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homepage add : www.youjeonsteel.co.kr
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- Products : LNG Carriers, LNG-RVs, LNG-FPSOs/FSRUs, LPG Carriers, LPG-FPSOs, ULCCs, VLCCs, Suezmax/Aframax/Panamax Tankers, Shuttle/Chemical Tankers, Product Carriers, Containerships, Capesize/ Kamsarmax/ Supramax Bulk Carriers, Ore Carriers, VLOCs, Ro-Ro Ships, PCTCs, Passenger Car Ferries, FPSOs, FSOs, FPUs, Drill Ships, Semi-Submersible Drilling Rigs, Fixed Platforms, Submarines, Submarine Rescue Vessels AUVs, Destroyers, Battle Ships

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- <http://www.shi.samsung.co.kr>
- Products : Arctic Shuttle Tankers, VLLCs, Crude Oil Tankers, Container Vessels, LNG/LPG Carriers, FPSO, FSO, Drillships, etc., LNG FPSO, Offshore Platforms, TLP, SEMI, Cruise Ships & Ferries, Steel Structures, Bridges & Building, Cargo & Material Handling Equipment

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- Products : Tankers, VLCCs, Product Carriers, Chemical Tankers, Containerships, LNG Carriers, LPG Carriers, Pure Car Carriers, Bulk Carriers, Other Vessels

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- Address : 1, Jeonha-dong, Dong-gu, Ulsan, Korea • Tel : +82-52-202-2114 • Fax : +82-52-202-3470 • <http://www.hhi.co.kr>
- Products : Bulk Carriers, Containerships, Tankers, VLCCs, Product Carriers, Multi-purpose Cargo Ships, OBO Carriers, Pure Car Carriers, LPG Carriers, Ro-Ro Ships, Chemical Tankers, Offshore Rigs/Barges, LNG Carriers, Passenger Ships, Drill Ships, Special & Naval Ships, FPSO, FSO, Semi-submersible Drilling Rig, Other Vessels

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