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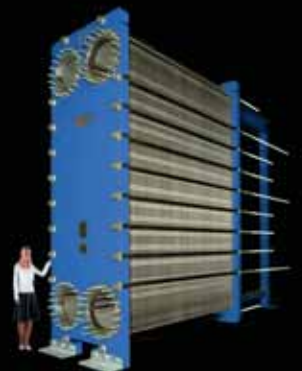
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A sunset over a dark landscape with a large '2012' graphic in the background. The sun is low on the horizon, casting a warm glow. The background is dark with a large, stylized '2012' graphic in a reddish-orange color. The foreground has some decorative wavy lines in the same color.

New Year Greetings

We would like to express our heartfelt appreciation to all who have supported MONTHLY KORSHIP also this year.

The shipbuilding industry is expected to slow down a little bit amid sluggish global economy. Those in domestic shipbuilding industry have to show profound wisdom to tide over difficulties and prove strong resilience of nation's shipbuilding industry, the largest worldwide. MONTHLY KORSHIP will exert best efforts to become the true partner of domestic shipbuilding industry and provide in-depth information in the quickest manner and marketing support.

We wish you all the success in all your endeavors in 2012.

*In the morning of new year, 2012
From all employees of MONTHLY KORSHIP*

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Logistics Service





STXOS launched its 2nd drill-ship

STX Offshore & Shipbuilding (STXOS) successfully launched its 2nd drillship recently, following the delivery of its 1st drillship in May.

STXOS announced that it held a ceremony to celebrate the launch of the drillship christened 'Noble Globetrotter 2' at the STX Dalian Shipbuilding Complex in China on November 22, which was attended by Gang Deok-soo, Chairman of STX Group, David Williams, Chairman of Noble Drilling, and related officials.

This drillship is the 2nd vessel additionally ordered in August last year from Noble Drilling based on the shipbuilder's construction of the drillship of the same class delivered successfully in May. This vessel, which measures 189m in length and 32.2m in width, can sail at a maximum speed of

11 knots and accommodate 180 crews. This newbuild drillship is equipped with state-of-art facilities, capable of drilling in water depths up to 12,000m. Particularly, this drillship, smaller than conventional large-sized drillships but with the same drilling performance, is a new-concept drillship that offers dramatically enhanced drilling capabilities and reduces the maintenance costs.

Having successfully launched its 2nd drillship, STXOS has accumulated experience in the construction of deepwater drillship for which demand has been spurred amid the sustained high oil prices even despite the global financial crisis that began in Europe, and laid the cornerstone for turning itself into a shipyard specializing in offshore drilling facilities.

STXOS is ready to keep up with the rising demand for deepwater drillship as its 1st drillship - deployed in the oil field develop-

its experience of building its 1st drillship.

An official from STXOS said, "The successful launch of the 2nd drillship is owed to hard work and cooperation between Noble Drilling and the employees of STX Dalian Shipbuilding Complex. Our experience building the 1st drillship was vital in constructing even higher-quality 2nd drillship. STXOS will keep making efforts to ensure that the best quality drillships are delivered to all ship owners, including Nobel Drilling."

HHI became the 1st ship-builder to win type approval for electrolysis ballast water treatment system

Hyundai Heavy Industries (HHI) developed the eco-friendly facility that can prevent contamination affecting the marine ecosystems, making a full-scale entry into the market for green ship.

HHI announced on November 27 that it developed the 'HiBallast', a electrolysis ballast water treatment system and acquired the final type approval from the government.

The HiBallast, independently developed by HHI, filters out various marine organisms larger than 50µm drawn into the ballast tanks and sterilizes such aquatic organisms through electrolysis.

This system capable of sterilizing 500-8,000m³ of sea water per hour has the specially-coated electrode electrolyzing the seawater and reduces the power consumption, thus drawing favorable reaction from ship owners.

Now, HHI has become the nation's 1st shipbuilder that has 2 types of ballast water treatment technology. In March, HHI won



STXOS held a launching ceremony for 'Noble Globetrotter 2' at the STX Dalian Shipbuilding Complex in China on November 22. The photo shows Lee In-seong, Vice-Chairman of STXOS, Jang Won-gab, Vice-Chairman of STX Dalian Shipbuilding Complex, Gang Deok-soo, Chairman of STX Group, and David Williams, Chairman of Noble Drilling (from the 5th on the left side).

ment project being conducted by global oil giant - has been well recognized for its excellent performance. David Williams, Chairman of Noble Drilling, who attended the launching ceremony, expressed his thankfulness to STXOS which launched even higher-quality 2nd drillship by fully leveraging



'HiBallast', a ballast water treatment system, for which HHI won type approval recently

the type approval for its 'EcoBallast' that sterilizes seawater using ultraviolet rays. In addition, HHI is making full-fledged effort to win bigger slice of the market, clinching orders from both domestic and overseas ship owners for its HiBallast and EcoBallast systems to be installed on board about 30 ships.

Choi Yong-yeul, Managing Director in charge of fluid machinery sector at HHI, said, "Different types of ballast water treatment systems are being installed, depending on the type and size of ship and marine environment. The acquisition of type approval this time further strengthens our ability to provide customers with the most suitable types of ballast water treatment system and puts us in a better position to build up competitiveness."

SSME received the USD 2 billion Export Tower Prize

Sungdong Shipbuilding & Marine Engineering (SSME) was honored with the USD 2 billion Export Tower Prize during the ceremony at the 48th Annual Trade Day held at COEX, Samseong-dong, Seoul on December 12.

SSME registered exports amounting to USD 2.45 billion between the 2nd half of 2010 and the 1st half of 2011, the projection period, which is a 36.1% increase compared to the same period of previous year. SSME nearly doubled its export turnover in 2 years after it had been awarded the USD 1 billion Export Tower Prize in 2009 only 5 years after the construction of its 1st ship, thus cementing its place at the forefront of the nation's export drive. SSME has delivered approximately 120 vessels, including large containerships, crude carriers, ultra large cargo carriers, etc, to many prominent ship owners in Greece, Japan, Hong Kong, U.S.A. and others since the delivery of its 1st ship in 2007. SSME has gained reputation for excellence in shipbuilding technology and



SSME received the USD 2 billion Export Tower Prize at the Trade Day on January 13.

quality and accomplished unparalleled growth, making strides in the global market.

Particularly, SSME won an order for the shuttle tanker used for oil transport from offshore oil fields in late March and an order for a Floating Storage and Offloading (FSO) unit from the Vietnamese state-run oil company in May, thus becoming the nation's 5th shipbuilder to successfully enter the offshore plant market.

Meanwhile, SSME was officially designated as the defense contractor by the government in June and has been focusing on expanding capabilities for another giant leap forward.

HHI completed the Pearl GTL plant in Qatar

Hyundai Heavy Industries (HHI) completed the Pearl GTL plant, a gas-to liquids facility, in Ras Laffan, Qatar on November 22.

This ultra-large scale project, valued at approximately USD 20 billion, aims to build a state-of-art plant capable of producing 140,000 barrels of ultra low sulfur diesel,

naphtha, LPG, condensates (super-light crude oil), etc, per day through the conversion of natural gas from subsea well.

This project, segmented into a total of 10 zones, was participated by 12 global construction and engineering companies. HHI undertook the construction of cutting-edge

gas facility that separates, desulfurizes, and refines 1.6 billion cubic feet of natural gas per day for the production of methane feed gas for GTL process and by-products such as ethane, propane, butane and others.

This project, clinched jointly with the Japan-based Chiyoda Corporation in



August 2006, is valued at approximately 2 billion, and HHI carried out this project for about 5 years with annual deployment of 7.8 million workers.

GTL plant produces eco-friendly liquid fuel free of sulfur, the major contributor to the environmental pollution, and GTL plant projects were conducted exclusively by a handful of overseas companies in Japan, Europe, etc, due to high technological barriers.

An official from HHI said, "This plant will produce 3% of global clean diesel capacity when it reaches the full capacity. By successfully completing the essential facility in the GTL process, HHI further cemented its

leading position in the oil and gas plant sectors."

The ceremony to mark the completion of GTL plant on the same day was attended by Min Gye-sik, Chairman of HHI, Cheon In-soo, Chief Operating Officer of Industrial Plant & Engineering Division at HHI, Sheikh Hamad bin Khalifa Al-Thani, Emir of the State of Qatar, and other high-ranking officials.



GTL plant in Ras Laffan, Qatar, completed on November 22 by 12 international construction and engineering companies including HHI

DSME held a ceremony to mark the completion of Pazflor FPSO

Daewoo Shipbuilding & Marine Engineering (DSME) held a ceremony on November 22 to mark the completion of Pazflor FPSO (Floating Production Storage & Offloading) unit, the world's largest, built on a turn key basis by DSME for France-based Total.

The ceremony held in Angola was attended by Nam Sang-tae, CEO & President of DSME, Christophe De Margerie, Chairman of Total E&P, Manuel Vicente, President of Sonangol, and others.

Nam Sang-tae, CEO & President of DSME, who attended the ceremony, received USD 54 million of incentives, the largest amount in history, as an expression of Total's thankfulness for Pazflor FPSO's successful completion and early oil production, which reaffirms the leadership of DSME in shipbuilding technology.

Pazflor FPSO departed from DSME's Okpo shipyard in January after the christening ceremony, heading to Angola. It

started 1st oil production only about 4 month after installation, which attests to the DSME's proven ability to complete high-tech and high value-added projects with perfection.

Pazflor FPSO produced over 6 million barrels of oil from its

1st operation in August until early November. DAME which adhered to rigorous supervision and process control brought forward the 1st oil production by 1 month earlier than previously schedule and shortened the duration of the project. Particularly, DSME completed the project without incident although it involved extremely difficult installation.

Nam Sang-tae, CEO & President of DSME, said, "DSME, which has carried out a total of 3 ultra-large scale projects for Total since it completed construction of the 1st one in 2003, has maintained strong partnership with Total. DSME conveyed its intention to successfully complete the currently ongoing Clov FPSO project to the client."

Meanwhile, Pazflor FPSO is the world's largest in terms of both contract value and size. This facility measures 325m in length, 61m in width, and 32m in height with a deadweight of 120,000 tons.



Pazflor FPSO which successfully produced 1st oil in Angola



DSME made HoA to develop gas field in Israel

DSME will begin the full-scale development of natural gas field in the territorial waters of Israel.

DSME recently announced that it made the Heads of Agreement (HoA) with the owners of the Tamar gas field in Israel for the gas field exploitation.

DSME established D&H Solutions in Norway in 2010 to develop offshore gas fields and has vigorously pushed ahead with multi-directional business ranging from gas field exploitation to LNG sales.

Tamar gas field to be developed in this project is situated about 80km west of Haifa Port, and is estimated to have approximately 240 billion m³ of natural gas reserves which is approximately 5 times greater than current annual consumption in Korea. Having made the HoA, DSME plans to immediately initiate a pre-feed study for LNG-FPSO with European ship owners and enter into the contract by the end of 2012.

DSME plans to start liquefied natural gas (LNG) production from the field by the end of 2016 if all processes go on as planned.

In particular, owners of the Tamar gas field, such as Noble, Delek, and Isramco, are positively considering the use of LNG-FPSO, not the land-based plant, for the natural gas production in view of geopolitical factors. These owners plan to order LNG-FPSOs continuously to speed up gas field exploitation if the first project is completed successfully. Thus, DSME anticipates many new orders for LNG-FPSO.

Nam Sang-tae, CEO & President of DSME, said, "Israel is a market that huge potential



Nam Sang-tae, CEO & President of DSME, Colin Sinclair, Vice-President of Nobel, Gideon Tedmore, Chairman of Avner Oil, etc. are raising a toast after making the HoA to develop the gas field in Israel (from the second on the left side in the front row).

for development with the natural gas reserves standing at approximately 2 trillion 800 billion m³ in its territorial waters. DSME will provide comprehensive solutions that encompass a wide range of services ranging from the exploitation of energy resources to their sale by taking active role in carrying out projects in Israel."

HHI successfully lifted the load 26m, equal to the weight of 17,000 cars

Hyundai Heavy Industries (HHI) successfully loaded an ultra large offshore platform weighing a total of 23,600 tons.

HHI announced that it loaded North Rankin 2, the world's largest offshore platform ordered by Australia-based Woodside Energy, onto a barge at HHI's Ulsan offshore factory on December 4 by applying the "on-ground build" method.

This facility ordered in April 2008 - measuring 100m in length, 50m in width, and 80m in height - is the topside of glass compression platform with a weight of 23,600 tons equal to the weight of 16,857 medium-sized cars.

This offshore platform was lifted 26.5m above the ground and placed on a temporary load transfer frame before being loaded onto the barge in order to best protect the structure from the rough sea waves and typhoons on the sea off the coast of northwestern Australia.

Particularly, this off-



23,000-ton NR2 ultra large offshore platform built by HHI for Australia-based Woodside Energy



shore platform weighing over 23,000 tons was jacked 26.5m above the ground, which is expected to be recognized by the Guinness Book of Records for lifting the heaviest loads.

This offshore platform will leave from the port to the North Rankin gas field off the northwest coast of Australia upon the completion of remaining works by mid

December, and will be fitted to the jacket (substructure) installed at sea.

This offshore platform will be deployed in 2012 to supply 1.815 billion cubic feet of gas to the existing platform already producing the natural gas while increasing the pressure.

Currently, HHI holds 3 Guinness Book of Records titles for building the world's largest cargo carrier (36,500-ton, constructed in

December 1986), becoming the world's first company that reached the milestone of 10 million visitors (in June 1992), and lifting the heaviest load (12,000 tons, in October 2002). By loading this offshore platform onto the cargo, HHI broke its previous record for lifting the heaviest load.

STX Heavy Industries hit a major milestone of 1,000th large marine engine

STX Heavy Industries reached the milestone of 1,000th large marine engine.

STX Heavy Industries held a ceremony to mark the milestone of 1,000th low speed large marine engine at its assembly plant in Changwon, South Gyeongsang, on December 14. The ceremony was attended by Jeong Dong-hak, President of STX Heavy Industries, Lee Young-jae, President of Zodiac Maritime, and related officials.

STX Heavy Industries reached the cumulative production milestone of 1,000 engines

when it successfully completed the test-run of 6S80MC-C8 type marine engine with an output of 34,000 horse power, and exceeded the 15 million horse power mark in cumulative production at the same time.

This monumental accomplishment came in 7 years and 3 months after STX Heavy Industries produced its first engine in September 2001, which is the shortest period of time in industry.

This engine will be fitted to the 298,000DWT very large crude carrier (VLOC) of Zodiac Maritime, a U.K.-based shipping company, which is currently under construction at the Jinhae shipyard of STXOS.

STX Heavy Industries came into the lime-

light in the ultra-

large engine sector when it produced 12K98MC-C engine, the world's largest, in 2009. With an annual production capacity of 4 million horsepower, STX Heavy Industries has established a position as a leader in the production of low speed engines. Jeong Dong-hak, President of STX Heavy Industries, who attended the ceremony, said, "It is an unprecedented feat worldwide to reach a total production milestone of 15 million horsepower in marine engines in only 7 years. STX Heavy Industries will further sharpen its competitiveness by keeping up with the global trend towards large ships in the shipbuilding and shipping industries."



STX Heavy Industries is holding a ceremony to mark the milestone of 1,000th large marine engine at its assembly plant in Changwon, South Gyeongsang.

Rockwell Automation Korea opened Customer Briefing & Competency Center

Rockwell Automation Korea recently opened Customer Briefing & Competency Center (CBCC).

This Center is dedicated to providing information about the advanced automation technology and solution to both customers and partners and conveying the message related to the strength and value of Rockwell Automation Korea's solutions and products. The Customer Briefing Center is instrumental in introducing integrated architecture and information solutions to customers based on proof-of-concept, as well as the cutting-edge automa-



Inside view of CBC that Rockwell Automation Korea recently opened

tion products, while the Competency Center offers technical training and demonstrations to all levels of technicians and engineers.

Under the slogan of 'smart, safe and sustainable manufacturing solutions', the Customer Briefing Center aims at helping customers have better understanding of Rockwell Automation Korea's products and solutions that enable plantwide optimization, improvement of machine builder performance and sustainable production. For that, the center houses working models that demonstrate integrated architecture, process automation, information solution, intelligent motor control (IMC), connected component (component level bundle solution), network, and reference architecture.

Particularly, CBC are considered to clearly visualize the value and strength of Rockwell Automation Korea, a leader in the integration of information, network, control, and power technologies, built on the basis of the integrated, flexible and scalable Logix-based multi-disciplined control.

Emerson Process Management Korea received commendation from the MKE at the Foreign Company Day 2011

Emerson Process Management Korea (hereinafter "Emerson") was honored with the commendation from the Minister of Knowledge Economy at the Foreign Company Day 2011 held on November 3, which was hosted by the Ministry of Knowledge Economy (MKE) and organized by Korea Foreign Company Association (FORCA).

This commendation is awarded to the president and employees of companies that have attracted foreign investment exceeding USD 1 million over the last 3 years in recognition of their outstanding contribution to the development of nation's economy, regional economy and society. The candidates are evaluated with respect to the contribution to the promotion of investment, actual contribution to the attraction of investment, and the size of investment attracted into the economy or society.

Patrick Deruytter, who is the General Manager of Emerson Korea since March 2008, has guided the company towards its present position as an unmatched leader in the power generation, water treatment, and power control system sectors, thus significantly contributing to the development of the nation's process industry, and introduced Emerson's 'smart wireless solution' to the Korea's automated process market. Additionally, he has leveraged the in-house research institute and technical training center to inject vitality into technical training programs related to the process automation and products for domestic

plant operators, technicians and engineers.

Thus, Patrick Deruytter, General Manager of Emerson Korea, was awarded the commendation in recognition of his outstanding contribution to the nation's economic growth as he has continuously introduced innovative technologies with application to plant business.

Patrick Deruytter, General Manager of Emerson Korea, remarked after winning the commendation, "I am delighted that Emerson Korea has played a key role in sharpening Korea's national and industrial competitiveness. Emerson Korea will make constant effort to strengthen global competitiveness of Korean companies, add vitality to regional economy, create more jobs, and promote diversity."



Patrick Deruytter, General Manager of Emerson Korea, was awarded the commendation from the MKE at the Foreign Company Day 2011 in recognition of his outstanding contribution to the advancement of Korea's process industry.

Emerson Korea expects growth over 10% in 2012 by being actively engaged in large-scale projects with many domestic EPC and process companies. To put the company to an upward trajectory, Emerson Korea is currently making many new investments in Korea, like increasing the recruitment.

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Korean industries under threat from China

Samsung Economic Research Institute (SERI) held a symposium on November 23 which was themed around the present and future of China's industries threatening the key industries of Korea. This symposium provided a unique platform for identifying the threats of China's industries to the key industries of Korea such as TV, mobile phone, petrochemical, shipbuilding and LED/lighting industries which are new engines driving the nation's economic growth and exploring the measures facilitating Korean companies to advance into markets. This article summarizes key points of the presentation by Bae Young-il, senior research engineer, which is titled 'Chinese industry emerging as a powerful player in the offshore industry'.

Shipbuilding industry is a key pillar of economic growth in Korea. Korea has the world's best technology for building new-concept vessels such as drillship, NG-FPSO, LNG-FSRU, ice-breaking tanker, etc.

In addition, shipbuilding industry is Korea's largest exporting

industry. The ship exports amounted to KRW 36.1 billion, the largest proportion followed by semi-conductor exports (KRW 29.3 billion), oil product exports (KRW 26.9 billion), and automobile exports (KRW 23.1 billion) during the period between January and July in 2011. Ships account for the largest share



of exports in 2009 and registered 10.5% share of Korea's total exports, the second largest share, in 2010. Approximately 90% of foreign currency earned from the exports of ships are added to the foreign currency reserves.

Recently, major shipyards of Korea are developing their business in the offshore sector into core portfolio. Korean shipyards clinched orders for 12 drillships, 2 FPSOs, 2 LNG-FSRUs, thus making clean sweep of all orders placed worldwide in this sector in the 1st quarter of 2011. Major domestic shipyards are strategically pushing further into the offshore sector, expanding necessary capabilities and pouring energy into winning new orders.

Then, what is offshore industry? Offshore industry relates to the resource development engineering which is essentially different from the shipbuilding industry. Despite different customer base and core capability requirement, both industries use similar technologies, such the drilling and production equipment technologies, etc, which makes its easier for shipyards to advance into the offshore sector.

The most typical products of offshore industry include fixed offshore platform, drillship, FPSO, subsea structures, etc.

China's shipbuilding industry

Chinese shipyards gained the world's top spot in the global shipbuilding industry in 2010 in terms of 3 major indexes such as new orders, volumes of ships built, and order backlog. However, Korean shipyards dethroned China to regain the world's top spot in 2011 amid the global slump in new orders for bulk carriers and oil tankers.

Chinese shipyards, supported by the Chinese government at the policy level, had aspirations to rise to the top spot in the global shipbuilding industry by 2015 and achieved that goal earlier than expected in 2008 in the wake of Beijing Olympics and global financial crisis. However, Chinese shipyards were faced with a glut in the bulk carrier market amid huge increase of global maritime container traffic after Beijing Olympics.

Table 1. Comparison between shipbuilding industry and offshore industry

Type	Shipbuilding	Offshore
Essence of business	Manufacturing	Engineering
Major customers	Led by shipping companies (Maersk, MSC, COSCO, etc)	Resource and energy developing companies (Exxon Mobil, BP, Total, Petrobras, etc)
Key needs of customers	Transportation cost reduction	Safety and stability of drilling and production
Essential capabilities	Manufacturing capabilities (productivity, cost, quality)	Manufacturing and designing capabilities
Technological paradigm	Determinism, mathematical algorithm explanation (shipbuilding experience, calculation method application)	Probabilistic test-based design (different environment based on drilling site → different approach)

Source: Baek Jeom-gi (2011), "Recommendation for maintaining the world's largest shipbuilding nation status"; produced by Samsung Economic Research Institute (SERI) based on interviews with those in the industry

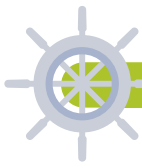


Table 2. Current condition of Chinese shipyards

(Unit: %)

Type (number)		Major shipyards	Technological capabilities	Proportion of shipbuilding volumes	Proportion of order backlog
State-run	CSSC (12)	-Jiangnan Shipyard adjacent to Shanghai Changxing shipbuilding complex, Hudong Zhonghua Shipyard, Shanghai Waigaoqiao Shipyard, etc -Guangzhou Longxue Shipbuilding adjacent to Guangzhou Longxue Shipbuilding Base Shipyard, Guangzhou Shipyard International, etc	-R&D · Shanghai Merchant Ship Design and Research Institute → bulk carriers, oil tankers, product carriers, etc · Shanghai 708 Research Institute → various ships and offshore plants	27	23
	CSIC (7)	-Bohai Dalian Shipbuilding Industry (leading shipyard), shipyards in Bohai, Beihai, Muchang, Shanhaiguan	-R&D · 702 Research Institute → ship fluid performance, structure dynamics, propulsion technology, vibration/noise, design · Dalian Shipbuilding Industry → separate R&D/design (1,000 employees)	13	14
	Subtotal (19 shipyards)			40	37
Private-sector, foreign-invested, joint venture	Large private-sector	Jiangsu Rongsheng Heavy Industries, Shixiang Dockyard, Jinhai, COSCO, Tai Yang, etc	-Investment by state-run shipping companies such as COSCO, CIMC -Shipyards such as Jiangsu Rongsheng, etc, have advanced into the market for offshore plants, including LNG carriers and FPSO, etc.	23	28
	Foreign-invested, joint venture	STX Dalian, Nantong, Tsuneishi, Hantong Ship Heavy Industry, DACOS	- Investment in foreign-invested Chinese shipyards - Contributing to developing the technology of Chinese shipyards	9	11
	Subtotal (14 shipyards)			32	39
Other small and medium-sized shipyards				28	24
Grand total				100	100

Source: Compilation of data from each company, based on the performance of year 2010

Shipbuilders in China

Chinese shipbuilding industry consists of 2 state-owned shipbuilding conglomerates and multiple private-sector shipyards. 19 shipyards under the 2 state-owned shipbuilding conglomerates such as China State Shipbuilding Corporation (CSSC) and China Shipbuilding Industry Corporation (CSIC) comprise 40% of Chinese shipbuilding industry's business volume and are taking a pivotal role in Chinese shipbuilding industry. In addition, both shipbuilding conglomerates are operating in-house R&D centers and large-scale design organizations dedicated to advancing the shipbuilding technology.

Meanwhile, private-sector shipyards are making strides, bolstered by injection of funds from overseas investors and Chinese shipping conglomerates, etc. (Table 2.)

China is the world's largest shipbuilder in quantitative terms in sectors such as bulk carriers, oil tankers, etc, and technologically independent. Chinese shipyards built a giant ore carrier with 400,000-ton capacity, the world's largest, in the bulk carrier sector and has the world's best technology for building oil tankers. Recently, Chinese shipyards began to build high-priced vessels that require advanced technology, such as LNG carriers, large containerships and others. (Table 3.)

Strategies of Chinese major shipyards

¥China's top shipbuilding giant: Shanghai Waigaoqiao

Shanghai Waigaoqiao Shipbuilding is China's largest shipyard. Shanghai Waigaoqiao Shipbuilding under the wing of CSSC is one of the leading shipyards of China in terms of scale, technology, etc. Established in 1996, Shanghai

Table 3. Major ships of Chinese shipyards

Type	World s best	China s best	Shipyard
Large bulk carriers	400,000DWT	400,000DTW*	Jiangsu Rongsheng Heavy Industries (ore carrier)
		300,000DWT	Nantong COSCO KHI Ship Engineering Dalian shipbuilding Heavy Group
		206,000DWT	Shanghai Waigaoqiao Shipbuilding
Containership	18,000TEU	13,000TEU	Nantong COSCO KHI Ship Engineering
		10,000TEU	Yangzijiang Shipbuilding
		8,800TEU	Hongdong-Zhonghua Shipyard
Large oil tanker (Very Large Crude Carrier)	320,000DTW	320,000DTW	Shanghai Waigaoqiao Shipbuilding
			Dalian shipbuilding Heavy Group
			Jiangsu New Times Shipbuilding
			Yangzijiang Shipbuilding Others
LNG carrier	266,000CBM	172,000CBM	Hongdong-Zhonghua Shipyard
		147,000CBM	
LPG carrier (High pressure system)	7,000CMB	6,500CBM	Zhejiang Dongpeng Ship Build & Repairing
		5,000CBM	Sinopacific Offshore & Engineering
LPG ship (Cooling system)	23,000CMB	22,000CBM	Jiangnan Shipyard (Group)
		16,500CBM	Sinopacific Offshore & Engineering

*Notes: VLOC (very large ore carrier)
Source: websites of each company

Waigaoqiao Shipbuilding has achieved a compound annual growth rate (CAGR) of 45% until 2010 and has about 26,000 employees.

In 2010, ships with 70.7 million DWT were built at the shipyards of Shanghai Waigaoqiao Shipbuilding. Its order backlog stood at 18.83 million DWT while achieving the sales revenue of CNY 20.1 billion (net profit of CNY 1.46 billion) in the same year.

This shipyard's flagship product include tankers (Aframax with a carrying capacity ranging from 80,000 to 120,000 DWT), VLCC (with a carrying capacity of 300,000 DWT) and bulk carriers (Capesize with a carrying capacity between 170,000 and 200,000 DWT)

Recently, Shanghai Waigaoqiao Shipbuilding made inroads into the offshore sector. In April 2010, Shanghai Waigaoqiao Shipbuilding established its first offshore business unit which currently hires about 250 offshore engineers (apart from 150 engineers related to the headquarters) and built FPSOs and 'Marine Oil 981', the 6th-generation semi-submersible drilling platform which measures 114m in length, 90m in width and

Table 4. Current business condition of Shanghai Waigaoqiao Shipbuilding

(Unit: 10,000DWT)

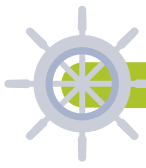
Major index	2010	2009	2008
Order backlog (year-end)	1,883	1,266	2,254
Order intake	644	192	500
Shipbuilding volume	707	605	466

Source: Website of Shanghai Waigaoqiao Shipbuilding



Marine Oil 981

Source: Website of Shanghai Waigaoqiao Shipbuilding



137.8 m in height.

Shanghai Waigaoqiao Shipbuilding is proceeding with basic design works and R&D at the Central Research Institute under the wing of CSSC. Specifically, Shanghai Waigaoqiao Shipbuilding is independently carrying out detailed designs for production (including the offshore facility design) and has great potential for growth as it has a strong technical manpower and team that is young.

Shanghai Waigaoqiao Shipbuilding aims to build ships totaling 10 million DWT by 2015 and plans to secure firm foothold in the offshore sector.

¥History of Chinese shipbuilding industry: Dalian Heavy Industry

Dalian Heavy Industry under CSIC is the shipyard that represents the history of shipbuilding in China. Established in 1898, Dalian Heavy Industry was merged with Dalian New Shipbuilding Heavy Industry in 2005 after being restructured into Dalian Shipbuilding Corporation. Dalian Heavy Industry has 20,000 employees.

In 2010, the orderbook of Dalian Heavy Industries stood at 3.15 million DWT with the order backlog of 14.14 million DWT

and revenue of CNY 22.08 billion (net income of CNY 2.27 billion).

The flagship products of Dalian Heavy Industry include the containership (9,000TEU), platform supply vessel, VLCC (300,000 DWT), etc. Moreover, Dalian Heavy Industry has made entry into the offshore sector and gained firm foothold. Specifically, Dalian Heavy Industry has built 5 FPSOs and constructed a semi-submersible drilling platform for deep-sea operations at water depths of up to 3,000m.

Dalian Heavy Industry operates the in-house ship design laboratory staffed with 1,000 employees (100 persons for R&D, 50 persons for basic design, 850 persons for detailed design), the largest in China. Furthermore, Dalian Heavy Industry successfully applied the inundation method used in the tandem shipbuilding process for the first time in China.

Dalian Heavy Industry set the goal of building ships totaling 7 million DWT by 2015 and 9 million DWT by 2020 and plans to raise the proportion of offshore business volume by 20% until 2015.

¥Fast growing private-sector shipyards: Jiangsu Rongsheng Heavy Industries

Jiangsu Rongsheng Heavy Industries is the most innovative private-sector shipyard in China. Established in 2005, Jiangsu Rongsheng Heavy Industries set a record of the shortest construction period in China when it built its first ships in 2 years and 4 months.

In 2010, Jiangsu Rongsheng Heavy Industries' orderbook stood at 5.68 million DWT with the order backlog totaling at 15.86 million DWT and revenue reaching CNY 12.67 billion (net profit of CNY 1.78 billion). Jiangsu Rongsheng Heavy Industries currently has a workforce of approximately 20,000 persons, including 4,601 employees and 16,115 contract workers.

Jiangsu Rongsheng Heavy Industries has expanded into the shipbuilding, offshore, and engine industries. This company adopted the technologies for oil tankers (VLCC), bulk carriers, medium-sized containers, and LNG carriers in the shipbuilding sector and is building drilling platforms, platform supply vessels (Marine Oil 201) for deepwater operations at depths of up to 3,000m, FPSOs, etc in the offshore sector. Furthermore, Jiangsu Rongsheng Heavy Industries is engaged through its subsidiaries in manufacturing low-speed engines and medium-sized engines which are installed aboard 400,000-ton vessels.

Table 5. Current business condition of Dalian Heavy Industry

(Unit: 10,000DWT)

Major index	2010	2009	2008
Order backlog (year-end)	1,441	1,727	2,051
Order intake	315	192	885
Shipbuilding volume	581	389	292

Source: Website of Dalian Shipbuilding Industry



Noble NDB, a semi-submersible deepwater drilling platform
Source: Website of CSIC

Table 6. Current business condition of Jiangsu Rongsheng Heavy Industries

(Unit: 10,000DWT)

Major index	2010	2009	2008
Order backlog (year-end)	253.1	1,48.1	37.8
Order intake	568.1	220.8	513.9
Shipbuilding volume	1,586.0	1,271.0	1198.4

Source: Half-year report of Rongsheng Holding Group



Marine Oil 201

Jiangsu Rongsheng Heavy Industries has the in-house R&D unit staffed with 400 employees (106 engineers), but is yet capable of basic design for offshore facilities. Thus, Jiangsu Rongsheng Heavy Industries is collaborating with domestic and overseas companies and institutes (Shanghai Ship Research & Design Institute, KOMAC, Shanghai Boten Ship Corporation, Korea Shipping, Shanghai branch of China Ship

Science Research Center, etc) to close the technology gap. Jiangsu Rongsheng Heavy Industries has the ambition to turn itself into one of the 3 largest companies worldwide by 2020 and plans to make foray into the market for oil tankers, offshore plants, and cruise ships.

Chinese shipyards solidifying its foothold in the offshore sector

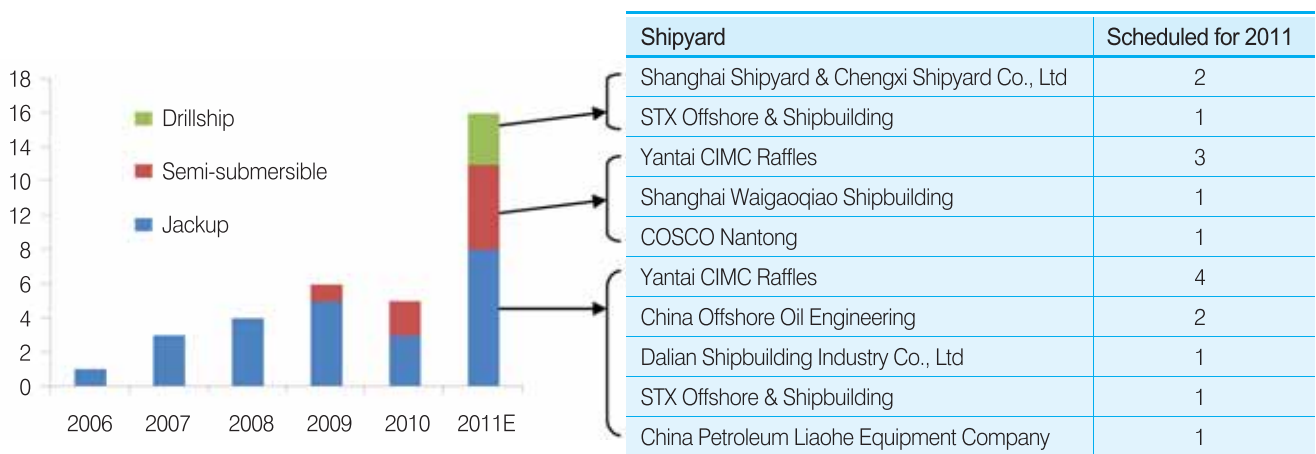
Meanwhile, China's major shipyards is recently setting up offshore business division in the form of subsidiaries which spearhead advancement into new sectors.

Large state-run shipbuilding conglomerates are creating separate offshore business divisions to make full-scale entry into offshore sector and increasing the volume of facilities such as jack-up platforms, FPSOs, deepwater drilling rigs, etc, which are used for offshore development.

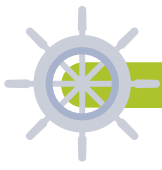
Moreover, the shipyards that specialize in the construction of offshore facilities other than commercial vessels have emerged as fast-growing players with a focus on building up technologies and strengthening R&D activities related to marine equipments.

Chinese shipyards mostly rely on domestic offshore market. Particularly, Chinese shipyards without any track record in the construction of offshore facilities are building up experience by winning the orders from China National Offshore Oil Corporation (CNOOC), and are seeing their business sail smoothly as the market is firmly buttressed by stable demand.

Table 7. Drilling facility construction in China



Source: ZHENG Wu and YANG Sen (2011), Xun Xu Jian Jin, Hou Ji Bo Fa, Gousen Securities Research, May 26th, 2011; Worldwide MODU construction/upgrade survey.



Threat from Chinese shipyards

Korean shipyards are facing stiff competition from Chinese shipyards emerging stronger than ever due to their rapidly improving shipbuilding technology, Chinese government's strong support for China's shipbuilding industry, and China's huge domestic market for offshore facilities.

First, China is rapidly expanding its technological capabilities in the sectors ranging from existing commercial ships to special purpose vessels and moving beyond the production of their core products, such as bulk carriers, oil tankers (VLCC) and containerships, into the construction of ultra large bulk carriers (with the capacity of 400,000 tons) and LNG carriers. In fact, Hudong-Zhonghua Shipbuilding is currently building a total of 5 LNG carriers with technology transfer from the France-based GTT.

In addition, a growing number of Chinese shipyards are operating in-house R&D centers to sharpen capabilities in technology and Chinese government is designating the colleges of technology as incubators for skilled manpower. Such colleagues of technology are turning out 3,000 graduates specializing in shipbuilding and offshore sector annually, which is 3 times greater Korea's 1,196 graduates from 19 general universities and 19 technical colleges nationwide (based on 2010).

Second, Chinese government is providing continued support for domestic shipbuilding industry and adding fuel to the growth of offshore industry with massive capital injection. In other words, the Chinese government's support for domestic shipbuilding industry revolves around 3 major policies designed to promote specialization, concentration and restriction on foreign investment.

Besides, the Chinese government, based on its recognition of offshore sector's special characteristics, is infusing fresh momentum in their efforts for developing offshore sector, like including the marine equipment industry in the 7 major new strategic industries which will be nurtured and developed under the 12th 5-year plan for industrial development.

With China's foreign currency reserves topping USD 3 trillion, Chinese government has dramatically increased financial support to domestic shipbuilding industry, such as ship financing, mergers and acquisitions (M&A) involving overseas companies, overseas investment, etc. Chinese government invested USD 70 billion for the development of overseas oil fields until 2010. In addition, China's acquisition of a Singapore-based and a U.S.A.-based semi-submersible plat-

form company in January and August, respectively, 2010, further expanded China's reach in the global market.

Chinese government's 3 major policies to support the shipbuilding industry

- Announcement of 'the medium and long-term development planning of shipbuilding industry' in December 2007, detailed strategies for global business development
 - Specialization: Hudong-Zhonghua Shipbuilding specializing in LNG carriers, Dalian Heavy Industries specializing in oil tankers, containerships, etc
 - Concentration: 3 clusters, such as Bohai Bay Region (Dalian, Qingdao), Yangtze river (Shanghai), Pearl River (Guangzhou), etc, that will be developed in the years to come
 - Restriction on foreign investment: Chinese side is required to hold over 51% shares, and partnership enterprise is mandatorily required to set up R&D center which aims to facilitate acquisition of technology.
- Policies for the post-financial crisis period
 - 'Policy for restructuring and promoting the ship industry' in February 2009: Minimizing the cancellation of orders, support for domestic market, restructuring, etc
 - "Detailed regulations pertaining to aforesaid policy' in June, 2009: Providing credit loan to the buyers of ships built in China, setting the limit on the volumes of ships built annually (quantity limit), etc

Chinese government has intensively promoted the offshore industry since mid 2000s and takes the expansion of technological capabilities as top priority. (Table 8.)

Third, China has huge domestic market with abundant marine resources. China has a proven offshore oil and natural gas reserve of 2.1 billion tonnes oil equivalent (TOE) as of 2008, which is equal to 5-year consumption in China. China's annual consumption was 484.4 million TOE in 2009. Moreover, the full-fledged deep water oil and gas exploration is expected to lead to additional discovery of oil-and-gas-bearing zones. Currently, the probability of discovering deep-water oil and natural gas in China stands at about 10%.

China is acquiring the technology based on domestic market. CNOOC has pushed ahead with offshore development and expanded capabilities in the offshore sector (basic design capability, track record, etc). Additionally, China has driven forward the policies that aim to develop offshore sector through partnership with overseas companies since 1980s, and resultantly, global oil giants are accelerating the pace of entry into China.

- Partnership between CNOOC and Conoco Phillips, etc (China has developed partnership with 22 foreign companies)
- Establishment of COOEC based on the high-tech collaboration (engineering companies, about 2,000 engineers)

Meanwhile, Korea is in a disadvantageous position because it does not have any domestic demand in the offshore sector.

Opportunities for Korean shipyards

Growth of offshore sector

The offshore sector, a new sector, has great potential for development, although it still remains an early market. The offshore market is potentially worth USD 22 trillion and has a small number of specialized players. Amid sustained high oil prices, the investment in offshore sector is expected to increase until 2014.

The offshore sector is expected to grow at a compound annual growth rate (CARG) of 8 to 24.5%, depending on business, and specifically, the market for floating facilities is expanding fast amid the surge in the demand for deepwater oil exploration. FPSO accounts for over 50% of all demands for floating facilities.

Korea can enter into the offshore sector by leveraging its world's best shipbuilding technology. Furthermore, Korea has the capabilities differentiated from those of China in floating facilities, engineering, PM sectors, etc, and has built



strong relationship with customers based on trust.

Sluggish shipbuilding market

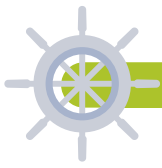
The current slump in the markets for commercial vessels, such as bulk carriers and oil tankers, etc, is expected to persist for some time to come. The glut in the bulk carrier and tanker (oil tanker) market is also expected to continue (41% for bulk carriers and 20% for tankers) in view of the high ratio of overcapacity to the order backlog. According to the report

Table 8. Change in policies designed for promoting growth in offshore industry

	2006	2009	2010
Characteristics	Subsectors of shipbuilding industry: strengthening the offshore sector under the policy designed to stimulate the growth of shipbuilding industry	Highlighting the special characteristics of offshore sector: differentiation through restructuring (shipbuilding) vs. technological development (offshore)	Considered as independent area: Guidance at policy level in the value chain of offshore resources exploitation
Major policies	5-year development plan for ship industry (2006~2010)	Guideline on the scientific research projects related to offshore plant facilities	12th 5-Year Plan
	<ul style="list-style-type: none"> - Including the 'offshore facility manufacturing technology in the 4 major technologies to be developed intensively - Including 3 major technologies, such as the fundamental technology for offshore facility manufacturing, in the core category that will be developed under the 13 specific guidelines on implementation - Including ultra-large FPSO, etc, in the 10 major areas for commercialization 	<ul style="list-style-type: none"> - Detailed measures for offshore sector in the ship industry restructuring and promotion plan - R&D expansion, tax relief for related companies, etc, to be implemented for the industry, in contrast to the approach to the shipbuilding industry - Presentation of 22 detailed research projects (e.g., development of research vessel capable of operating at water depths up to 3,000m) 	<ul style="list-style-type: none"> - Including the 'offshore process equipment industry' in the field of cutting-edge equipment manufacturing under 7 major new strategic industries - Strengthening the approach to the offshore industry from the standpoint of offshore economy - In September 2011, the Chinese government announced the strategies for innovation in offshore process equipment industry (10-year plan).

Note: The term 'process' means engineering in China.

Source: China Ocean Engineering Corporation (2011), "Chinese Maritime Industry Research Report"



of AXA-Alphaline, containerships with a combined capacity of 270,000TEU are expected to be inactive, which accounts for 1.8% of total vessels.

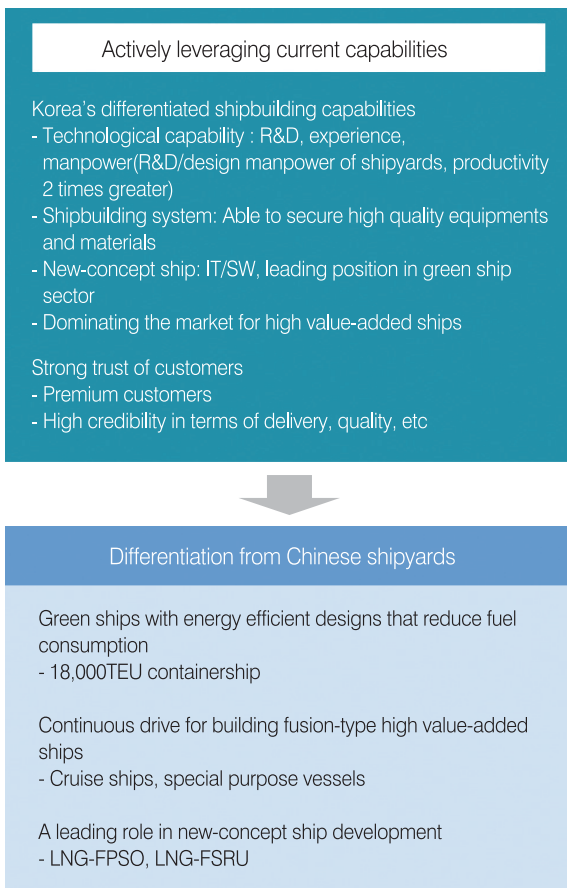
Korean shipyards can seize the opportunity when Chinese rivals slump as a result of sluggishness in the commercial vessel market. The slowdown in the shipbuilding market is expected to deal a heavy blow to Chinese shipyards where commercial vessels accounts for 90% share of shipbuilding. By contrast, Korea which has shown strong performance in offshore sector is expected to secure competitive advantage over China amid the rising demand for high-priced special purpose vessels.

Countermeasures for Korean shipbuilding industry

Korean shipyards need to maintain its leading position in the shipbuilding industry while making aggressive inroads into the offshore sector. Korean shipbuilding industry must fully leverage its current shipbuilding capabilities to differentiate



itself from Chinese shipbuilding industry before Chinese rivals fully expand their capabilities.





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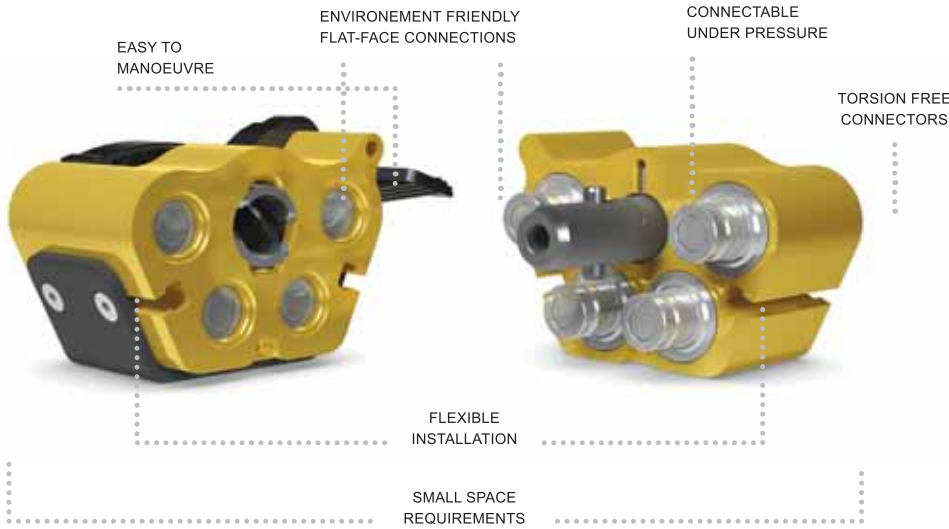
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(unmounted crank shaft)



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A global leader in motion and control technology

Parker Hannifin Corporation is the world's top leader in the industry related to the systems and parts for the motion and control of all equipment and is endeavoring to create value for customers worldwide. Parker Hannifin entered the Korean market in 1986 and has been well-received by domestic customers across industries for its total solutions offered on the basis of its vast array of product portfolio. Parker Hannifin plans to expand its supply of total solutions and tap into new markets, aiming to accomplish a double-digit growth.

Parker Hannifin Korea



Yoo Shi-tak, Country Managing
Director of Parker Hannifin



Manufacturing plants of Parker Hannifin. Various products related to motion & control are produced here.



Major products of Parker Hannifin

Parker Hannifin is the global leader in the industry related to the system and parts for motion and control of all equipments. Headquartered in Cleveland, United States, Parker Hannifin has around 300 manufacturing plants and 60,000 employees worldwide and is endeavoring to create value for customers around the globe.

Parker Hannifin embarked on full-scale production in Korea in 1986. Parker Hannifin Korea has 4 affiliates and 5 manufacturing plants that churn out a wide range of products related to motion & control under the slogan of 'Engineering Your Success!'. Parker Hannifin Korea exports approximately 20% of all products and has registered USD 400 million in sales in 2011.

Yoo Shi-tak, Country Managing Director of Parker Hannifin, said, "Parker Hannifin has achieved an annual growth rate of 20 to 30% in Korea. We registered USD 300 to 400 million in sales in 2010 and expect to achieve USD 400 million in sales in 2011."

Continuing on its strong growth path

As the global economic focus is shifting from Europe and United States to Asia, Parker Hannifin aims to achieve USD 3 billion in sales from Asian market in the period ahead and Parker Hannifin Korea plans to increase the sales from the Korean market to USD 600 million by 2014.

To attain the objective, Parker Hannifin is poised to make inroads into the market for renewable energy, which the government promotes as one of the key sectors with high growth potential, and new markets for life science (medical equip-

ment, pharmaceutical, and Laboratory and Diagnostic), oil and gas, etc, and expand its supply of total solutions based on its broad range of product portfolios.

Yoo Shi-tak, Country Managing Director of Parker Hannifin, explained, "Particularly, Oil & Gas Division covers the upstream, downstream, FPSO, drillship, LNG transport, refining facilities and others, and the headquarters are operating a team separately from the Marine Division. It is the same case with warships or submarines." Mobile (construction equipment) and automobiles are the two key markets from which Parker Hannifin generates the largest share of revenue. Parker Hannifin derives 40% of its revenue from control valves, hoses and connectors, etc, used for construction equipment in the mobile market and 20% of its revenue from HVAC, connectors, filters, hydraulic and pneumatic components in the automotive market.

Yoo Shi-tak, Country Managing Director of Parker Hannifin, explained, "We will focus on the marine, semi-conductor, and plant automation sectors, besides new sectors such as renewable energy, life science, etc. These markets currently account for about 15% of Parker Hannifin's revenue, but the share will increase in the upcoming period."

Currently, Parker Hannifin is mapping out a variety of marketing plans to tap into new markets and carve out significant share in the key markets. As the first step forward, Parker Hannifin is participating in the trade fairs such as 'SEMICON' and 'KIMES' slated to open in February.

Meanwhile, the major operating segments of Parker Hannifin include Aerospace, Automation, Climate & industrial controls,



Filtration, Fluid connectors, Hydraulics, Instrumentation, and Seal In Korea, Parker Hannifin is operating 7 divisions without aerospace division and supplying about 250 types products through authorized agencies, including hydraulic pumps for heavy-duty equipment, machine tool, ships, etc, pneumatic cylinders and valves necessary for plant automation, systems related to ventilation and refrigeration, fuel filters for cars and heavy-duty equipments, and regulators and valves for pipelines in semi-conductor factories.

Specifically, Parker Hannifin Korea supplies all sorts of connectors, hoses, hydraulic and pneumatic products and filter through 'Parker store', its unique distribution channel. Among the Parker stores across the country, which form the web of customer touch points, are included the premium agencies that offer knowledgeable support and professional services and Shuttle Light agencies that provide equipment capable of hydraulic hose cutting and connecting.

Parker Hannifin Korea riding high on success

Parker Hannifin Korea has approximately 1,000 employees, a relatively large workforce for any multinational company, and operates 5 manufacturing plants, a strength which makes the company differentiated



Marine water desalination & purification systems

from other multinational companies. Yoo Shi-tak, Country Managing Director of Parker Hannifin, added, "With unsparing investment and support, Parker Hannifin takes the localization tailored to the needs of local country and customers as top priority in the global market."

Particularly, Parker Hannifin's greatest success has been in Korea among other countries. Currently, Parker Hannifin's manufacturing plant in Yangsan has registered the highest sales in Asia and its manufacturing plant in Jangan has achieved the fastest growth. Parker Hannifin Korea plans to add another manufacturing plant soon.

Moreover, Parker Hannifin has taken the role of solution provider at the industrial site by establishing 'Asia R&D Center' dedicated to Parker Hannifin advanced technologies with a main focus on system engineering capabilities. Thus, Parker Hannifin Korea is recognized for unmatched excellence in technology in Asia.

Marine business of Parker Hannifin

Marine business coupled with oil & gas industry has been recognized as a key growth market sector for Parker. Therefore, Parker has established marine service centers in key regions including Korea around the world and developed new products - High pressure tube flanges, Desalination & Purification system & Subsea power cables - specific to marine market. As Korea is a global hub of marine market, Parker plans to localize these products to support its Korean and multinational customers.

Parker is the one choice for motion control and fluid control systems for marine applications worldwide. From engine or vessel systems, to fuel and fluid conditioning, to shipyards and service shops, at the lake or on the sea, Parker is there with experience and uniquely designed systems and components for original equipment manufacturers and end user.

Why is Parker the best choice? Parker offers a win-win partnership. Working with Parker has many benefits, including quality products, system integrity, worldwide distribution, extensive field support, unequalled customer service, as well as shortened product lead times, simplified ordering and more efficient shipping.

First, Quality First, The Parker name is recognized throughout the world as representing the highest quality products. The people of Parker are dedicated to Total Quality management. Second, One of the world's most extensive motion and control product lines is offered by Parker. All of its products share

common heritages of advanced technology for customer's applications. With Parker's unequalled range of motion and control products, Parker can be a single source supplier for all of customer's components, sub-system and system solutions.

Meanwhile, Parker currently operates Parker Marine Service Center in Busan. This Center aims at providing on-site supervision, On-site prefabrication, Installation & Modification Service, Piping Turn Key Package Service, Breadman (Kanban System) Operation, and Tech Service.

Parker Marine Service Center provides many profitable services to marine and offshore companies with on Parker's own technology and product. And Parker has been supplying hydraulic products to NOV (National Oilwell Varco) during 3 years. NOV is the world famous drill ship equipment company. Recently Parker Korea Marine Service Center set up Parker on-site Container Service for support to NOV at Samsung Heavy Industry Shipyard. Parker on-site Container Service can operate crimping, bending, tube forming and cutting. Therefore, it can quick respond to on-site requirement more efficiently. The Parker on-site Container Service will significantly reduce the time it takes to obtain critical spares or fabricate replacement hose assemblies. Equipment and labor downtime are greatly reduced, keeping customers' operations up and running longer. Parker Marine Service Center main task is focus on marine & offshore business. Also, it has powerful value added services can offer optimized management stock, reduce stocks and no obsolete items and increase productivity to customer.

New products of Parker Hannifin

Parker Hannifin recently unveiled new products designed for marine sector. The following

Parker Marine Service Center of Parker Hannifin, located in Busan

summarizes the special features of each product:

¥Marine water desalination & purification systems

Parker has developed innovative water desalination and purification plants for some of the most challenging environments - the middle of the ocean, 800 feet below the sea, offshore oil rigs, deserts, and disaster areas.

Parker's new 3 series, 'OML-Aegean', 'OML-Baltic' and 'OML-Caspian' are designed to withstand the punishment of big rollers. Keeping fresh water in their tanks, keeps the working mariners from distractions and allows them to focus on the task at hand. They have corrosion-resistant titanium pump heads and pumps and motors are shock-mounted to isolate and minimize vibration transfer to a ship's hull, especially with the crew's safety in mind at all times, the OML series have built-in safeguards like low-voltage protection to keep motors from overheating.

The VMT-SW32 Series reverse osmosis desalination systems are designed to provide portable water in demanding environments. Its rugged, efficient design allows high through-put of water with minimum electronic power use. This series are quiet because the mounting of the motors and Aqua Pro pumps isolate and minimizes vibration transfer to the vessel's hull or the reverse osmosis system enclosure.

¥High pressure tube flange connections

The new Parflange F37 technology is suitable for tube sizes from 16mm up to 140mm outside diameter and for pressures up to 420 bar, coupled with the widely diverse range of types completely new perspec-





tives in design.

In comparison with standard welding procedures, Parflange F37 technology shows outstanding time and cost savings. For example, expensive tube connection cleaning and x-ray procedures immediately become a thing of the past. Also, the manufacturing time for a tube connection rapidly reduces by more than half in comparison with traditional welding. Components in the Parflange F37 flange program are supplied with the new chromium (VI)-free surfaces, thus contributing to clean and environment-friendly production methods.

¥Umbilicals & subsea power cables

Parker is a global supplier of umbilicals, subsea power cables and associated termination equipment to the offshore oil & gas industry and the offshore wind turbine industry. The work force has a long, proven record in design and manufacture of these products. Umbilicals and Subsea power cables are used in a variety of applications, connecting platform to platform, platform to land, FPSO to Subsea templates, and offshore wind turbines. Parker's cabling machine with its 16 insets, gives a highly flexible production capability, which mean the ability to produce complex and demanding products, simply, efficiently and effectively.

Parker is well-known for services differentiated from those of other companies. The following summarizes the details and

characteristics of the services that Parker offer:

¥Pipe spool production and installation

- Design and prefabrication of pipe spools up to 10°±, cold bended
- On site supervision and installation
- Pipe flushing and pressure testing
- Significant cost savings compared to welding or induction bending
- Reduced need of own pipe installation employees and supervisors

¥Breadman (KanBan) system

- On site collection and replacement
- Constantly monitoring usage to adjust box quantity (Ideal 14 days usage)
- Barcode labels with customer and Parker item number
- Separate 'Breadman' customer number
- No purchase orders
- One monthly invoice
- Rolling inventory 2 to 3 times before payment
- Able to monitor usage and to separate same items being purchased for other purposes

¥Container services for offshore and onshore

- Containers with separate customer numbers
- Shelves with customer and Parker item number Barcode labels
- Up front order for expected usage for a particular project (crane, winch, drilling equipment etc)
- Potential replenishment ordered to the separate customer number
- When project (crane, winch, drilling equipment etc) is finished produced the Container is returned to Parker for credit of reminding items
- Can be with Staff (supervisor) from Parker
- Knows exactly the connector usage of the project
- Time saving (container can be placed in best possible possessions to the workplace)

¥Tech services & training program

- Reduced number of potential leak points
- Fewer parts
- Easier assemblies
- Service friendlier
- Value added training, Train the trainer, Hands on training



Umbilicals & subsea power cables

- BOM cost reduction
- Less workforce needs
- Better visual appearance
- Reducing maintenance, rework & replacement costs
- Increasing machine performance & job safety

Achievements in marine sector

Yoo Shi-tak, Country Managing Director of Parker Hannifin, said, "We have achieved an annual growth rate of 40% in the marine sector and aims to accomplish USD 50 million in sales by 2015."

Parker Hannifin has showed outstanding performance in the marine market. In 2010, Parker Hannifin successfully installed Parker EO2 tube fitting and F37 DIN spool on board the seismic research vessel built by S Heavy Industries, winning high praise from the ship owner.

Furthermore, Parker Hannifin has supplied hydraulic pipe products for most drilling package products fitted to the drillships at 3 major domestic shipyards. Under the GCC (Global Connector Contract) entered into with NOV in early 2010, Parker Hannifin will exclusively supply fluid connector products for all drillship topside equipments to be manufactured from 2012. Currently, all hose assemblies and F37 DIN spools that Parker Hannifin produces are fitted to the diesel engines of ME type ship, and the same products that Hannifin produces seeks to export will be mounted to the marine engines manufactured in Japan.

In the commercial vessel sector, Parker Hannifin is manufacturing and supplying F37 DIN spool for the steering gear units under the contract awarded by Aker. Besides, Parker Hannifin is said to be negotiating with domestic manufacturers on the replacement of existing welding pipes.

"We will focus on winning orders in the field of special pur-

pose ship, such as wind turbine vessel, pipe-laying vessel, warship, which holds out bright prospect for business in the period ahead, and expand into the system sector over the long-term by manufacturing the hydro power units consisting of only Parker Hannifin's hydraulic products."

"All these attest to the customers' recognition of our system's reliability and efficiency, which we gained while supplying single solutions so far. This is what only Parker Hannifin is capable of and cannot be emulated by any competitors." stressed Yoo Shi-tak, Country Managing Director of Parker Hannifin.

Strategies for marine market

Yoo Shi-tak, Country Managing Director of Parker Hannifin, remarked, "The primary factor behind the transformation of Parker Hannifin's marine business into core portfolio has been the effective localization strategy creating new value for customers, not merely replicating the existing systems." Creating new value means offering accurate and customized cutting-edge technology for any system that has not been implemented properly due to technological constraints regarding what customers need or require.

Parker Hannifin plans to fully carry out its role as partner committed to helping customers build up competitiveness. For that, Parker Hannifin will provide systems optimized for customers based on accurate understanding of customers' systems and requirements, not just introducing advanced technologies to customers.

In addition, Parker Hannifin will realize precision control on the basis of large-capacity flow control technology for hydraulic equipments to be installed on board drillship or FPSO. Furthermore, it will supply servo-proportional valves with faster response at affordable price, thus allowing the customers to achieve high precision control and increase productivity.

Besides, Parker Hannifin Korea plans to expand its supply of products and technical support in relation to the drillship, semi-submersible, and offshore plants built at Korean shipyards and strengthen the installation and site supervision services. Parker Hannifin Korea is making this strategic move amid strong performance of Korean shipyards in the offshore plant. Korea's 3 major shipyards made a clean sweep of drillship orders placed worldwide in 2011, emerging as the mecca of drillship construction, and have increased focus on building high value-added ships to widen the gap with Chinese rivals. ⚓

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Constant innovation and development of new services for ship owners and operators

Chris Lim, Maritime Market Manager - Asia Pacific, Inmarsat

Inmarsat was established in July 1979 by the Convention on the International Maritime Satellite Organization and the Operating Agreement on the International Maritime Satellite Organization signed by 7 countries, including the United States. Its business was split into INMARSAT Holdings Limited, a private company, and the small group which became the regulatory body, International Mobile Satellite Organization (IMSO), in 1999. Inmarsat plans to launch a satellite to offer global Express VSAT service in 2014.

Chris Lim, Maritime Market Manager of Inmarsat Asia Pacific, said, "Inmarsat provides the industry's most reliable satellite communications that meet the varied needs of ship owners and operators, and continue to innovate and develop new services so that we are best placed to address new demand as it evolves in the future."



Q : Please give us a brief overview of Inmarsat.

A : Inmarsat was founded in 1979, as an intergovernmental organization (IGO) under United Nations' charter, to provide safety and distress communications via satellite for seafarers. The organization quickly expanded to offer non-safety voice communications at sea, on land and in the air - but the maritime sector continues to contribute around half of the company's revenues. Inmarsat was the first IGO to privatize in 1999, and floated on the London Stock Exchange in 2005 (with the ticker symbol ISAT). With its latest generation of geostationary satellites - the three Inmarsat-4 (I-4) satellites - Inmarsat is able to provide high-speed IP data communications alongside its telephony services. In fact, the vast majority of the traffic over the I-4s is now data.

Inmarsat has traditionally acted as a pure wholesale organization, but has recently integrated Stratos (one of its two largest distributors, which it acquired in 2009) and the VSAT provider Ship Equip (acquired in 2011) into the organization and now sells services directly alongside its well-established value-added indirect channel.

Q : What technologies and services does Inmarsat provide in the maritime sector? What are some of the competitors of Inmarsat in the market and what is the unique strength of Inmarsat compared to those competitors?

A : From its earliest days, Inmarsat has taken great pride in providing the Global Maritime Distress & Safety System (GMDSS), on which seafarers literally trust their lives, and we continue to be the only satellite operator to offer GMDSS. This requires Inmarsat to offer the industry's best network availability - we are regulated to have a network reliability of 99.99% - and this applies to all services that operate on the network, making Inmarsat the gold standard for reliability.

In addition, Inmarsat's latest generation satellites are operational now, and launched as recently as 2008. The expected life span of the I-4s stretches to 2023 and beyond. Our future is certainly exciting, with the Global Xpress network due to launch in 2013, but we are also providing reliable services to customers today, with an advanced satellite network that is just a few years into its service.

We offer dependable services today and a clear pathway into the future.

We also have the industry's widest range of services: from voice services such as FleetPhone or our global handheld

phone, IsatPhone Pro; to our flagship maritime service, FleetBroadband, capable of providing up to 0.5Mbps in any conditions and currently delivering live HD television from the Volvo Ocean Race boats as they compete in the round-the-world yacht race.

Q : How much importance and significance does the maritime sector take in Inmarsat's business? What plans does Inmarsat have to strengthen its business in the maritime sector?

A : Maritime remains half of our business, and is incredibly important. It is no coincidence that, as we build the Global Xpress capability, partners for the maritime terminals have been announced first - it's a market we know very well. We are continuing to innovate and push the boundaries of our maritime services; we have announced our commitment to introduce GMDSS capability on FleetBroadband, for example, and are well advanced in the steps to achieve that (we launched a non-SOLAS voice distress service for FleetBroadband in mid-2011). Other innovations due for launch in 2012 include a multi-voice capability for FleetBroadband that will support up to 9 simultaneous telephone calls; and our Dynamic Telemetry Service, which will enhance the ability of FleetBroadband to transmit the very low data communications used in telemetry (e.g. for engine or cargo monitoring).

Our commitment to constantly improving our maritime services - so that we continue to meet the evolving demands for operational or crew communications - proves how important the maritime industry is to Inmarsat.

Q : What is the growth strategy of Inmarsat in the maritime sector in the upcoming period?

A : We will continue to do what we do best: provide the industry's most reliable satellite communications that meet the varied needs of ship owners and operators, and continue to innovate and develop new services so that we are best placed to address new demand as it evolves in the future. We are now doing this through both direct and indirect service delivery, but our overriding goal is to grow the business.

Q : What is the recent performance, sales, and future growth goal of Inmarsat? Please elaborate on the whole aspect and maritime sector, respectively.

A : Our full-year results for 2011 will be announced next year,



but in 2010 we saw good growth in revenue, EBITDA and profit. We saw positive results as well in the quarterly financial results we have announced throughout 2011. Our maritime revenue has been flat for recent quarters, but that has largely been a result of vessels migrating to our newer services, such as FleetBroadband - which are more capable and therefore more cost-effective to use - faster than we initially expected. We have recently seen record numbers of FleetBroadband installations. There are now over 23,000 active terminals. The growth in usage of those new services, as ships begin to utilize the greater functionality, will gradually offset the revenue impact of service migration (and of course the number of ships yet to migrate is rapidly falling.)

Q : As far as we know, Global Xpress will be released soon. When will the Global Xpress be launched? What difference does it have compared to the previous years and what are the special features? What results do you expect in the market in the period ahead?

A : Global Xpress will launch in 2013, with full global service in 2014. It will be the world's first global Ka-band network, combining ultra high bandwidth and exceptional service quality with global coverage and seamless mobility. Vessels will have access to data speeds of up to 50Mbps through a 60-100cm antenna. This kind of throughput, on a global basis, is unprecedented. This is true mobile broadband.

The Global Xpress network will allow customers to cross satellite spot beam boundaries seamlessly, providing vessels with continuous, uninterrupted connectivity. We anticipate the service will eliminate many of the disadvantages associated with Ku-band VSAT today.

This will be delivered alongside our existing L-band maritime services. We see a future where mobile satellite services are delivered through a combination of L-band and Ka-band satellites, harnessing the strengths of each to offer an unrivalled package of services based on speed, price and portability. With two global constellations managed by one operator, Inmarsat is in the unique position to provide the right solution to every sector and customer type in the maritime market.

Q : What do you think are the recent issues in the mobile satellite communication market? What is the issue in which Inmarsat is interested?

A : I think there are two key issues in the market right now. One is the dependability and longevity of satellite operators; basically, ship owners want to know that the communications service they install today can be relied upon to deliver a high-quality service tomorrow. It's an issue of confidence. Inmarsat is a solid business with an advanced global network that is operational now, and we have laid out very clearly our plans for the future - all of which are fully funded and currently ahead of schedule.

The other issue, which is of no surprise in these current times, is price. Ship owners are sensitive to the cost of satellite communications, but more than anything they want an element of predictability - they want to fix their costs. We have recently overhauled our pricing structure to not only bring prices down - voice calls from as low as \$0.55 per minute, for instance - but also to introduce various packages with fixed Gigabyte allowances. We don't hide costs, and we don't snare customers with an inadequate service that they later find they need to pay to upgrade.

Q : As the Asia-Pacific Maritime Market Manager, what do you think of the recent performance and future growth potentials in the Asia-Pacific market? What country do you think has experienced the highest growth or will see the highest growth rate?

A : The Asia Pacific market has always been extremely important to Inmarsat, and the growth potential is huge in our three core maritime sectors: merchant, fishing and leisure. Target countries for us next year include Korea, China, Japan, Australia and Singapore, but we will support our partners where there is significant business opportunity across the region.

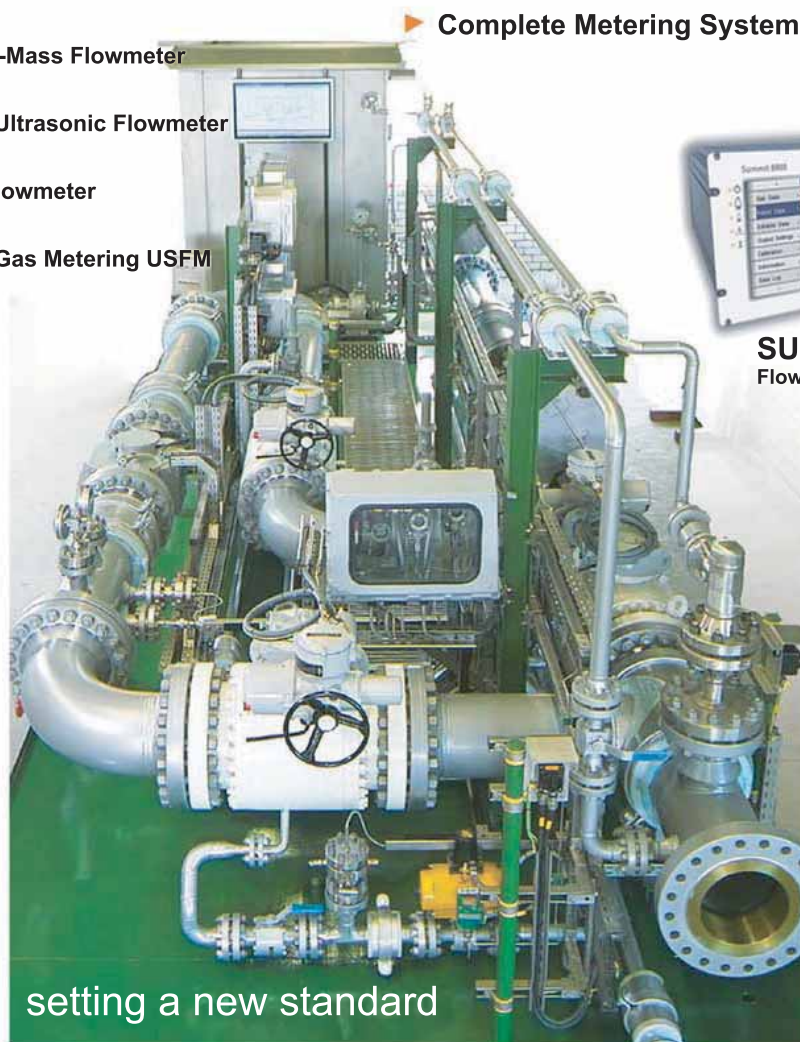
Q : Korea has shown strong performance in the maritime sector. Do you offer any special service or provide support for Korean customers? Please elaborate on Inmarsat's business and performance in Korean market.

A : Ours is a global network, so our Korean customers enjoy the same reliability and range of services that are delivered to all our customers worldwide. Our strategy in Korea - as in other parts of the world - has been to partner with local service providers who have in-depth understanding of the market in Korea, and the specific needs of Korean shipping companies. 

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Present and future of Fieldbus: Foundation Fieldbus Seminar 2011

Foundation Fieldbus Korea Marketing Committee held 'Foundation Fieldbus Customer Seminar' in COEX, Seoul, on November 23. This year's event which marks 3rd anniversary aimed to speed up supply of Foundation Fieldbus in domestic market and increase cooperation with users.



Booths at the event site

Foundation Fieldbus Korea Marketing Committee (hereinafter "FFKMC") announced that it would hold 'Foundation Fieldbus Customer Seminar' for manufacturers, plant engineers and automation solution providers in COEX, Seoul, on November 23.

This seminar is the only Fieldbus seminar ever held in Seoul by FFKMC to promote supply of Foundation Fieldbus in the domestic market and impart momentum into the cooperation with users. This event drew many suppliers, the member companies, from both domestic and overseas process control, DCS and instrumentation fields.

This annual seminar, the third event since its inception back in 2009, revolved around the theme, 'Achieving Operational Excellence with FOUNDATION Technology', and touched on issues such as the technological evolution of fieldbus, requirements of market



'Foundation Fieldbus Customer Seminar' held in COEX, Seoul, from November 23 to 24

and change, major examples of applications in manufacturing sector, and others. Particularly, the seminar was attended by ABB, Rockwell Automation, Invensys, Azbil, EMERSON, Honeywell, LAPP Group, YOKOGAWA, P&F, etc, which are the members of Fieldbus Foundation

Association and featured presentations on the examples of applications in industries, demonstrations and customer counselling. This event is said to have been of great help to the plant managers, factory operation and instrumentation maintenance managers. ⚓

New technologies of FOUNDATION Fieldbus

The Fieldbus Foundation is a global not-for-profit corporation consisting of leading process end users and automation companies. Within the Fieldbus Foundation, end users, manufacturers, universities and research organizations work together to develop an automation infrastructure that provides process integrity, business intelligence and open scalable integration in a managed environment.

Fieldbus Foundation has constantly announced enhancements to the physical layer technology of its open Foundation fieldbus. The latest updates to the H1 (31.25 kbit/s) physical layer specifications will improve the robustness of fieldbus control systems by optimizing device interoperability and integration. End users will benefit from easier installation, faster commissioning and seamless startups.

Enhancements to the Foundation fieldbus specifications include:

- Addition of a test procedure for isolated couplers to the existing FOUNDATION fieldbus Coupler Test Specification. Registration of isolated couplers is now possible.

- Improvements to the H1 Physical Layer Conformance Test Specification based on Action Requests received during the last few years. The most significant changes include the addition of a receive jitter test case and a device-coupler interoperability test.

- Updates to the H1 Physical Layer Test Specification to remove obsolete profiles and align new references in the document with the current International Electrotechnical Commission (IEC) specifications. Coupler profiles were also added to the test specification.

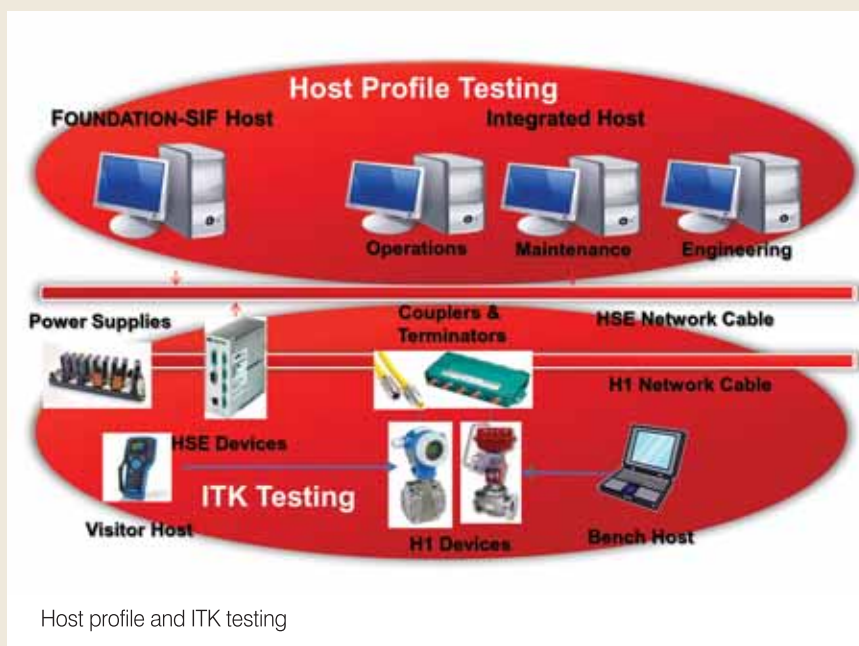
- Miscellaneous updates to the FOUNDATION fieldbus Cable Specification.

Fieldbus Foundation Director-Fieldbus Products Stephen Mitschke commented, "The Fieldbus Foundation's rigorous interoperability test and registration procedures thoroughly examine all aspects of a fieldbus device. The latest enhancements to our physical layer specifications will strengthen this testing and provide end users with greater confidence that registered Foundation fieldbus devices can be employed in a tightly integrated, interoperable control system architecture."

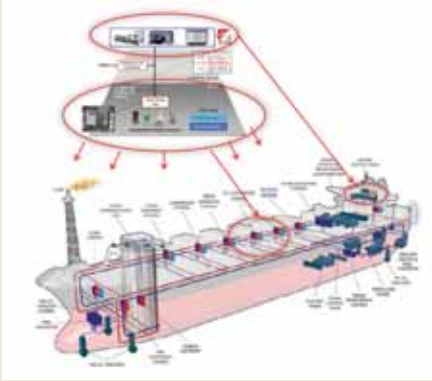
Transducer block for wired HART and WirelessHART devices

WIO system architecture and WIO data structures related to the transducer block specification were updated, including the Foundation WIO (Wireless and Remote I/O) preliminary specification that processes the fieldbus transducer block for wired HART and Wireless HART devices.

Part of the FOUNDATION for Remote Operations Management solution implementing wireless and remote I/O, the new technical specification defines a fieldbus transducer block used to represent HART devices within FOUNDATION for Remote Operations Management devices. Both wired HART and WirelessHART devices may be represented in this block. In addition, the specification describes the expected method for HART configuration tools and asset-managing hosts to access HART devices using the native HART command protocol transported through the FOUNDATION High Speed Ethernet (HSE) network. The specification also defines structures to identify and maintain



Host profile and ITK testing



Examples of FOUNDATION fieldbus application

HART device status in wired multi-drop networks as well as in WirelessHART mesh networks connected to FOUNDATION for Remote Operations Management devices.

The Fieldbus Foundation's director of technology development, Dave Glanzer, commented, "The new transducer block specification will benefit end users who need to be able to interface HART and WirelessHART devices to FOUNDATION fieldbus to improve their integration with a control system, or with FOUNDATION devices. They may also require a networked method for an asset-managing host to access a large set of HART and WirelessHART devices for HART configuration and maintenance purposes."

Within the FOUNDATION architecture, H1 and HSE provide a distributed function block capability with HSE serving as a larger pipeline offering increased speed and throughput. The WIO development expands these capabilities by establishing open, non-proprietary specifications for a wired or wireless HSE backhaul network integrating various wireless FOUNDATION for Remote Operations Management devices with interfaces to wireless field device networks.

HSE provides an efficient way to bring

large concentrations of discrete and analog field I/O from modular devices back to the control room using a high-speed HSE connection. Employing HSE devices functioning like a smart remote terminal unit (RTU), the technology brings all forms of conventional I/O into the native fieldbus environment easily. This solution makes discrete-in, discrete-out, analog-in, analog-out and H1 fieldbus available over a common Ethernet network. The addition of remote I/O further tightens the integration of process instrumentation within a FOUNDATION control system infrastructure.

H1 Interoperability Test Kit

The recently announced H1 ITK (Interoperability Test Kit) 6.0.1 is a powerful tool to test the functionality of an H1 (31.25 kbit/s) fieldbus device and its conformity with the FOUNDATION function block and transducer block specifications. H1 ITK 6.0.1 demonstrates the Fieldbus Foundation's commitment to quality and its continuous improvement of solutions supporting developers of FOUNDATION fieldbus products. The updated test kit addresses bug fixes to the NI-FBUS Communication Manager (4.0.1) software, which have resolved issues related

to alarms and obsolete descriptor errors. It also includes miscellaneous bug fixes to H1 device test cases.

Developed by the Fraunhofer Institute, an internationally-recognized expert in communication and network testing software based in Karlsruhe, Germany, the H1 ITK consists of a test engine, communication stack and function block interface card. An excellent tool for troubleshooting and debugging devices, the H1 ITK includes all hardware and software required to ensure a manufacturer's complete device interoperability as specified by the Fieldbus Foundation's official registration testing procedure. By using the H1 ITK, device developers can run tests identical to those used by the foundation before submitting their device for official registration.

The H1 interoperability test suite can be paired with an ITK Automation Tool designed to eliminate several manual intervention steps required when performing pre-registration testing of fieldbus devices. The tool improves ITK schedule efficiency and provides a direct reduction in the person-hours needed to complete the testing phase.

Rockwell Automation selected as DSME's drillship project partner

Rockwell Automation was awarded a contract worth over USD 6 million from Daewoo Shipbuilding & Marine Engineering (DSME) to provide automation solution. Selected as the project automation provider, Rockwell Automation will provide DSME with ICP (Information, Control, Power & Safety) solutions using PlantPax process automation system, the flexible and scalable single platform.



PlantPax process automation system



FactoryTalk View family of products

Daewoo Shipbuilding & Marine Engineering (DSME) announced that it awarded a contract worth over USD 6 million to Rockwell Automation and its Global Solutions team recently. Under this contract, Rockwell Automation will provide emergency shutdown (ESD), fire and gas (F&G) safety systems, and engineering services for 4 new DSME offshore drillships. In addition, Rockwell Automation will provide leading safety system technology using its PlantPax process automation system, FactoryTalk View, AADvance scalable process safety and project management expertise. Rockwell Automation and DSME signed a contract for 4 new DSME offshore drillships and will cooperate in the project for 3 more drillships in mid 2012.

design, develop and deliver these systems, working with their partners here in Korea," said an official in charge of purchase at DSME. "Based on our long, successful relationship, we are confident in the ability Rockwell Automation has to provide the integrated information, control, power and safety systems we need for this important project."

"This win is significant because it propels Rockwell Automation to the forefront of control and safety solutions for offshore vessels and drilling rigs," said Terry Gebert, Vice President and General Manager, Rockwell Automation Global Solutions. He added, "Our solution is unique as it provides a single, flexible, scalable platform using the PlantPax system to meet the specifications of an integrated control and safety system. Our experience, oil and gas domain expertise which have accumulated so far, and global resources will help DSME run a profitable and sustainable operation."

To better serve its Korean customers, Rockwell Automation recently opened a new customer briefing and competency center in Seoul. The center houses working models that demonstrate integrated, flexible and scalable automation systems operated by multidisciplinary controls and the PlantPax system. 

Rockwell Automation will offer a robust safety system for DSME's offshore vessels and rigs. This safety system has a proven performance. Rockwell Automation has the experience and expertise to



AADvance diagram



PLM being adopted across a wide range of industries

Dassault Systèmes Korea announced in a press conference on December 7 that it achieved a double-digit growth in 2011 with Dassault V6 PLM solutions being adopted across a wide range of industries. This year, Dassault Systèmes Korea has expanded the reach of PLM applications to aerospace, automotive, industrial machinery, shipbuilding, energy, national defense, distribution industries recently.

“Dassault Systèmes Korea accomplished double-digit growth in 2011 with the integrated V6 (Version 6) PLM (Product Lifecycle Management) solution, our flagship product, finding its application in a wide range of industries such as shipbuilding, national defense, construction, energy, distribution industries, as well as the aerospace, automotive, industrial machinery industries.” said Cho Yeong-bin, Managing Director of Dassault Systèmes Korea in a press conference on December 7 which was held to announce the business performance of Dassault Systèmes Korea for year 2011.

Dassault Systèmes' V6 solution is an open and scalable platform, enabling real-time collaboration and online-enabled design. It is the industry's best integrated PLM solution that supports swift implementation environment and provides user-friendly interface. As the data model is shared on the basis of single interface, the systematic collaboration with external vendors can be strengthened. Open architecture is compatible with a variety of systems.

Expansion into various industries

Dassault Systèmes Korea accomplished



A press conference on December 7 to announce the performance of Dassault Systèmes Korea for year 2011

a balanced growth this year. It has successfully supplied its solutions to many large companies, such as LG Electronics, Korea Aerospace Industries (KAI), Doosan Engine, Hyundai Rotem, Hanwha, Hyundai Mobis, STX, SK Innovation, and furthermore, has seen the revenue from small and medium sized companies rising. Particularly, LG Electronics introduced ENOVIA V6, which enables collaborative environment, to build an integrated IT platform supporting the entire area of product development.

The Mobile Communication Division of LG Electronics completed the project in 2010 and the Home Entertainment Division of LG Electronics successfully

deployed Dassault Systèmes' enterprise platform recently and plans to expand its application to overseas branch offices in 2012.

In relation to that, Cho Yeong-bin, Managing Director of Dassault Systèmes Korea, said, “Dassault Systèmes Korea successfully tapped into new markets and accomplished remarkable results in expanding the markets for V6, Dassault Systèmes' flagship product, despite economic slowdown.”

He explained, “Dassault Systèmes has made huge strides as PLM is recognized by domestic large and medium sized companies as the key driver for maintaining competitive edge in the global mar-



Cho Yeong-bin, Managing Director of Dassault Systèmes Korea

ket. Another driving force behind our burgeoning success. is our constant investment in Korean market, like establishing R&D center here.

Cho Yeong-bin, Managing Director of Dassault Systèmes Korea, said in relation to the noticeable achievements in the PLM market this year, "The knowledge and use of PLM has increased across the industries, considering that various industries have adopted Dassault Systèmes' solutions."

Even small and medium sized parts manufacturers have been fast to adopt PLM although it was used mainly by auto makers previously. PLM solution is also being used by tyre manufacturers for vibration and rolling test, etc, to simulate real-world transportation data.

Daewoo Shipbuilding & Marine Engineering (DSME), which signed a strategic partnership agreement with Dassault Systèmes in October last year, has deployed V6 solutions such as CATIA V6, etc, to drive innovation for production and design processes in new growth engine sectors including shipbuilding, wind power, green energy, plant sectors, etc,

and optimize business processes through 3D PLM.

Increased focus on R&D

Dassault Systèmes has played a key role in promoting domestic IT development by establishing global R&D center and actively engaging itself with university-industry collaboration. Dassault Systèmes is participating in a project to develop 3D fusion industry with Daegu Metropolitan Government, North Gyeongsang Provincial Government and Gwangju Metropolitan Government and currently holding the presidency of Korea 3D Fusion Industry Forum. Moreover, Dassault Systèmes is playing a supporting role to help 3D fusion industry, the next-generation growth engine, become a model for various industries.

In addition, Dassault Systèmes opened 'Authorized Training Center of Dassault Systèmes' in Keimyung University in Daegu in September as part of university-industry collaboration initiatives to develop skilled and specialized manpower in the fields of 3D and PLM. This Center with excellent instructors and best cur-

riculum is also open to employees of other companies and students of universities than Keimyung University and has been at the forefront of effort to foster specialized manpower in relation to 3D and PLM in Daegu, North Gyeongsang region.

Besides, Dassault Systèmes gained membership of the Korean Society for Industry & Academy Collaboration and vigorously explored the measures to create new momentum to the collaboration with various universities.

Dassault Systèmes' R&D Center, founded in 2010 in Daegu, is currently staffed with 22 persons and plans to increase recruitment in 2012. Furthermore, it recently expanded research area beyond the R&D related to CATIA product into DELMIA for virtual production and digital manufacturing. Dassault Systèmes has dispatched 6 3D PLM researchers from the headquarters to the R&D Center in Daegu to transfer technology to domestic workers. Specifically, Dassault Systèmes' R&D Center in Daegu, which specializes in shipbuilding sector, has accomplished tangible results, like playing a crucial role in formulating the partnership agreement with DSME.

Gliding on a continued growth path in 2012

Cho Yeong-bin, Managing Director of Dassault Systèmes Korea, remarked, "I expect that a broader range of businesses and communities will have hands-on experience with Dassault Systèmes solution-rendered lifelike 3D virtual reality in 2012. Dassault Systèmes will unveil EXALEAD, the search engine, 3DSwYm, a social media-inspired community building and collaboration platform, etc, in addition to its flagship products such as CATIA, ENOVIA, etc. 



The nation's largest PLM conference

Siemens PLM Software hosted 'Siemens PLM Connection Korea 2011' which ran from November 23 to 24. This event, the nation's largest, brought together many PLM users and presented strategies for swift decision-making and quick launch of high quality products.

Siemens PLM Software held 'Siemens PLM Connection Korea 2011', the nation's largest PLM industry user conference, for 2 days from November 23 to 24.

Siemens PLM Connection is an annual year-end conference where Siemens PLM solution users come together to exchange information, which is the largest event in the industry.

Siemens PLM Connection has drawn about 1,300 users and experts in the related industry every year and is considered the best PLM event that offers opportunities for networking and interchanging with global companies and various international organizations, as well as domestic companies.

A blueprint for business growth through PLM

Siemens PLM Connection Korea 2011 provided a platform to showcase a variety of new solutions and a blueprint for driving PLM innovation, offering an insight into the vision of the company that has maintained a leading position in product lifecycle management (PLM) technology.

Siemens PLM Software presented the competitiveness-enhancing strategies for ensuring swift decision-making and quick launch of high quality products under the theme of 'Smarter Decisions, Better Products' and drew highly favorable reaction. Siemens PLM Software offered the first view of the latest version



'Siemens PLM Connection Korea 2011' hosted by Siemens PLM Software for 2 days from November 23 to 24

of NX Software, a CAD solution for the design, and a new version of Tecnomatix', a digital manufacturing solution, in the domestic market.

For Siemens PLM Software, a leader in PLM industry with leading technology and a broad range of new solutions, Siemens PLM Connection Korea 2011 provides a valuable opportunity to examine current market conditions and better understand the needs and requirements of users.

A variety of auxiliary events

Siemens PLM Connection Korea 2011 featured various programs and auxiliary events. Siemens PLM Software presented its total solutions covering a wide range of fields such as CAD, CAM, CAE, DM, etc, as well as PLM, at dozens of its booths to many domestic and overseas strategic partners, including HP and



Gwon Gyeong-reul, Managing Director of Siemens PLM Software, delivers keynote speech at the event.

NVIDIA, who attended Siemens PLM Connection Korea 2011.

Particularly, this year's event included the NX modelling competition for university students nationwide as part of education project to mark the launch of new NX version.

In addition, Siemens PLM Connection Korea 2011 provided detailed overview and demonstration covering the 4 tracks of DPD, PLM, DM, and mainstream in tandem with the presentation on successful applications in various industries such as high tech industry, electronics, automotive, transportation industries, etc. Noticeably, Siemens PLM Software offered the hands-on experience with new solutions at its booths specially themed around Teamcenter Mobility, DM, etc, which it directly operates. 

Machine Tool Manufacturers' Day celebration

The '11th Machine Tool Industry Day' was held at the Renaissance Hotel on December 1, organized by the Korean Machine Tool Manufacturers' Association (KOMMA). The event drew approximately 300 persons from machine tool industry and featured speeches of encouragement by Kim Jae-hong, the Growth Engine Manager of the Ministry of Knowledge Economy (MKE), and awards for those who made outstanding contribution to the development of machine tool industry.



Machine Tool Manufacturers' Day was held on December 1.



Sohn Jong-hyeon, Chairman of KOMMA, is delivering the welcoming address.

The '11th Machine Tool Manufacturers' Day' was held at the Diamond Ball Room of Renaissance Hotel on December 1, which draw about 300 people from the machine tool industry, government, academic societies, etc.

In 2010, domestic machine tool production amounted to KRW 5.2 trillion with the export and import registered at USD 1.678 billion and USD 1.444 billion, respectively. The machine tool sector recorded a surplus of USD 234 million in the same year. In 2011, domestic machine tool production is expected to reach KRW 6.2 trillion with the export being projected at USD 2 billion and the trade surplus in the machine tool sector is expected to record USD 300 million, the strongest performance in history.


During the ceremony on the same day, Presidential commendations were

awarded to Kim Sa-il, President of SM Korea which developed indigenous high pressure cleaner, and Kim Chang-seon, President of Hansung Precision which has developed and exported machine tools and industrial metering valve. In addition, a total of 22 persons, including Kim Seong-rak, Managing Director of Doosan Infracore, received the commendations from the Minister of Knowledge Economy (6 persons), commendations from the Commissioner of Small and Medium business administration, and the best paper awards (7 persons).

Kim Young-hwan, Chairman of the National Assembly's Knowledge Economy Committee delivered the congratulatory speech, and Kim Jae-hong, a deputy minister from the Ministry of Knowledge (MKE) in charge of new growth engine sector, delivered a speech of encourage-

ment.

Kim Jae-hong, the Growth Engine Manager of the MKE, said, "The machine tool industry needs to proactively respond to the global trends toward convergence, multi-functionality, environment-friendliness to take another leap forward. I hope that the industry will focus on concentrating the capabilities on developing high-tech products through collaboration between large companies and small and medium-sized businesses."

Machine Tool Manufacturers' Day, which falls on the Thursday of the first week in December each year, was established in 2001 to highlight the importance of the machine tool industry, further raise its status, lay the groundwork for the nation to join the ranks of advanced machine tool countries and increase export. 



Turing crisis into opportunity

STX Group held 'Business strategy meeting for the 2nd half of 2011' on November 27. In the meeting, Gang Deok-soo, Chairman of STX Group, stressed the need to proactively respond to the looming threat of global economic crisis and focus on qualitative business and stable growth more than any other time in history.

STX Group announced that it held 'Business strategy meeting for the 2nd half of 2011' at STX Resort in Mungyeong, a city in North Gyeongsang Province, for 2 days from November 27, which was attended by Gang Deok-soo, Chairman of STX Group, and about 200 officials from STX Group and executives of affiliates.

This business strategy meeting, a biannual event, provided a platform for examining major performance of this year and exchanging ideas about the core business plan that will be implemented next year.

Gang Deok-soo, Chairman of STX Group, said, "The business environment will be adversely affected by the uncertainty of global economy taking its toll on the world economy, as well as the financial crisis in Europe and United States. We need to proactively respond to the looming crisis and put an added emphasis on qualitative business and stable growth more than any other time."

For that, he suggested 3 major goals, such as sustained upturn in order intake, revenue-oriented business management, and stability of financial structure, and urged action plans to be developed to meet these goals.

He stressed that winning new orders and driving forward sales activities would represent a first step toward creating revenue and a prerequisite for the survival



Gang Deok-soo, Chairman of STX Group, is delivering a speech at the 'Business strategy meeting for the 2nd half of 2011' which ran from November 27 to 28.


and thriving of the Group.

In addition, he mentioned that the Group should focus on qualitative business management and stable growth for the next 10 years, moving beyond quantitative growth over the last decade, and pursue revenue-oriented business by strengthening cost competitiveness and productivity.

He emphasized the need to proactively increase the agility in order to create new business opportunities by building practical action plans designed to enhance financial structure in respective sectors.

Gang Deok-soo, Chairman of STX Group, mentioned that the Group would be able to continuously tread on the growth path by expanding basic capabilities based

on stronger technological competitiveness in production and quality, greater independence in business system of affiliates, globally competent workforce, as well as achieving the 3 major goals.

Gang Deok-soo, Chairman of STX Group, remarked, "The real crisis does not stem from global economic sluggishness but from our failure to be in touch with reality. We can actively cope with the rapidly changing business environment through crisis management and improvement of structure, turing crisis into opportunity." 

SPP Shipbuilding turning itself into a smart yard

SK Telecom and SPP Shipbuilding signed a smart yard contract on December 2. The integrated wired and wireless network to be installed under this deal will allow SPP Shipbuilding to have access to the ship production, logistics, maintenance systems of the shipyard via mobile devices, increasing the productivity.

SK Telecom and SPP Shipbuilding entered into a contract at the Sacheon shipyard of SPP Shipbuilding in Sacheon, South Gyeongsang, on December 2 to build smart shipyard.

Thus, SK Telecom will provide total communication services to SPP Shipbuilding's shipyard, including the intra-ship communications network, video conference system, Wi-Fi system in major facilities, along with the solutions for smart shipyard system such as computer room monitoring system, etc. SK Telecom will start laying the foundation for smart shipyard by installing the dedicated lines and building wireless wide area network infrastructure in phase throughout the 5 work places including Sacheon shipyard, while facilitating about 6,000 employees of SPP Shipbuilding to switch to smartphones and table PCs.

SPP Shipyard will have the mobile communication environment optimized for the unique situation of shipyard with large workspace, if the smart work system is completed as planned. The productivity can be increased as the affairs related to the shipyard's production, logistics, maintenance, etc, can be managed via the mobile phone. Additionally, the intra-ship communication solutions will dramatically increase efficiency in commu-



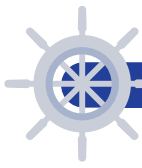
Park In-sik (left), Head of Enterprise Business Division at SK Telecom, and Gwak Han-jeong, CEO of SPP Shipbuilding, signed a contract at the Sacheon shipyard of SPP Shipbuilding in Sacheon, South Gyeongsang, on December 2 to build smart shipyard.

nication during shipbuilding.

Park In-sik, Head of Enterprise Business Division at SK Telecom, who attended the signing ceremony, said, "SK Telecom's state-of-art information technology system, harnessed with the ship solutions technology, will dramatically increase internal communication efficiency and productivity in SPP Shipbuilding. Our unmatched ICT technology and expertise will help SPP shipyard continuously tread the growth path, and we will

strengthen cooperation for that."

Meanwhile, Gwak Han-jeong, CEO of SPP Shipbuilding, said, "SPP Shipbuilding will evolve into a shipyard with enhanced productivity and safety and stronger competitive edge when the smart shipbuilding system is completed." 🚢



Forging a growing presence

The Asia Pacific region has become a key target for business growth among Nordic drillers, contractors and equipment suppliers over the years. Morten Toennesen, vice president of Roxar Software Solutions, Asia Pacific, explains why his company was attracted to the region and how it believes it can make a difference there.

Emerson Process Management Korea

Scandinavia and the Asia Pacific upstream oil & gas sector have had a close relationship for many years, as the size of Norwegian pavilions at major oil & gas shows throughout the region these days amply testifies.

StatoilHydro has significant interests in oil & gas fields in Indonesia and China, and the recent China Oilfield Services acquisition of Norway's Awilco Offshore, creating the world's eighth largest rig fleet, reaffirms the close relationship between the two regions.

Other recent deals include a USD 7.5 million contract for Electromagnetic Geoservices (EMGS) to rank prospects offshore Malaysia.

Why has the Asia Pacific upstream become such a major attraction for Scandinavian offshore players?

Aside from the positive changes in investment policies, which has seen a shift away from red tape and a welcoming of foreign investment and partnerships with national oil companies, the two most important reasons have been, first, the growth in oil & gas opportunities - particularly offshore, and second the need for technological know-how in the cases of the more remote and complex fields.

The growth in offshore opportunities in the Asia Pacific has been well documented, with data analysts Infield Systems forecasting that Asia will be second only to Africa in terms of capital offshore expenditure up to 2012. China alone has brought 38 offshore fields online since 2000, with another 39 likely up to 2016.

According to the Energy Industries Council's EICDataStream, which tracks the 6,500 most important projects in the global energy industry, Indonesia is currently leading the way in terms of upstream offshore projects with 18, followed by India with 11, Kazakhstan with nine and Malaysia with six (see accompanying chart).

With the increase in opportunities has come an increase in technological challenges too. Many of the new fields are in deepwater with analysts Douglas Westwood predicting that deepwater investment will total USD 14.6 billion in the five-year period 2009-2013. A number of deepwater facilities in harsh environments are currently planned for Indonesia, China and Malaysia.

And the fields are often complex as well. A large proportion of Vietnam's proven oil and gas reserves, for example, are found in naturally fractured reservoir rock, where fracture modelling and reservoir simulation will be essential.

The key challenge for operators with these projects, often in their infancy, is to optimize production, and deliver greater economic value from the region's oil & gas assets to meet energy demand.

And this must be achieved, while at the same time, managing the deepwater challenges of high capital and high risk. Although this will result in increased demand for offshore equipment, drilling rigs and FPSOs, much of the reduction in risk for operators will be achieved through technological innovation and reducing uncertainty in reservoir management.

By better quantifying uncertainty, areas of the reservoir which require more detailed analysis can be determined and more accurate assessments and predictions of reservoir performance can be generated for the purpose of guiding development and operational decisions. The result will be reduced levels of financial risk.

Whereas traditional approaches to reservoir uncertainty have tended to focus on, first, either a single base case model then taken through to flow simulation or, secondly, on reservoir simulation based on the understanding that only the dynamic analysis of the reservoir can fully quantify uncertainties, we believe that reservoir uncertainty requires a complete-



ly integrated approach.

By an integrated approach, we mean a seamless modelling workflow where uncertainty is evaluated across the entire reservoir model from the initial development of an accurate structural model though to both a static and dynamic modelling workflow, reservoir simulation and history matching.

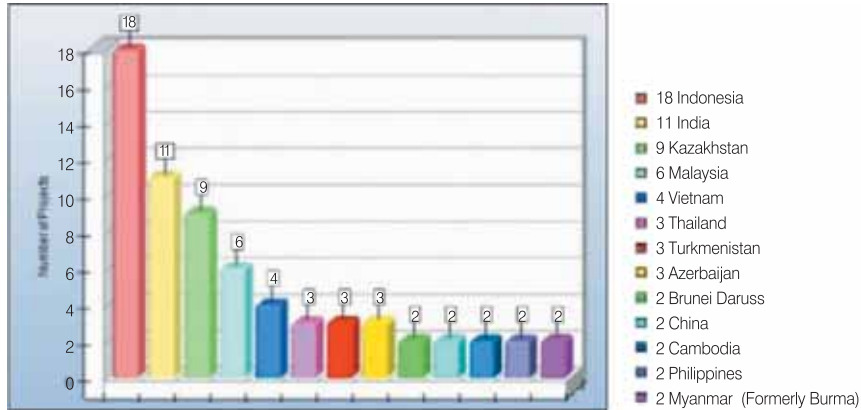
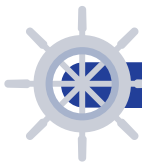
Uncertainty management should extend to include all uncertainties and scenarios within the reservoir, such as structure, faults and fractures through to porosity/permeability, water saturation, fluid contacts and flow assurance. It should also cover such crucial activities as building a high-resolution geological model around the wellbore which will be able to link

through to the target and trajectory planning process.

In this way, geometrically accurate models can be built up and then created into simulation models, consistent with all known geological information.

In this context, Roxar has been working with some of Asia's leading oil & gas companies to help them better understand and manage their reservoirs, resulting in increased production and maximum reservoir performance.

One key client, for example, is Petronas Carigali, exploration arm of Malaysian state oil company. It has access to Roxar's reservoir modelling solution, IRAP RMS, its fracture modeling solution, Fracperm, its reservoir simulation solution, Tempest,



*Source: EICDATASTREAM

Fig. 1 Asia Pacific upstream offshore projects

and its history matching and production forecasting software, EnABLE.

In Vietnam, Roxar has also been working with two joint ventures - Hoan Vu Joint Operating Company and Hoang Long Joint Operating Company - to supply reservoir simulation solutions. With much of Vietnam's production coming from fractured, offshore basement reservoirs, it is essential that accurate and robust models are fully simulated to reduce risk and uncertainty.

Australia is another key market. Here, a leading E&P company operating out of Australia's east coast, is using Roxar's history matching software. In addition, Chinese companies PetroChina, Sinopec and CNOOC are all using our reservoir management software.

The net result for all these Asian companies is reduced uncertainty when it comes to making economic decisions, such as bid valuations, new field development and operational plans, production estimates or divestments.

However, challenges remain. One such challenge to the Asian oil & gas sector's long-term development is the need to reduce the reliance on foreign expertise and increase local capacity.

In a bid to bolster the number of young people and graduates entering the Asian oil & gas industry, we have been working with local academic institutes to help pass on our expertise. Late in 2008, we signed an agreement with the Hanoi University of Mining & Geology (HUMG) in Vietnam, which will see the establishment of a laboratory at the univer-

sity with Roxar donating its software for academic use.

Similar academic partnerships have also been initiated with Universitas Padjadjaran (UNPAD) in Bandung, Indonesia, the Vietnam Petroleum Institute, the University of Adelaide in South Australia and Curtin University in Western Australia.

Asia remains today one of the world's most exciting oil & gas markets and a centre for innovation in the sector. As one of many Nordic companies investing in the region, we look forward to seeing continued success in the sector and region over the coming years. ⚓

The author:

Morten Toennesen,

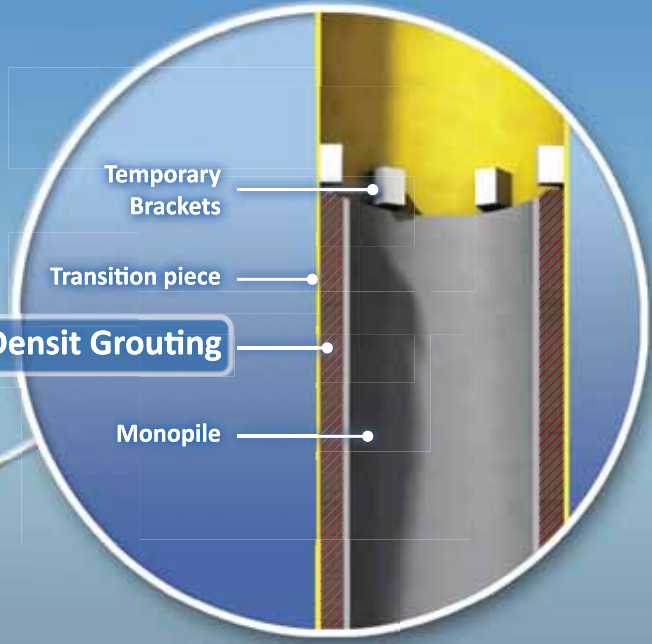
Roxar Software Solutions, Middle East and the Asia Pacific



Morten Toennesen is vice president of Roxar Software Solutions, Middle East and the Asia Pacific, and has led Roxar's business development activities in the two regions since 2003. He has been based in Kuala Lumpur, Malaysia, since 2006. Toennesen began his career at Norsk Hydro - now StatoilHydro - where he worked in various positions including senior geologist and subsurface IT manager for the E&P division. He gained an MSc in Petroleum Geoscience in 1988 from Luleå University of Technology in Sweden.

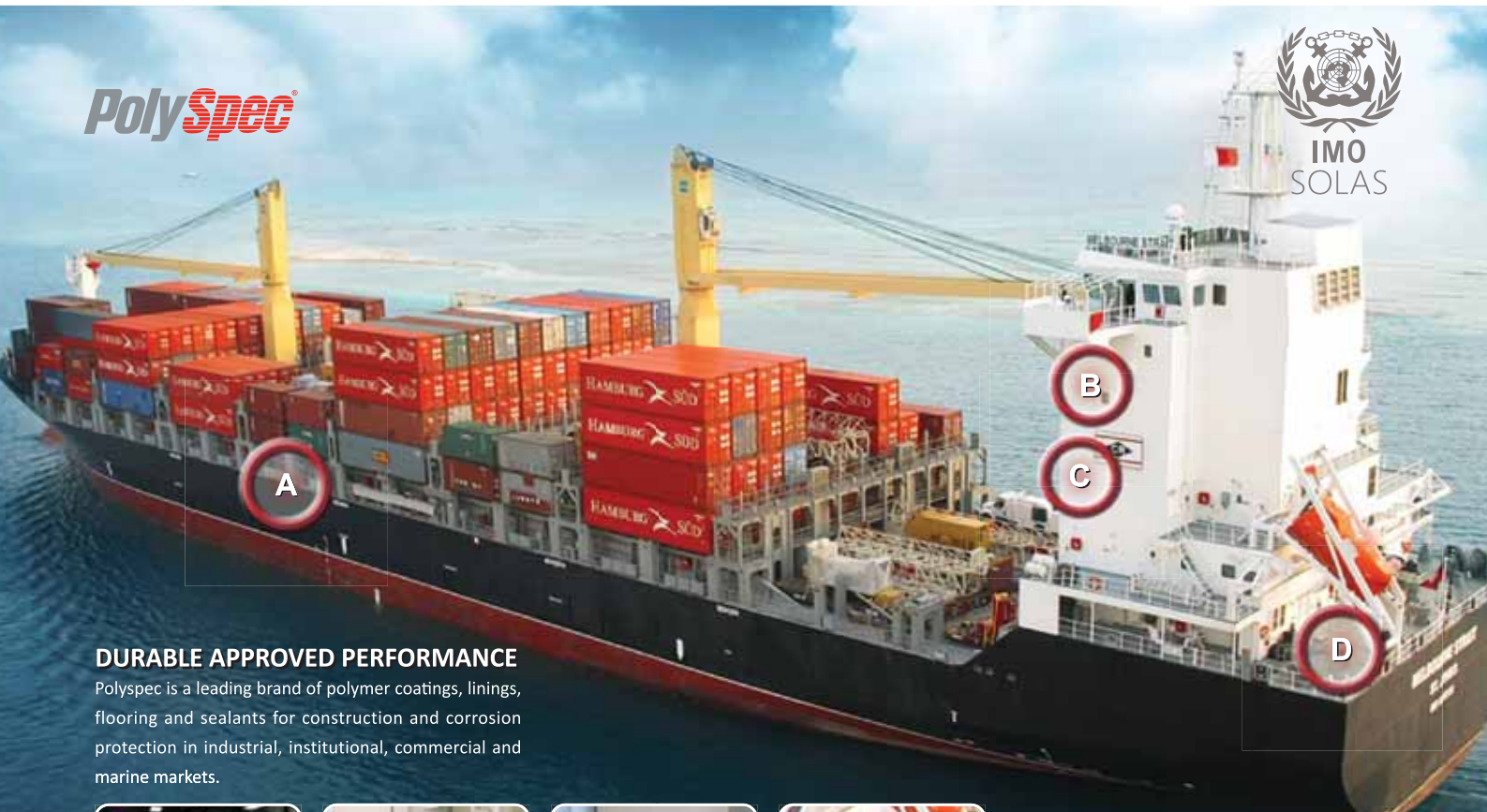


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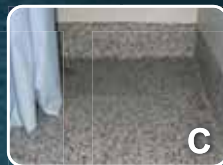
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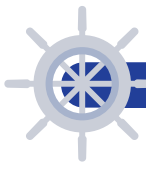


Photo: MPI Offshore; Bosch Rexroth AG

Working on stilts: The MPI Resolution at a wind turbine in the Thanet Wind Farm.

The great ascent

An innovative, continuous jacking system developed by Rexroth makes installing and maintaining offshore wind farms even safer, more reliable and more efficient.

Bosch Rexroth Korea

Weighing around 25,000 tons, the jack-up rig slowly rises out of the sea - as if by magic - and comes to a stop only when high above the waves. These so-called installation platforms or vessels serve the booming offshore wind farm market and are absolutely indispensable since they stand firmly on their legs on the seabed, even in rough seas. Work can be carried out safely and quickly and the operations window is extended significantly.

High degree of reliability

The practical design requires dependable jacking systems and Rexroth has supplied them since the early 1960s. Its many years of experience led to the development of hydraulic jacking systems specially designed for leading companies in

the offshore industry and generating jacking forces of 25,000 tons and upward. Following evolutionary development of the original concepts to create semi-automatic, double-yoke systems, Rexroth set a new standard at the end of 2009: the continuous jacking system.

Great demands are placed on these powerful jacking systems. Customers expect service lives of twenty-five years and more, in spite of wind, weather, seawater and enormous loads. To enhance reliability and operational safety, the engineers had to eliminate fatigue risks. To do so they developed special designs for the cylinders and piping. A special ceramic finish particularly suitable for the harsh environment protects the piston rods. The jacking cylinders are equipped with the Ceramax Integrated Measuring System (CIMS). It ensures

precision, accurate movement and exact leveling of the installation platform during operation. This magnetic measuring system transmits high-resolution data to the control system, indicating the cylinder's position.

A question of precision

The software specially developed for the jacking system provides for the smoothest possible transitions between the various operating modes, pressures and loads - thus helping to reduce wear. It guarantees exact control of all the acceleration and deceleration phases, parallel and opposing cylinder strokes, and smooth transfer of massive loads. In addition, it enables automatic transition between the four operating modes, i.e. leg lowering, platform lifting, platform lowering and leg lifting. Especially the transition between setting down the legs on the seafloor and lifting the platform requires superb accuracy and speed. In this transitional phase the platform follows the rise and fall of the ocean. As a result, enormous forces act on the entire system. The continuous jacking system hoists the platform out of this critical situation faster than a lifting system that operates intermittently.

Working together to achieve savings

Responsibility lies within the control software and the drive

system. They not only provide for higher speed during the lowering and lifting operations, but also economize on power consumption. The use of HS4P hydraulic controls supports this feature. They implement flow control for the jacking system, pressure regulation for the crane or winch, and power control to minimize the two pumps' energy consumption. The owner also profits from integrating the various hydraulic functions. That boosts redundancy and reliability - and lowers the investment costs for the ship, since it combines higher performance with lower consumption, reduced space needs and lower weight by means of secondary-controlled drives for the crane.

All in all, this new hydraulic continuous jacking system supports the current tremendous rise in demand for installation platforms. Only a very small fleet of platforms is available to handle the present boom in offshore wind farm construction. The EU Commission anticipates that investments of 200 billion euros across Europe will be devoted to the expansion of the sector by 2030. So there's still a lot of room to grow for jack-up rigs. ⚓

The author:

Arnold Krielen, Bosch Rexroth B.V.

How the hydraulic jacking system works

The functional principle is simple: The jacking system climbs up or down the platform's legs, much like a monkey. Two yokes surrounding each leg are fitted with sets of holding pins. The first such yoke snaps its pins in place in holes along the leg. The cylinders of this first yoke then lift the platform. By the time the first yoke's cylinders have nearly reached the end of their strokes, the second yoke has moved into position to insert its set of pins in the mating holes. Those pins at the second yoke now take over the load. The pins at the first yoke retract and the cylinders raise the first yoke so that its pins can again assume the load in the next position.

This new continuous jacking system eliminates any interruptions during the lifting or lowering operation. It thus attains a constant jacking speed of one meter a minute or more.

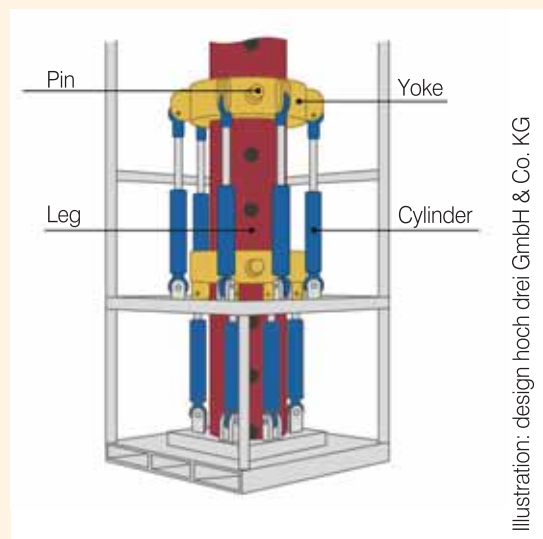
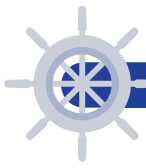


Illustration: design hoch drei GmbH & Co. KG



Future technology (6): The virtual ship

Modern ship design requires careful consideration of technical uncertainties, market specificities, future energy prices, existing and upcoming regulations, and anticipated climate change. These factors pose greater challenges for handling uncertainty and for managing risk. Advanced modelling methods and tools for the development and assessment of new hull designs, propulsors, and complex machinery systems are an enabling technology for addressing these risks.

DNV

Introduction

Ship designers always strive to combine different objectives, such as cargo capacity, optimal speed, fuel efficiency, and safety, while also being constrained by rules and regulations. New designs face further challenges from an increasing number of new and upcoming regulations, governing areas such as ballast water, air emissions, and new emission control areas. Volatility in energy prices, business concerns over market uncertainty, and extreme weather conditions all contribute to the complexity of future designs.

Advanced modeling methods are emerging in response to the new design challenges. In order to manage the complexity and risk inherent in innovative solutions, there is a drive towards use of advanced, model-based techniques for assessing novel concepts and technologies with respect to technical and economic performance from a lifecycle perspective.

Integrated ship design tools

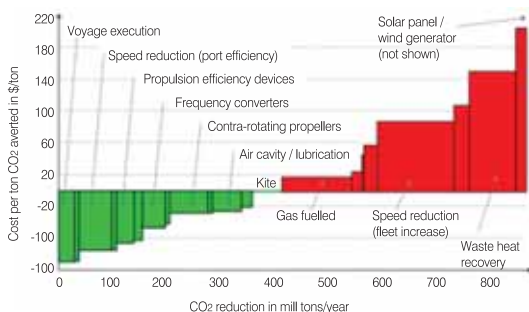
The complexity of future designs and the risks involved will accelerate the adoption of advanced modelling methods and

tools, thereby enabling the development and assessment of new hull designs, propulsors, and machinery systems. This design approach will be based on versatile software environments, including multi-objective optimisation algorithms.

Mathematical methods, objectives, constraints, and analysis suites will be entirely controlled by the designer on a case-specific basis. The calculations involved will utilise module-based tools for each subsystem of the ship, e.g. for the machinery components or the hull shape. The different modules will be linked through an integrated design platform. In order to ensure timely evaluations, the software will devise multi-scale, multi-physics, and multi-resolution models of the pertinent physics.

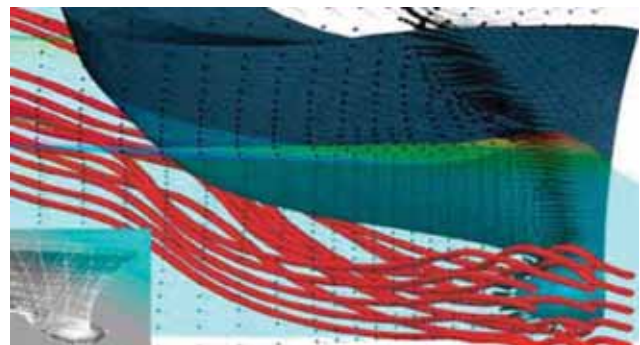
The definition of performance will be multi-dimensional. The integrated design tools in place by 2020 will support the distributed, parallelised, and coordinated execution of the various design tasks by taking full advantage of multi-processor architectures and the internet infrastructure. The uptake in the design and optimisation of more complex, specialised, and costly ships, such as passenger and service vessels, will be higher.

Cost benefit of abatement measures



Average marginal abatement cost and CO₂ reduction potential for the world fleet in 2030. Baseline: 1.53 bill tons/year. Source: DNV

Model based hull design



Coupling of CAD and CFD for ship design

The major risks that will be faced in the use of integrated design tools towards 2020 will be their considerable complexity and the need for expert users. Additional risks, related to software integration, data management, and communication, can also be expected.

One crucial factor is access to reliable data on design, performance, and cost of the different technology options. Most of these data may be collected from end-user applications, model-based approaches, and large-scale testing. Tighter interactions between ship-owners, yards, component manufacturers, and classification societies will be essential.

Model-based ship machinery design

Emerging powering systems, like fuel cell, batteries, and renewable auxiliary sources, will result in more complex configurations. Traditional designs focus on improving efficiency via the optimisation of individual components.

With today's maturity of equipment technology, new approaches will need to be adopted that consider machinery and energy conversion from an integrated systems' perspective.

By 2020, modular computer tools will be available to model, simulate, and optimise the operation of machinery systems under realistic operational profiles. By building a system from libraries of equipment models, the same tools will be used to perform optimal design, condition monitoring, and performance optimisation, as well as safety and reliability analyses. The lack of experts and data reliability are the major risks that these tools will face towards 2020.

Model-based hull design

Traditional hull design optimisation is usually limited to still-water conditions, design cargo loads, and design speed

conditions. This approach can result in ships being built that have poor performance under off-design conditions.

In 2020, hull design tools will seamlessly integrate computer-aided engineering components, i.e. CAD, CFD, & FEM, with multi-objective optimisation. The definition of performance will be generalised to include resistance, efficiency, sea-keeping, manoeuvrability, strength, etc. The inclusion of drag reducing or propulsive efficiency enhancing devices increases the need for computational tools of high predictive power. In 2020, ships will be designed with realistic operation profiles to produce robust hulls that perform adequately under a wide range of external conditions.

The major challenge is to implement these tools in a way that is both flexible and computationally efficient.

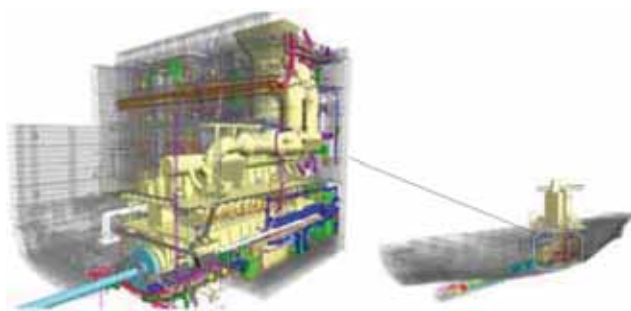
Large-scale demonstrators

In order to remain abreast of the complexities and risks in shipping in 2020, a faster and safer path from idea creation to the actual launch of novel products is required. The use of advanced modelling tools will be the first step. To gain confidence and bring innovative technologies forwards to commercialisation, laboratory tests and large-scale demonstration projects are necessary.

Showcase projects have the ability to validate theoretical models, identify and address safety challenges, qualify technologies, and eliminate perception biases. Modelling tools and experimental projects will complement each other by defining the specifications for testing and scale-up with greater accuracy. Large-scale demonstrators can only be established jointly, between developing organisations and end-user shipping companies.

Sharing the investment and risks among the major stakeholders will accelerate innovation and technology adoption. ⚓

Virtual engine room



Model based ship machinery design

Large scale demonstrators



Ongoing large scale demonstration for marine fuel cells (Viking Lady)



The two vessels of the SLRG Arbon: the Pollux II (left). The Sirius has been equipped with a FLIR M-Series thermal imaging camera. The acquisition of a FLIR thermal imaging camera for Pollux II is under consideration.



The FLIR M-625L thermal imaging camera can be used to spot a person from over 800 meters or a small vessel from a distance of over two kilometers.

Thermal imaging helps ensure boater safety on lake Constance

Bordered by three countries it is no wonder that the beautiful Lake Constance - or Bodensee as it is called in the German language - is traversed by hundreds of people each year. A number of secure societies make sure that these people can safely enjoy its wonders. On the Swiss side of that lake that task is fulfilled by the Seerettungsdienst Arbon, with the aid of a FLIR M-Series thermal imaging camera.

FLIR Systems Korea

The lifeboat station at Arbon was founded in 1964 as a branch of the Swiss Life Saving Association (SLRG). The well trained volunteers of SLRG Arbon are always ready to come to the aid of boaters in need, 24 hours a day and 365 days a year. Their activities include search and rescue operations, first aid, firefighting and issuing warnings to boaters when bad weather is approaching that can endanger their safety.

To enable the volunteers to fulfill these tasks the rescue boat Sirius of the SRLG Arbon is equipped with a FLIR M-Series thermal imaging camera.

"We wanted to make sure we can deploy our rescue boats regardless of the lighting conditions", explains Eric Meyer of SLRG Arbon. "Several cases have shown that rescue operations which searchlights alone can be very difficult. In man



Eric Meyer of the SLRG Arbon lifeboat station.



On the high contrast thermal images people and vessels show up clearly, even in complete darkness.

overboard situations just a few minutes - or seconds even - can sometimes make the difference between life and death, so it is extremely important that we not only arrive on location swiftly, but also spot the person in the water as quickly as possible. At night this can be very challenging when you are

using only a searchlight. A good night vision system would allow us to swiftly navigate our vessel towards the location of the emergency and to quickly spot people and vessels. Not only would that save time, it would also likely save human lives."

For that reason Meyer and the other volunteers set out to compare the available night vision systems, including light amplifiers. The light amplifier was not a great success, Meyer recalls. "We went out for a rescue operation at night and tried one of these light amplifying systems, but searchlights from other rescue vessels and the lights from buildings on the shore constantly blinded the system." Then Meyer discovered thermal imaging. "We had requested a demonstration of the FLIR HM-307 XP+ handheld thermal imaging camera, but the FLIR representative had also brought along a FLIR M-Series thermal imaging camera and as soon as I saw the remarkable image quality it produces I was immediately convinced."

Good investment

After using the FLIR M-Series for some time Meyer has not regretted the purchase one single moment. "It was quite a big investment for us, since we are almost completely dependent on local sponsors for our funding, but it was definitely worth it. I use the FLIR thermal imaging camera every time I set out at night, and sometimes even during the day as well. Of course you can also navigate using the radar, but with the FLIR M-Series thermal imaging camera I can actually see what is out there."

The FLIR M-Series thermal imaging camera records electro-



Meyer was surprised to see the amount of detail in the thermal footage produced by the FLIR M-Series thermal imaging camera. "As soon as I saw the remarkable image quality it was immediately convinced."



The FLIR M-Series thermal imaging camera is mounted on top of the bridge to provide a good range performance.

magnetic radiation in the infrared part of the spectrum and translates that into a visible image. This means that a thermal imaging camera can produce crisp clear images even in the darkest of nights and that it is not impeded by the flash of other vessels' searchlights, Meyer explains. "You can use the FLIR M-Series thermal imaging camera and the searchlight simultaneously, which is a vast improvement to the light amplifying system we tested."

Daytime applications

Due to the fact that the FLIR M-Series relies on thermal contrast instead of color contrast it provides excellent nighttime vision, but Meyer was surprised to see the amount of detail in the thermal footage produced by the FLIR M-Series thermal imaging camera. "As soon as I saw the remarkable image quality it was immediately convinced."

Meyer also uses it during the day. "There are several reasons why normal vision can be impeded during the day. Reflected sunlight can blind you for instance, or light fog can obstruct your vision. And in case of fire the smoke can completely render normal eyesight useless. Now all I have to do is switch on the FLIR M-Series thermal imaging camera and I can see straight through smoke or light fog and ignore blinding reflections on the water. Another daytime application is spotting floating rubble. In the aftermath of a thunderstorm sometimes driftwood, like tree branches or even whole trees, floats around in the lake, carried there from the mountains by the Rhine and other rivers. The FLIR M-Series thermal imaging camera can be a great help in spotting them, since the dark wood is difficult to see against the background of the dark water, while they show up very clearly in the thermal image."



The FLIR M-Series' Joystick Control Unit is seamlessly incorporated in the bridge.


The ideal tool

Although SLRG Arbon is the first rescue service in the lake to employ thermal imaging it is only a matter of time until others will follow suit, according to Meyer. "Thermal imaging is simply the ideal tool for this type of application. I have no doubt in my mind that other rescue societies will pick up on that as well in the near future."

The vessel on which the FLIR M-Series thermal imaging camera has been installed is the MS Sirius, a Linssen 372 SX Patrol that has been built in Maasbracht, the Netherlands. This 11.5 meters long and 3.6 meters wide vessel has been in service since 1990 but only recently received the addition of its FLIR M-Series thermal imaging camera.

The FLIR M-Series' Joystick Control Unit is seamlessly incorporated in the bridge and the live thermal footage is displayed on a dedicated screen, giving the ship's pilot an excellent overview of the situation. The FLIR M-Series produces thermal footage at a resolution of 640 by 480 pixels, regardless of lighting conditions and allows the user to 'see' when darkness, light fog or smoke impede regular vision.

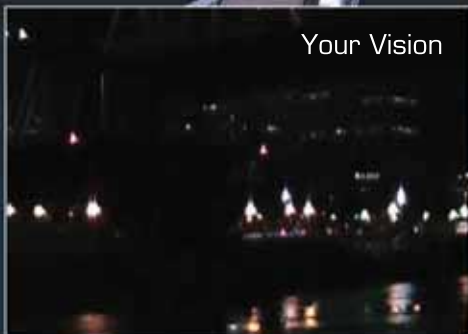
Choosing thermal imaging over radar

The other vessel of SLRG Arbon is the MS Pollux II. This 6.8 meters long and 2.7 meters wide MST 680 Workjet was built in 2004 in Liverpool, United Kingdom. Currently it has neither radar nor thermal imaging camera. If forced to choose, Meyer would opt for a thermal imaging camera, he explains. "Although radar is clearly very useful I would say that in our case the vision enhancement that a thermal imaging camera provides is more important." 

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Doosan Engine won a KRW 303 billion contract to supply 80 engines used aboard containerships

Doosan Engine announced on November 29 that it signed a contract worth approximately KRW 303 billion to supply 40 main engines and 40 auxiliary engines which will be installed on board 20 ultra large containerships currently under construction by Daewoo Shipbuilding & Marine Engineering (DSME) for Denmark-based A.P. Moller Maersk.

Doosan Engine will supply the engines with a total capacity of 2.2 million h.p. (horse power), equal to about 20% of the company's annual production in horsepower, in a largest ever single contract since its establishment in 1983. These engines, developed by Doosan Engine's independent technology at its manufacturing plant in Changwon, South Gyeongsang Province, will be delivered consecutively from November 2012 to November 2014.

Doosan Engine anticipates additional orders for 40 auxiliary engines pending the approval of the ship owner, which will be used in the same project.

The vessels to be equipped with these engines under this contract are 18,330TEU class units, the world's first and the largest. Winning this contract, Doosan Engine is comparatively better positioned than other engine manu-

facturers to dominate the heavily competed market for the engines used in containership amid the trends towards the deployment of ever larger containerships.

Lee Sung-hee, President & CEO of Doosan Engine, said, "This contract to supply the engines in large quantity for ultra large containerships, the world's largest ever built, attests to the excellence of Doosan Engine in technology and quality. Having signed this contract, Doosan Engine will be better positioned to garner large shares of the market for the engines used aboard large ships and build stable production system."

STX Europe secured a KRW 120 billion order for a ice-breaking rescue vessel

Arctech Helsinki Shipyard, formed as a joint venture between STX Finland and Russia's state-run United Shipbuilding Corporation (USC), announced it was awarded a contract worth KRW 120 billion (EUR 76 million) from the Russian Ministry of Transport on December 8 (local time) for the construction of 1 ice-breaking rescue vessel.

The vessel will measure 76.4m in length and 20.5m in width, and is scheduled for delivery to the ship owner by the end of 2013.

This vessel will adopt the 'ARC 100' design optimizing the ice-breaking technology. ARC 100 developed independently by Aker Arctic Technology, the subsidiary of STX Finland, is fitted with the propulsors in 3 directions at the bottom, allowing the vessel to operate efficiently in the polar regions.

The vessel is capable of 2 ice-breaking operation modes. It can break the ice sheet up to 1m thick during both forward and reverse movement or create a channel of 50cm width on each side of the ship through the sea ice less than 60cm thick. In addition, this vessel incorporates cutting-edge oil spill prevention technology and can salvage floating facilities and vessels. Also, it is

designed to withstand high waves.

Arctech Helsinki Shipyard plans to build this



Image of ice-breaking rescue vessel ordered to Arctech Helsinki Shipyard

vessel in conjunction with Shipyard Yantar JSC. Shipyard Yantar JSC will construct the hull while Arctech Helsinki Shipyard will outfit the essential facilities and carry out the remaining works.

Meanwhile, Arctech Helsinki Shipyard clinched an order from Russian state-owned shipping company Sovcomflot for the construction of 2 ice-breaking vessels for polar regions immediately after the company was created in December last year through a joint venture between STX Finland and Russia's state-run USC.

Having secured the ice-breaking rescue vessel order from the Russian ship owner, in addition to the ice-breaking vessel order awarded to Arctech Helsinki Shipyard last year, STX Finland is better positioned to win orders for

special purpose vessels from Russian ship owners in the period ahead.

An official from Arctech Helsinki Shipyard said, "This contract attests to Arctech Helsinki Shipyard' excellence in design capability and technology. We will actively proceed with R&D and exert effort to achieve the strongest competitiveness in the global market for ships operating in the polar regions."

HHI clinched a KRW 1 trillion contract to build offshore facilities

Hyundai Heavy Industries (HHI) announced that it signed a contract worth KRW 1 trillion (USD 900 million) with a global oil giant in Nigeria on December 19 to build offshore facilities.

Under this contract, HHI will build various facilities with a gross tonnage of 16,000 in the offshore gas field off the southeastern coast of Nigeria, including 2 gas platforms and residential units. The facilities will be capable of compressing 120 million cubic feet of natural gas and produce 300 million cubic feet of natural gas per day.

These facilities will be constructed at HHI's Ulsan offshore plant and local plant in Nigeria, and installed in sea off the coast of Nigeria in the 2nd quarter of 2014.

Having won this order, HHI has accomplished this year's new order target of USD 19.8 billion from the shipbuilding and offshore plant sectors (including the order intake of Hyundai Samho Heavy Industries). HHI will carry out entire project works that cover Engineering, Procurement, Installation, and Commissioning (EPIC).

Gang Chang-joon, Head of Offshore Engineering Division of HHI, said, "HHI has the world's best technology and extensive track record in offshore construction industry, successfully delivering offshore oil production facilities to oil companies in 32 countries worldwide over the last 3 decades. We will bring our unmatched experience and expertise to this offshore plan project in Nigeria and strengthen our leading position as the world's largest EPIC service provider in the offshore construction field."

Global oil majors have made sizeable investment in Nigeria, the largest oil producer in Africa, to develop offshore oil resources.

HHI, which already carried out EGP-3 project in Nigeria, built and delivered USAN FPSO to Nigeria. In 2007, HHI was awarded contracts to build large-scale offshore facilities, including the production platform for Ofon oil and natural gas field off southeast Nigeria.

Currently, HHI anticipates winning the bid for ultra-large FPSO project that will be deployed in the sea off the coast of Nigeria.



A facility similar to the gas platform awarded to HHI this time, which is the Bongkot gas platform installed by HHI this year in Bongkot oil field in the sea off the southeastern coast of Thailand



STXOS was awarded a contract to build 2 FFX frigates

STX Offshore & Shipbuilding (STXOS) announced on November 29 that it signed a contract with Defense Acquisition Program Administration (DAPA) for the construction of the Ulsan-class Batch-1 FFX No. 4 and 5 frigates.

These frigates ordered to STXOS this time are the next-generation frigates to replace the currently operating frigates (FF) and Pohang class corvettes (PCC) in the Navy and will be equipped with state-of-art warfare systems, including surface-to-air missiles, long-range anti-ship missiles, anti-submarine helicopters, etc, which dramatically improve the offense and defense capabilities in anti-air, anti-ship and anti-submarine operations.

These frigates, which will measure 114m in length and 14m in width, can carry about 140 crew member and sail at a maximum speed of 56km. These newbuild frigates will have significantly stronger hull structures for increased protection and incorporate stealth features that reduce electromagnetic, infrared, and underwater radiated noise signatures.

STXOS has successfully delivered 4 high-speed warships (PKGs) armed

with anti-ship guided-missiles to the Navy since it was designated as defense contractor building cutting-edge warships in 2007, and is currently building 3 more warships.

An official from STXOS said, "This contract was awarded to STXOS, the defense contractor, in recognition of its extensive experience and leadership in shipbuilding technology. STXOS will further improve its technology through the construction of these next-generation frigates and make inroads into the overseas warship markets and establish a leading position worldwide."

Water Mist Fire Fighting System for Cruise Liner

The image shows a cruise liner at sea with a water mist fire fighting system installed. The system is designed to protect the ship's interior and exterior from fire. The diagram illustrates the system's components and its application on a cruise liner.

Total VOC Reduction System VOC reduction rate 77.8%

The diagram illustrates a Total VOC Reduction System. It shows a liquid cargo tank with a suction device and a VOC reduction valve. The system is designed to reduce VOC emissions during the loading process. The diagram includes a control panel and a pump. The model is labeled as TVRU-W for voyage and TVRU-650 for loading.

Non-Lethal Anti-Piracy Solution

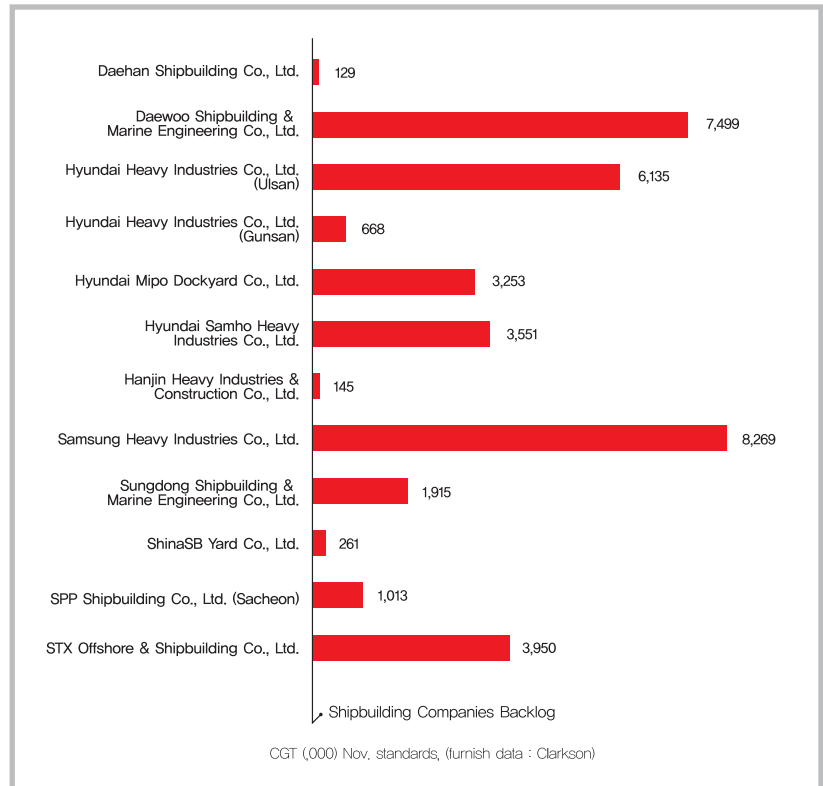
The image shows a non-lethal anti-piracy solution for ships. The system is designed to protect ships from piracy attacks. The diagram illustrates the system's components and its application on a ship. The system is labeled as Model No. PS-J-1001 (Single Nozzle Type). The system is described as a plug-and-play solution.



Korean shipyards reclaimed the top spot in the global shipbuilding orders/order amount in 2011 after being overtaken by China in 2010 by a slight margin in terms of new orders, shipbuilding volumes and order backlog as the world's largest shipbuilder. Domestic shipyards are expected to show strong performance, dominating the market for high value-added vessels, such as containership and LNG carrier, or offshore plants, although the growth may slow down amid sluggish global economy.

According to the Clarkson data published recently, many domestic shipyards still register high order inflow and maintain leading position in the global shipbuilding market.

Here, we take a close look at the performance of Korea's 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. ⚓





Offshore plant orders awarded to domestic shipyards in 2011

Date	Type	Number of vessel	Amount	Ship owner
January	Drillship	1 vessel (including 1 optional vessel)	KRW 590 billion	Diamond Offshore Drilling Limited, U.S.A
	Offshore Plant	-	USD 900 million	RasGas, Qatar
	Drillship	2 vessels (including 2 optional vessels)	KRW 1 trillion 140 billion	Noble Drilling, U.S.A
	Deepwater drillship	1 vessel	-	Atwood Oceanics, U.S.A
February	Offshore facility carrier FPSO for the North Sea	1 vessel	KRW 265 billion	Dockwise, Netherlands
	Platform Supply Vessel	-	USD 1.2 billion	BP (British Petroleum), U.K
	Fisheries Research Vessel	1 vessel	-	-
March	Fisheries Research Vessel	1 vessel	EUR 35 million	Ministry of Fisheries and Marine Resources, Republic of Namibia
	Offshore Platform (North Sea Drilling & Production platform, Quarters & Utilities platform)	1 unit each	USD 600 million	BP (British Petroleum), U.K
	Deepwater drillship	2 vessel (including 2 optional vessels)	KRW 1 trillion 200 billion	Aker Drilling, Norway
	Drillship	2 vessels	USD 1.1 billion	Ship owner, U.S.A
	Platform Supply Vessel	1 vessel	-	Norsea Group AS, Norway
April	Platform Supply Vessel	1 vessel	-	-
	Drillship	1 (including 1 optional vessel)	-	Fred Olsen Energy, Norway
	Drillship	2 vessels	USD 1.12 billion	Maersk, Denmark
	Drillship	1 vessel	USD 680 million	Ocean Rig, Greece
May	Shuttle Tanker	2 (including 2 optional vessels)	USD 200 million	European Navigation, Greece
	Drillship	2 (including 1 optional vessel)	USD 1.12 billion	Rowan, U.S.A
	Deepwater drillship	1 (including 1 optional vessel)	-	Vantage Drilling, U.S.A
	Offshore Platform (Top side of offshore platform)	-	USD 414 million	Statoil, Norway
	FPSO	1 vessel	USD 636 million	Teekay Petrojarl, Norway
	Platform Supply Vessel	2 vessels	Around KRW 120 billion	Farstad Shipping, Norway
	FSO	1 unit	-	PTSC, Vietnam
June	LNG-FPSO	1 unit	USD 3.026 billion	Royal Dutch Shell, U.S.A
	Platform Supply Vessel	2 vessels	Around KRW 150 billion	Island Offshore, Norway
	LNG-FSRU	2 units (including 2 optional vessels)	USD 500 million	Høegh LNG, Norway
	Multifunctional Deep Water Anchor Handling, Offshore Service Vessels	2 vessels	KRW 240 billion	Farstad Shipping, Norway
July	Drillship	1 vessel	USD 680 million	Ocean Rig, Greece
	Drillship	2 vessels	USD 1.1225 billion	Maersk, Denmark
August	LNG-FSRU (Floating Storage and Regasification Unit)	1 vessel	USD 280 million	Excelerate Energy, U.S.A
September	Semi-submersible Rig	2 units	USD 1.1 billion	Songa Offshore, Norway
	Well Intervention Vessel	2 vessels	USD 420 million	Eide Marine Services AS, Norway
	Drillship	1 unit (optional vessel awarded on January 19)	Approximately KRW 600 billion	Noble Drilling, U.S.A
October	Fixed Offshore Platform	-	USD 1.4 billion	Chevron, U.S.A
	Drillship	1 unit	Approximately USD 550 million	Offshore drilling company, Americas
	Platform Supply Vessel	1 unit	-	Troms Offshore Supply AS, Norway
	Offshore Plant Module	2 units	-	-
	Platform Supply Vessel	4 units	KRW 2 trillion	Island Offshore, Norway
November	Pipe Laying Support Vessel	2 units	USD 500 million	Odebrecht, Brazil

*Note : Based on the press release and public announcements of each shipyards, internal estimation of Monthly KORSHIP (estimation until December 15, 2011)

Delivery	Shipyards
Mid 2013	Hyundai Heavy Industries
Late 2013	Hyundai Heavy Industries
On a staggered basis until late September 2013	Hyundai Heavy Industries
Second half of 2013	Daewoo Shipbuilding & Marine Engineering
October, 2012	Hyundai Heavy Industries
Early 2015	Hyundai Heavy Industries
2012	STX OSV
Early 2012	STX Finland
Late 2014	Hyundai Heavy Industries
Second half of 2013	Daewoo Shipbuilding & Marine Engineering
-	Samsung Heavy Industries
Jun-12	STX OSV
2012	STX OSV
Aug-13	Hyundai Heavy Industries
-	Samsung Heavy Industries
Oct-13	Samsung Heavy Industries
2013	STX Offshore & Shipbuilding
Second half of 2013	Hyundai Heavy Industries
Late May, 2013	Daewoo Shipbuilding & Marine Engineering
-	Samsung Heavy Industries
Mid 2013	Samsung Heavy Industries
First half of 2013	STX OSV
Early 2013	Sungdong Shipbuilding & Marine Engineering
2016	Samsung Heavy Industries
First quarter, third quarter of 2013	STX OSV
Second half of 2013, first half of 2014	Hyundai Heavy Industries
From the second quarter of 2013	STX OSV
Nov-13	Samsung Heavy Industries
Jul-14	Samsung Heavy Industries
First quarter of 2014	Daewoo Shipbuilding & Marine Engineering
Second half of 2014	Daewoo Shipbuilding & Marine Engineering
2013	STX Finland
Second half of 2014	Hyundai Heavy Industries
Second half of 2014	Daewoo Shipbuilding & Marine Engineering
	Daewoo Shipbuilding & Marine Engineering
First half of 2013	STX OSV
First half of 2012	STX Finland
Consecutively from the 3rd quarter of 2013 to the 1st quarter of 2014	STX OSV
August of 2014	Daewoo Shipbuilding & Marine Engineering





Major trade shows for shipbuilding/off-shore industries in 2012

• Asia Pacific Maritime 2012 (APM 2012)

Venue: Singapore Marina Bay Sands, Singapore, Singapore

Period: March 14 to 16

Show site area: 15,600 sqm

No. of exhibitors: 938 exhibitors from 52 countries

Featured items: shipbuilding, ship repair & conversion, marine equipment, propulsion system (prime & auxiliary), ship operation equipment, marine technology, electronics/electrical engineering, ports technology, cargo handling systems, freight forwarding, freight forwarding equipment, maritime services, maritime security, navigation & communication technology

URL: <http://www.apmaritime.com>

• China International Marine Port & Shipbuilding Fair (CIMPS-Europort)

Venue: Nanjing International Expo Center, Nanjing, China

Period: 5.23-5.25

Show site area: No. of exhibitors: 503 exhibitors from 20 countries

Featured items: ship building & repairing, offshore engineering, shipyard equipment, welding & cutting, marine steel & ship materials, painting & antisepsis, port technology, logistics & transport

URL: <http://www.china-ship.com>

• International Shipping Exhibition (Posidonia)

Venue: Hellenikon Exhibition Center, Athens, Greece

Period: June 4 to 8

Show site area: 28,500 sqm

No. of exhibitors: 2,091 exhibitors from 80 countries

Featured items: shipping building materials, spare parts, appliances, systems, machinery, shipyards, ship owners, etc

URL: <http://www.posidonia-events.com>

• Shipbuilding and Offshore Industries Expo and Conference (Navalshore)

Venue: Centro de Convencoes Sulamerica, Rio de Janeiro, Brazil

Period: August 1 to 3

Show site area: 7,500 sqm

No. of exhibitors: 320 exhibitors

Featured items: equipment and services related to shipbuilding and repair, oil & gas solutions

URL: <http://www.navalshore.com.br>

• Int'l Shipbuilding, Machinery, Marine Tech. Show (SMM)

Venue: Hamburg Exhibition Ground, Hamburg, Germany

Period: September 4 to 7

Show site area: 89,000 sqm

No. of exhibitors: 2,667 exhibitors from 56 countries

Featured items: shipbuilding, shipyard Industry, ship's equipments, gears and drives technology, electrical engineering, electronics, ocean engineering, ports, port technology, load transfer systems, shipping companies, consulting, services, defense technology

URL: <http://www.hamburg-messe.de>

• The 7th International Shipbuilding, Ports and Marine Equipment Exhibition for China (SHIPTEC CHINA)

Venue: Dalian World Expo Center, Dalian, China

Period: October 23 to 26

Show site area: 30,000 sqm

No. of exhibitors: 700 exhibitors from 26 countries

Featured items:

- Ship manufacturing & repair, ship craft equipment and accessories

- Port logistics, offshore project, logics and cargo handling, etc

- Maritime service, maritime technology, etc
- Small vessels, etc

URL: <http://www.shiptec-china.com>

• **Marine Equipment Trade Show (METS 2012)**

Venue: Amsterdam RAI, Amsterdam, Netherlands

Period: November 13 to 15

Show site area: 52,000m²

No. of exhibitors: 1,131 exhibitors from 100 countries

Featured items: Ship and all ship-related equipments and items

URL: <http://www.metstrade.com>

• **Marine Tech Korea 2012**

Venue: Changwon CECO, South Gyeongsang Province, Korea

Period: November 13 to 16

Show site area: 10,000m²

No. of exhibitors: 360 exhibitors

Featured items:

- Shipyard, shipbuilding equipments, engine & machine,

- shipping, maritime communication, rescue and fire safety equipment

- LNG pump, compressor, valve equipments and machinery for offshore plant

- Marine transportation, port automation logistics facility & equipments for transportation

URL: <http://mtkorea.org>

• **Offshore Korea 2012**

Venue: BEXCO, Busan, Korea

Period: November 14 to 16

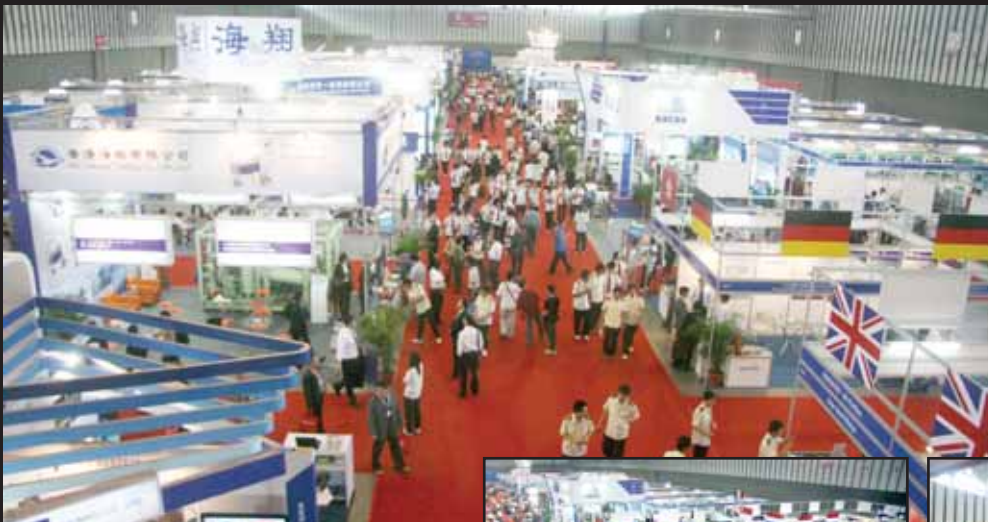
Show site area: 15,000m²

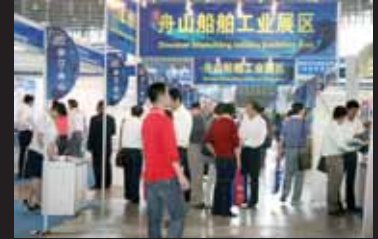
No. of exhibitors: -

Featured items: offshore plants & structures, maritime/sub-sea exploration, drilling & excavation technology and system, offshore energy, submersible offshore structures, offshore wind power, offshore pollution prevention, maritime traffic control system, marine accident prevention technology, related equipments, etc

URL: <http://www.okkorea.org> ⚓

■ **China International Marine Port & Shipbuilding Fair (CIMPS-Europort)**



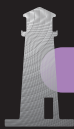


■ International Shipping Exhibition (Posidonia)

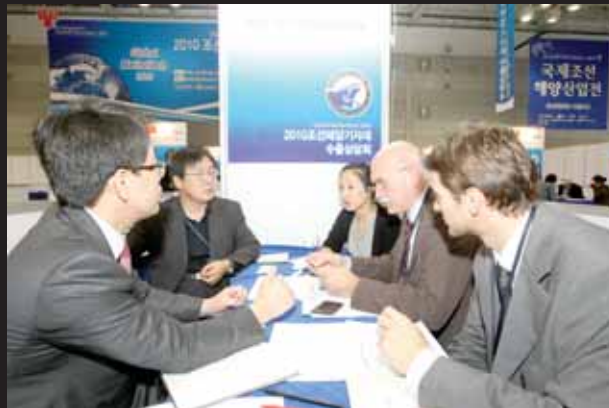
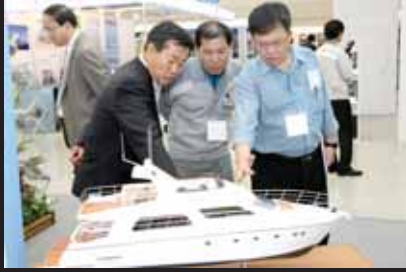


■ Int'l Shipbuilding, Machinery, Marine Tech. Show (SMM)





■ Marine Tech Korea 2012



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The **Parker Fluid Connectors Group** manufactures and markets the widest range of hydraulic tube and hose fittings as well as related accessories. There are also high-quality instruments for measuring pressure, temperature and flow. Make the most of this broad product offering of millions of proven components. Furthermore, for product reliability and safety, Parker offers you many advantages when it comes to assembly, purchasing and logistics.

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Siemens



SIMATIC STEP 7

All configuration and programming tools required for generating a safety-oriented program are integrated into the SIMATIC STEP 7 user interface and use a common project structure. The SIMATIC STEP 7 Safety Advanced V11 option empowers users to leverage all the advantages of the TIA Portal for fail-safe automation. Safety Advanced V11 functionalities include project-wide cross-reference list, safety administration editor, online/offline comparator, as well as other integrated support functions.

SIMATIC STEP 7 Safety Advanced V11 provides intuitive operation, using the same operating concept and configuration employed for the generation of standard programs. This facilitates quick entry into the generation of fail-safe programs. Ready to start, the F-runtime group is set up automatically on insertion of the F-CPU.

Creation of the safety program is done in the FBD or LAD programming languages, and safety functions are easily implemented due to the integrated library with TÜV-certified function blocks.

"The library concept supports in-house standardization and simplifies the validation of safety-oriented applications, along with special signatures for device parameters," says John D'Silva, business development manager for safety integration at Siemens Industry Automation.

The STEP 7 Safety Advanced V11 safety administration editor provides central support for the administration, display, and modification of safety-related parameters. Standardized and integrated identification of safety-related resources simplify the overview process.

STEP 7 Safety Advanced V11 requires SIMATIC STEP 7 Professional V11 SP1, which has been available since July 2011. For supported operating systems and required hardware, please refer to STEP 7 Professional V11 - entry ID: 51774795. Compatibility with other SIMATIC products is the same as for STEP 7 Professional V11.

-TEL: +82-2-3450-7103

-<https://www.siemens.co.kr/automation>

New
Product

Electric pressure switch

Kilwoo Corporation



Electric pressure switch

Kilwoo Corporation has supplied the state-of-art equipment renowned worldwide in the construction, transportation, stevedoring, environment and industrial precision testers since its establishment in 1980.

Specifically, this company is providing the force measuring, pressure measuring, temperature measuring, switching solution of German-based Tecsics, the leader in the industrial instrumentation and test equipment field, and related services.

Electric pressure switch SC420 in Tecsics product range is available as a pressure switch with 2 switching outputs and as a pressure sensor (4-20mA).

The integrated LED-Display provides a continuous pressure indication and allows together with the function keys an easy set-up of the pressure switch. There are nearly no limits for mounting the pressure switch SC420, because of the turnable display and the optional turnable process connection.

The special features of SC420 can be summarized as follows:

- Alarm, switch-off and continuous signal with one device possible
- Integrated password protection
- Display-head and optional pressure connection 330° turnable
- Analogue output scaleable (minimum 20% of span)
- Switching points, hysteresis and switching function (NC/NO) over display configurable
- Attenuation 0 to 2 seconds configurable
- Delay time 0 to 99.99 s configurable
- Min-/Max-pressure memory
- Integrated polarity- and overvoltage protection

SC420 has the following specification:

- Ranges: -1 to 700 bar
- Output: 2 free configurable switching points and 1 scaleable analogue output 4-20 mA
- Repeatability: 0,2% FS
- Media: Liquids or gases
- Sensor element: up to 50 bar ceramic cell or over 100 bar thin film sensor
- Pressure connection: G 1/4 acc. to DIN 3852-E others on request
- Media temperature: -20 - 80 °C
- Electrical connection: Round connector M 12x1; 5-pin
- Protection class: IP65

This product is applied for vacuum, filter monitoring, hydraulic, pneumatics, machine tools and others.

-TEL: +82-2-728-6800

-<http://www.kilwoo.com>

BMEA (Busan Marine Equipment Association)

Member List

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Head Office : Gangseo-gu Busan
 Homepage Add. : www.answerclear.com
 Main Products : CO2 Extinguishing Sys. External Fire Fighting Sys.
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Head Office : Gangseo-gu Busan
 Homepage Add. : www.bando.info
 Main Products : Life Boat
 TEL : +82-51-831-1950

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 Homepage Add. : www.byvalve.com
 Main Products : Quick Closing Valve, Ball Valve, Bellows, Beal Valve
 TEL : +82-51-311-2511

BMT CO., LTD.

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 Homepage Add. : www.superlok.com/
 Main Products : Fitting & Valve, Vacuum Clamp
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Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : O-ring, Sealing, Gasket
 TEL : +82-51-831-4615

BOKYUNGTL CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Rudder Body, Winch, Crane
 TEL : +82-51-832-0801

BO MYUNG METAL CO., LTD.

Head Office : Saha-gu Busan
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 Main Products : Copper Tube & Pipe, Cupro-Nikel Pipe, Copper Fitting
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 Main Products : Stairway Body, Ladder, Hardware
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BUSAN INDUSTRY CO.

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 Main Products : Powder Coating
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BUSUNG PLANT CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Cargo Reducer Piece
 TEL : +82-51-831-1784

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 Homepage Add. :
 Main Products : Butterfly Valve
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 Homepage Add. : www.chkj.co.kr
 Main Products : Telephone Booth, Work Shop, Cable Box, Spare Box
 TEL : +82-51-831-9500

CHWANG HYEOP INSTRUMENTS.

Head Office : Gangseo-gu Busan

Homepage Add. : www.chkj.co.kr
 Main Products : Telephone Booth, Work Shop, Cable Box, Spare Box
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CHANG WON ENVIRONMENT IND CO., LTD.

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 Main Products : Sewage Treatment Plant
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 Main Products : Main Bearing support, Chain Wheel, Gear Wheel
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 Homepage Add. : www.ddentec.com/
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 Main Products : Flower Meter, Viscometer, Control Valve
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 Main Products : Shot & Blast, Painting, Painting's Manufacture
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Head Office : Saha-gu Busan
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Head Office : Gangseo-gu Busan
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 Main Products : Head, Air Receiver Tank, Pressure Vessel, Reactor
 TEL : +82-51-831-1456

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Head Office : Gangseo-gu Busan

Homepage Add. : www.daesan-eng.com
 Main Products : E/R Package unit, Pipe Group Unit
 TEL : +82-51-831-0090

DAE SEONG MARINE TEC CO., LTD.

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 Homepage Add. : www.ds-frp.com/
 Main Products : Pipe Insulation System, FRP Weather Door
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Head Office : Gangseo-gu Busan
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 Main Products : VENT SYS, OIL TANK, Out Fitting
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 Main Products : Precision Instrument
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 TEL : +82-51-200-5331

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 Main Products : Welding machine
 TEL : +82-55-388-3800

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 Homepage Add. :
 Main Products : Marine valves
 TEL : +82-51-311-1882

DAOM METAL.

Head Office : Sasang-gu Busan
 Homepage Add. :
 Main Products : Sus plate, Flange, Pipe sleeve
 TEL : +82-51-315-1347

DEAIL MACHINERY.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Piston Rod, Cross headpin, Propeller Shaft
 TEL : +82-51-832-1119

DECKWIN CO., LTD.

Head Office : Youngdo-gu Busan
 Homepage Add. : www.deckwin.com
 Main Products : Winch
 TEL : +82-51-413-1193

DH-M CO., LTD.

Head Office : Seo-gu Incheon
 Homepage Add. : www.dhm.co.kr
 Main Products : High Pressure Blower, High Pressure Washer
 TEL : +82-32-527-5782

DHP ENGINEERING CO., LTD.

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Homepage Add. : www.dhpeng.com
Main Products : Plate Type heat Exchanger, Disk & Shell type heat Exchanger
TEL : +82-51-556-4200

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Main Products : Provision Crane, Tilting Radar Post
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DK INDUSTRIAL CO., LTD.

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Homepage Add. : www.dk-ind.com/
Main Products : Silencer, Fire Damper, Lashing Bridge, Rudder
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DK TECH CORPORATION CO., LTD.

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Homepage Add. : www.dklok.com
Main Products : Instrument TuBe Fitting, Instrument Valve
TEL : +82-55-338-0114

DNP CO., LTD.

Head Office : Gangseo-gu Busan
Homepage Add. : www.dnpco.kr
Main Products : Fire & Gas Damper, Galley Equipment, AL, Steel Furniture
TEL : +82-51-831-4551

DOLIM PRECISION.

Head Office : Gangseo-gu Busan
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Main Products : Cross Head Pin, Main Journal, Crank Shaft
TEL : +82-51-831-8861

DONG-A VALVE IND.

Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products : Marine Offshore valve, Strainer
TEL : +82-51-831-1500

DONGBANG SHIP MACHINERY CO., LTD.

Head Office : Jinhae Gyeongsangnam-do
Homepage Add. : www.dongbangsm.co.kr
Main Products : General Steel Piping, Framo & Hydro Piping, Module Unit
TEL : +82-55-545-0882

DONGHAE INTEC CO., LTD.

Head Office : Gangseo-gu Busan
Homepage Add. : www.dhntec.co.kr
Main Products : Sleeve, Scupper, Suction Bell Mouth
TEL : +82-51-831-2565

DONG HUN ENTERPRISE CO.

Head Office : Sasang-gu Busan
Homepage Add. :
Main Products : Ball Valve
TEL : +82-51-314-2610

DONGHWA ENTEC CO., LTD.

Head Office : Gangseo-gu Busan
Homepage Add. : www.dh.co.kr
Main Products : E/R Heater & Cooler, Copt, Condenser, Plate Heat Exchanger
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DONGHWA M&E CO., LTD.

Head Office : Kimhae Gyeongsangnam-do
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Main Products : Heat Exchanger
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Main Products : Air Compressor, Cylinder, Head, Piston
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TEL : +82-51-200-1211

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Main Products : Swing bolt a' sssy, Fittings
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Homepage Add. : www.dseng.com
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TEL : +82-51-831-2046

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Homepage Add. : www.dskworld.com
Main Products : Piston Crown
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Homepage Add. :
Main Products : Cable Tray, Vent, Hull Outfittings
TEL : +82-51-831-0849

HAE DONG METAL CO., LTD.

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

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

Head Office : Gangseo-gu Busan
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Main Products : Rudder & R.Stock, Rudder Horn, Rudder Carrier
TEL : +82-51-831-0101

HAE SUNG INDUSTRIAL.

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

HAEWON INDUSTRIES CO.

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

HAEWON IND. CO., LTD.

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

HAEYANG FAMILY CO., LTD.

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

HAEYANG METAL CO., LTD.

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

HAEYANG PROPELLER CO., LTD.

Head Office : Gangseo-gu Busan

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

HANCHANG TRANS CO., LTD.

Head Office : Gangseo-gu Busan
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Main Products : Pole Mounted Transformer, Pad Mounted Transformer
TEL : +82-51-831-3470

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Homepage Add. : www.hanjulevel.co.kr
Main Products : Level Instrument Etc, Vapour Emission Control Sys.
TEL : +82-51-303-0537

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

HANLA IND CO., LTD.

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

HANMAUM KI-GONG CO., LTD.

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

HEARTMAN CO., LTD.

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

H.M.E.

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

HOSEUNG ENTERPRISE CO., LTD.

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

HWAJIN ENTERPRISE CO., LTD.

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

HWAJIN PF CO., LTD.

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

HWA SHIN PRECISION CO., LTD.

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

HYOSUNG STEEL TECHNOLOGIES CO., LTD.

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

HYUNDAI HYCRAULIC CO., LTD.

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

HYUNDAI ZINC METAL CO., LTD.

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

HYUNJIN MATERIALS CO., LTD.

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

ILDO MACHINE ELECT CO., LTD.

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

IL - SUNG INDUSTRY CO.

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

IN SUNG INDUSTRY CO.

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

JAESEUNG ENGINEERING CO., LTD.

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

JEILSANKI CO.

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

JEONG-AM SAFETY GLASS CO., LTD.

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

JEONG HWA ACCOMMODATION SYSTEM CO., LTD.

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

JEONG WOO COUPLING CO., LTD.

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

JIN GU ENGINEERING.

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

JIN IL BEND CO., LTD.

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

JINKWANG ELECTRIC CO., LTD.

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

JINYOUNG METAL CO., LTD.

Head Office : Sasang-gu Busan

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

JMC HYDRAULICS.

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

JNC HI-TECHNOLOGIES.

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

JOKWANG I.L.I CO., LTD.

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

JONGHAP POLESTAR ENGINEERING CO., LTD.

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

JUNG GONG IND. CO., LTD.

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

JUNG - WOO MACHINERY CO., LTD.

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

KANG BACK INDUSTRY CO., LTD.

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

KANGIL CO., LTD.

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

KANGRIM HEAVY INDUSTRIES CO., LTD.

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

K.C. LTD.

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

KEO HUNG MACHINERY.

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

KEYSUNG METAL CO., LTD.

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

KOC ELECTRIC CO., LTD.

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

KOREA HYDRAULIC CO.

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

KOREA PHE CO., LTD.

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

KOREA STEEL SHAPES CO., LTD.

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

KOREA TRADING & INDUSTRIES CO., LTD.

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

KORINOX CO., LTD.

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

KORVAL CO., LTD.

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

KSP CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Ship Engine Valve Spindle, Flange, Ring Gear
 TEL : +82-51-831-6274

KSV

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

KTE CO., LTD.

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

KUKDONG ELECOM CO., LTD.

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

KUKDONG INDUSTRIAL ENGINEERING.

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

KUKJE METAL CO., LTD.

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

KUM HAW PRECISION CO.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Coupling Flange, Bellows Flange
 TEL : +82-51-831-5685

KUMKANG ENGINEERING.

Head Office : Gangseo-gu Busan
 Homepage Add. :

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

KUMKANG PRECISION.

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

KWANGIL CORP.,

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

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

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Pipe Piece, Pipe Spool
 TEL : +82-51-831-1435

KWANG JIN IND. CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Part of Heat Exchanger
 TEL : +82-51-831-4131

KWANG JIN TECH.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Non Asbestos, Teflon, Rubber
 TEL : +82-51-973-5566

KWANG LIM MARINE TECH. CO.,LTD.

Head Office : Sasang-gu Busan
 Homepage Add. :
 Main Products : Window Box, (STEEL, AL, SUS) Vent Hole
 TEL : +82-51-313-0055

KWANG SAN CO., LTD.

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

KWANGWOON CO.,LTD.

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

KYEONG SIN FIBER CO., LTD.

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

KYOUNGWON BENDING CO.

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

KYUNGIL METAL CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Marine Equipment Plating, Head Rest Pipe Plating
 TEL : +82-51-831-1677

KYUNGSUNG INDUSTRY CO., LTD.

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

LHE CO., LTD.

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

MANZU INDUSTRY. CO., LTD.

Head Office : Gangseo-gu Busan

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

MARINE RADIO CO., LTD.

Head Office : Youngdo-gu Busan
 Homepage Add. : www.mrckorea.co.kr
 Main Products : Public Addresser Sys, Common Aerial Sys.
 TEL : +82-51-831-7891

MARINE TECHNICAL ENGINEERING CO., LTD.

Head Office : Sasang-gu Busan
 Homepage Add. :
 Main Products : Oily Water Separator, Bilge Alarm, Air Dryer
 TEL : +82-51-831-1118

MARSEN CO., LTD.

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

MAX TECH.

Head Office : Kimhae Gyeongsangnam-do
 Homepage Add. : www.maxtech21c.com
 Main Products : Engine, Shock Absorper, Gasket
 TEL : +82-55-327-9652

MCM CO., LTD.

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

MI JIN PRECISION.

Head Office : Sasang-gu Busan
 Homepage Add. :
 Main Products : Valve, Tube, Vend, Pipe for ship
 TEL : +82-51-315-3143

MIJOO INDUSTRY CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products :
 TEL : +82-51-831-1588

MIRAE ENGINEERING CO., LTD.

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

MJ TSR CO., LTD.

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

MODERN INTECH CO., LTD.

Head Office : Sasang-gu Busan
 Homepage Add. :
 Main Products : Curtain, Carpet, Upholstery, Mattress for Marine
 TEL : +82-51-325-0260

MT.H CONTROL VALVES CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products :
 TEL : 82-51-974-8831

MYTEC CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. : www.imytec.com
 Main Products : Heat Exchanger, Pressure Vessel
 TEL : +82-51-831-7474

NAMSUNG SHIPBUILDING CO., LTD.

Head Office : Saha-gu Busan
 Homepage Add. :
 Main Products : Rescue Boat Davit & Winch, Assembly, Line Hauler
 TEL : +82-51-200-1277

NAMYANG METAL.

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

NARA CORPORATION CO., LTD.

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

NAVUTEC.

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

NEW-OHSEUNG CO., LTD.

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

NK CO., LTD.

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

NOKSAN FLANGE CO., LTD.

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

OBOOK ELECTRIC CO., LTD.

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

OK KWANG ENG CO., LTD.

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

OK KWANG METAL CO., LTD.

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

ORIENTAL PRECISION & ENGINEERING CO., LTD.

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

ORIENTAL PRECISION MACHINERY CO., LTD.

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

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

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

PACO HITEC CO., LTD.

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

PAL MI METAL IND CO., LTD.

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

TEL : +82-55-552-3840

PANASIA CO., LTD.

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

PI PLUS CO., LTD.

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

POONG JIN METAL CO., LTD.

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

PSM CO., LTD.

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

SAEJIN INTECH CO., LTD.

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

SAMBOO METAL CO., LTD.

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

SAMGONG CO., LTD.

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

SAMJOO ENG. CO., LTD.

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

SAMJUNG MACHINERY.

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

SAM KWANG HI-TEC CO., LTD.

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

SAMSUNG NONFERROUS METAL CO., LTD.

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

SAMYANG METAL IND. CO., LTD.

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

SAMYOUNG FITTING.

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

SDK CO., LTD.

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

SEAPLUS CO., LTD.

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

SEBO METAL CO., LTD.

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

SEBO TECH CO., LTD.

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

SEIL SERES CO., LTD.

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

SEJIN BOLT CO., LTD.

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

SEUNG JIN E.N.G.

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

SEUN STEEL CO., LTD.

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

SEWOONG PRECISION MACHINERY CO., LTD.

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

SEYANG HIGH-TECH

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Water & Oil Strainer, Condensate Chlorination Tank
 TEL : +82-51-831-9125

SHILLA E&T CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Spot Cooler, Heat Exchanger, Pressure Yeses
 TEL : +82-51-831-7705

SHINDONG DIGITECH CO., LTD.

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

SHINHWA INTERIOR & TECHNOLOGY CO., LTD.

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

SHINKWANG ACE ELECTRIC CO., LTD.

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

TEL : +82-55-332-3315

SHINMYUNG INDUSTRIAL CO., LTD.

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

SHIN SHIN HEAVY INDUSTRIES CO., LTD.

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

SHIN SHIN MACHINERY CO., LTD.

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

SHINWOO METAL CO., LTD.

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

SHIN YOUNG AIR CLUTCH.

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

SILLA METAL CO., LTD.

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

SIN HUENG FLANGE CO., LTD.

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

SINWEO GRATING CO., LTD.

Head Office : Sasang-gu Busan
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Main Products : Steel Grating for Ship
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Head Office : Gangseo-gu Busan
Homepage Add. : www.smpt.co.kr
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Homepage Add. :
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Main Products : Welding Fittings (Butt Welding)
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STASB CO., LTD.

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Homepage Add. :
Main Products : Marine Furniture, Door
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Homepage Add. : www.shge.co.kr
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Head Office : Gangseo-gu Busan
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Head Office : Gangseo-gu Busan
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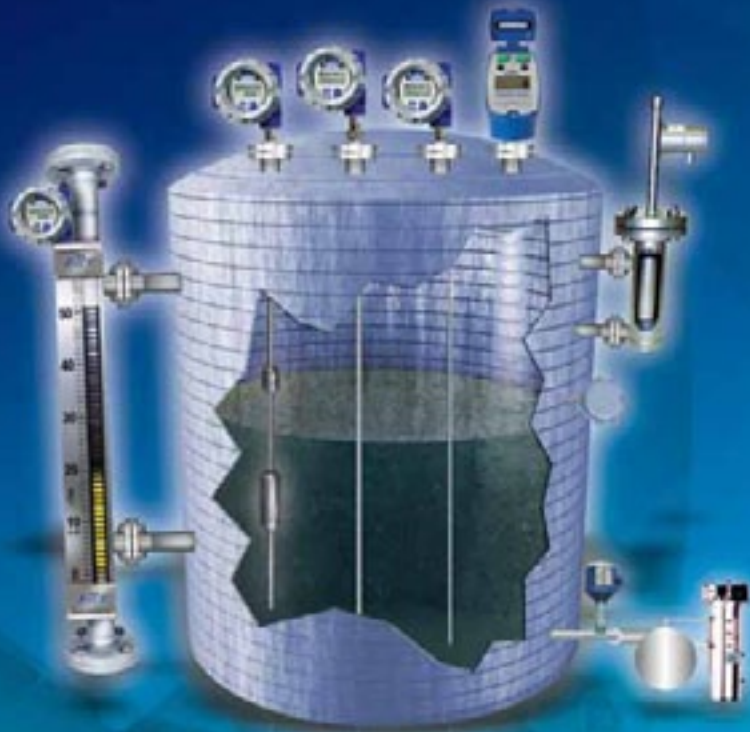
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