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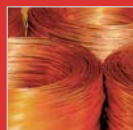
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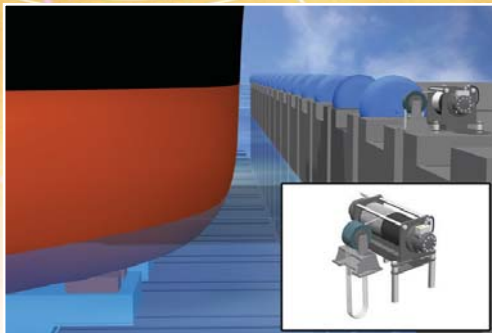


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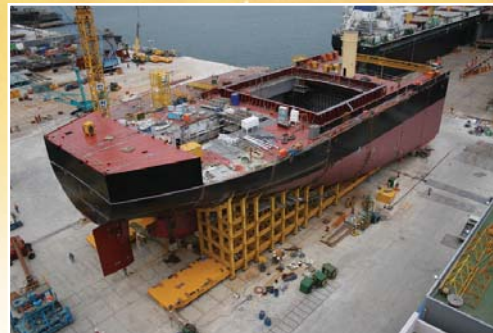
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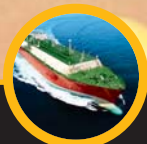

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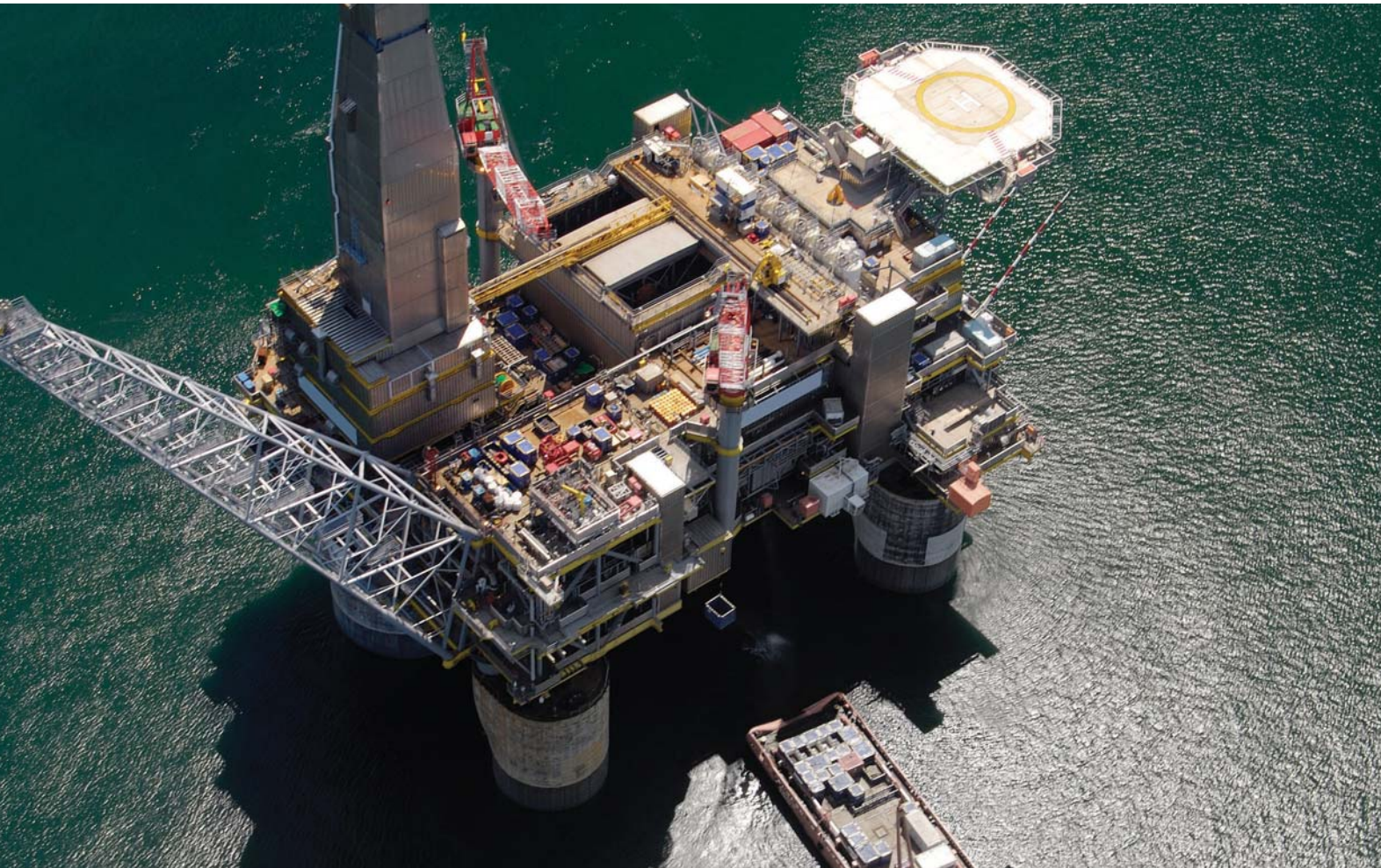
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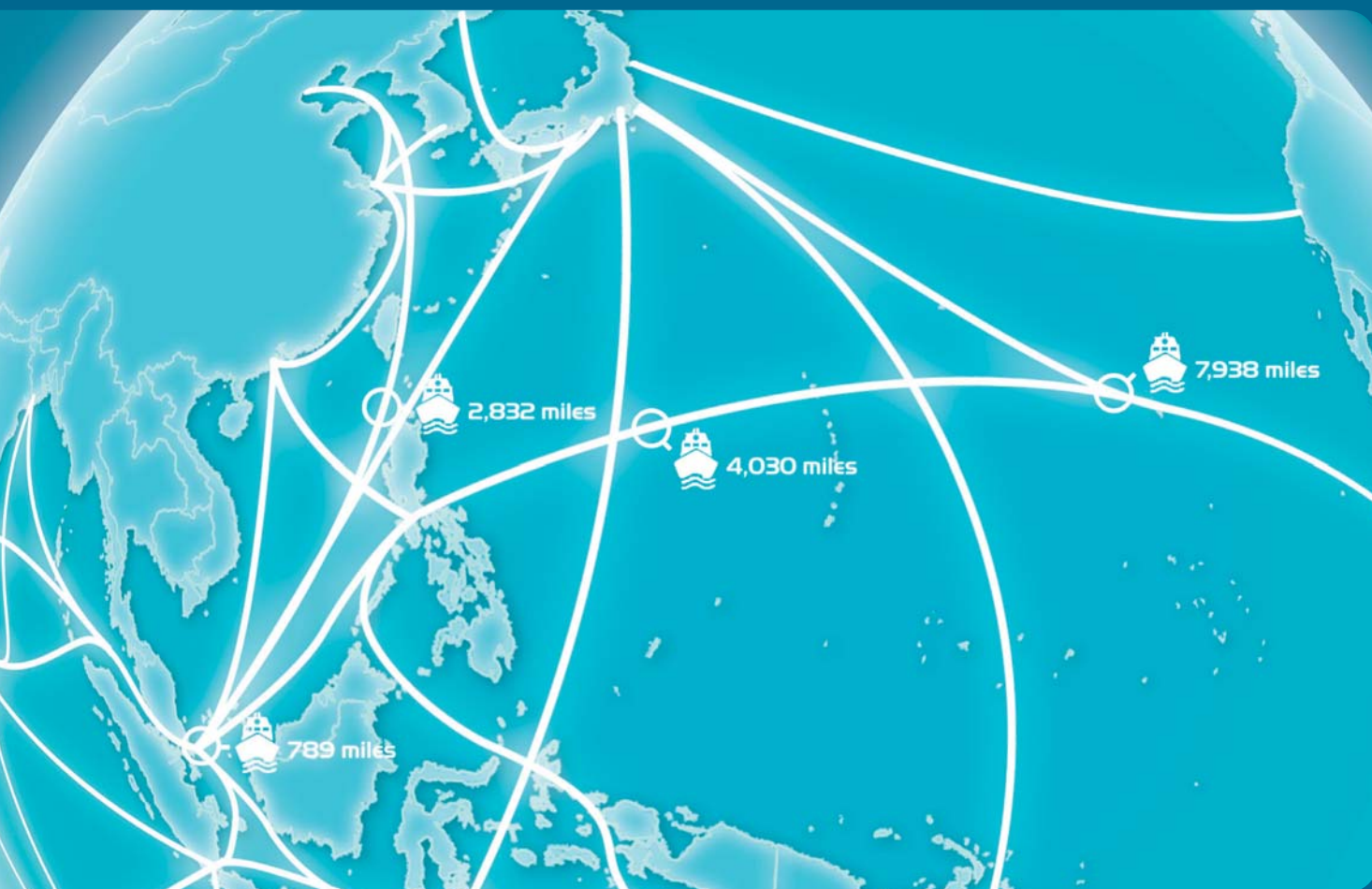
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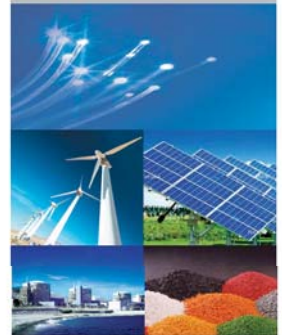
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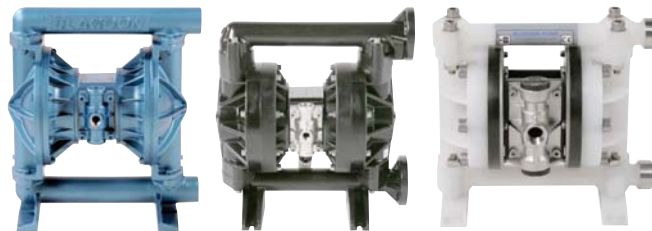
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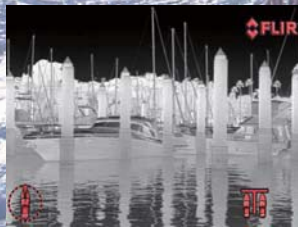
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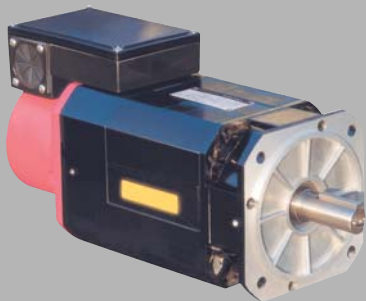
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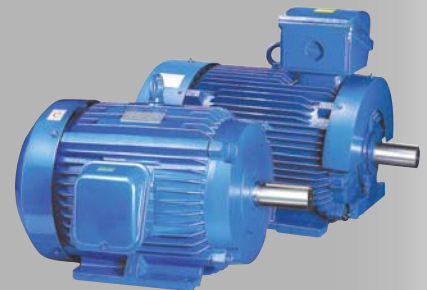
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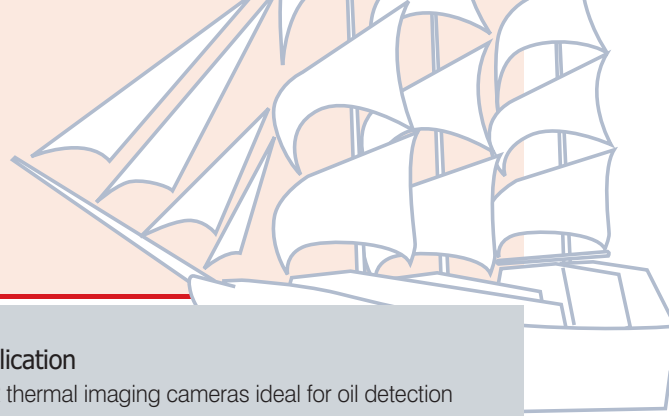
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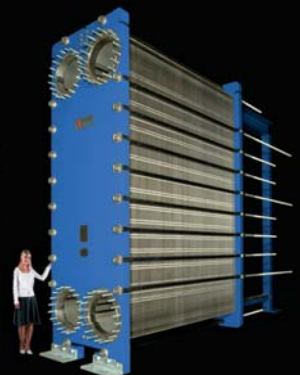
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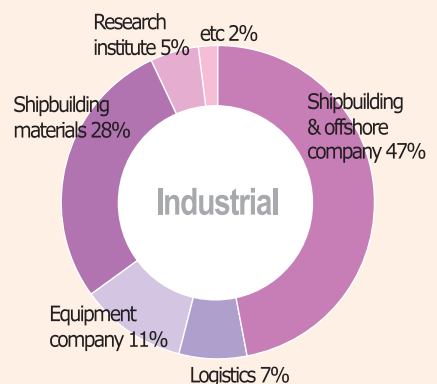
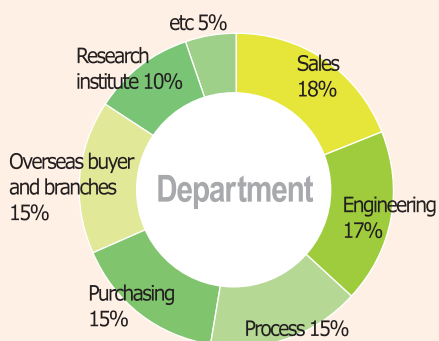
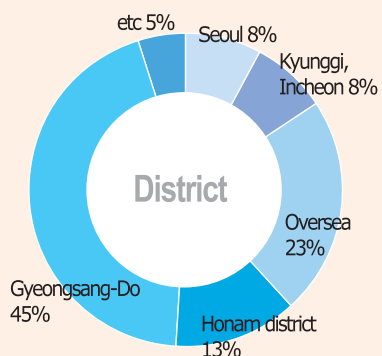
Product

New shipbuilding & offshore industry products overview

Business News

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Logistics Service



SSME delivered its 20th vessel of this year

Sungdong Shipbuilding & Marine Engineering (SSME) held a naming and hand-over ceremony for 'CAPE KENNEDY', a Kamsarmax class bulk carrier at its Tongyeong shipyard in South Gyeongsang Province on 12 June.

CAPE KENNEDY, the 20th vessel delivered by SSME this year, was ordered by the Greece-based Cape Shipping in 2011. This vessel is 229m long, 32.3m wide, and 20.2m high with a carrying capacity of 82,000 tons and can sail at an average speed of 14.5 knots. This ceremony was attended by Ha Seong-yong, CEO of SSME, Byeon Moon-seong,

President of SSME in charge of sales, Genie Adrianopoulos, Chairman of Cape Shipping, Efi Nihoritou, President of Cape Shipping, and others. Kamsarmax refers to a new type of vessels larger than Panamax(76,000 DWT) and smaller than Post-Panamax (92,000 DWT), which are suited for berthing at the Port of Kamsar, Guinea in Africa.

성동조선해양, 올해 20번째 선박 인도

성동조선해양이 캄사르막스급 벌크선 '케이프 케네디(CAPE KENNEDY)' 호의 명명식과 인도 서명식을 지난 12일 경남 통영조선소에서 가졌다.

성동조선해양이 올해 들어 20번째로 인도하는 선박인 케이프 케네디호는 지난 2011년 그리스의 케이프시핑(Cape Shipping)사가 발주해 건조되었으며, 길이 229m, 폭 32.3m, 높이 20.2m로 82,000

톤의 화물을 싣고 14.5 노트의 평균속도로 운항할 수 있는 선박이다.

이번 행사에는 성동조선해양 하성용 대표이사와 변문성 영업부문 사장을 비롯해 케이프시핑사 지니 아드리아노폴로스(Genie Adrianopoulos) 회장, 에피 니호리토(Efi Nihoritou) 사장 등이 참석해 자리를 빛냈다.



Efi Nihoritou, President of Cape Shipping, Genie Adrianopoulos, Chairman of Cape Shipping Ha Seong-yong, CEO of SSME, his wife Park Soon-ae, N.LE CHERIF, the Godmother of CAPE KENNEDY, her husband R.CLERISSI, President of SSME in charge of sales (from the second left in the front row) are posing for photo in a festival on the eve of the naming ceremony.

캄사르막스(Kamsarmax)는 일반적인 파나막스(Panamax, 76,000 DWT)급 보다는 크고 포스트 파나막스(Post-Panamax, 92,000 DWT)급 보다는 작은 신선형으로 아프리카 기니의 캄사르(Kamsar) 항구를 입항할 수 있는 최대 크기의 선형을 지칭한다.

MLTM takes the lead in establishing international standards for green ship

Ministry of Land, Transport and Maritime Affairs (MLTM) announced that it would embark on full-fledged development of test and performance evaluation standards for green ship technology in order to cope with the regulations on greenhouse gas (GHG) emissions which are enforced worldwide to reduce the global warming.

IMO (International Maritime Organization) adopted the Amendments to International Convention for the Prevention of Marine Pollution (International Convention for the Prevention of Pollution from Ships) during the 62nd Marine Environment Protection Committee held in U.K. in July 2011. This Convention, scheduled to come into force from January 1, 2013, requires the ships

operational worldwide to meet the Energy Efficiency Design Index (EEDI) and drastically reduce CO₂ emissions.

MLTM said that it was proceeding with the research to establish the 'Green ship technology test and performance evaluation standards development system (Green ship TCS system)' under the supervision of the Korean Register of Shipping (KR) in an endeavor to cope with the GHG Convention and take the lead in setting the international standards for green ship.

For that, MLTM installed the energy measurement and monitoring system, which would enable perfect understanding of ship energy flow, in 2 large containerships of Hanjin Shipping and Hyundai Merchant Marine and

has collected and analyzed the data since April this year. Additionally, MLTM is moving ahead with the research to identify the green ship technology applicable to ships based on comprehensive review of the maturity of green ship technology, GHG reduction effect, and requirements of maritime industry, besides the analysis of ship energy. To ensure the success of the research project, MLTM is currently building the 'Green Ship Equipment Test & Certification Center' dedicated to the evaluation and certification of green ship technology in Gunsan City, North Jeolla Province.

An official from MLTM said, "We are considering the measures to constantly research the green ship technology even after

September 2016 when the "Green ship TCS system project" is completed, and exert our

best efforts to help establish a leading position of Korea in the green ship technology in

the period ahead."

국토해양부, 글로벌 그린십 기술 국제표준 선도

국토해양부는 지구 온난화 방지를 위한 전 세계적인 온실가스 규제에 대응하기 위해 그린십 기술에 대한 시험 및 성능평가표준개발에 본격 착수한다고 밝혔다.

IMO는 2011년 7월 영국 런던에서 개최된 제62차 해양환경보호위원회에서 선박으로부터 배출되는 온실가스를 규제하기 위한 해양오염방지협약 부속서 개정안(선박 온실가스협약)을 채택한 바 있다. 이 협약은 2013년 1월 1일부터 발효될 예정이며, 이에 따라 국제항해 선박은 '에너지효율지수' 등을

적용하여 이산화탄소를 획기적으로 감축해야 한다. 국토해양부는 온실가스협약에 대응하고 그린십 기술 국제표준을 선도하기 위하여 한국선급 주관으로 '그린십 기술 시험 및 성능평가 표준개발시스템(그린십 TCS 시스템)' 구축 연구사업을 진행하고 있다고 밝혔다.

이 연구를 위하여 한진해운 및 현대상선의 대형 컨테이너 선박 두 척에 선박 에너지 흐름을 완벽하게 파악할 수 있는 에너지 계측 및 모니터링 시스템을 설치하고 올해 4월부터 데이터 수집 및 분석을 실시해왔다. 또한 선박 에너지 분석과 함께 그린십 기술의 성숙도, 온실가스 감축효과 그

리고 해사 산업계의 요구사항을 종합적으로 검토해 현재 선박에 적용할 수 있는 그린십 기술을 발굴하는 연구를 추진중이다. 국토해양부는 이 연구사업의 성공적 추진을 위하여 그린십 기술의 성능을 평가하고 인증할 수 있는 '그린십 기자재 시험?인증센터'를 전북 군산시에 구축하는 사업을 동시에 진행하고 있다.

국토해양부 관계자는 '그린십 TCS 시스템 구축' 과제가 종료되는 2016년 9월 이후에도 그린십 기술연구를 지속적으로 추진하는 방안을 고려하고 있으며, 향후 우리나라가 그린십 기술을 국제적으로 선도할 수 있도록 최선을 다하겠다고 말했다.



DSME held a naming ceremony for a luxury ferry, brightening the prospects of entering the cruise ship market

DSME (Daewoo Shipbuilding & Marine Engineering) held a naming ceremony for Night Car Ferry, the world's largest ferry, at its Okpo shipyard on May 29.

DSME won an order worth approximately USD 300 million from the Tunisia's state-run shipping company Compagnie Tunisienne de navigation (COTUNAV) in 2010 for the construction of this ferry. Measuring 210m in length and 30m in width, Night Car Ferry is the largest among the currently operational ferries worldwide. Night Car Ferry has 814 cabins and a capacity of 3,200 passengers, 285 crews and 1,060 cars and can sail at a maximum speed of 27.5 knots(about 51Km/h). In

addition, Night Car Ferry has the passenger amenity space, occupying approximately 11,000m², on 3 floors.

Particularly, Night Car Ferry is fitted with navigation-related major equipments in pairs such as main engine, power generator, etc., to protect the passengers and ships in case of emergency, including the inundation or fire, etc., in compliance with the Safe Return to Port (SRTP) rules for the first time for a passenger ship worldwide, and therefore, other equipments can be used if any problem arises dur-



'Night Car Ferry', the world's largest luxury ferry

ing the navigation.

An official from DSME said, "DSME won the bid for this luxury ferry, beating the competition from prominent liner shipyards worldwide, in recognition of its excellence in passenger ship construction technology and interior expertise, and has bright prospects of making inroads into the cruise ship market."

대우조선해양, 호화 페리션 명명식 '크루즈선' 진출 청신호

대우조선해양은 지난 5월 29일 세계 최대 호화 페리션(Night Car Ferry)의 명명식을 목포조선소에서 가졌다.

튀니지의 국영선사인 코투나브(COTUNAV: Compagnie Tunisienne de navigation)사와 지난 2010년 약 3억 달러에 수주계약을 맺은 이 페리션은 현재 전 세계에서 운행 중인 페리션 중 가

장 큰 규모로 길이 210m, 폭 30m에 달한다. 814개의 선실과 최대 3,200명의 승객을 비롯해 285명의 승무원, 그리고 1,060대의 자동차를 싣고 27.5 노트(시속 약 51Km)의 속력으로 운항이 가능하다. 또한 3개의 층에 걸친 약 11,000m²에 달하는 승객 편의 공간이 마련되어 있다.

특히 전 세계 여객선 최초로 SRTP(Safe Return To Port : 국제안전협약)를 준수하는데, 침수나 화재 등 긴급상황 발생시 승객과 선박을 보호하기

위해 메인 엔진과 발전기 등 항해와 관련된 주요 장비들이 각각 2개씩 설치되어 있어 문제가 발생하더라도 운항이 가능하도록 설계되었다.

대우조선해양 관계자는 "이 페리션은 세계 유수의 여객선 전문 조선소와의 경쟁 입찰에서 계약을 성사시킨 것으로 건조기술 및 인테리어 능력 등 종합적인 여객선 건조 능력을 인정받아 향후 크루즈선 시장의 진출도 기대할 수 있게 됐다"고 말했다.

Intergraph® Releases Smart 3D 2011 R1 for Enhanced Quality and Productivity

Intergraph® has released upgrades for its market-leading, next-generation plant, offshore and material handling design solutions, SmartPlant® 3D, SmartMarine® 3D and SmartPlant 3D Materials Handling Edition, collectively known as Smart 3D. All three Smart 3D 2011 R1 solutions are available to customers in the process, power, offshore and marine industries. Current users report that Smart 3D solutions deliver significantly higher productivity than other solution.

Smart 3D 2011 R1 customers now have additional licensing flexibility to combine any of the three applications - SmartPlant 3D, SmartMarine 3D and SmartPlant 3D Materials Handling Edition - with any other Smart 3D license. The advantages of Smart 3D licensing flexibility include reduced administrative costs; additional features available to the plant market from running the marine product; built-up members; and construction management. By upgrading to the latest release, users will now be able to have access to all functionalities of Intergraph's integrated Smart 3D solutions. Smart 3D extended its 3D modeling capabili-

ties to address the needs of the offshore design and fabrication industry. Specialized Advanced Plate Systems (APS) quickly and efficiently model complex nodal connections for offshore topsides structure composed of ring plates, continuity plates, base plates, transition plates, cap plates, and more. Complex member end-cuts for welded connections can be applied to the various configurations typical in offshore projects from front-end engineering design through steel cutting.

The unprecedented integration between Smart 3D and SmartPlant P&ID is another greatly enhanced feature in the new version, promoting improved quality and higher productivity. The upgraded automatic correlation functionality finds and makes items the same between SmartPlant P&ID and Smart 3D, including topological checks on pipelines, thus saving users valuable time on projects. Also, any minor inconsistencies to include topological inconsistencies like vents and drains that are modeled in Smart 3D, but not in SmartPlant P&ID can be easily approved with the "approve inconsistencies" feature.

Smart 3D 2011 R1 further enhances Intergraph's ground-breaking 3D interoperability. Datasets generated from multiple sites can be checked for interferences against one another in a single Smart 3D project. Smart 3D also now offers the ability to create and save intelligent connections to referenced datasets. Gerhard Sallinger, Intergraph Process, Power & Marine president, said, "Intergraph's integrated Smart 3D solutions are being used by an ever-increasing number of companies worldwide to boost productivity, accelerate projects and gain a competitive edge."

SmartPlant 3D is the world's first and only next-generation 3D plant design solution, employing a breakthrough engineering approach that is focused on rules, relationships and automation. It is the most advanced and productive 3D plant design solution that effectively enables optimized design, increasing safety, quality, and productivity, while shortening project schedules. Companies using SmartPlant 3D typically report a 30 percent improvement in overall engineering design productivity.

Siemens, New Seoul Office Opening Ceremony

Siemens Ltd. Seoul held the New Office Opening Ceremony on June 20 at the new office, Poongsan Building. As the first session, the ribbon cutting ceremony and office tour was held on 10th floor with participation of Michael Suess, Member of the Managing Board of Siemens AG, JongKap Kim, Chairman & CEO of Siemens Ltd. Seoul, ChewKong Lum, Senior

Executive Vice President & CFO, and all Sector heads.

After that, the opening ceremony was held at the conference room on the B1 floor with participation of top 200 Siemens employees. During the ceremony, a welcome speech by JongKap Kim Chairman & CEO and congratulatory speech by Michael Suess was held.

Furthermore, the new office film was played and the cake cutting session by Michael Suess, JongKap Kim and ChewKong Lum took place to celebrate the opening of the new office while wishing sustainable success for Siemens in Korea.

한국 지멘스, 충정로로 사무실 이전

지멘스(주)는 지난 6월 20일 서대문구 충정로 풍산빌딩으로 사옥을 이전하고 이전 행사를 가졌다. 이날 행사에서 마이클 수스 지멘스 경영이사회 멤버, 김종갑 한국 지멘스 대표이사/회장, 럼추콩 수석 부사장 및 CFO, 각 사업본부장 등이 참석한

가운데 리본커팅 행사 및 신규 사옥의 투어가 10층에서 개최했다.

아울러 지하 1층 대회의실에서는 지멘스 주요 임직원 200여 명이 참석한 가운데 신규 사옥 이전 행사가 진행되었다. 행사는 김종갑 대표이사/회장의 환영사로 시작해 마이클 수스(Michael Suess)

사장의 축사로 이어졌다. 이후 지멘스 신사옥 영상 관람과 마이클 수스 사장, 김종갑 회장, 럼추콩(Lum ChewKong) 부사장의 케익 커팅이 진행되어 신규 사옥 이전을 축하하고 한국 지멘스의 지속적인 성공을 기원하는 시간을 가졌다.



Alfa Laval wins order to supply equipment for the world's first FLNG facility

Alfa Laval has won an order from a Technip Samsung Consortium (TSC) to supply Alfa Laval equipment to Shell's Prelude FLNG (Floating Liquefied Natural Gas) facility on June 1, 2012. Alfa Laval is unable to disclose the exact value of the order due to a confidentiality agreement.

FLNG opens up new business opportunities for countries looking to develop their gas

resources, bringing more natural gas to the market and Shell is the first to go ahead with an FLNG project, Prelude FLNG.

The Alfa Laval equipment consists of desalination units, heat exchangers and filters. The desalination units will convert sea water into fresh water to be used for steam generation, process water and potable water. The heat exchangers will use seawater in the vital cool-

ing applications in the gas liquefaction process.

"We are very proud to be part of this technology breakthrough in the energy field", says Lars Renstrom, President and CEO of the Alfa Laval Group. "This order confirms our strong position as a reliable partner to the major players in the oil and gas industry."

알파라발, 업계 최초로 FLNG 설비에 장비 공급

알파라발은 셸(Shell)의 Prelude FLNG 설비에 자사의 장비를 공급하는 계약을 체결했다고 지난 6월 1일 발표했다. FLNG는 가스 자원을 개발하고 더 많은 양의 가스를 시장에 공급하는데 있어 새로운 비즈니스의 기회를 열어주고 있다. 현재 셸

은 가장 선두에서 FLNG 시장을 이끌고 있다. 알파라발이 이번에 공급하는 장비들은 담수화 장치, 열교환기와 필터로 구성되어 있다. 담수화 장치는 바닷물을 담수로 변화시켜 스팀 제너레이션을 비롯하여 다양한 프로세스에 활용되는 물과 식수로 사용할 수 있도록 도와준다. 또한 알파라발의 열교환기는 해수를 이용한 가스 액화 공정시 필수적인

냉각 공정에 응용된다. 알파라발의 라스 렌스트롬 CEO는 "에너지 분야의 새로운 장을 여는 프로젝트에 참여할 수 있게 되어 매우 자랑스럽다."며 "알파라발이 오일 및 가스산업의 주요 회사들에게 신뢰할 수 있는 파트너임을 재확인시키게 되었다."고 밝혔다.



KR was accredited as the verification body of CSP

Korean Register of Shipping (KR) announced that it was accredited as a verification body of CSP (Clean Shipping Project) for Clean Shipping Index (CSI) on June 3.

To be accredited as the CSP verification body, an organization is required to meet the qualification requirements in accordance with the international standards (ISO/IEC Guide 65) setting out the criteria for the bodies which operate the certifications of products, services, and processes, as well as have regular membership of International Association of Classification Societies (IACS).

Kim Mahn-eung, Senior Vice President of KR's New Growth Industry Division, said, "Accredited as a CSP verification body, Korean Register of Shipping can offer whole range of

services related to the greenhouse gas (GHG) verification which is conducted voluntarily in the marine transportation sector, such as GHG inventory verification for shipping companies/ships, CCWG (Clean Cargo Working Group) verification, CSP verification, etc., for the first time in Asia as a classification society, thus contributing to the reduction of GHG emissions from shipping."

CSP is a regional project that gives the Clean Shipping Index (CSI) rating to forwarders based on the emissions of CO₂, NO_x, SO_x from ships, various chemical material management system and performance, and has attracted the involvement of 32 companies, including ABB. Recently, shipping companies that want to transport the cargo of forwarder

involved in CSP project are required to conduct verification of at least 2 ships and companies.

KR's New Growth Industry Division, which conducts the verification of GHG inventory, CCWG and CSP verifications in marine transportation sector, is currently proceeding with research to expand its capabilities as an international certification body for wind power system in collaboration with internationally prominent organizations, such as the National Renewable Energy Laboratory (NREL) of U.S., Energy research Center of the Netherlands (ECN), etc., and offer technical services of global standard in offshore energy and offshore plant sectors.

한국선급, CSP 검증기관 지정

한국선급은 지난 6월 3일 CSP(Clean Shipping Project)로부터 선박친환경지표(CSI, Clean Shipping Index)에 대한 검증기관으로 지정 받았다고 밝혔다.

CSP 검증기관으로 지정 되기 위해서는 국제선급 연합회(IACS) 정회원 자격과 함께 제품, 서비스 및 프로세스 인증을 운영하는 기관에 대한 국제 규격(ISO/IEC Guide 65)에 따른 인증기관 자격을 갖추고 있어야 한다.

김만응 신성장산업 본부장은 "이번에 CSP 검증기관으로 지정됨으로써 한국선급은 아시아 선급 으로서는 최초로 선사 및 선박에 대한 온실가스 인벤토리, CCWG(Clean Cargo Working Group) 검증과 CSP 검증 등 해운분야에서 자발

적으로 시행되고 있는 모든 온실가스 검증서비스를 제공할 수 있게 되었으며, 이를 통해 해운선사의 온실가스 감축에 기여할 수 있게 되었다”고 밝혔다.

CSP는 선박으로부터 배출되는 CO₂, NO_x, SO_x 및 각종 화학물질 관리체계 및 실적을 평가한 ‘선박친환경성지표(CSI)’ 등급을 화주에게 제공하는

프로젝트로서 ABB를 비롯한 32개 기업이 참여하고 있으며, 최근 CSP 프로젝트에 참여하는 화주의 화물을 운송하고자 하는 선사는 최소 2척 이상의 선박 및 회사에 대한 검증을 요구받고 있는 것으로 알려져 있다.

한편, 해운분야에 대한 온실가스 인벤토리, CCWG 및 CSP 검증업무를 수행하고 있는 한국

선급 신성장산업본부에서는 미국 국립 신재생에너지연구소(NREL), 네덜란드 에너지 연구센터(ECN) 등 세계 유수 기관과의 상호 협력을 통해 풍력발전시스템 국제인증기관으로서의 역량을 강화하고, 해양에너지 및 환경플랜트 분야에서 세계적인 수준의 기술 서비스를 제공하기 위한 연구를 수행하고 있다.



Lloyd's Register launches groundbreaking rules for FLNG facilities at 2012 World Gas Conference

Lloyd's Register uses its technical knowledge and experience to publish the world's most comprehensive rules to guide the design, construction and operation of floating liquefied natural gas (FLNG) facilities - the biggest, most complex floating structures ever seen - meaning natural gas will now be safer, cheaper and have a lower environmental footprint on 6 June 2012 in the World Gas Conference, Malaysia.

Lloyd's Register's unprecedented 50-year offshore experience, including its technical knowledge of LNG containment and liquefaction technology, FPSO development and process engineering systems, has allowed this 250-year-old classification society to publish the first set of rules to comprehensively look at all areas of FLNG facilities.

“Natural gas is a key ‘fuel for the future’ and its safe and economic production will become increasingly more important,” says John Rowley, President, Lloyd's Register Asia. “The

FLNG facilities we have worked on to form these rules will be the biggest floating structures ever seen and in the coming decades, they will allow us to unlock the world's stranded offshore natural gas reserves. They are essential to the world's future energy mix and Lloyd's Register's experience and knowledge is integral to their safe, sustainable and economic operation.”

According to the International Energy Authority, the world's primary energy demand will increase by 37% between 2008 and 2035 with the natural gas share overtaking coal before 2035 and starting to reach parity with oil soon after 2040. Gas reserves currently remain abundant yet they are technologically complex to both extract and transport. Liquefied natural gas takes up about 1/600th the volume of natural gas yet until now, formal FLNG design codes have remained underdeveloped and this has presented challenges to develop production engineering systems.



John Rowley, President, Lloyd's Register Asia

“Ultimately, the Lloyd's Register FLNG Rules provide a robust and efficient framework in which all other specialist codes and standards can be used. This will be hugely beneficial, for the energy industry and for our wider societies in the future,” concludes John Rowley.



AVEVA celebrates its first 45 years

AVEVA announced it is celebrating its 45th anniversary on 13 . Since its inception as a research project at the University of Cambridge in 1967, AVEVA has seen extraordinary growth, becoming one of the Cambridge technology success stories together with ARM, Autonomy and others.

“Our visionary technology and global business operations have certainly been key factors, but the real foundation of our success lies in the long-term relationships we have established with EPCs, Owner Operators and Shipbuilders”, said Richard Longdon, CEO, AVEVA. “We have always operated, not only

as a vendor of technology, but as an active member of the industries we serve. In our first 45 years, we have evolved with our customers and their markets, delivering software solutions that fundamentally reshape the quality and competitiveness of their businesses.”

“It's great to look back and see how far AVEVA

has come from our early CADCentre days and the contribution we've made to the process plant, power and marine software industry", added Dave Wheeldon, CTO, AVEVA. "We have introduced many innovations that have changed the way that our customers work, improving project efficiency and the

quality of their deliverables. From the start we have always worked closely with customers and listened to their needs. We've created an evolving and unmatched suite of products and services that customers rely on to create and operate the world's most complex engineering assets."

Richard Longdon added further, "The fact AVEVA is a software company with 45 years of successful history speaks for itself. We are stronger than ever - still growing, innovating and capturing market share. There are many good reasons to be excited about the future of AVEVA and we are looking forward to our next 45 years!"

아비바, 창립 45주년 맞아

아비바가 올해로 창립 45주년을 맞이했다. 1967년 캠브리지 대학 연구 프로젝트의 일환으로 시작된 아비바는 지금껏 놀라운 성장을 거듭해왔다. 현재 ARM, Autonomy 등과 같은 캠브리지 기술의 대표적인 성공 스토리 중 하나로 손꼽히고 있다. 아비바의 CEO인 리처드 롱던(Richard Longdon)은 "미래지향적인 기술력과 전세계에 뻗어있는 사업망은 우리가 성공할 수 있었던 기반이다. 그러나 더 중요한 것은 바로 장기간 발전시켜 온 고객과의 관계이다. 우리는 전세계 EPC, 오퍼레이터 및 조선사들과 신뢰와 협력의 관계를 쌓아왔다. 그리고 우수한 기술을 제

공하는 벤더이자 업계 조력자로서 충실히 역할을 수행해왔다. 창립 이후 45년 동안 고객의 사업 경쟁력을 높이고 발전할 수 있도록 유용한 소프트웨어 솔루션을 제공함으로써 고객 및 시장과 함께 성장해왔다."라고 말했다. 아비바의 CTO인 데이비드 휠든(Dave Wheeldon)은 "CADCentre로 시작한 아비바의 사업초기부터 오늘에 이르기까지 지난 날을 되돌아 보니 참으로 감개가 무량하다. 플랜트, 파워 및 조선해양 업계에 많은 기여를 해 온 것도 뿌듯하게 느껴진다. 우리는 수많은 혁신적인 솔루션을 선보임으로써 고객들의 업무 방식을 바꾸고 프로젝트의 효율성을 개선시켜 양질의 결과를 얻는데

일조해왔다. 우리는 사업초기부터 고객과 밀접하게 협업하며 그들이 무엇을 필요로 하는지 눈여겨 보아왔다. 그래서 가장 진보한 형태의 독보적인 제품과 서비스를 제공할 수 있었고 고객들은 이를 기반으로 매우 복잡한 엔지니어링 자산을 생산하고 운영할 수 있었다."고 말했다. 리처드 롱던은 "소프트웨어 회사로서 45년의 성공적인 기업 역사를 보유하고 있다는 것만으로도 시사하는 바가 크다. 우리는 지금 그 어느 때보다도 뛰어나지만, 앞으로 혁신적인 기술개발을 통해 시장 점유율을 더 높일 것이다. 아비바의 미래는 매우 밝다. 우리는 다음 45주년도 함께 축하하고 기념할 것"이라고 덧붙여 말했다.



Vacon Korea's Cranes and Hoists Roadshow gained lots of attention

Vacon Korea arranged 4 seminars in several Korean heavy industry locations where the demand for cranes and hoists is higher on May. Cranes and hoists is one of Vacon Korea's key-focus industrial segments in portfolio.

A total of 65 key customers from Seoul and Busan areas participated in the seminars. Among the participants were companies such as Posco, a multinational steel-making company and Hyundai Heavy Industries' distributors. Their feedback was very positive and they are willing to give us new opportunities for growth in the market.

Typically, cranes availability is very important for the heavy industry sector since they play an important role in the building or heavy industry processes. The high quality performance is particularly important in the sector, where any downtime would mean big losses. Therefore plant owners and crane makers are highly

focusing also on finding the best AC drives suppliers for their projects.

One of the seminar speakers was Antti Kellomaki, Technical Account Manager, Corporate Accounts from Vacon Finland who has extended experiences of cranes while working earlier in Konecranes. Besides

Antti and the Korean team, also Liping Zhang, Supervisor, AMS from Vacon China represented 3,000 tons of ZPMC Offshore Crane project (Controlling a crane on Chinese offshore pipe-laying vessel) in the events.

After the roadshow, Jussi-Pekka Sampola, Managing Director of Vacon Korea highlighted, "I want to thank guest speakers and the



whole Vacon Korea team for the excellent cooperation during the week. We received good feedback from customers and this will give us a good start to work on this segment. Also, our quote pipeline for cranes drives has been growing promisingly during the recent months, thus I'm expecting some breakthrough orders on this segment in future."

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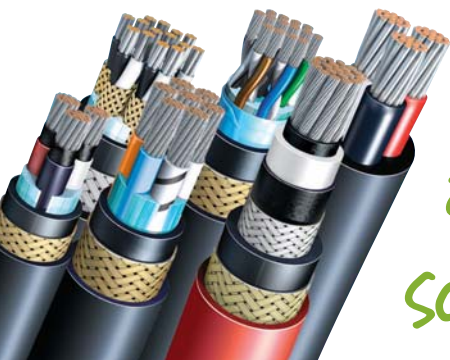


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High value-added shipboard and offshore cable markets soars to new heights

- High growth potential of offshore wind power and subsea sectors!

Shipbuilding industry worldwide is facing difficulties as the placement of new orders for commercial vessels and ship declined nearly 40% compared to the previous year. About 100 small and medium-sized Chinese shipyards have already begun the process for restructuring and adjusted the prices of newbuilds downward by almost 20% despite the potential risk of business shutdown. Shipyards are engaged in fierce competition to win orders in the market for ordinary vessels.

Major cable manufacturers, such as JS Cable, Kukdong Electric Wire (a Nexans company), TMC etc., which supply the cables for shipbuilding and offshore applications, are accelerating their drive to tap into new markets as part of effort to spur growth amid the sluggish shipbuilding market. These cable manufacturers are actively targeting the offshore plant sector, in which domestic shipbuilding heavy-weights have technological competitiveness, to pull themselves out of current difficulties, while seeking to expand into new sectors such as offshore, wind power, deepwater and subsea sectors.

Offshore cable growth 30~50%

Prominent energy developers worldwide are rushing to place new orders for various facilities, such as FPSO, FSRU, drill-ship, etc., used in the offshore energy exploitation projects.

As the focus is shifting from oil to LNG and from onshore to offshore, many countries that have large reserves of energy resources, such as Malaysia, Vietnam, Brazil, Australia, Russia, etc., are moving fast.

According to the related industry, ultra large offshore facility projects will be announced from the second half of this year to early part of next year. Domestic shipyards have actively



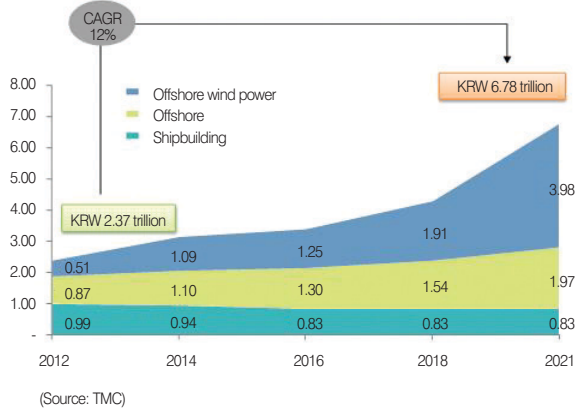


Figure 1. Trends of growth in shipbuilding, offshore, and offshore wind power sectors

participated in all projects and consortiums worldwide to win the contracts, and have already swept orders for 70% of all quantities booked worldwide in the first half of this year in the offshore plant sector.

On the back of the strong performance of the offshore plant market, the manufacturers of shipboard and offshore cables, such as JS Cable, Kukdong Electric Wire, TMC, etc., are expected to experience a 30 to 50% or higher growth in the offshore sector compared to the previous year.

Robust growth in offshore wind power and deepwater sectors

According to the data analyzed by TMC, the market for the cables applicable in the shipbuilding, marine, offshore and offshore wind power sectors will be worth KRW 6.8 trillion by 2021, growing at an annual average rate of 12% from KRW 2.37 trillion in 2012. Particularly, the market for offshore wind power is expected to see robust growth. Countries, including the U.K., Denmark, Germany, etc., are proceeding with large scale offshore wind farm projects.

The industry speculates that the marketability of offshore wind power will be well recognized when the price of offshore wind power falls to ERU 1,500 per kW from current EUR 3,000 per kW as a result of technological advancement and trends toward large wind turbines. Currently, the installed offshore wind energy capacity worldwide approaches approximately 4GW and is expected to reach 10GW by 2014. According to Carbon Trust of the U.K., the installed offshore wind energy capacity worldwide will reach 1,150GW by 2050 and the annual market size is projected to be worth about EUR 170 billion.

The deepwater sector is expected to come under limelight within several years in the period ahead. In fact, not much attention has been paid to the deepwater resources exploitations for reason of technological hurdles and economic feasibility. However, the deepwater sector undoubtedly has unlimited potential for growth. Cable manufacturers are actively seeking to enter the deepwater resources exploitation sector while mapping out mid and long-term R&D plans and forming partnership particularly because the deepwater sector requires higher stability and more advanced technology compared to the offshore sector. The deepwater sector is expected to be worth USD 320 billion by 2020, up from USD 145 billion in 2010.





Variable Frequency Drive (VFD) cables



Hybrid ship-to-shore cables



ICEFLEX® cables for FPSOs



LIST fire-detection cables



Shipboard fiber optic cables



INFIT®-based fire-resistant cables

◀ Shipboard and offshore cable product line (Source: Kukdong Electric Wire)

Taking a leap forward to achieve double-digit sales growth from offshore cable sector

- Winning larger share in the offshore wind power and subsea sectors

JS Cable

JS Cable, established as Yonhab Cable in 1968, is the nation's first manufacturer of shipboard and offshore cables and special industrial cables. Acquired by LG Cable & System in December 2004, JS Cable was renamed from Jinro Industry to its current name in April 2007.

JS Cable made great strides, achieving KRW 461.2 billion in sales and KRW 19.8 billion in operating income in 2009, compared to 2004 when its sales and operating income were only KRW 158.7 billion and KRW 4 billion, respectively, and has cemented its leading position in the ship and offshore sectors.

JS Cable, a leader in shipboard and offshore cable market, has concentrated its capabilities in the offshore and special cables, vigorously making inroads into the global market. This year, JS Cable is expected to register KRW 160 billion in sales: KRW 75.7 billion from the shipboard cable market and KRW 84.3 billion from the offshore cable market. Particularly, JS Cable is focusing on the market for high value-added vessels such as warship, cruise ship, drillship, FPSO (Floating Production, Storage and Offloading), etc., in the offshore sector.

Um Ki-jun, Technology Division, Senior Vice President of JS cable, said, "Major cable manufacturers are shifting their focus to high value-added market due to low margin, as well as fierce competition arising from the decline in new orders for ordinary vessels. High stability and particular characteristics of work environment need to be considered to better target the market for LNG carriers and offshore plants, and long-term research is necessary to satisfy the requirements of ship owners and shipyards."

Although JS Cable achieved KRW 78.1 billion in 2009 when the orderbook for product with offshore applications swelled, the company has seen the sales of its shipboard and off-



Um Ki-jun, Technology Division, Senior Vice President of JS Cable

shore cables grow at a compound annual growth rate (CAGR) of only -19.1% over the last 3 years. From this year, JS Cable plans to move ahead with the strategy to increase the sales and profitability of the shipboard and offshore cables. Particularly, JS Cable plans to increase the proportion of sales from offshore plant sector to 51% by 2012, 63% by 2013, and 70% by 2015.

Meanwhile, JS Cable's sales of shipboard and offshore cables rose to KRW 30.5 billion in the first quarter of this year, an increase by approximately 14% from KRW 26.3 billion recorded in the same period of previous year. Particularly, its sales of offshore wires registered a year-on-year increase of approximately 8%.

Technology and know-how amassed over 4 decades

JS Cable, the nation's first manufacturer of shipboard and offshore cables have amassed technology and know-how for about 4 decades and can meet all requirements related to

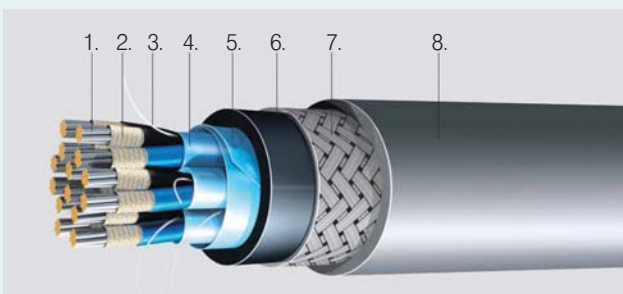


Figure 2. JS Cable headquarters located in Cheonan, Chungnam

the manufacturing of shipboard and offshore cables.

JS cable can manufacture the cables used in all ships including submarines and destroyers, and the cables used in offshore plants for the oil and gas field exploitations, storage and transportation of gas, shipboard and offshore cables, and cables used for emergency power supply, control and communication. JS Cable can also manufacture the cables used in offshore structures, such as offshore platform, drillship, FPSO, etc., and drillship operating in oil fields.

Um Ki-jun, Technology Division, Senior Vice President of JS cable, said, "The requirements for cables have become much more rigorous than ever as the focus of oil and gas business is shifting to polar regions or deepwater. JS Cable



1. Tinned copper conductor
2. Mica / Glass tape
3. EPR insulation
4. Individual screen (with drain wire)
5. Collective screen (with drain wire)
6. Inner covering; HFC
7. Tinned copper braid armor (or Galvanized steel wire braid armor)
8. Sheath (= Outer sheath) ; SHF2, SHF Mud

Figure 3. Halogen Free and MUD Resistant Cable

has acquired the technology related to the environment and stability through relentless R&D since 2006 and has already commercialized the high heat resistance cable (1100°C/1H) and high chemical resistance cable (1000°C/3H) that can be used in polar regions at the temperature of -50 degrees.

JS Cable makes unceasing efforts to develop the products

targeted to the high value-added market. According to JS Cable, the company is making multifaceted efforts for manufacturing light weight and compact products, a new trend in the cable technology, commercializing the engineering plastic materials for cables, fulfilling the needs for high safety (fire resistance, chemical resistance, non-toxicity), and expanding the use of eco-friendly (recycle & eco) materials.

Specifically, JS Cable plans to expand its development of environment-friendly Eco-Green Cable, a product contributing to green growth, thus increasing the proportion of environment-friendly products in its entire cable product lineup to 80% by 2015.

Last year, JS Cable's new products made debut, such as 'silicon fireproof cable' for shipboard and offshore applications, 'NEK cable' that enhanced the freezing-resistance, and the cable for wind turbine (1000V EWTC-TPV), and others. The silicon fireproof cable has the fire resistance exceeding the requirements of international standards, thereby increasing the stability of ship operations. NEK cable that enhanced the freezing resistance can withstand the temperatures up to -55°C and therefore can be widely applied to the offshore drilling, storing, and transporting facilities, etc., used in the polar regions.

Sales of shipboard and offshore cables to be doubled by 2015

JS Cable supplied the cables for MODU (Mobile Offshore Drilling Unit), Offshore & Rig, LNG Carrier, FPSO (14 units) from 2006 to 2011. The company stood out in the market for offshore plants, as well as ordinary vessels.



Figure 4. Halogen Free Shipboard Cables (XLPE Insulation / SHF1 Sheath Cables)



Figure 5. Halogen Free & MUD Resistant Cables for Marine & Offshore (NEK 606)

Um Ki-jun, Technology Division, Senior Vice President of JS cable, said, "Since last year, JS Cable has proceeded with strategic marketing campaigns targeting ship owners and shipyards as the offshore market expands. Also, JS Cable is focusing on the deepwater and subsea sectors which have witnessed fast growth, and already has secured the technology for deepwater subsea cables."

JS Cable has mapped out a mid and long-term plan to double the sales from the shipboard and offshore cables by 2015. For that, JS Cable plans to push ahead with the marketing activities targeting major overseas ship owners, including the world's 5 major oil and gas companies, as well as beef up competitiveness to maximize the profitability.

Particularly, domestic cable manufacturers have strong competitiveness in all aspects including the quality, price, delivery management and others. However, they are facing stiff price-competition from China that has the advantage of cheap labor, like other industries. Thus, JS Cable is striving to develop new materials and raise productivity in a bid to ratchet up its product competitiveness.

Um Ki-jun, Technology Division, Senior Vice President of JS cable, said, "JS Cable has a plan to focus on special industrial cables used in nuclear power plants, wind turbines, port cranes, passenger boats(cruise) and others with an aim to achieve KRW 250 billion from the market for shipboard and offshore cables by 2015."

A leader in the shipboard and offshore cable markets

- Synergic effect from global network

Kukdong Electric Wire

Kukdong Electric Wire (a Nexans company), a leader in the shipboard and offshore cable market, was acquired by Nexans in 2003. With the acquisition of Kukdong Electric Wire, Nexans has become the world's leader in offshore

cables and has expanded its production base in Asia which has experienced the fastest growth worldwide.

Meanwhile, Kukdong Electric Wire has gained access to Nexan's advanced management technique, global sales net-



Jincheon factory of Kukdong Electric Wire

work, and cutting-edge technology, which are vital for the company's further growth. Particularly, the research center of Kukdong Electric Wire, which became the 4th NRC (Nexans Research Center) of the Group in 2010, is focusing on the research to develop new materials.

Kukdong Electric Wire registered KRW 256 billion in sales last year (up from KRW 227.8 billion in 2010), and shipboard cables comprised 71.1% of total sales. Major products of Kukdong Electric Wire include the shipboard cables (75%), LAN (16%), and other power cables (9%) used for nuclear power plants and others.

Lee Sang-dam, Shipboard & Offshore, Senior Executive Director of Kukdong Electric Wire, said, "The proportion of shipboard cables in total sales has decrease worldwide, compared to the previous year, due to the declining orders



Lee Sang-dam, Shipboard & Offshore, Senior Executive Director of Kukdong Electric Wire

for ordinary commercial vessels. By contrast, the sales in offshore market are expected to increase. The outlook of the market for shipboard and offshore cables depends on the price competitiveness amid the rising costs of labor and materials. So, we have shifted our focus to the technology-intensive and high value-added markets, such as the market for special cables -

which are lightweight, compact, and suited to the cold environment and provide high stability - to carve out larger share of the market."

Kukdong Electric Wire will make constant effort to maintain its leading position in the shipboard and offshore cable sectors and plans to focus on identifying new market and customers while maintaining current customer base according to its customer orientation strategy (service + quality + delivery). Specifically, Kukdong Electric Wire is strategically targeting the market for offshore cables that require the state-of-art technology, rather than the commercial vessel market which is witnessing fierce price competition.

In addition, Kukdong Electric Wire plans to strengthen its competitiveness through the complementation of facilities as the ability to meet delivery schedule in the cable market is emerging as key issue.

Development of optimal solutions

Kukdong Electric Wire has the top leading position in the field of the shipboard and offshore cable sectors within the Nexans Group. 'ICEFLEX' is the flagship product of Kukdong Electric Wire.

ICEFLEX can maintain the unique performance of cable even at -50oC, and therefore is useful for the offshore oil and gas field exploitations in extremely cold regions and intended for use in shipboard, offshore and onshore applications. Cables made with



Figure 6. 'ICEFLEX', the state-of-art freezing resistance shipboard and offshore cable

ordinary insulation process are easy to become hardened and fragile in extremely cold weather and can show problems in extremely low temperature region such as the Arctic. To resolve such problems, Kukdong Electric Wire used special materials that maintain flexible conditions even at low temperatures.

Moreover, 'NEK TS 606', the offshore cable, is useful for LNG carriers or offshore facilities that develop oil or gas fields in deepwater or continental shelf, and does not burn or release smoke or toxic gases in case of fire.

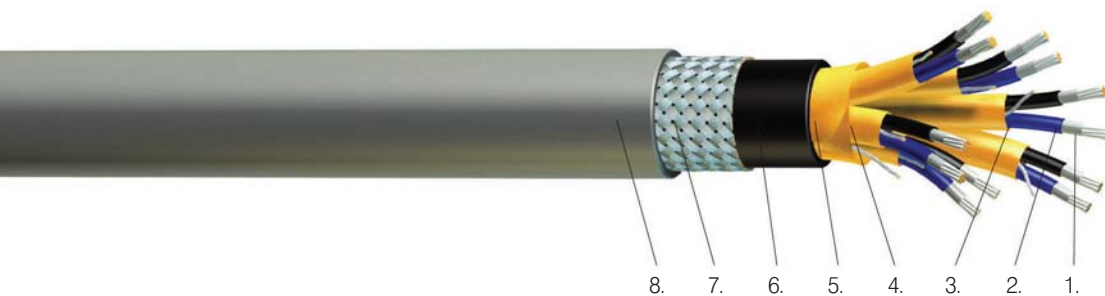
HIS (High-quality IEC base Simplified Standard) Cable is an upgraded standard product applicable in various ways according to the requirements of the region or customers. It is lightweight, has high fire resistance and chemical resistance, and can be used at low temperatures. Beside, Kukdong Electric Wire has a variety of product lineup, including the shipboard optical cable, fiber optic cable and others. Park Jong-Woon, Product Manager, Senior Executive Director of Kukdong Electric Wire, carries out the duties to set essential strategies for ship and offshore sectors in the global market or determine the needs of the market and connect the producers and consumers.

He said, "The key drivers for Kukdong Electric Wire's leading position in the ship and offshore sectors are the experience and technology that it has amassed over many years of work



Park Jong-Woon, Product Manager, Senior Executive Director, Kukdong Electric Wire

in related fields. Kukdong Electric Wire has met the requirements of market and customers in a timely manner and at the right place, such as the requirements for flame retardancy, cold resistance (cold bending & cold impact), and oil resistance and others. 'ICEFLEX cable' for extremely low temperatures which recently made debut, NEK TS 606, HIS cables for offshore applications, shipboard optical cables, 'QPL', the special cable for military applications, etc., are the innovative products which we are proud of."



1. Conductor : stranded tinned annealed copper as per IEC 60228, Class 2
 2. Fire proof layer (for fire resistant cable) : Mica glass tape overlap
 3. Insulation : Halogen-free ethylene propylene as per IEC 60092-351, HF-EPR
 4. Individual screen (option) : Cu/PS mylar tape with drain wire
 5. Collective screen (option) : Cu/PS mylar tape with drain wire
 6. Inner covering (for armored cable) : Halogen free thermosetting compound
 7. Armour (for armored cable) : Metal wire braid as per IEC 60092-350
 8. Outer sheath : Halogen free thermosetting compound as per IEC 60092-59 SHF2 or SHF Mud %.
- Certificates Approved : DNV

Figure 7. NEK TS 606:2009 - cable for offshore application

Targeting KRW 500 billion in sales by 2015

- A global leader in shipboard and offshore cables

TMC

TMC has established a leading position in the shipboard and offshore cable sector since 2008 through constant R&D and drastic investment. In addition, TMC has achieved an annual growth rate of 15.5 % over the last 5 years in the market for shipboard and offshore cables. Currently, TMC is diversifying its business portfolio, pushing ahead with the efforts to localize shipboard optical cables, acquire certifications from classification societies and certifications of industrial standards, expand the production line, etc., as part of effort to evolve into a global company. The business area of TMC is largely divided into 4 sectors: Offshore Cable, Oil & Rig Cable, Special Cable (Rubber cable, Nuclear power plant cable, Halogen free & fire resistant cable), and Optical Fiber cable.

Ahn Gong-hoon, Managing Director, Sales Division of TMC, said, "The shipboard and offshore cables comprised approximately 90% of about KRW 250 billion that TMC registered in sales last year. TMC has already surpassed competitors in this sector and set the target of KRW 350 billion in sales this year which will be met without problem if the current performance is sustained."

TMC has been highly recognized by ship owners and shipyards for its high productivity and reliability and is currently



Ahn Gong-hoon, Managing Director, Sales Division of TMC

supplying products to major domestic shipyards. In the incipient stage of business, TMC launched aggressive marketing campaigns targeting the ship owners and shipyards in an attempt to increase its brand awareness. Particularly, TMC pressed ahead with technical sales strategy targeting the shipyards and attained the fast growth in short period of time. The key driver of TMC's growth is the quality, timely delivery, and cost competitiveness. Specifically, TMC has the world-class productivity. Currently, TMC's second manufacturing plant occupying approximately 13,000m²(4000 pyong), located adjacently to its first manufacturing plant, has already started operations. TMC's second manufacturing plant is equipped with the manufacturing and inspection facilities for new products, special cables, optical & electrical composition cables which the company is intensively focusing on, as well as the expanded facilities for shipboard cable production. TMC's productivity is reported to have increased by over 1.5 times compared to 3 years ago.

Ahn Gong-hoon, Managing Director, Sales Division of TMC, said, "TMC has been treading the fast growth path, com-



The TMC's first manufacturing plant

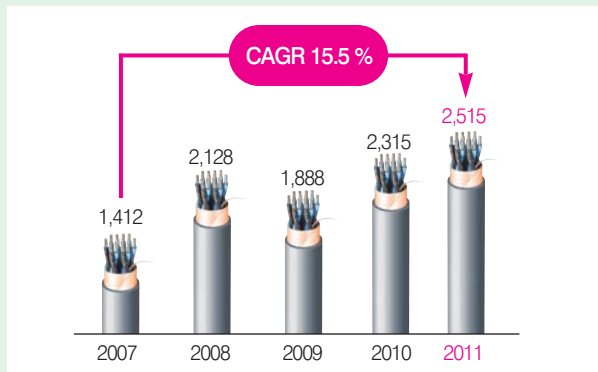


Figure 8. Changes in TMC's sales over the last 5 years

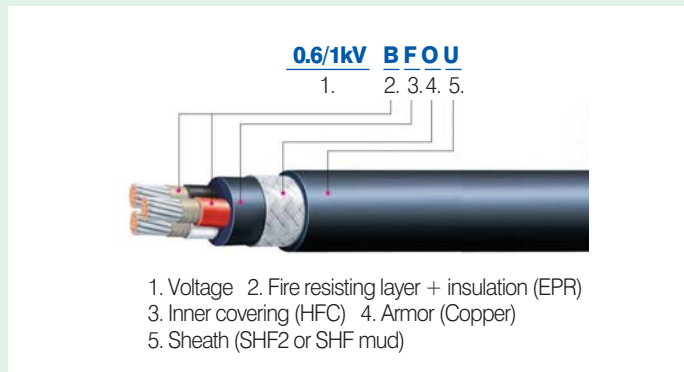


Figure 9. Halogen free & Mud resistant Offshore cable (O-ROUTE)

pared to competitors, because it predicted the market trends fast. Offshore cables require more rigorous specifications, compared to the cables used in existing ships, and particularly, require high stability, such as excellent cold resistance, chemical resistance, fire resistance and others. For that, TMC has pushed ahead with R&D and investment in facilities, and therefore established an undisputed leading position in the market for offshore cables.”

Growth in new orders from abroad

TMC expanded and developed its technological capability in the market for the cables used in shipbuilding and developed the unarmored paint resistant cable as part of effort to achieve the world's top leading position in related sector by 2021. (Most shipboard cables have the steel armored layers to protect the cables from external physical impact.) The market for offshore cables requires high oil resistance, environmental resistance, and cold resistance technologies as the oil and gas field drilling operations expand to the polar regions. Thus, TMC is expanding its boundaries through constant R&D and innovation.

Major products of TMC include the cable (S-ROUTE) for commercial vessels, offshore cable (O-ROUTE, P-ROUTE), cables for passenger ship (E-ROUTE), HIS cable developed jointly with Hyundai Heavy Industries, FINE-ROUTE developed jointly with STX Offshore & Shipbuilding, and optical cable for shipboard and offshore applications which was localized for the first time nationwide.

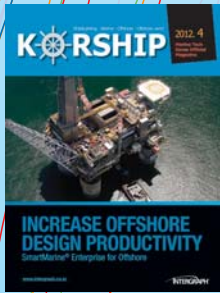
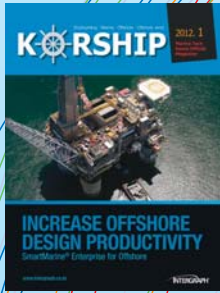
Particularly, TMC unveiled the composition cable for motor heater and the cable for ballast pump, which were jointly developed with Daewoo Shipbuilding & Marine Engineering.

These cables received the certifications from various classification societies and completed patent registrations, which proves TMC's excellence in technology for shipboard cables.

Ahn Gong-hoon, Managing Director, Sales Division of TMC, said, “Ship owners and shipyards demand very strict specifications for the cables, particularly the cables used in ultra large offshore plants such as FPSO, drillship, etc., in the same way with high value-added vessels such as LNG carriers. That is why we expanded our second manufacturing plant and R&D center recently. Our R&D center is currently staffed with 30 researchers, and the research workforce will increase to 50. Furthermore, we plan to gradually raise the proportion of R&D budget to 4% of total sales.”

Meanwhile, TMC expects that the water resistance would increase from 300kgf/cm² to 400kgf/cm² as the current water depth limits of drilling will expand from 3,000m to 4,000m amid the heightened interest in deepwater resources exploitation.

TMC is moving ahead with "Challenge 511", a mid and long-term vision to take a leap forward, using the achievements so far as the stepping stone for more success. To evolve into the world's best energy and information transmission product manufacturer, TMC has set the target of KRW 500 billion in sales and plans to turn itself into the undisputed global leader in the industry and the best company assuring the greatest satisfaction of customers with quality by 2015. For that, TMC is pushing forward with its strategy to increase its share in overseas market, identify new growth engine, and take its business management infrastructure to the next advanced level. ⚓



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Vacon Korea Busan Office

#2403 Centum Leaders Mark, 1514 Woo-Dong,
Haeundae-Gu, Busan 612-020, Korea
Tel. +82(0)51 784 6668 • Fax +82(0)51 745 8363





Prognosis: Ship Energy Efficiency Management Plan (SEEMP) 2013

My objective in this article is to remind our friends, the highest achievement in Energy Efficiency will start at revisiting the fundamental knowledge of the Energy and skills in Energy Management. History tells us; never to forget the beginnings (the fundamentals) during the evolving environment (not me but, some call it the bad times)! We must simply be more humble, go back to the drawing table, look at the fundamentals and sustain the investment in people as I believe the key ingredient in wining (or to survive) is creativities and efficiency. It will only come from knowledge and skills enhancement of the human resources as it is the only unknown productivity in the players (Business Enterprise). Shipping and shipbuilding can't be faded as the world will get even closer. The evolving environment and the paradigm shaft will instigate the lead position of the players. The pies likely are divided amongst the leaders and those who survived.

Kil-su Yun Manager / Coordinator

GL Academy

Growing challenges in business environment is, the climate change, rising fuel prices and stricter legislation make energy efficient operation a key topic as well as the most important issue for ship operators now.

The MARPOL legislation, mandatory SEEMP by Jan. 2013, focuses on energy efficiency. Yes, The IMO regulations MEPC.1/Circular 683 must be implemented throughout your fleet by 2013.

To be able to find the best ship- and company specific measures to reduce energy consumption (and therefore fuel cost) onboard, the Ship Energy Efficiency Management Plan (SEEMP) fosters structured and codified management processes with the aim of increasing a vessel's energy efficiency.

The Technical Directors, Superintendents, Fleet Managers, Chief Operating Officers, Chief Engineers, Masters and Nautical Officers are some of the potentials can be designated for a project team to build, apply & implement the SEEMP to address the operational demands in challenging business environment.

To draw-up, apply and implement the SEEMP requires, the team make up of operations personnel and the Energy Management Expert in the team will be a key to the project SEEMP. Other instrument in drawing up a SEEMP will be to

reference IMO MARPOL Legislation and to ISO 50001.

The knowledge of Energy Management team and their expertise should include Fundamentals of Energy (definition, units, rules and calculation of energy), Electricity, Thermal energy, Chemical energy, Current Climate Changes, Cost aspects of energy, Management responsibilities, Energy policy, Energy planning (Legal and other requirements, Energy review, Energy baseline, Energy performance indicators, Objectives, targets and action plan, Evaluation of potentials etc) and Implementation of the Energy Management System (Competence, training and awareness, Documentation,



Figure 1. Operational energy management process

Operational control, Communication, Procurement etc). Additionally for continual improvement, checking performance, Management review

Brief introduction to ISO 50001 Certification

Get your Energy Management System certified by an external certifier as it can improve your company image, increase the relevance of your Energy Management System, save money (EEG apportionment, energy taxes). Select your certification company carefully.

- Initial certification: Energy Management System should run

at least three month to deliver all relevant data.

- Re-certification: Do it in time before your certificate expires.

The initiative will be to gain knowledge, a good background of the requirements of a SEEMP as recommended by IMO, the knowledge for implementation of corresponding measures, within the framework of a SEEMP.

The facts are that energy efficiency and environmental performance are getting more and more attention from regulators and markets. A Warm Up: Each vessel must have a SEEMP by 2013.

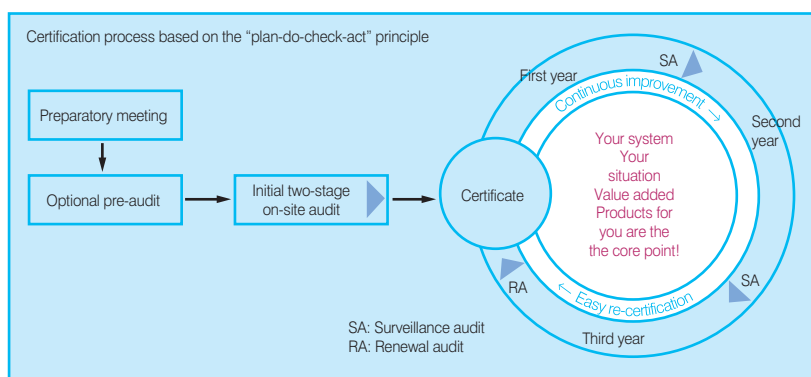


Figure 2. Process of ISO 50001 Certification

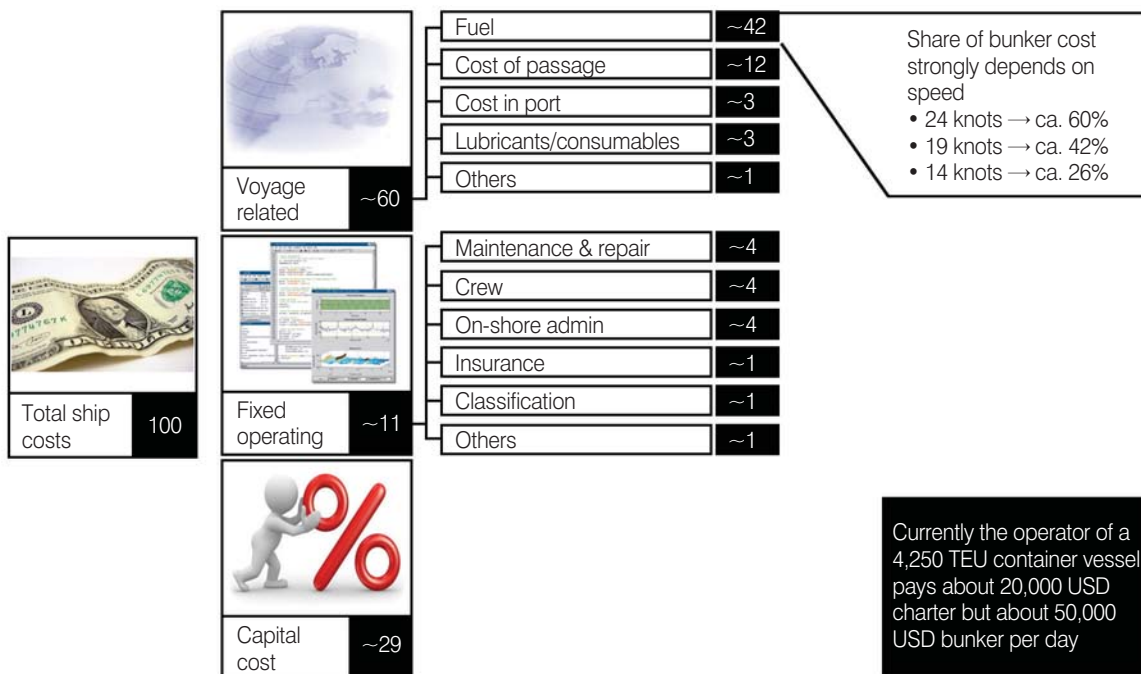


Figure 3. Energy costs account for 30-60% of total shipping costs, up to 3 times as much as capital costs

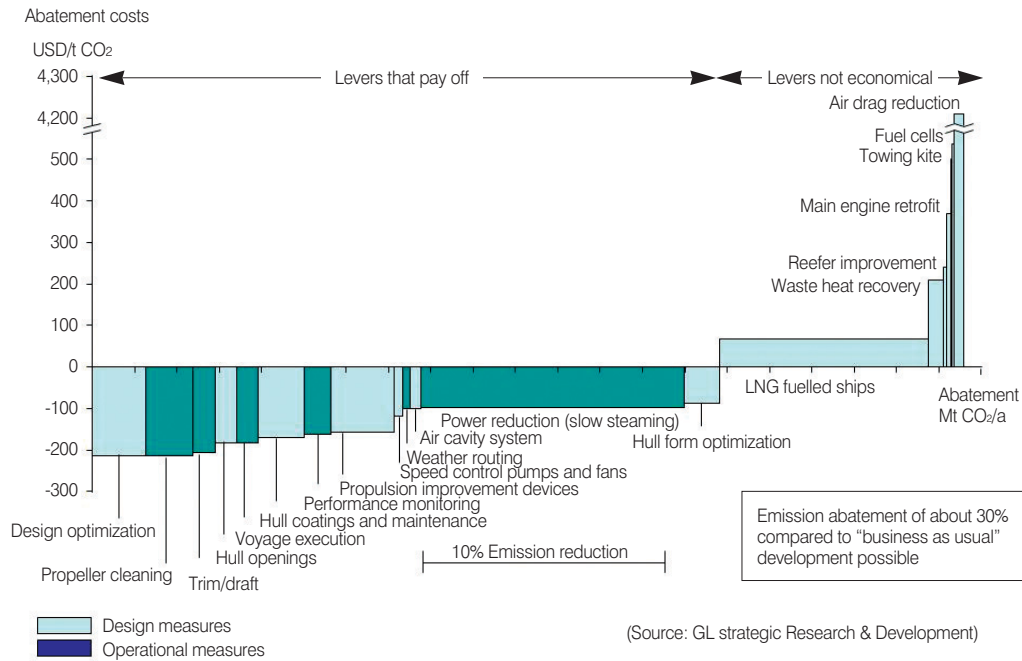


Figure 4. Slow steaming is one operational measure to reduce bunker costs, but there are many more levers to be pulled

Why the SEEMP? Overview and timeline for maritime environmental regulations, Regulatory initiatives for improving air quality are getting more and more global. Some of the influencers are;

- CO₂ - Technical and operational measures need to be flanked by market measures to stay <2°C
- The industry favours voluntary self-regulation
- 2011: Threat of mandatory CO₂ emissions trading scheme urged IMO to make SEEMP and EEDI mandatory from 2013
- The CO₂-challenge for shipping and market demand for efficient ships
- Operators have an inherent interest to save fuel
- Energy costs account for 30-60% of total shipping costs, up to 3 times as much as capital costs (Figure 3)
- Looking ahead, bunker prices are likely to double over the lifetime of a vessel
- Owners have different concerns during the vessel's lifetime
- Significant fuel savings can be secured in the design and the operations phase
- Slow steaming is one operational measure to reduce bunker costs, but there are many more levers to be pulled (Figure 4)

Some of the key tasks in building and maintaining a SEEMP will be the SEEMP Process, Planning, Goal Setting, Implementation, Monitoring and record keeping, Evaluation and improvement, Statement of Compliance.

The IMO Requirements are, SEEMP included in MARPOL, MARPOL Annex VI Regulation 22, Energy Efficiency Operational Indicator EEOI.

Target areas of operational efficiency may include Fuel Efficiency, Hull & Propulsion System, Improved Fleet Management, Optimized Ship Handling and Voyage Optimization.


SEEMP 2013 is written in view to assist the maritime industry preparing for challenging business environment. Please be advised that the large amount of texts and quotes are from GL Academy Seminars Energy Manager ISO 50001 and Application & Implementation of SEEMP. The two seminars are recommended for Energy Management System ISO 50001 Certification. 



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Korea takes the lead in the international standards for ship and shipbuilding-IT convergence

The shipboard communication network security technology, developed in Korea, was adopted as a draft of International Electro-technical Commission (IEC). Thus, Korea is expected to be better positioned in establishing the international standards for the marine equipment sector.

Korean Agency for Technology and Standards (KATS) under the Ministry of Knowledge Economy (MKE) announced in the Maritime Radio Communication Technology Committee of IEC (IEC TC80) - which supervises international standards in global ship communication sector - that Korea's shipboard communication network security technology gained approval (89%) from 16 countries including the United States, Japan, Germany, etc., and was adopted as the draft of international standards on June 18. The safety and security technology for ship communication', developed by Korea's Electronics and Telecommunications Research Institute (ETRI) is related to

the 'transmission of image' over the SAN-Ship Area Network which was incorporated into the IEC international standards last year.

This technology protects the network and navigation system from potential risks, such as virus attack, hacking, etc., and prevents errors that may be caused by traffic increase in various sensors inside the ship. This technology will be applied to various network-based marine equipments (automatic ship identification system, electronic navigational chart and others).

This standard technology can be applied to small and medium-sized vessels such as yachts, as well as large vessels, and

is expected to create a demand for the equipment related to about 1 million new yachts that are put on the market each year. Particularly, this technology is very likely to be adopted as the compulsory standard of International Maritime Organization (IMO), following the shipboard Ethernet communication (IEC 61162-450), which raises the prospect that domestic yards and marine equipment manufacturers would be better positioned to dominate the global market.

Last year, the Ship Area Network (SAN), the wired/wireless integrated ship network communication technology proposed by Korea was adopted as international standard of IEC (IEC 61162-450), and has been applied to approximately 100 commercial ships mandatorily so far. The global market for ship-IT equipment is projected to be worth approximately USD 8 billion. European countries and Japan are currently dominating the market, followed by Korea and China.

Korean Agency for Technology and Standards (KATS) plans to proceed with a comprehensive strategy framework for standardization in an endeavor to help Korea evolve into a powerhouse for high value-added vessels in the shipbuilding and IT convergence sector which is affected significantly by standardization. 

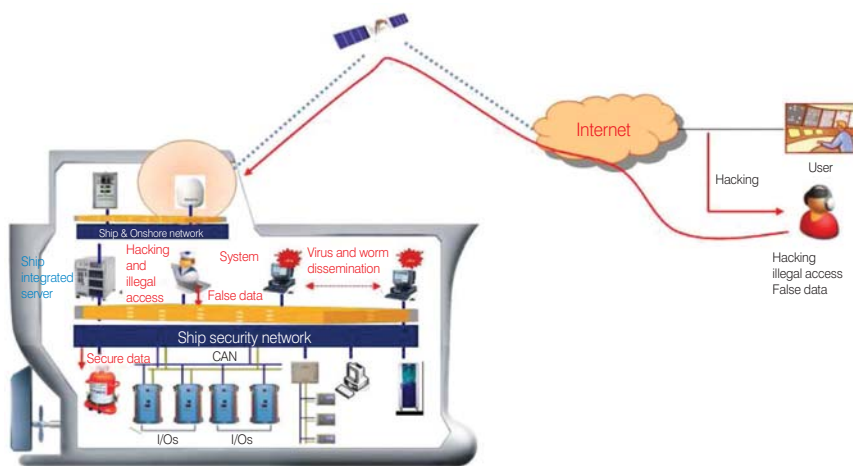


Figure 1. Schematic diagram of ship network of KATS under MKE

Honeywell expands its gas business capability through Enraf & RMG

- Broadening its reach from onshore to offshore

Recently, gas has come into the spotlight in the energy market. Shale gas has also emerged as alternative energy for oil. The development of technology and cutting-edge offshore drillship enable the exploitation of subsea energy resources. Honeywell showcased innovative gas regulation and measurement solution in the '25th World Gas Conference' that opened in Kuala Lumpur on June 4.

Honeywell, the leader in ship automation, has maintained its leading position in the field of instrumentation, control systems, advanced applications in the oil and gas market. Honeywell has supplied the control system to onshore plants in Korea since 1980s, and has tapped into new markets in the ship control sector as part of effort to expand its boundaries of business over the last decade. Particularly, Honeywell has offered total solutions for ship and offshore plant markets, such as control system, APC (Advanced Process Control), tank gauging system, field instrument and others.



Honeywell's booth in the '25th World Gas Conference'

Gas solutions with stronger competitiveness

Honeywell established the Engineered Field Solutions (EFS) division to sharpen the competitiveness of its product lineup in each sector, including gas regulation, metering, automation, control, etc., amid heightened interest worldwide in gas market.

EFS division integrates 4 business areas such as RMG (RMG by Honeywell), Enraf, Gortor, and Mercury. Honeywell's major products were showcased by brand, except for Enraf, during the WCG

in June. Particularly, Enraf and RMG, acquired in 2007 and 2009, respectively, can be said to be the core of EFS division. According to Honeywell, the tank gauging system of Enraf and gas flowmeter of RMG were essential for Honeywell to build competitive solutions for the ship and offshore markets. In particular, skid-mounted and pre-packaged solutions are designed to meet the individual requirements of major customers such as Shell and ExxonMobil.

Pil-Eun Jang, Business leader,

Engineered Field Solutions, Honeywell, said, "RMG, Enraf and others proved their performance in the offshore plant market and European countries that have already been actively engaged in the oil and gas development. They are expected to create synergic effect with existing product lineup of Honeywell. Specifically, EFS, which integrated 4 business areas, such as RMG, Enraf, Gortor, and Mercury, will play a pivotal role in increasing our share in the gas market."



Albrecht Jakob Business manager Gas metering - RMG Center of Excellence, RMG by Honeywell

Total solution for gas business

RMG, the process solution division of Honeywell, launched the gas business in 1843 and has supplied the gas metering and regulation products for industries. RMG has successfully operated its business, particularly in the field of gas pres-

sure reduction stations, for a long time. Albrecht Jakob, Business Manager Gas Metering - RMG Center of Excellence, RMG by Honeywell, said, "RMG has high brand recognition as a high-end metering product in Europe, but is not well-known in Korea. It has proven excellent performance in the fields of major gas facilities and equipment that require high performance such as gas terminal. The pure metering product was applied to Korea Gas Corporation at the end of last year."

Various solutions of RMG, such as turbine meter, flowmeter, regulator, shut-off valve, etc., were showcased during the WCG.

Ultrasonic Flowmeter USZ 08 is a product that ensures accurate measurement and volume of gas transferred from the gas terminal. USZ 08 is composed of a range of custody-transfer metering and secondary metering devices useful to determine how much gas is generated and transferred at different stages of gas distribution chain.



Turbine meter of RMG by Honeywell

Along with that, the device offers easy operation using control computer with corrector function from flow computer Series ERZ 2000.

RMG 711 Shut-Off Valve is used in the gas pressure regulating stations and easy to maintain and repair, and has the advantage of easy replacement of internal parts without need for dismantling the valve from the line. Furthermore, it has the features such as the integrated pressure compensating valve, low pres-

Gas Pressure Regulating Stations by RMG

RMG by Honeywell has successfully engineered gas pressure reduction stations for over 5 decades. This encompasses the skid-mounted and pre-packaged pressure drop solutions which are used for above-and below-ground applications. These stations range from domestic regulator skids to high-pressure gas transmission stations, including the regulators, filters, and isolation valves. They can become available with slam-shut and safety relief valve, if necessary.

RMG by Honeywell's pressure controlling stations can be designed and built as per individual customers' specifications. They apply modern practices in the control of gases, and furthermore, incorporate the features to realize high integrity. The units built at factory are pre-tested to ensure that the rigorous quality assurance standards are met, while simplifying installation, commissioning and decreasing the manpower requirements at the site.

Gas Metering Systems by RMG

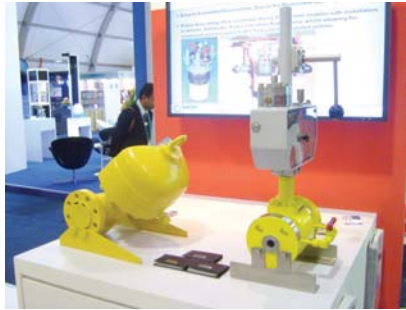
In addition to the devices used to compute the gas quantity based on the measured values of density (volume correctors), RMG solution includes volume measuring instruments, including rotary displacement, turbine and ultrasonic meters, pressure, temperature, and gas analysis system. These devices offer all data which are necessary for the billing of industrial gases or natural gas. Honeywell's equipment is offered as a complete measurement system for gas metering stations or is available individually.

sure drop due to in-line flow, high response accuracy and short response time, max. flow rate not exceeding 80 m/sec, and others.

Enraf is the solution which corresponds to the storage in Honeywell's overall business areas of production', 'processing', 'storage', 'transmission', and 'distribution'. Enraf, which provides high stability, is capable of offering the "SmartTerminal for gas (LNG) storage" solution, which manages and controls in a most efficient,



RMG 711 Shut-Off Valve of RMG by Honeywell



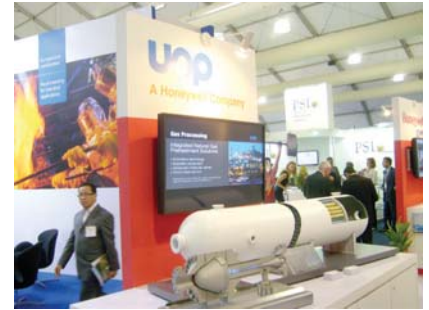
Gas pressure regulating systems of Gorter

effective and profitable. Enraf has maintained a leading position in the field of tank gauging and terminal automation for the LNG industry over 3 decades.

Major advantages of Enraf is as follows:


- Tank Gauging
- Safety integrity
- Field equipment interfacing
- Host systems integration

Gorter brand of Honeywell has the product lineup similar to that of RMG and is the solution suited for the low-end fields. R100 series, the most typical products of Gorter, consists of several effective high



Natural gas pretreatment solutions of UOP

pressure regulators for use in gas transmission system, gas distribution networks and industrial gas pressure regulating systems.

UOP, a subsidiary of Honeywell, is a SW-based licensing company that provides the process technology related to the oil refining and petrochemical fields. UOP showcased the state-of-art process technologies related to the offshore gas processing during the WGC. 

Station Automation and Control Systems by RMG

Based on the requests of customers, RMG designs and builds station automation and control systems. Natural gas cools down at relaxation of pressure. Low temperatures may lead to icing, separation of condensate, besides the hydrate formation with a potential effect of malfunctioning on pressure and flow control. The temperature control can be managed and operating costs can be decreased when the intelligent automation systems are used.

The flexible programming of RMG automation systems ensures quick conversion of complex gas controllable and regulative technical tasks such as outlet pressure regulation, meter protection, inlet pressure, and standard flow control.

Integrated Terminal Automation Solutions by RMG

Terminals receive oil and gas directly from fields through pipelines or from redistribution to tankers, rail, pipelines or processing plants. The terminal management system ensures that a terminal can operate in a safe, secure and well-documented fashion. The enhanced use of storage facilities and efficient management of terminal operations are vital for moving product throughout the enterprise.

The integrated Terminal Automation Solution (TAS) of Honeywell helps manage the movement of hydrocarbons through the global network of pipelines, terminals and tankers, eliminating the losses and conforming to the strict regulations of government. Honeywell offers total automation from field to boardroom to terminals around the globe, with integrated applications used for oil movement, inventory management, industrial security, and operations scheduling.

HHI enters the global market for gas engines that reduce CO₂ and NO_x by 97%

HiMSE engine of HHI was developed for the propulsion of ship and power generation and is highly recognized for its excellent features such as the modular design for lightweightness, high output and efficiency, etc.



Trial operation of 'HiMSEN' gas engine

Hyundai Heavy Industries (HHI) achieved the feat of exporting 'HiMSEN', an eco-friendly gas-powered engine developed with independent technology for the first time nationwide. Recently, HHI successfully completed the official trial operation of 'HiMSEN H35/40GV', the unique model of gas engine, in the presence of approximately 20 people, including the customers from Middle East, at the Engine Technology Center of its Ulsan Headquarters. HiMSEN, an eco-friendly LNG-powered engine, has the maximum output of 13,000 horsepower. It can be used for both offshore and onshore power generation and installed in offshore facilities

such as drillship. HiMSEN has the engine performance efficiency exceeding 47%, the highest worldwide, and reduces the emissions of carbon dioxide (CO₂) by more than 20% and harmful nitrogen oxides (NO_x) by over 97% (50 ppm) compared to diesel engine. HHI plans to export HiMSEN engine to the onshore gas power plants in the Middle East after the final painting, anti-rust and packing processes. This year, the global market for gas engine (medium to large-sized engines) is expected to reach approximately USD 1.7 billion. The demand for gas engine will further increase as the exhaust emission

requirements have become more stringent after WTH classified the diesel exhaust gas as human carcinogen. HHI expects that the mass production of this eco-friendly engine will lead to the market diversification and increase in sales amid the sustained high oil prices and rigorous enforcement of regulations on exhaust emissions worldwide. Meanwhile, HHI, which captures in excess of 30% of share in the global market for large engines, aims to carve out 15% share of the market for the gas engines used in the power generation and join the ranks of the global top 3 companies by 2013. ⚓

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DNV reveals technology uptake towards 2020

DNV has developed a simulation model using global shipping data and technology specific information to predict the deployment of emission reduction and energy efficiency technologies up to 2020. The results show that high fuel costs will result in a drive towards more energy efficient ships ahead of the EEDI regulatory timeframe. Fuel choices up to 2020 will be driven by the time spent in an Emissions Control Area (ECA), but distillate is a more likely option than scrubbers for most ships towards 2020.

By 2020, it is expected that new tankers, bulkers and container vessels will be up to 30 per cent more energy efficient than today's newbuildings. DNV predicts that one-third of the reductions will be cost effective for ship-owners. The Energy Efficiency Design Index (EEDI) will be the driver for the remaining two-thirds of the efficiency gains.

These results have been obtained by examining the technology choices available to ensure regulatory compliance and how these technology options will be adopted based on simulated investment decisions for individual ships.

The model can support owners and managers in their business-critical decisions by providing a ship-specific scenario analysis as well as market predic-

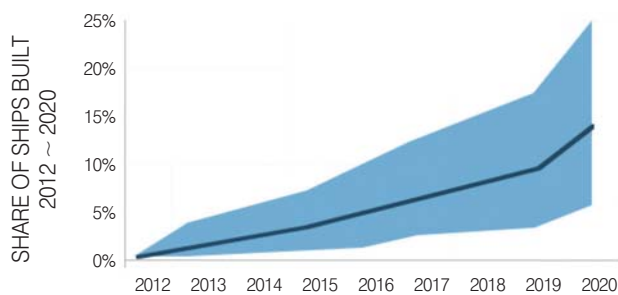
tions for specific ship segments or the entire world fleet. The model is not restricted to the newbuilding market alone, and offers insights on fuel choice, exhaust gas treatment and ballast water treatment for existing ships as well. Over 20 technology options have been included in the modeling process.

The results of a survey conducted March 2012 and involving a number of the world's leading shipping companies have been used as the basis for the investment decisions. The model also factors in fuel availability, regulatory timelines and the net growth in the world fleet, amongst other things. This is not an optimization model trying to predict the optimal choices for the world fleet, but a model that aims to simulate the most

likely outcomes amongst a multitude of technology options and preferences in a highly uncertain world.

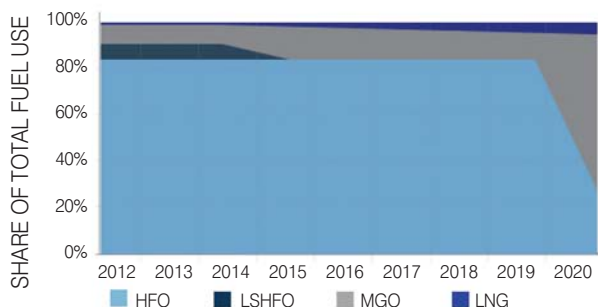
An analysis of fuel choices reveals that between 10 and 15 per cent of the newbuildings delivered up to 2020 will have the capacity for burning LNG as fuel. This equates to about 1,000 ships. Larger vessels will benefit more from using LNG than smaller vessels. Furthermore, a gas-fuelled engine can be justified if a ship spends about 30 per cent of its sailing time in ECAs. In 2020, the number of ships using LNG will increase significantly with the introduction of a global sulphur limit.

"Incorrect investment decisions could be devastating for individual ship-owners and collectively they could impact nega-



(source: DNV)

Figure 1. Cumulative uptakes of LNG engines




(source: DNV)

Figure 2. World fleet fuel mix

tively on the environment as well," says DNV President Tor Svensen. DNV believes the industry must work together to avoid a legacy of sub-optimal ships entering the global fleet in the lead up to 2020. "This model gives ship-owners a clear technology and market context to work in, with the opportunity for targeted analysis of individual ship profiles."

Current annual demand for distillate fuels is around 30 million tonnes. This will rise to 45 million tonnes when the 0.1 per cent limit comes into force in ECAs and will be around 200~250 million tonnes by 2020. Conversely, the demand for heavy fuel oil will plummet from around 290 million tonnes in 2019 to 100 million tonnes once expected global emissions regulations enter into force in 2020.

"Ship-owners costs will increase sharply in 2020 when even more stringent air emissions regulations take effect. It will be unfamiliar territory for us all as the fuel market adjusts," says DNV President Tor Svensen. "The investment decisions made over the next few years will be critical preparation for this time and DNV is dedicated to ensuring that the industry as a whole is ready and able to make the correct decisions to ensure responsible environmental stewardship that also makes good business sense." 

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ABS Supports Technology Development for Wind Energy

ABS, the leading provider of classification services to the global offshore industry, has concluded a study on the technical feasibility of floating wind turbines for the Bureau of Safety and Environmental Enforcement (BSEE) on 5 June 2012.

The goal of the study was to determine how floating structures and moorings would be affected by the strong interactions among the wind turbine rotor, control system, floating platform and mooring/cable system and how different loading events could impact these systems.

ABS was awarded this study in December 2010 through the BSEE's Technology Assessment and Research (TA&R) Program. The project included a technical feasibility study of existing floating wind turbines. Study results served as a basis for identifying the critical technical challenges to deploying floating wind turbines on the US Outer Continental Shelf (OCS). The final step of the project was the proposal of a draft design guideline for permitting floating wind turbine deployment on the US OCS.

Extensive case studies were conducted to evaluate the characteristic load conditions and global responses of three representative design concepts, including a spar-type, a TLP-type and a column-stabilized (semisubmersible-type) floating support structure and their associated stationkeeping systems. Operational and extreme environmental conditions of the East, West and Gulf of Mexico coastal regions on the US OCS were applied in all of the case studies.

Research findings were presented at a one-day workshop held at ABS World Headquarters in Houston, Texas on 20 March 2012. Representatives from national registries, industry, government and academia joined forces to discuss the results of the research and analysis. Recommendations have been made for future research on the simulation software, design and analysis methods, design standard development and hurricane wind modeling for floating offshore wind turbines. The final report was submitted to BSEE in mid-May 2012.

ABS also was involved in an earlier BSEE TA&R project that resulted in a report titled "Design Standards for Offshore Wind Farms," which was submitted to the BSEE in September 2011.

A Neutral XML schema for basic design stage interface to class societies (3)

Intergraph (Korea) Corporation

4.6 GEOMETRY SCHEMA

The geometry schema supports a rich set of analytic objects, such as point, line, ellipse, plane, and vector. Many support both a two- and three-dimensional definition. In addition, a set of objects are provided to define Non-uniform Rational B-spline curves and surfaces made up of control points, knots, parameters, and weights, as illustrated in Figure 17. Table 6 lists the elements (objects) of this schema subset, as well as the simple and complex data types.

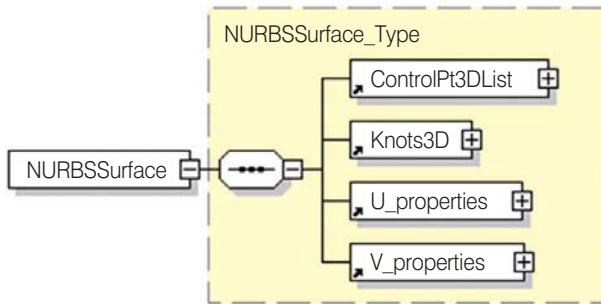


Figure 19. "NURBS Surface" Schema

4.7 PLATE GEOMETRY SCHEMA

This schema subset provides the definition of objects that represent the various aspects of the geometry of a plate in a contextual manner, such as "inner" and "outer" contours. In

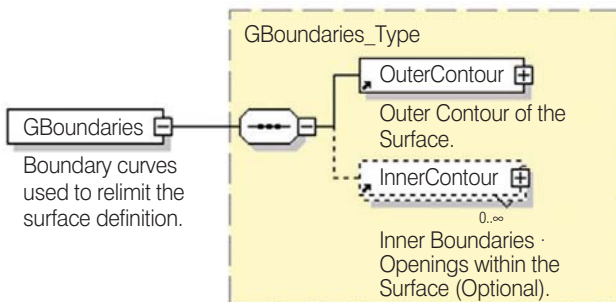


Figure 20. "GBoundaries" Schema

Table 6. Geometry Schema Objects and Data Types

Elements	Complex types
Axis3D	Contour2D_Type
CenterVertex2D	Contour3D_Type
CenterVertex3D	Contour_Type
Contour2D	ControlPt2D_Type
Contour3D	ControlPt3D_Type
ControlPt2D	ControlPt3dList_Type
ControlPt3D	Ellipse2D_Type
ControlPt3DList	Ellipse_Type
Ellipse	EllipticArc2D_Type
Ellipse2D	EllipticArc_Type
EllipseRatio	Knot_Type
EllipticArc	Knots3D_Type
EllipticArc2D	Knots_Type
EndAngle	Line2D_Type
EndPoint2D	Line3D_Type
EndPoint3D	NURBS2D_Type
Knot	NURBS3D_Type
Knots2D	NURBSSurface_Type
Knots3D	ParamProps_Type
Line2D	Plane_Type
Line3D	PlaneContour_Type
MajorAxis	Point2D_Type
MajorAxis2D	Point3D_Type
Normal	Point3DList_Type
NURBS2D	Transformation_Type
NURBS3D	Vector2D_Type
NURBSSurface	Vector3D_Type
Origin	
Plane	
PlaneContour	
Point2D	
Point3D	
Point3DList	
PrimaryAxis	
RootPoint	
SecondaryAxis	
StartAngle	
StartPoint2D	
StartPoint3D	
TertiaryAxis	
Transformation	
U_properties	
UKnots	
V_properties	
VKnots	

addition, it provides for the capability to define both a 2D and 3D representation for many of the objects to support exchanging the definition of an object in a 2D “sketch” plane as well as the 3D result after projection onto a non-planar surface.

For both “inner” and “outer” contours, their definition is then made up of one type of geometry objects (e.g. line, ellipse, NURB) where the “elliptical arc’s” properties can be set such that they represent a circular arc.

Table 7 lists the elements (objects) of this schema subset, as well as the simple and complex data types.

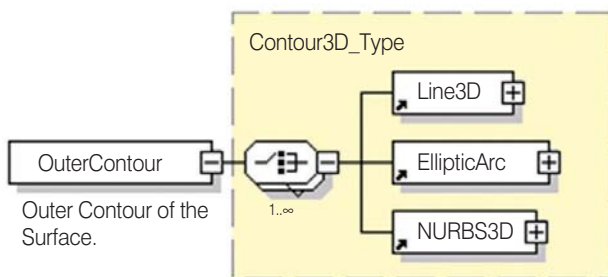


Figure 21. “Outer Contour” Schema

Table 7. Plate Geometry Schema Objects and Data Types

Elements	Complex types
Curved	Curved_Type
Embedded	DoubleArray_Type
External	Embedded_Type
Facet	External_Type
Facets	Facet_Type
GBoundaries	Facets_Type
GBoundaries2D	GBoundaries2D_Type
InnerContour	GBoundaries_Type
InnerContour2D	Geometry_Type
Opening	Opening_Type
OuterContour	PlanarSurface2D_Type
OuterContour2D	PlanarSurface3D_Type
PlanarSurface	PlanarSurface_Type
PlanarSurface2D	PolyMesh_Type
PlanarSurface3D	
PolyMesh	
SurfaceTextureU	
SurfaceTextureV	

5. SCHEMA EXTENSIONS

Several extensions can easily be envisioned for this schema that would extend it beyond its current capabilities and benefit all parties involved. The goal would be to introduce exten-

sions in such a manner that they would supplement the previous version of the schema and not force everyone to modify translators that were already developed and used in a production setting.

The author has found it ideal when real-world opportunities in the form of an application user set of requirements and a capital project can be coupled together so that the implementation is focused and validated as the work progresses. Following is a brief discussion of these extensions.

5.1 OPTIONAL PROPERTIES

One of the easiest extensions to add to the schema would be to support one or more optional “custom properties” that could be associated with any object in the schema. These would be represented by simple data types like integer, string, double, angle, area measure, volume measure, etc. Sender and receiver could then agree on a common interpretation of these custom properties.

5.2 OPTIONAL DESIGN HISTORY

For the most part, this schema supports the exchange of one state of the data model - representing the final state of the part. Many 3D applications support a history of operations that precede the final state. In the case of SM3D, these include a set of zero or more “seams” that serve to split the root systems into leaf systems such that their properties can be modified. The “plate systems” in this model represent these “leaf” systems; however, the data model is incomplete when it comes to the definition of seams.

5.3 OPTIONAL OUTFITTING OBJECTS

As stated earlier in the paper, the scope of the schema was “structural” models. If the schema was extended to support “outfitting” objects, a more complete set of data could be exchanged with analysis applications such as weight, hydrodynamics, and longitudinal strength. These outfitting objects could include equipment, piping, electrical, HVAC, stairs, ladders, and handrails.

5.4 OPTIONAL APPROVAL STATUS

During the early STEP AP development efforts, considerable debate and discussion centered on the idea of having an “approval” object in the schema such that it would be possible to denote whether an object was approved by a person and organization on a specific date and time. If it were reject-

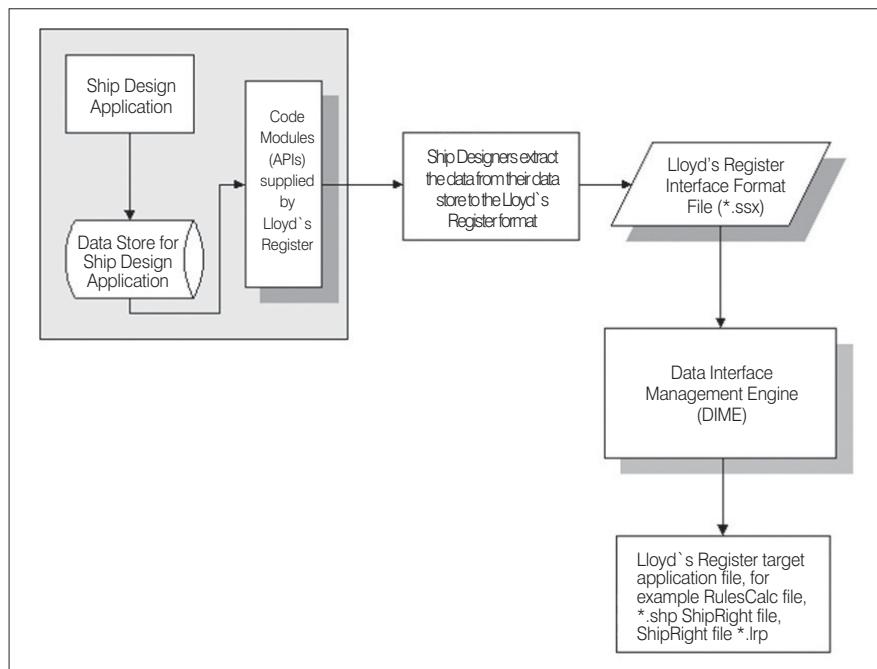


Figure 23. The LR Interface Process Workflow

ed, this object should carry the reason for the rejection. These extensions would better facilitate two-way exchanges between those responsible for the design and those responsible for its classification and adherence to regulatory standards.

5.5 OPTIONAL ANALYTICAL RESULTS

One last area where extensions could be beneficial is that of objects representing “analytical results”. Typically, a set of objects from a model is exchanged with an analysis application where the data may be augmented with additional information, idealized, and then fed to one or more third-party analysis applications. These applications produce various types of output such as text, Excel, and/or drawings. It would be helpful if the schema contained objects that could group all of this together such that it would be possible to know which analyses were run on which set of data and what the output and results were.

6. INDUSTRY ADOPTION

While the concept of a neutral interface is appealing, it provides no benefit unless it is utilized by the industry. Two real-world examples are provided that serve to validate the schema.

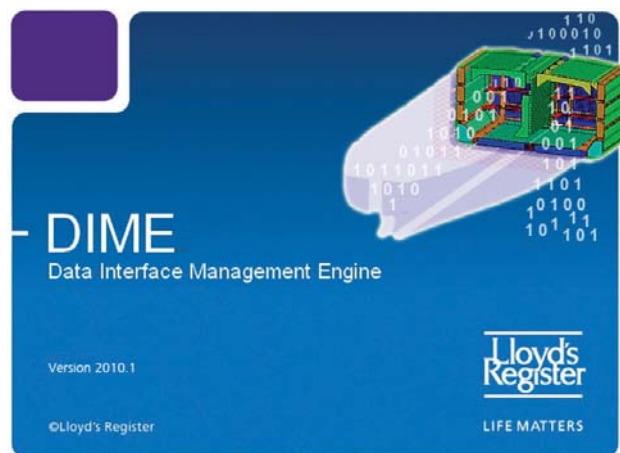


Figure 22. LR's DIME Interface Application

6.1 LLOYD'S DIME IMPLEMENTATION

Lloyds Register Group was an early contributor to the STEP data standards work described in this paper's introduction. As such, it developed a good understanding of the needs and benefits of creating interfaces to its analysis applications and the product modeling and CAD tools used by the industry. To this end, it developed an “Interface Toolkit” named “Data Interface Management Engine” (DIME) [Reference 6]

that it makes available free to the industry so that companies can develop an interface from their tools - or optionally, manually enter the data - and transfer their designs in a “paper-less” manner.

The existing Lloyd’s Register ship design assessment applications, such as RulesCalc, enable plan approval surveyors, shipbuilders, designers and consultants to perform assessment to Lloyd’s Register’s Rules and Regulations for Ships prior to submitting drawings for approval. This ensures that the classification aspects of a design will be right the first time, requiring minimal changes.

The Lloyd’s Register ship design assessment applications enable users to:

- Verify rules compliance
- Track down rule failures
- Rapidly identify areas of concern and the design modifications that might be required

The ship design assessment applications may be used as standalone systems (enabling users to enter data and use drawing tools to design the ship structure), and also in conjunction with other ship design systems. The interface process is depicted in the figure above:

While Figure 20 provides a graphical overview of the interface process workflow, the following steps detail the various actions one would take:

- (1) Ship designers design a ship using their chosen application.
- (2) The ship design data is stored in the ship design company’s data store.
- (3) Lloyd’s Register supplies the ship design company with code modules (APIs).
- (4) The ship design company developers extract the data from their data store, using the APIs.
- (5) A Lloyd’s Register Interface Format File (*.ssx) is produced.
- (6) The *.ssx file is validated in DIME and the appropriate Lloyd’s Register application file (for example *.shp) is produced.
- (7) The ship design is validated in the Lloyd’s Register application, for example RulesCalc.
- (8) The Lloyd’s Register application file and the drawings are submitted to Lloyd’s Register for Plan Approval.

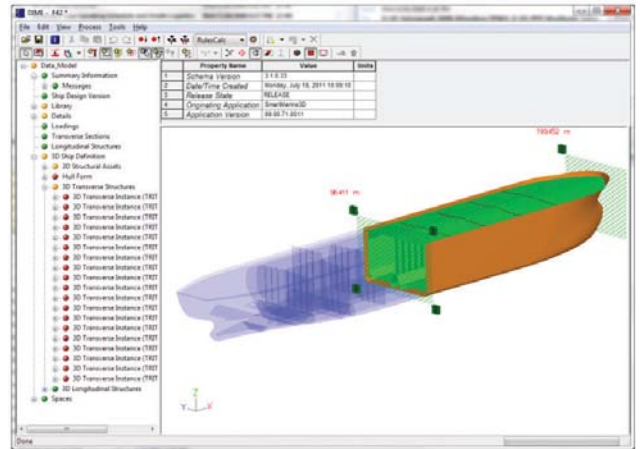


Figure 24. DIME Model Imported from SM3D

The figure below shows the results of importing a basic test model produced with Intergraph’s SM3D application into LR’s DIME application.

The imported data reflects both the native final trimmed SM3D geometry (shown in translucent blue on the aft end) as well as the data created by the DIME application. Options are provided to control viewing, check material properties, and, if necessary, define additional structure.

6.2 KYUSHU UNIVERSITY ACADEMIC PROGRAM

In 2009, the Department of Marine Systems Engineering, Kyushu University started an education program on SHIP Design using Intergraph’s Smart Marine 3D application and the Lloyd’s Register (LR) Rule Calculation application (RulesCalc).

This education program demonstrates the integration of SM3D and rule calculation applications. Master and Ph.D. level research students who have learned the ship design and classification society’s approval processes on a theoretical basis are now exploring these tools and applications to learn the practical ship design and classification society’s approval processes.

These students design the realistic, complete midship model using a design from a notable Japanese shipyard that has provided the drawings specifically for the university’s education program. This designed midship model is then imported into LR’s intermediate application (DIME) as a gateway to LR’s RulesCalc application. Within DIME, students verify all necessary data needs of the model for RulesCalc and make the necessary corrections if any problems or issues are

found.

This validated model is then imported into the RulesCalc application and all necessary Classification Society rules (Lloyd's rules) are then automatically calculated. Problem Areas are visually reported in the application by red-highlighted fields. Students then correct the problematic areas back in the "master" SM3D model and re-execute the same processes again until satisfactory results are achieved and RulesCalc reports no further problem areas.

7. CONCLUSIONS

The lack of commercial support for industry standard interfaces has provided the rationale and justification for an XML-based "neutral" schema interface mechanism between shipbuilding 3D modeling systems. This paper has provided the specifics of a representative subset of objects within the schema.


Validation of the schema for the intended purpose of exchange between a design system and a structural analysis tool has been provided through the ongoing and daily use of the schema to exchange data between SM3D and LR's DIME tool in a university setting. This paper has also described extensions to the schema that could serve to broaden their applicability and adoption across the industry.

It is the author's hope that by offering this schema to the industry, future interface work among the various stakeholders could be reduced from that which is now necessary in supporting the combinatorial explosion of point-to-point solutions on the market today. With a more universally supported, neutral schema approach, industry members would have a wider variety of choices for exchange of data between application solutions and third-party tools.

Without the benefit of an accepted industry standard, the challenge for the shipbuilding industry is to team together to adopt a "de facto" standard to meet its collective needs. The CIS/2 standard serves as a good model for the shipbuilding industry to follow.

8. ACKNOWLEDGEMENTS

The author would like to acknowledge the work of Mr. Sushant Godghate of Intergraph who assists Kyushu University Department of Marine Systems Engineering staff with lectures and is also a Ph.D. second-year student in the department.

Kyushu University students in this education program have expressed gratitude for having the hands-on learning experience that these applications provide and the opportunity and experience of learning a realistic and practical problem solving approach that supplements their theoretical studies. It is hoped that this experience lead students to undertake more detailed research in this area. 

AUTHORS' BIOGRAPHIES

Michael Polini holds the current position of SmartMarine® 3D Product Manager at Intergraph Corporation and is based in Hampton, Virginia, USA. He is responsible for defining the scope and requirements of the product and co-ordinates the activities of the Product Center (Development, Support, and Certification), Business Development, Sales and Marketing, and Product Management. He was heavily involved with the development of the STEP Shipbuilding Application Protocols - especially AP215, AP216, and AP218. He has both a B.S.E. and M.S.E. in Naval Architecture and Marine Engineering from the University of Michigan.

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ENGINEERING YOUR SUCCESS.

5 ppm type approval certification for bilge water separators

A new milestone in oily water treatment onboard ships has been reached. Ship owners seeking Clean Design class notation can now specify a bilge water treatment system that is certified according to DNV's new 5 ppm type approval process.

Alfa Laval

DNV Clean Design class notation is a voluntary new building specification which covers most aspects of ship design and operation. For bilge water, Clean Design stipulates a maximum 5 ppm of oil remaining in the water after treatment, prior to pumping overboard. MARPOL regulations stipulate 15 ppm. In 2011, DNV introduced a 5 ppm type approval process for marine bilge water separators. Leading the wave, Alfa Laval's PureBilge is the first system to obtain the new 5 ppm DNV type approval certificate. The system has also been granted the US Coastguard Certificate of Approval.

Previously, ship owners specifying 5 ppm have had to take the word of the equipment supplier that the system really does meet the limit. Unfortunately, this has not always been enough. Some systems actually have problems reaching even 15 ppm under real life conditions.

While claiming that their equipment can meet the limit, it is not unknown for suppliers to simply adjust the oil-in-water monitor down from 15 ppm to 5 ppm so that it functions as an oily water alarm with automatic stop.

Recirculation, tanks fill up

In such cases, the equipment is not removing the oil down to 5 ppm. It simply prevents it from being discharged overboard. The bilge water then goes into recirculation and fills up the bilge water tank. When this is full it is pumped to the waste oil tank and when that has no more capacity the ship has a problem. It is in situations like these that environmental infringements may occur.

Type Approval certification

In May 2011, the DNV 5 ppm Type Approval Program No. 771.60 became available for certification for Oily Water

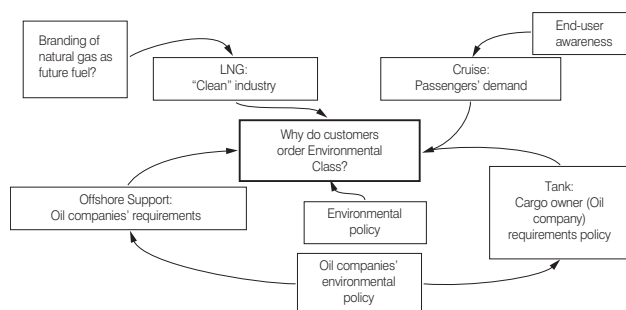


Figure 1. DNV Clean Design presentation (Source: DNV)

Separators (OWS) for the first time.

Alfa Laval's PureBilge system was tested according to this procedure and in December 2011 Alfa Laval obtained Type Approval Certificate No. P-13965 for PureBilge 2005 and 5005 (2.5 m³/h and 5.0 m³/h).

For Alfa Laval this was not a great step. Since its release on the market in June 2009, PureBilge had been tested onboard ships under real life conditions and consistently achieved results below 5 ppm.

Clean and Clean Design notations

DNV Environmental Class notation reduces a ship's environmental impact due to air emissions, sea discharges and accidental damage to the ship's hull. The notations award owners and operators who choose to design and operate their ships in an environmentally sustainable manner. The aim is to reduce the emissions from each ship so that the overall environmental burden from shipping is reduced.

DNV Clean notation stipulates that the vessel must be designed and operated in accordance with current and future

regulations for protection of the environment. Technical and management processes and procedures for collection, transfer and storage of waste must also be adopted.

The Clean Design notation is based on the same clean goals but is stricter. It stipulates that the constructional design and operation of vessels should be such that it minimizes their impact on the environment.

Why do ship owners want Environmental Class notation?

Clean and Clean Design class notations are voluntary environmental new building specifications. As indicated in Figure 1, an important driver is the oil majors' environmental policies, which are becoming increasingly stringent following a number of environmental disasters.

As cargo owners and charterers, the oil companies typically demand higher than normal environmental compliance from the ship owners transporting their cargoes, such as tanker owners and owners of offshore supply vessels.

The same applies to owners building LNG carriers and car carriers and, to some extent, to cruise lines, as environmental awareness grows among passengers.

Clear benefits

DNV points out that the image of the individual ship owner and operator will clearly improve with customers and authorities, "since the notation demonstrates that the company's policy is to be environmentally proactive in order to prevent accidental pollution as well".

For owners interested in promoting an environmental profile, the notation confirms a higher environmental standard. By adopting the Clean Design notation, owners clearly demonstrate that they have acted to limit emissions and operational and accidental pollution by taking proactive steps and responsibility.

Aspects covered by Clean Design

The Clean Design notation stipulates requirements for controlling and limiting operational emissions and discharges. As



Figure 2. DNV Clean Design presentation (Source: DNV)

Figure 2 shows, these requirements cover the most important environmental aspects: Fuel tanks' protection from grounding damage; handling of sewage and garbage; environmentally friendly antifouling; combustion machinery emissions (NOx and SOx); use of refrigerants; Green Passport Inventory for recycling the ship; handling of ballast water; handling of fuel oil; handling of bilge water.

As stated in DNV's "Guidance for the Environmental Class Notations Clean and Clean Design", "for Clean Design the vessel must have bilge water holding tanks as required for the Class Notation OPP-F, which means that they must have required capacities dependent on the engine rating. The machinery space bilges must not be discharged to sea, but be discharged to shore. Clean Design requires oil content of bilge water to be less than 5 ppm."

However, meeting DNV's Clean Design requirements for bilge water takes more than setting the oil-in-water monitor to 5 ppm. The treatment system must actually achieve 5 ppm. Current MARPOL legislation stipulates that separated bilge water containing 15 ppm or below oil in water can be discharged into international waters. In reaction to increasing environmental awareness in the shipping and other industries, future legislation is expected to be more stringent, requiring the limit to be reduced to 5 ppm. For the Great Lakes it is already 5 ppm.

Since a growing number of ship owners are specifying it and DNV now has a 5 ppm type approval process for bilge water separators, a MARPOL 5 ppm limit may not be far away.



Figure 3. PureBilge BlueBox of Alfa Laval

A new angle on OWS type approval testing

International Maritime Organization (IMO), resolution MEPC 107(49), effective from January 1, 2005, for type approval of bilge water separators for 15 ppm, specifies that, in addition to the removal of oil from bilge water, bilge water separators must be

tested with a stable emulsion (including fine particles and a surfactant chemical).

What differentiates DNV 5 ppm type approval testing from type approval testing for 15 ppm according to MEPC 107(49) - Actually, very little. It is basically the same basic process with one very important difference. As stated by DNV, "the 5 ppm bilge water separator must be designed to operate in each plane that forms an angle of 22.5° with the plane of its normal operating position."

This simulates a ship listing 22.5°. Thus, this testing process has gone some way towards simulating real life operating conditions at sea. Although Alfa Laval believes that it could have gone even further and simulated sea heave, the company sees this as confirmation of its assertion that centrifugal separation is the only effective technology for bilge water treatment onboard ships.

"The gyroscopic effect of the liquid circulating at high speed inside the separator bowl offsets pitching and rolling," said Pauli Kujala, Senior Business Manager, Oily Waste Treatment Systems, Alfa Laval Marine & Diesel Equipment. "The result is sustained high separation efficiency. If traditional static systems were to be tested with a realistic bilge water 'cocktail' under conditions simulating a rough sea state 24/7 for 20 days, they would immediately be eliminated."

The first certified 5 ppm Bilge Water Separator - PureBilge

So, for the first time there is a marine supplier who can supply a bilge water separator with a 5 ppm DNV Clean Design type approval certificate. Many claim to provide this performance, but only Alfa Laval with PureBilge currently holds the certificate. For the first time, the ship operator can sleep at night,

completely secure in the knowledge that his crew will not have to face full bilge water and waste oil tanks and that his ship is discharging treated bilge water with an oil content of less than 5 ppm (a good margin considering the MARPOL limit is still 15 ppm).

PureBilge is the only system on the market that provides a cleaning performance in real life conditions of 0-5 ppm oil content in the water without chemicals, adsorption filter or membranes. This cleaning performance is unaffected by sea heave, oil shocks or high solids loading, and no back flushing is required.

Fully integrated tamper-proof BlueBox

The PureBilge system is the fastest growing technology in the market. Like Alfa Laval fuel oil and lube oil separators, it offers the full automation and remote control that will be required by the unmanned engine rooms of the future. No manual engagement is required.


The system is supplied with the fully integrated tamper-proof BlueBox Bilge Data Recorder, which locks in critical data and encapsulates the whole sampling line. In combination with PureBilge's certified performance, the result is assured compliance - not only with IMO MEPC 107(49), but with the wishes of all who demand a greener profile.

About Alfa Laval

Alfa Laval is a leading global provider of specialized products and engineering solutions based on its key technologies of heat transfer, separation and fluid handling.

The company's equipment, systems and services are dedicated to assisting customers in optimizing the performance of their processes. The solutions help them to heat, cool, separate and transport products in industries that produce food and beverages, chemicals and petrochemicals, pharmaceuticals, starch, sugar and ethanol.

Alfa Laval's products are also used in power plants, aboard ships, in the mechanical engineering industry, in the mining industry and for wastewater treatment, as well as for comfort climate and refrigeration applications.

Alfa Laval's worldwide organization works closely with customers in nearly 100 countries to help them stay ahead in the global arena. Alfa Laval is listed on Nasdaq OMX, and, in 2011, posted annual sales of about SEK 28.6 billion (approx. 3.2 billion Euros). The company has today about 16 000 employees. 

Ships are not still



So why are bilge water treatment systems static?

Traditional bilge water treatment systems rely on gravity, filters or flocculation chemicals to achieve 15 ppm. But while they may pass type approval tests in stable conditions on shore, these static technologies seldom perform at sea.

Because in real life, the ocean is anything but stable.

In a pitching and rolling environment, only a dynamic system like Alfa Laval's PureBilge offers continuous bilge water treatment. PureBilge uses centrifugal separation – the same technology trusted to protect your engine – to handle varying bilge water feed and the toughest emulsions.

The result is less filter waste and reject. Not to mention less time in the engine room.



PureBilge – a dynamic force
in bilge water treatment



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FLIR thermal imaging cameras ideal for oil detection

FLIR systems offers a full range of maritime thermal imaging cameras for every possible application.

Oil recovery is an important task that needs to be performed quickly and effectively in order to be successful. FLIR thermal imaging cameras are an ideal tool to help the oil recovery teams to do their job effectively.

FLIR Systems Korea

To test the effectiveness of the maritime thermal imaging cameras of FLIR Systems for oil spill detection FLIR Systems set up a test in the OHMSETT tank in Leonardo, New Jersey. The OHMSET tank is one of the largest of its kind in the world, measuring 203 meters long by 20 meters wide by 3.4 meters deep. The tank provides a realistic full scale environment, complete with a wave generator and state of the art data-collection systems. The researchers from FLIR used it to replicate oil spills in realistic conditions. The goal of the test was to obtain quantitative information to confirm that thermal imaging cameras see oil on water. In order to do that the researchers investigated 5 different kinds of oil in different sea states, from glassy calm to storm-like, at different view-

ing angles and at different times of day.

The conclusion was that FLIR maritime thermal imaging cameras excel in providing real time video and photos of oil, even in the roughest of seas, in glaring sunlight, with no light at all and from just about any angle.

How does it work?

The detection of oil spill is based on the differences between oil and water in temperature, thermal reflection and thermal emissivity. Due to a difference in thermal conductivity oil will usually absorb heat faster during the day, thus it becomes warmer than the surrounding sea water. This makes it show up on the thermal images as a hot spot. During the night, the opposite is true; the oil body will lose heat faster than the surrounding water, which makes the oil show up as a cooler region.

During the day reflection oil also shows up in the thermal image because it reflects the thermal radiation from the sun differently. This is similar to the way that oil and water reflects sunlight differently, allowing the human eye to see a color difference.



The OHMSETT tank in Leonardo, New Jersey, is one of the largest of its kind in the world.



These FLIR thermal imaging cameras are pointed at oil spills in the OHMSETT tank at different angles.



A visible image and a thermal image of Doba/Chad crude oil, at a low camera angle, a glassy calm sea state, in full daylight.

Detect oil at night

Another difference that enables oil spill detection is a difference in emissivity. Although emissivity differs in the types of oil, generally speaking the thermal emissivity of oil is lower than that of water. This allows thermal imaging cameras to 'see' oil spill in complete darkness, which means that the oil recovery can continue during the night. That's very important because there's a very limited amount of time in which you can collect the oil before it sinks, dissolves or evaporates.

During the day thermal imaging systems also have an edge over visual imaging systems. Not only can thermal imaging cameras visualize oil spill in total darkness, they can also see through smoke, dust and light fog. And because visible imaging cameras rely on visual light they are much more susceptible to solar reflections and changes in the viewing angle, while these factors have very little effect on thermal imaging cameras.

DDE: visualize the smallest of thermal differences

But not all thermal imaging cameras qualify for oil spill detection. The thermal imaging camera has to be very sensitive to small temperature differences. One reason why FLIR thermal imaging cameras are an ideal tool for oil spill detection is that they contain a built in image processing algorithm called Digital Detail Enhancement (DDE). This allows the camera to visualize even the smallest of thermal differences.

Put to the test

After the tests were finished, the thermal imaging cameras had to prove their usefulness in earnest. On April 20, 2010, just a few weeks after the initial tests the Deepwater Horizon drilling rig blew up. The explosion killed 11 workers and injured 17 others; another 98 people survived without serious physical injury. It caused the Deepwater Horizon to burn and sink, and led to the largest accidental marine oil spill in the history of the petroleum industry.

FLIR maritime thermal imaging cameras were intensely used by the oil recovery teams to provide valuable information about the location of oil. Whether during the finding, containing or the consecutive cleanup, FLIR maritime thermal imaging cameras contributed to the entire recovery process.

FLIR maritime thermal imaging cameras can be plugged into just about every existing video monitor using standard con-



An oil recovery operator uses a FLIR HM-Series handheld thermal imaging camera to direct the positioning of oil recovery booms.



Visual image and thermal image of oil that escaped from the Deepwater Horizon as it sunk. Note that the oil is much easier to spot on the thermal image.



The oil spill shows up clearly on this thermal image.

nections and they integrate very easily with other on board maritime electronics.

A wide variety of oil spill applications

Thermal imaging cameras can not only be used at the time of an accident. They can also be very useful for monitoring oil spills during the oil transfer from oil storage

bunkers to oil tanker vessels and vice versa. Thermal imaging cameras are also valuable tools for coastguard or other law enforcement agencies. They can track vessels that are illegally polluting our seas by cleaning their oil tanks in open water.

Thermal imaging cameras can monitor all these activities day and night, in practically all weather conditions. Furthermore, once they are installed on a vessel they can not only be used for monitoring oil spills but they can be used for night-time navigation, shipboard security and many other maritime applications as well.

Water Mist Fire Fighting System for Cruise Liner

Two diagrams show the water mist system in operation, spraying fine mist onto a fire. Below is a large image of a cruise liner with callouts to various interior areas like the casino, lounge, and dining room, indicating where the system is installed.

Total VOC Reduction System VOC reduction rate 77.8%

The diagram shows a system for reducing VOCs in cargo tanks. It includes a suction device, pump, VOC reduction valve, control panel, and IG line. Two models are shown: MODEL: TVRU-V (for voyage) and MODEL: TVRU-650 (for loading).

Non-Lethal Anti-Piracy Solution

PLUG & PLAY

The image shows a red water jet device being used on a small boat. A sequence of four small images illustrates the 'Plug & Play' process: Start up, Turn over, Connect, and Water-jet. The model is identified as Model No.PSJ-1004 (Single-Nozzle Type).

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Rolls-Royce uses AVEVA Marine in practical and daily design work only two months after migration from Tribon M3

In December 2010, Rolls-Royce received an order from the Singapore-based offshore company, PaxOcean Engineering, to provide the ship design, propulsion systems and deck machinery for two platform supply vessels (PSVs) of the UT 755 CD design, (a development of the popular UT 755 series). The vessels are currently being built at PaxOcean Engineering's offshore vessel shipyard in Zhuhai, China, with delivery due in 2012.

AVEVA Korea

Rolls-Royce is a world leader in marine solutions, providing products, services and expertise to more than 30,000 vessels in the offshore, merchant, and naval surface and submarine markets. The Rolls-Royce UT-Design range for the offshore industry covers platform supply, anchor handling, cable laying and multi-purpose vessels, as well as seismic survey, intervention service and drilling vessels.

Following a requirement from PaxOcean Engineering that the vessels should be designed with AVEVA Marine, Rolls-Royce decided to migrate immediately to this application. In order to be able to deliver the design in time, Rolls-Royce took on a challenging schedule for the training and implementation of

the AVEVA Marine system.

The offshore ship design is carried out at the offices in Ulsteinvik, Norway, and at Navis Consult, an engineering company in Rijeka, Croatia, owned by Rolls-Royce. The ship designers in both Ulsteinvik and Rijeka are all experienced Tribon shipbuilding users. We met Oddvar Skotte, CAD Manager, and Oystein Alme, Senior Engineer, Structural Design, at the AVEVA World Marine Seminar in Malmö in November 2011, to find out more about their speedy and efficient migration to AVEVA Marine from the Tribon M3 shipbuilding system.

Migrating to AVEVA Marine from Tribon M3

AVEVA Marine was implemented at Rolls-Royce in early January 2011. Training started in the second week in January in Rijeka, with a five-day project set-up and a basic administration course. Over the following two weeks, a five-day AVEVA Hull upgrade course and a four-day basic course in AVEVA Outfitting were held. In parallel, a two-day migration seminar was arranged at AVEVA's office in Malmö, Sweden.

After a two-week project planning meeting in Singapore between Rolls-Royce and PaxOcean Engineering, seven



The UT 755 series has generated more than 180 vessels either currently in service or on order worldwide. Photograph courtesy of Rolls-Royce. AVEVA Marine model of a platform supply vessel (PSV) of the UT 755 CD design.



PaxOcean Engineering's offshore vessel shipyard (OVS) in Zhuhai, China. Photograph courtesy of PaxOcean Engineering.

weeks of training followed, covering the complete outfitting system.

Rolls-Royce had recently delivered a similar platform supply vessel, designed completely with AVEVA's Tribon M3 ship-building system. For the two new vessels, Rolls-Royce decided to use the Tribon data from this project and migrate the data to AVEVA Marine. Migration tools and services from AVEVA helped Rolls-Royce to convert the data to AVEVA Marine.

The hull design work for the new vessels started last week in March, when the hull data from Tribon was converted to AVEVA Marine for further design and modifications. The outfitting design started first week in May, when outfitting data from Tribon was converted to AVEVA Marine. Specific design requirements for the new vessels were re-engineered in AVEVA Marine. This data then served as a base for the re-engineering within AVEVA Marine, to cope with the specific design requirements for this ship. The Outfitting application from AVEVA Marine proved to be easy to use, and efficiently handled these design modifications.

The first AVEVA Marine hull and outfitting models of the PSV vessel were delivered to PaxOcean in the first week in May and in mid-June, respectively, and the complete AVEVA Marine model was delivered in the last week in November.

All deliveries were made according to schedule and PaxOcean was able to derive all the necessary production information automatically from the delivered models. First steel cutting at Zhuhai shipyard took place on the 15th of July.

Rolls-Royce found the hull application in AVEVA Marine easy

to start working with, as many features were similar to the hull application in Tribon. The outfitting application in AVEVA Marine was a new application for them but, thanks to effective training supplied by AVEVA, and good training manuals and user guides, they were ready to start outfitting design work already in the first week in May.

During this intense and comprehensive design project in AVEVA Marine, Rolls-Royce became aware of a number of useful new features for their design projects, including AVEVA Marine's well-organized project structure which offers a very flexible way to set up a project. Furthermore, the PML scripting language makes it simple to customize AVEVA Marine and to add much new functionalities.

Famous UT-Design vessels

The UT-Design PSV series of vessels, which also perform rescue and standby duties, continues to evolve, and ranges from small vessels with the most up-to-date features to much larger complex vessels.

The UT 700 series is recognised as a worldwide standard in the offshore industry. To date, approximately 800 UT-Design vessels have been built or are under construction around the world. Platform supply vessels typically transport pipes, cement, liquid and cargo to and from mainland and offshore installations.

Since it was first delivered in 1996, the UT 755 series has generated more than 180 vessels either currently in service or on order worldwide.



An order for two more platform supply vessels

As a result of the successful design of the two PSVs for PaxOcean Engineering, the company awarded Rolls-Royce a contract in November 2011 to design and equip two more oil platform supply vessels.

These vessels, which also will be built at PaxOcean Engineering's shipyard in Zhuhai, China, will have a fully-integrated Rolls-Royce diesel electric propulsion system and deck machinery. The vessels will be equipped for oil recovery and fire fighting, and are due to be delivered during the first six months of 2013.

AVEVA Global to be used in future projects

Rolls-Royce's ship design projects are often very complex and executed globally, often using subcontractors. Rolls-Royce plans to use AVEVA Global, AVEVA's solution for multi-site concurrent working, enabling Rolls-Royce's offices in Ulsteinvik and Rijeka and their partners to work concurrently towards the same ship model.

About Rolls-Royce

Rolls-Royce is a world-leading provider of power systems and services for use on land, at sea and in the air, and has established a strong position in global markets - civil aerospace, defence aerospace, marine and energy. Rolls-Royce employs over 39,000 people in offices, manufacturing and service facilities in over 50 countries.

The marine business of Rolls-Royce employs 9,000 people in 35 countries, with the main manufacturing centres being in the UK, the Nordic countries, the United States and, increasingly, Asia.

Rolls-Royce offers a range of ship designs for the offshore sector from its well-known UT-Design family, launched in the mid-1970s. The range includes platform supply vessels, anchor handling/tug/supply vessels, multipurpose service vessels and other specialised vessels such as coastal patrol vessels, well intervention, diving support vessel, sub-sea vessels, etc.

About PaxOcean Engineering

PaxOcean Engineering is an integrated offshore and marine engineering group, headquartered in Singapore, and offering new-build, conversion, repair and design services.

The Group's two shipyards in Zhuhai and Zhoushan in China are modern and fully equipped with plate/profile shot blasting and painting systems, CNC plate-cutting machines, profile- and plate forming shops, panel and block assembly shops, and block blasting and painting shops. 

Notice

AVEVA World Magazine 2012 Issue 1 'Rolls-Royce uses AVEVA Marine in practical and daily design work only two months after migration from Tribon M3' 29 page. This article may be reproduced by any means without permission in writing from AVEVA. Brands and product names mentioned may be trademarks and protected by copyrights of their respective owners.



Blocks under construction. Photograph courtesy of PaxOcean Engineering.

Hammelmann High pressure systems in the plant industry

Process pumps - High pressure pumps – Cleaning systems

Founded in 1949 Hammelmann has decades of experience in the development and manufacture of high pressure systems for all branches of chemical industry.

Process pumps

Hammelmann Triplex and Quintuplex pumps provide the highest standards of safety and reliability.

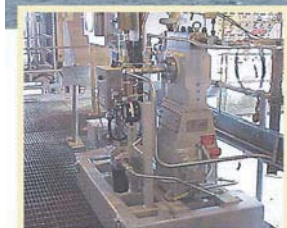
Power ratings up to 650 kW
Flow rates up to 2000 l/min
Pressures up to 3000 bar

Typical applications

Methanol injection
Fatty alcohol process
LDPE
Wet oxidation
CO₂ extraction
Mill scale removal
Non woven fabrics
Boiler feed pumps
Re-injecting reservoir water

Typical fluids

- Acrylic acid
- Adipoladipinat
- Butane
- Carbon dioxide
- Diesel oil
- Ester
- Ethanol
- Fatty acids
- Glucose
- Glycol
- Inhibitors
- LDHI
- Methanol
- Methylester
- Pentane
- Process water
- Salt water
- Scale Squeeze
- Vinyl acetate
- Waste water



High pressure pumps

Hammelmann pumps produce maximum performance from a minimal footprint which is the result of combining a compact integral speed reduction gear end with the concept of a vertical configuration.

Power ratings up to 750 kW
Flow rates up to 1700 l/min
Pressures up to 4000 bar



Industrial cleaning with high pressure pumps and applications systems up to 3500 bar

- Heat exchanger cleaning: rigid and flexible flushing lances, tube cleaning nozzles, internal and external heat exchanger cleaning systems
- Tank cleaning: tank cleaning heads, internal cleaning systems for autoclaves
- Pipe and sewer cleaning: standard and reversible sewer cleaning nozzles, powered hose reels
- Surface prep./cleaning: with and without vacuum, remote controlled
- Abrasive cutting: abrasive entrainment and cutting nozzles, abrasive container, precision cutting components





DSME won the first LNG-FPSO order



Ryu Wan-soo (third from the right), Senior Executive Vice President and Chief Business Officer of DSME, Datuk Anuar Ahmad (fourth from the right), President of Petrolim Nasional Berhad, and Philippe Barril (fifth from the right), President of Technip, are shaking hands right after signing the contract in Kuala Lumpur, Malaysia, on 5 June.

Daewoo Shipbuilding & Marine Engineering (DSME) received a LNG-FPSO order for the first time in the industry, opening the door to the era of LNG.

DSME and Technip Consortium, a France-based world-leading offshore plant design and construction company, secured an order from Petrolim Nasional Berhad, Malaysia's state-run oil company, for 1 LNG-FPSO on 5 June.

This LNG-FPSO, which will measure 300m in length and 60m in width, can store up to 180,000 m³ of liquefied natural gas (LNG) and 20,000 m³ of condensate (volatile liquid hydrocarbon) in the hull. Based on that, this LNG-FPSO can produce, refine, and unload up to approximately 1.2 million tons of LNG yearly.

The detailed design of this offshore facility will be undertaken jointly by DSME and Technip. This LNG-FPSO will be built at DSME's Okpo shipyard and delivered to the ship owner by June 2015. After delivery, it will be deployed in the Kanowit field located off the northwest coast of Sarawak State in Malaysia.

Ryu Wan-soo, Senior Executive Vice President and Chief Business Officer of DSME, who attended the signing ceremony on the same day, said, "Additional orders are anticipated as the natural gas field

exploitation is expanding worldwide, using the LNG-FPSO."

Thierry Pilenko, Chairman of Technip, expressed his expectation, saying, "We will successfully carry out the project if the DSME's expertise in offshore facility construction and the technological capability of Technip are combined."

대우조선해양, 최초로 LNG-FPSO 수주

대우조선해양이 업계 최초로 LNG-FPSO를 수주하며 본격적인 LNG 시대의 문을 열었다. 지난 6월 5일 대우조선해양과 프랑스의 세계적인 해양구조물 설계 및 시공회사인 테크닙(Technip) 컨소시엄은 말레이시아 국영석유업체 페트로나스(Petrolim Nasional Berhad)로부터 LNG-FPSO 1기를 수주했다.

길이 300m, 폭 60m 규모의 이 LNG-FPSO는 선체(Hull) 부분에 최대 18만 m³의 액화천연가스(액화천연가스)와 2만 m³의 컨덴세이트(휘발성 액체탄화수소)를 저장할 수 있다. 이를 바탕으로 연간 최대 약 120만 톤의 액화천연가스를 생산·정제·하역이 가능하다.

이 설비의 상세설계는 대우조선해양과 컨소시엄 설계자인 테크닙이 공동으로 작업한다. 건조는 대우조선해양 옥포조선소에서 진행되며, 2015년 6월까지 발주사 측에 인도될 예정이다. 인도 후에는 말레이시아 사라왁(Sarawak) 북서부 해역에 위치한 카노윗(Kanowit) 필드에서 운영될 예정이다.

이날 계약식에 참석한 대우조선해양 사업총괄장 류완수 부사장은 "현재 세계 각국에서 LNG-FPSO를 이용한 해저 천연가스 필드 개발 움직임이 본격화되는 만큼 앞으로의 추가 수주가 기대된다"고 밝혔다.

티에리 필렌코(Thierry Pilenko) 테크닙 회장 역시 "대우조선해양의 해양 건조 노하우와 테크닙의 기술 역량을 결합시킨다면 성공적인 프로젝트 수행을 이뤄낼 수 있을 것"이라며 기대감을 표시했다.

HHI Bags Order for Biggest Drilling Rig

Hyundai Heavy Industries (HHI), the world's biggest shipyard, announced that it won an order to build a semi-submersible drilling rig for Fred Olsen Energy on 28 May.

Hyundai Heavy, as a turnkey contractor, will undertake all works including engineering, procurement and commissioning for the USD 700 million pro-

jects. The contract also includes an option exercisable by the owner to order an additional same class drilling rig.

The rig will be built at Hyundai Heavy's Gunsan Shipyard. Equipped with a 1,650 ton Goliath Crane and the world's largest 1.3 million DWT dry dock, the Gunsan Shipyard has delivered 26 ships since its establishment in 2010.

The semi-submersible, measuring 123 m in length and 96 m in width with an operating depth range of 70 m to 3,000 m, will be built according to NORSOK standards. These standards are applicable to rigs operating in the adverse conditions of the North Sea. When completed in March 2015, this semi-submersible rig will be the biggest ever built and able to drill to depths of 12,200 m.

현대중공업, 세계 최대 반잠수식 시추선 수주

현대중공업이 세계 최대 규모의 반잠수식 시추선 수주에 성공했다. 지난 28일 노르웨이 프레드 올센 에너지(Fred Olsen Energy)로부터 7억 달러 규모의 반잠수식 시추선(Semi-submersible rig) 1기를 수주했다. 이번 계약에는 설계부터 시운전까지 모든 과정을 책임지는 '일괄수주계약' 방식으로 옵션 1기도 포함되어 있다.

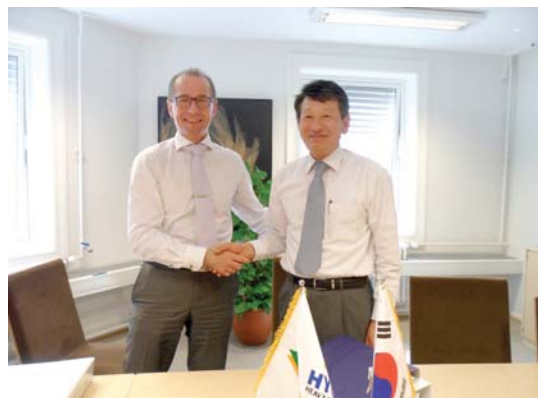
현대중공업은 이 시추선을 군산조선소에서 건조, 2015년 3월 선주 측에 인도할 계획이다. 지난 2010년 완공된 군산조선소는 현재까지 26척의 선박을 성공적으로 건조했으며, 이번 시추선 첫 건조를 계기로 앞으로 고부가가치 선박 건조에 주력할 예정이다.

이번 초대형 시추선은 수심 70m~3,000m의 해상에서 작업 가능하도록 설계되었으며, 해수면에서 최대 12,200m까지 시추할 수 있다. 길이와 폭은 각각 123m, 96m로 지금까지 건조된 반잠수식 시추선 중 최대 크기다.

현대중공업은 세계에서 가장 까다롭기로 소문난 '노르웨이 해양산업 표준(NORSOK)'을 반영해 이번 반잠수식 시추선을 설계 및 건조하게 된다. 시추선이 북극해의 추운 날씨와 강한 파도에 견디기 위해서는 보다 엄격한 조건을 만족시켜야 하기 때문. 현대중공업은 지난 2011년 프레드 올센 에너지로부터 드릴십 1척을 수주, 현재 건조 중에 있으며, 드릴십 설계와 건조부문에서 인정받은 실력이 이번 반잠수식 시추선 수주로 이어졌다.



Deepwater Nautilus. Hyundai Heavy built this semi-submersible drilling rig for Transocean in 1999.



Naming ceremony: Ivar Brandvold, CEO and President of Fred Olsen Energy (left) and Kang Young-seog, Senior Vice President and Head of Hyundai Heavy's Oslo branch.

STXOS received orders for 2 units of 6,500 CBM LPG carriers

STX Offshore & Shipbuilding (STXOS) announced that it won an order for 2 units of 6,500 CBM LPG carriers from a Greece-based ship owner in Athens, Greece on 22 June. The 2 LPG vessels will be built at Busan shipyard of STXOS and delivered to the ship owner by the second quarter of 2014.

According to STXOS, STXOS recently entered into a Letter of Intent (LOI) with a domestic shipping company for the construction of 2 LNG carriers and is in the final stage of negotiation with a Middle Eastern shipping company for the construction of 1 LNG carrier. Thus, STXOS is expected to win new orders worth a total of USD 430 million when the final contract is signed.

Meanwhile, new orders for LPG carriers and medi-



um-sized tankers have been increasing this year despite the overall decline in placement of new orders this year, according to Clarkson. Particularly, LPG carrier orders placed until April this year surpass those placed throughout the previous year.

STX Group is strategically moving ahead to meet the requirements of ship owners worldwide. STX has steadily secured orders for medium-sized tankers since the beginning of this year, and has won orders for 8 liquefied gas carriers worth USD 570 million, including the order awarded this time. That is a splendid performance, considering that the LNG and LPG carrier orders booked until the first quarter of this year worldwide stand at 32 units. STX won orders for 45 vessels worth USD 2.42 billion so far this year.

An official from STXOS said, "STX has steadily won orders in the medium-sized tanker and high value-added vessel sectors where STX has the competitive edge. We will focus on winning more orders as we see a rising demand for these vessels in European countries, including Greece."

STX조선해양, 6,500 CBM급 LPG선 2척 수주

STX조선해양은 지난 6월 22일 그리스 아테네에서 6,500 CBM급 LPG선 2척을 수주했다고 밝혔다.

STX조선해양이 그리스 선사로부터 수주한 6,500 CBM급 LPG선 2척은 부산 조선소에서 건조해 2014년 2분기까지 인도될 예정이다.

STX조선해양에 따르면, 최근 국내 선사와 LNG선 2척에 대한 LOI를 체결했으며 중동 선사에서도 LNG선 1척 건조계약을 위한 막판협상 단계에 있어 최종 계약시 총 4.3억 달러 규모의 신규 수주를 달성할 수 있을 것으로 기대하고 있다. 한편 클락슨리서치에 따르면 올해 들어 전반적인 선박 발주가 줄어든 가운데



서도 LPG선과 중형 탱커 분야는 유독 증가세를 보이고 있다. 특히 LPG선의 경우 이미 지난해 전체 발주된 물량보다 올해 4월까지 발주된 선박이 더 많은 상황이다. STX 그룹은 세계 선박 발주시장의 트렌드에 발맞춘 전략적인 수주 행보를 보여주고 있다. STX는 연초부터 꾸준히 중형탱커를 수주해 왔으며 이번 수주물량을 포함해 액화가스운반선은 총 8척, 5.7억 달러에 달한다. 올해 1분기까지 세계시장에 발주된 LNG 및 LPG선이 32척이라는 것을 감안하면 상당한 수치다. STX의 올해 선박부문 수주실적은 총 45척, 금액으로는 24.2억 달러가 되었다. STX조선해양 관계자는 "STX가 강점을 지니고 있는 중형 탱커와 고부가가치선 분야에서 꾸준한 수주가 이어지고 있다"면서 "그리스 등 유럽을 중심으로 해당 선종에 대한 수요가 늘고 있는 만큼 추가수주에 총력을 기울일 것"이라고 밝혔다.

Nexans awarded 16 million Euro umbilical contract by Statoil

Nexans has secured a 16 million Euro contract with Statoil to engineer and supply a 16.5km subsea power umbilical that will be used to connect the Gullfaks C platform in the North Sea to its subsea compression and processing equipment on 7 June, 2012.

The Gullfaks project, located 160km west of Sognefjorden, Norway, is the second largest subsea gas compression project planned by Statoil, after the Asgard subsea gas compression project, which it is also responsible for.

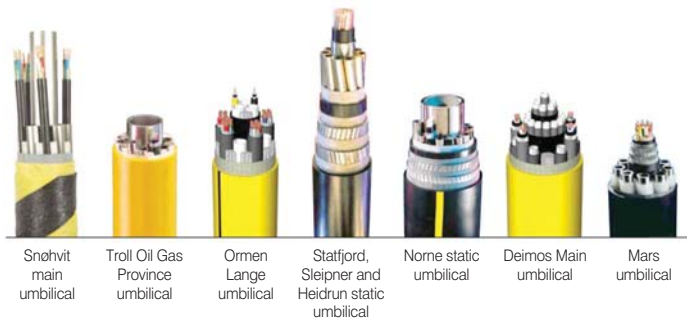
The field comprises several subsea templates at a depth of 135 metres. Statoil plans to install a subsea compressor that will facilitate the compression and transportation of gas.

"We are pleased to have been selected as a supplier of umbilicals for

this contract, which we believe is a result of a combination of proven expertise, skills and technology in this sector", said Ragnvald Graff, Sales & Marketing Director, Hybrid Underwater Cables Division, Nexans.

Subsea gas compression forms part of Statoil's ambition to develop the necessary elements required to create the 'subsea factory' to pave the way towards oil and gas exploration in the Arctic and other deepwater regions.

Nexans pioneered umbilical technology and its power umbilicals integrate the functions of power



cables and umbilicals in a single cable, enabling a high-voltage (HV) supply to be provided for deepwater projects. The power umbilical includes a number of steel tubes as well as fiber-optic elements, signal cables for control and monitoring, as well as insulated power cores, all being supplied from Nexans' factories. By eliminating the need to transport and install separate power and control umbilicals, the power umbilical significantly reduces transportation and installation costs.

넥상스, 스타토일과 1600만 유로 엄빌리칼 계약 체결

넥상스는 북해 지역의 걸팍스 C 플랫폼과 해저 압축기와 가공기계를 연결 하는데 사용할 16.5km 상당의 해저 전력 엄빌리칼 공급 계약을 스타토일 과 체결했다고 지난 7일 발표했다. 수주 규모는 1600만 유로이며, 엄빌리 칼의 디자인과 공급이 포함되어 있다.

노르웨이의 송네피요르드(Sognefjorden)에서 서쪽으로 160 km 떨어진 곳에 위치한 걸팍스는 스타토일이 시공한 아스가르드 해저 가스전에 이어 스타토일이 개발하고 있는 두 번째로 큰 해저 가스전 프로젝트이다.

이 가스전은 해저 135 m의 깊이에 여러 개의 해저 템플릿(구조물)으로 구성 되어 있다. 스타토일은 가스 압축과 운반을 용이하게 해줄 해저 압축기를 설치할 계획을 가지고 있다.

“넥상스는 이번 계약에 공급업체로 선정되어 매우 기쁘게 생각한다. 이 분야에서 검증된 전문성, 경험 그리고 기술의 조화로 이루어낸 결과다.”라고 넥상스 하이브리드 수중 케이블 분야 세일즈&마케팅 담당임원인 라그발드 그라프(Ragnvald Graff)는 말했다.

스타토일의 해저 가스 압축기는 북극 및 기타 심해 지역에서의 오일&가스 탐사를 위해 요구되는 “해저 공장(subsea factory)”를 위한 것이다.

넥상스는 엄빌리칼 기술의 선구자며, 심해 프로젝트에 초고압 전력을 공급할 수 있게 하나의 싱글 케이블에 전력선과 엄빌리칼 기능을 통합한 엄빌리칼 전력 케이블을 처음으로 개발했다. 이 전력 엄빌리칼은 여러 개의 철재 튜브와 광케이블, 제어 및 모니터링용 신호케이블, 절연된 전력코어를 포함하며, 이 모든 제품들이 넥상스에서 생산 및 공급하게 된다. 특히 전력과 제어 엄빌리칼을 하나로 통합함으로써 운송비와 설치비를 줄일 수 있다.

HHIC-Phil's Subic Shipyard clinched orders for 10 medium-sized containerships

Hanjin Heavy Industries and Construction (HHIC) successfully clinched a contract for 10 units of 5,000 TEU containerships (including the optional vessels) from a European ship owner for the first time this year. The contract is valued at approximately USD 450 million.

HHIC-Phil's Subic Shipyard, which has the price competitiveness based on abundant labor and newest facilities, has steadily amassed the technologies and overcome the difficulty arising from the recently declining ship prices. In addition, HHIC anticipates tangible results from its Yeongdo shipyard which is currently undergoing drastic improvement of production system to secure competitiveness.

An official from HHIC said, “We owe this success in winning the contract to our price-competitiveness and trust of ship owners for



our high quality vessels. Based on this achievement, we will aggressively target the market.”

The containerships ordered to HHIC this time are



255 m long, 37 m wide, 22 m high with a maximum speed of 21.5 knots and are eco-friendly vessels incorporating the fuel-saving technology (Eco-Design) which attracts the attention of ship owners.

한진중공업 수빅조선소, 중형 컨테이너선 10척 수주

한진중공업 수빅조선소가 올해 들어 처음으로 유럽 선주로부터 5,000 TEU급 컨테이너선 10척(옵션 포함)을 수주하는데 성공했다. 수주 규모는 약 4억 5000만 달러이다.

최신 설비와 풍부한 노동력을 바탕으로 원가경쟁력을 갖춘 한진중공업의 수빅조선소는 그 동안 꾸준히 쌓아온 기술력으로 최근의 선가 하락 추세를 극복할 수 있었다. 또한 현재 경쟁력 확보를 위한 생산시스템의 획기적인 개선작업을

추진 중인 영도조선소에서도 가시적인 성과를 기대하고 있다.

한진중공업 관계자는 “전체적인 시황 침체로 신규 수주에 어려움이 많지만 원가 경쟁력과 품질에 대한 높은 신뢰에 힘입어 수주에 성공했다”며, “이 같은 성과에 힘입어 향후에도 공격적인 영업 활동을 펼쳐 나가겠다”고 전했다.

한진중공업이 이번에 수주한 컨테이너선은 길이 255 m, 폭 37 m, 깊이 22 m의 제원으로 속도 21.5 노트로 운항할 수 있는 최신 선형으로 선주들의 주요 관심사항인 연료 절감 기술(Eco-Design)을 적용한 친환경 선박이다.

STXOS secured a KRW 160 billion order for 4 tankers from Alterna

STX proved its competitiveness in the medium to large-sized tanker market again. STX Offshore & Shipbuilding (STXOS) announced that it was awarded a contract to build 4 units of 50,000 DWT tankers from the U.S.-based Alterna on 2 May. The contract is valued at KRW 160 billion.

STXOS won an order for 2 vessels of the same kind from Alterna in late April and secured this contract as the ship owner exercised the option on additional vessels. These vessels will be built at STXOS' Jinhae shipyard and delivered to the ship owner by the second quarter of 2013. STX has strategically moved forward to conform to the requirements of ship owners worldwide since the beginning of this year.

STX has won orders for 23 tankers worth USD 830 million, and has secured orders for 8 liquefied gas carriers, such as LPG carriers, worth USD 560 million so far this year. According to the data published recently by Clarkson, the researcher in the global shipbuilding and shipping industries, new orders for medium-sized (30,000 to 60,000 DWT) tankers and liquefied gas carriers such as LNG/LPG carriers stood at 35 units and 41 units, respectively, from January to April this year.

An official from STXOS said, “I am convinced that we will maintain steady growth in new orders this year for various types of vessels such as tankers, liquefied gas carriers, offshore plants, containerships and others. We will actively cope with the changes in the market and respond to the requirements of customers in the best way, cementing our position as the global shipbuilding Group.”

STX조선해양, 알테나로부터 탱커 4척 1,600억원 수주

STX가 중형 탱커 시장에서의 경쟁력을 다시 한번 입증했다. STX조선해양은 지난 달 2일 미국 선주사인 알테나(Alterna)로부터 50,000 DWT급 탱커 4척을 추가 수주했다고 밝혔다. 수주 금액은 총 1,600억원 규모이다.

STX조선해양은 지난 4월말 동형선 2척을 알테나로부터 수주한 바 있으며, 이번 수주는 당시의 옵션계약이 발효된 것이다. 해당 선박은 진해 조선소에서 건조되어 2013년 2분기까지 인도될 예정이다. STX는 연초부터 세계 발주시장의 트렌드에 맞춘 전략적인 수주 행보를 보여주고 있다.

STX가 올해 수주한 탱커는 총 23척 8,3억 달러이며, LPG선 등 액화가스운반선은 총 8척 5.6억 달러 규모의 수주실적을 기록하고 있다. 글로벌 조선·해운 분야 전문조사기관인 클락슨리서치가 최근 발표한 보고서에 따르면 올해 들어 1월부터 4월까지 중형 탱커(30,000 ~ 60,000 DWT)는 총 35척, LNG·LPG선 등 액화가스운반선은 총 41척이 발주됐다고 발표한 바 있다.

STX조선해양 관계자는 “탱커와 액화가스운반선 이외에도 해양플랜트, 컨테이너선 등 여러 선종에서 올해 꾸준한 수주실적을 이어나갈 것으로 자신한다”며 “시장의 변화에 민감하게 대처하고 고객의 요구에 가장 탁월하게 대응하는 글로벌 조선그룹으로서의 입지를 강화해 나갈 것”이라고 말했다.




In 2012, domestic shipbuilding industry is expected to see new order intake decline in the second after rising in the first half. Last year, domestic shipyards showed a robust growth in the first half and a sluggish growth in new order intake last year. In 2011, they won a combined USD 38 billion worth of orders in the first half and USD 12.8 billion worth of orders in the second half. This year, domestic shipyards are expected to win a combined USD 20.6 billion worth of orders in the first half and USD 28.2 billion worth of orders in the second half.

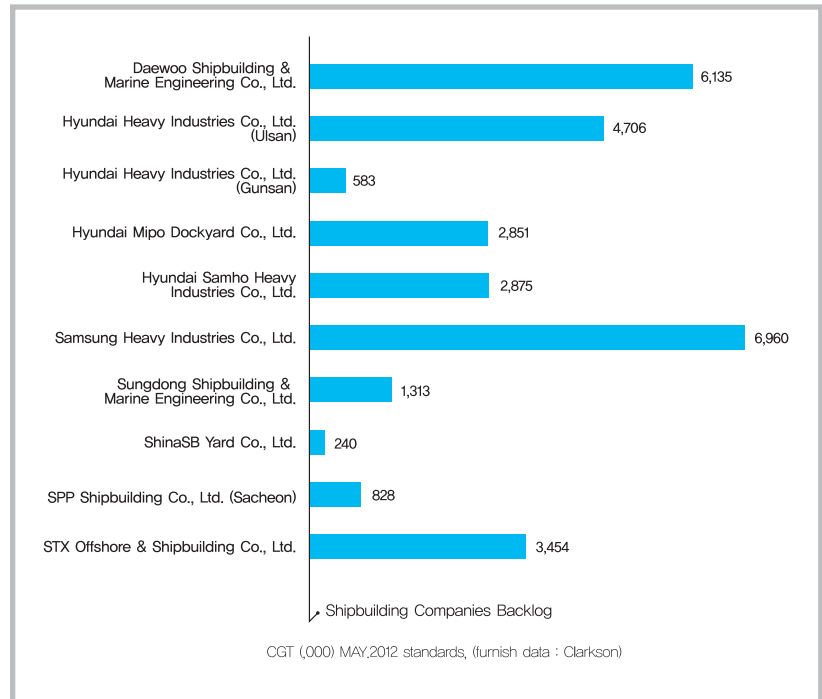
According to the data published recently by Shinhan Investment Corporation,

3 major shipping indexes, such as BDI, CCFI and WS, are expected to rebound after March and the price of second-hand vessels which have been falling are likely to stabilize and increase gradually.

The stabilizing prices of second-hand vessels, which will have a positive impact on the improvement of ship owners' liquidity, are expected to bring a turnaround in the shipbuilding market and help increase new orders over the long-term.

According to the Clarkson data, domestic shipyards have secured a significant portion of the world's orders and maintain world's leading position.

Here, we take a close look at the performance of major domestic shipyards, such as Hyundai Heavy Industries (HHI), Daewoo Shipbuilding & Marine Engineering (DSME), Samsung Heavy Industries (SHI), STX Offshore & Shipbuilding (STXOS), etc., in terms of order backlog. 



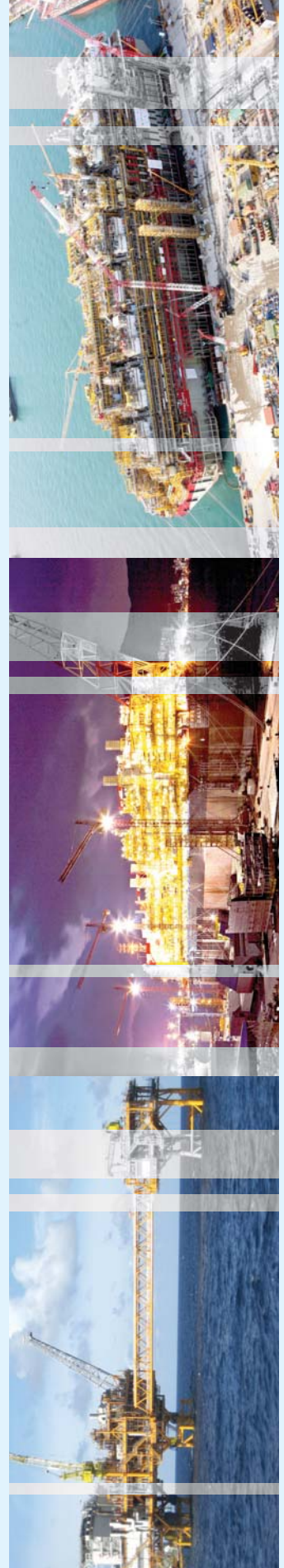
Offshore Plant Orders

Offshore plant orders awarded to domestic shipyards in 2011-2012

Date	Type	Number of vessel	Amount	Ship owner	Delivery	Shipyard
January	Drillship	1 vessel (including 1 optional vessel)	KRW 590 billion	Diamond Offshore Drilling Limited, U.S.A	Mid 2013	Hyundai Heavy Industries
	Offshore Plant	-	USD 900 million	RasGas, Qatar	Late 2013	Hyundai Heavy Industries
	Drillship	2 vessels (including 2 optional vessels)	KRW 1 trillion 140 billion	Noble Drilling, U.S.A	On a staggered basis until late September 2013	Hyundai Heavy Industries
February	Deepwater drillship	1 vessel	-	Atwood Oceanics, U.S.A	Second half of 2013	Daewoo Shipbuilding & Marine Engineering
	Offshore facility carrier FPSO for the North Sea Platform Supply Vessel	1 vessel	KRW 265 billion USD 1.2 billion	Dockwise, Netherlands BP (British Petroleum), U.K	October 2012 Early 2015	Hyundai Heavy Industries Hyundai Heavy Industries
	Fisheries Research Vessel	1 vessel	EUR 35 million	Ministry of Fisheries and Marine Resources, Republic of Namibia	Early 2012	STX OSV STX Finland
March	Offshore Platform (North Sea Drilling & Production platform, Quarters & Utilities platform)	1 unit each	USD 600 million	BP (British Petroleum), U.K	Late 2014	Hyundai Heavy Industries
	Deepwater drillship	2 vessel (including 2 optional vessels)	KRW 1 trillion 200 billion	Aker Drilling, Norway	Second half of 2013	Daewoo Shipbuilding & Marine Engineering
	Drillship Platform Supply Vessel	2 vessels	USD 1.1 billion	Ship owner, U.S.A	-	Samsung Heavy Industries
April	Platform Supply Vessel	1 vessel	-	Norsea Group AS, Norway	June 2012	STX OSV
	Platform Supply Vessel	1 vessel	-	-	2012	STX OSV
	Drillship	1 (including 1 optional vessel)	-	Fred Olesen Energy, Norway	August 2013	Hyundai Heavy Industries
May	Drillship	2 vessels	USD 1.12 billion	Maersk, Denmark	-	Samsung Heavy Industries
	Drillship	1 vessel	USD 680 million	Ocean Rig, Greece	October 2013	Samsung Heavy Industries
	Shuttle Tanker	2 (including 2 optional vessels)	USD 200 million	European Navigation, Greece	2013	STX Offshore & Shipbuilding
June	Drillship	2 (including 1 optional vessel)	USD 1.12 billion	Rowan, U.S.A	Second half of 2013	Hyundai Heavy Industries
	Deepwater drillship	1 (including 1 optional vessel)	-	Vantage Drilling, U.S.A	Late May, 2013	Daewoo Shipbuilding & Marine Engineering
	Offshore Platform (Top side of offshore platform) FPSO	-	USD 414 million	Stabil, Norway	-	Samsung Heavy Industries
July	Platform Supply Vessel	1 vessel	USD 636 million	Teekay Petrojarl, Norway	Mid 2013	Samsung Heavy Industries
	Platform Supply Vessel	2 vessels	Around KRW 120 billion	Farstad Shipping, Norway	First half of 2013	STX OSV
	FSO LNG-FPSO	1 unit	USD 3.026 billion	PTSC, Vietnam Royal Dutch Shell, U.S.A	Early 2013 2016	Sungdong Shipbuilding & Marine Engineering Samsung Heavy Industries
August	Platform Supply Vessel	2 vessels	Around KRW 150 billion	Island Offshore, Norway	First quarter, third quarter of 2013	STX OSV
	LNG-FSRU	2 units (including 2 optional vessels)	USD 500 million	Hoegh LNG, Norway	Second half of 2013, first half of 2014	Hyundai Heavy Industries
	Multifunctional Deep Water Anchor Handling, Offshore Service Vessels	2 vessels	KRW 240 billion	Farstad Shipping, Norway	From the second quarter of 2013	STX OSV
September	Drillship	1 vessel	USD 680 million	Ocean Rig, Greece	November 2013	Samsung Heavy Industries
	Drillship	2 vessels	USD 1.1225 billion	Maersk, Denmark	July 2014	Samsung Heavy Industries

August	LNG-FSRU (Floating Storage and Regasification Unit)	1 vessel	USD 280 million	Excelerate Energy, U.S.A	First quarter of 2014	Daewoo Shipbuilding & Marine Engineering
September	Semi-submersible Rig	2 units	USD 1.1 billion	Songa Offshore, Norway	Second half of 2014	Daewoo Shipbuilding & Marine Engineering
	Well Intervention Vessel	2 vessels	USD 420 million	Eide Marine Services AS, Norway		
2011	Drillship	1 unit (optional vessel awarded on January 19)	Approximately KRW 600 billion	Noble Drilling, U.S.A	Second half of 2014	Hyundai Heavy Industries
	Fixed Offshore Platform	-	USD 1.4 billion	Chevron, U.S.A	Second half of 2014	Daewoo Shipbuilding & Marine Engineering
October	Drillship	1 unit	Approximately	Offshore drilling company, Americas	-	Daewoo Shipbuilding & Marine Engineering
	Platform Supply Vessel	1 unit	-	Troms Offshore Supply AS, Norway	First half of 2013	STX OSV
November	Offshore Plant Module	2 units	-	-	First half of 2012	STX Finland
	Platform Supply Vessel	4 units	KRW 2 trillion	Island Offshore, Norway	Consecutively from the 3rd quarter of 2013 to the 1st quarter of 2014	STX OSV
December	Pipe Laying Support Vessel	2 units	USD 500 million	Odebrecht, Brazil	August of 2014	Daewoo Shipbuilding & Marine Engineering
	Offshore facilities (Gas platform and various facilities)	-	USD 900 million	Major multinational oil companies	2nd half of 2014	Hyundai Heavy Industries
January	CPF (Central Processing Facility)	-	KRW 2.6 trillion	Australia /INPEX	4th quarter of 2015	Samsung Heavy Industries
February	Semi-submersible rig	1 unit	USD 620 million	Norway / Odifell	by mid 2014	Daewoo Shipbuilding & Marine Engineering
March	LNG-FSRU	-	-	Norway / Hoegh	-	Hyundai Heavy Industries
	Offshore Platform	1 unit	USD 560 million	Danish / DONG E&P AS	April 2015	Daewoo Shipbuilding & Marine Engineering
April	FPSO	1 unit	USD 2.0 billion	INPEX / Australia	April 2016	Daewoo Shipbuilding & Marine Engineering
	Drillship	1 vessel	USD 645 million	Enesco plc	Third quarter 2014	Samsung Heavy Industries
May	Semi-submersible Drilling Rig	2 units	USD 1.1 billion	Songa Offshore, Norway	Mid 2015	Daewoo Shipbuilding & Marine Engineering
	Drillship	1 vessel	USD 600 million	Seadrill, Norway	Second half of 2014	Samsung Heavy Industries
June	Drillship	1 vessel	USD 655 million	Diamond Offshore Drilling Limited, U.S.A	4th quarter of 2014	Hyundai Heavy Industries
	Semi-submersible drilling rig	1 unit	USD 700 million	Fred Olsen Energy, Norway	March 2015	Hyundai Heavy Industries
	LNG-FPSO	1 unit	-	Petroliam Nasional Berhad, Malaysia	June 2015	Daewoo Shipbuilding & Marine Engineering

*Note : Based on the press release and public announcements of each shipyards, internal estimation of Monthly KORSHIP (estimation until Jun 15, 2012)



Spotlight



View of the 25th World Gas Conference ● ● ● ● ●

25th World Gas Conference

- Advent of gas industrial revolution

Wind power, solar power, etc., have emerged as alternative sources of energy since several years ago, but have yet to be proven effective. Clearly there are many technological hurdles to be overcome. As a result, natural gas has been highlighted as the energy for the near future.

'World Gas Conference' ran from June 4 to 8 in Kuala Lumpur, Malaysia with great success. This Conference, the 25th event, revolved around the theme, "Gas: Sustaining Future Global Growth".

'World Gas Conference', organized by International Gas Union (IGU), touched on a wide range of issues facing the industry in the field of gas. This conference draws approximately 5,000 executives and experts in energy from about 80 countries worldwide and provides the platform for gas companies to showcase their technologies and solutions related to the gas exploration, production, storage, transportation, supply, etc.

About 20,000 visitors to this event witnessed the enthusiasm worldwide for the development of gas energy. ⚓



Technip is an all-around player with unmatched capability in the global plant market.



Total, a France-based oil company





- Gazprom is the world's largest gas producer, producing about 20% of the world's natural gas.



PTT Group is the leading company in the South East Asia in the production of petrochemicals, oil and gas field exploration, drilling, transportation, and refining.



- 1
- 2
- 3

1. PGNiG, a Poland-based gas company
2. RWE, a German-based electricity and gas supplier, established in 1898
3. China National Petroleum Corporation (cnpc), the Chinese state-run oil company



Korea Gas Corporation (KOGAS), a public corporation established to supply the natural gas for domestic consumption, also participated in WGC.



Misc, a Malaysia-based marine transportation company



Offshore - Drilling ship's mud system valve

Hifly Valve



'High performance mud system valve' incorporating the multi seat knife gate valve technology

Hifly Valve developed the mud system valve for offshore drillship. The drilling rate is vital for the drillship and affected by mud line. Ordinary knife gate valve used in most drillship has high rate of leakage and is susceptible to abrasion. Consequently, the downtime caused by the failure or mud contamination is prolonged and significantly decrease the drilling rate. Thus, the dedicated valves for mud line need to be used, considering the efficiency of drillship operation.

The dedicated valve for mud line, developed by Hifly Valve, has strong wear resistance, is bi-directional, and can block the fluid without any leakage. Particularly, this valve, which incorporates the 'multi seat knife gate valve' of Hifly Valve's specialized technology, assures excellent performance. In addition, this valve can be replaced easily by non-experts, unlike other valves that require professional experts to replace the faulty valve with a new one or the valve seats. Furthermore, this valve is designed to have the closed structure preventing the entry of foreign matter perfectly, unlike ordinary valves, and is currently applied to the Noble drill ship.

Hifly Valve specializes in the manufacturing of knife gate valve used for the offshore mud line, petrochemical, power plant, mining sectors, and metal seat butterfly valve for the shipyards' tanker, container, FPSO, LNG, LPG, steam and foam line, fire fighting, hydrant, SEA Chest, hot exhaust gas and high temperature fluid control.

TEL: +82-51-831-8482
<http://www.hiflyvalve.com>

New
Product

Fisher® valves & FIELDVUE™ instruments, Lloyd's Type Approval

Emerson Process Management Korea



Fisher® FIELDVUE™ DVC6200f
Digital Valve Controller

Emerson Process Management's complete line of Fisher valves and FIELDVUE digital valve controllers has received Lloyd's Register's Marine Type Approval for process control applications within the offshore oil and gas production industry.

This Marine Type Approval ensures that Fisher products can be installed in critical duties on ships, mobile offshore units and floating structures moored at a fixed point such as drilling rigs or platforms.

Lloyd's Register is an impartial certification service that provides third-party verification of a product's conformance to specific standards or specifications and to the use of appropriate, quality manufacturing systems. According to Ken Kleemeier, Industry Business Development Manager at Emerson, there is growing international awareness of the importance of third-party certification such as Lloyd's Register, particularly in the oil and gas industry.

"Offshore oil and gas operators are very focused on equipment safety and integrity," Kleemeier stated. "This focus extends to material sourcing, procurement, and manufacturing activities, with the objective being that all equipment

utilized in offshore vessels and installations meets rigorous industry operating and safety standards."

Kleemeier went on to say, "Emerson is the first manufacturer to have a complete line of control valves and digital valve controllers Marine Type Approved by Lloyd's

Register."

Prior to granting certification to the Fisher products, Lloyd's Register personnel reviewed Fisher product designs to validate compliance with industry codes and standards. They also witnessed and reviewed documented product performance tests that confirmed the integrity and functional performance of the Fisher designs in production.

In addition to product Type Approval, multiple Emerson Fisher manufacturing sites met inspection and test requirements for Lloyd's manufacturing approval.

-TEL: +82-2-3438-4600
-<http://www.emersonprocess.co.kr>

LS Cable & System's flame retardant cables for ship and offshore applications

LS Cable & System



The photo shows the flame retardant for power application, flame retardant optical cable, silicon insulated flame retardant cable, and flame retardant cable for control and measurement (from the left).

LS Cable & System successfully developed the flame retardant cable withstanding the temperatures up to 950°C. This cable will have wide-ranging applications in ships, offshore plants, building, industrial facilities for emergency power supply in case of fire, operations of essential equipment and firefighting/disaster prevention system.

This product, which improved the properties of mica used in flame retardant tapes and is added with glass fiber, can withstand the temperatures 200°C higher compared to ordinary flame retardant cables that can stand up to 750°C.

According to LS Cable & System, this product can withstand up to 950°C for 2 hours and operates normally against external impact, water sprinkling during the firefighting activities. In relation to the performance, this product conforms to the International Engineering

Consortium (IEC) Standard, BS (British Standard), and NF (Normes Francaises) which are far more rigorous than domestic flame retardant standards.

In addition, LS Cable & System successfully developed the silicon flame retardant insulated cable and the flame retardant cable for industrial structures, which enhanced the flexibility, is easier to install and can be used in various environments.

Flame retardant cables product line

- Flame retardant cable for ship and offshore applications
 - *Ship & Offshore, oil & gas applications*
 - *High temperature flame retardant (950°C, 830°C)*
- Silicon insulated flame retardant cable
 - *Greater flexibility, easier to install, applicable in various environments*
 - *High temperature flame retardant (950°C, 830°C)*
- Flame retardant cable for buildings & infrastructures
 - *Buildings, Tunnels, Industrial facilities, Factories*
 - *High temperature flame retardant (950°C, 830°C)*
- Flame retardant cable for medium voltage
 - *Onshore & Offshore plants, Buildings, Infrastructures*
 - *Ordinary flame retardant (830°C, 750°C)*

- TEL: +82-2-2189-9114
- <http://www.lscns.com>

WS Line of Ultrasonic Compact Weather Stations

G. Lufft Mess- und Regeltechnik GmbH

G. Lufft Mess- und Regeltechnik GmbH (hereafter Lufft) has been involved in the production of climate measurement equipment since its foundation in 1881. Lufft products and equipment can be found wherever there is a need to measure and record atmospheric pressure, temperature, relative humidity and other environmental variables.

Among their products, VENTUS ultrasonic wind sensor and WS series compact weather stations are unrivaled in the world of weather instruments.

VENTUS is a seawater-resistant and maintenance-free wind meter which measures wind direction and wind speed and also calculates acoustic virtual temperature. The ultrasonic wind sensor is designed without mechanical parts as known with traditional "cups and vane".

VENTUS is heated in case of critical ambient conditions. In a cold climate, the ice-free condition of the measurement data acquisition system is the decisive advantage compared to vane anemometers. And not only has it demonstrated its suitability for turbine applications through the ice-free test, VENTUS has also successfully passed vibration tests, salt tests as well as destructive testing (HALT). It is recommended for: wind turbines, marine/ships, meteorology and building automation.

The WS series of compact weather stations are unrivaled in price to performance ratio. WS series are designed with different levels of functionality to meet your specific weather



VENTUS Ultrasonic wind sensor



WS501 Compact weather station

monitoring needs.

The WS family is a range of low cost, compact weather stations for the acquisition of a variety of measurement variables. Depending on the model, each device has a different combination of sensors for the various measurement variables as follows:

- Air temperature & pressure
- Relative humidity
- Precipitation intensity & quantity
- Wind direction & speed
- Compass
- Global Radiation

The external sensors like temperature sensor, surface temperature sensor, rain gauge, etc can be connected to the different WS models.

VENTUS and WS series are covered to protect from the elements. To keep the sensors in accordance with the latest state-of-the-art, it is possible to carry out a firmware update on site with no need to remove the sensors and to return it to the manufacturer.

- TEL: +82-32-351-2209
- <http://www.elovep.co.kr>
- <http://www.lufft.com>

BMEA (Busan Marine Equipment Association)

Member List

ANSWER CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. : www.answerclear.com
 Main Products : CO2 Extinguishing Sys. External Fire Fighting Sys.
 TEL : +82-51-831-3691

BANDO MARINE.

Head Office : Gangseo-gu Busan
 Homepage Add. : www.bando.info
 Main Products : Life Boat
 TEL : +82-51-831-1950

BERM YOUNG VALVE.

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

BMT CO., LTD.

Head Office : Yangsan Gyeongsangnam-do
 Homepage Add. : www.superlok.com/
 Main Products : Fitting & Valve, Vacuum Clamp
 TEL : +82-55-783-1000

BO KYOUNG IND., CO.

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
 Homepage Add. :
 Main Products : Copper Tube & Pipe, Cupro-Nikel Pipe, Copper Fitting
 TEL : +82-51-266-4101

BOYANG HARDWARE CO., LTD.

Head Office : Kimhae Gyeongsangnam-do
 Homepage Add. : www.byhd.co.kr
 Main Products : Stairway Body, Ladder, Hardware
 TEL : +82-55-345-1951

BUSAN INDUSTRY CO.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Powder Coating
 TEL : +82-51-831-4810

BUSUNG PLANT CO., LTD.

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

CEPHAS PIPELINES CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Butterfly Valve
 TEL : +82-51-263-3661

CHK CO., LTD.

Head Office : Gangseo-gu Busan
 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
 TEL : +82-51-831-3607

CHANG WON ENVIRONMENT IND CO., LTD.

Head Office : Kimhae Gyeongsangnam-do
 Homepage Add. : www.seaclean.kr
 Main Products : Sewage Tredtment Plant
 TEL : +82-55-342-5545

CMR KOREA CO., LTD.

Head Office : Kumjung-gu Busan
 Homepage Add. : www.cmkkorea.com
 Main Products : Temperature & Press Sensor, Alarm Monitoring Sys.
 TEL : +82-51-521-2883

DAECHANG METAL CO., LTD.

Head Office : Saha-gu Busan
 Homepage Add. :
 Main Products : Main Bearing support, Chain Wheel, Gear Wheel
 TEL : +82-51-264-0831

DAE-DONG ENTEC CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. : www.ddentec.com/
 Main Products : Air Cooler, Oil Cooler, Oil Tank, Air Tank, Oil Heater
 TEL : +82-51-832-1123

DAE HAN HEAT ELECTRIC MACHINERY IND., CO.

Head Office : Kijang-kun Busan
 Homepage Add. :
 Main Products : CO2 Welder, DC Tig, Welder, AC ARC Welder
 TEL : +82-51-724-6777

DAEHEUNG IND. CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. : www.daeheungind.kr/kr/
 Main Products : Forged Flanges, Nozzel & Forged Neck, Forged Items for ship
 TEL : +82-51-831-6635

AQ TECK CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Flower Meter, Viscometer, Control Valve
 TEL : +82-51-831-3720

DAEHWA TECHNICAL CO., LTD.

Head Office : Kimhae Gyeongsangnam-do
 Homepage Add. :
 Main Products : Shot & Blast, Painting, Painting' s Manufacture
 TEL : +82-55-329-5705

DAEJUNG SPECIAL STEEL CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : Winch, Shaft, Gear Clutch
 TEL : +82-51-831-1133

DAEKYUNG CO., LTD.

Head Office : Saha-gu Busan
 Homepage Add. : www.dkhoist.com
 Main Products : Chain Block, Lever Block Trolley
 TEL : +82-51-264-6611

DAERIM MACHINERY CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. : www.dae-rim.kr
 Main Products : Head, Air Receiver Tank, Pressure Vessel, Reactor
 TEL : +82-51-831-1456

DAESAN ENGINEERING CO., LTD.

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.

Head Office : Gangseo-gu Busan
 Homepage Add. : www.ds-frp.com/
 Main Products : Pipe Insulation System, FRP Weather Door
 TEL : +82-51-832-2071

DAESUNG IND CO.

Head Office : Gangseo-gu Busan
 Homepage Add. :
 Main Products : VENT SYS, OIL TANK, Out Fitting
 TEL : +82-51-831-7427

DAE WON HEAVY INDUSTRIES CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. : www.daewonindustry.co.kr/
 Main Products : Deck Machinery, Deck Equipments, OffShore
 TEL : +82-51-831-5215

DAEWON METAL IND. CO., LTD.

Head Office : Gangseo-gu Busan
 Homepage Add. : www.galvanizing.co.kr/
 Main Products : Hot Dip Galvanizing, Pipe for Shipbuilding
 TEL : +82-51-831-2541

DAEYANG ELECTRIC CO., LTD.

Head Office : Saha-gu Busan
 Homepage Add. : www.daeayang.co.kr
 Main Products : Precision Instrument
 TEL : +82-51-200-5331

DAEYANG INSTRUMENT CO., LTD.

Head Office : Saha-gu Busan
 Homepage Add. : www.daeayang.co.kr
 Main Products : Precision Instrument
 TEL : +82-51-200-5331

DAEYANG SP CO., LTD.

Head Office : Yangsan Gyeongsangnam-do
 Homepage Add. :
 Main Products : Welding machine
 TEL : +82-55-388-3800

DA HEUNG ENG. CO., LTD.

Head Office : Sasang-gu Busan
 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.

Head Office : Dongnae-gu Busan

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

DINES CO., LTD.

Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products : Provision Crane, Tilting Radar Post
TEL : +82-51-971-0972

DK INDUSTRIAL CO., LTD.

Head Office : Saha-gu Busan
Homepage Add. : www.dk-ind.com/
Main Products : Silencer, Fire Damper, Lashing Bridge, Rudder
TEL : +82-51-832-1436

DK TECH CORPORATION CO., LTD.

Head Office : Kimhae Gyeongsangnam-do
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
Homepage Add. :
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.dhintec.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
TEL : +82-51-970-1000

DONGHWA M&E CO., LTD.

Head Office : Kimhae Gyeongsangnam-do
Homepage Add. : www.donghwame.com
Main Products : Heat Exchanger
TEL : +82-55-340-6700

DONGHWA PNEUTEC CO., LTD.

Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products : Air Compressor, Cylinder, Head, Piston
TEL : +82-51-974-4800

DONGIL SHIPYARD CO., LTD.

Head Office : Saha-gu Busan
Homepage Add. : www.dongilshipyard.co.kr
Main Products : Rescue Boat Davit & Winch, Assembly, Line Hauler

TEL : +82-51-200-1211

DONGKYUNG INDUSTRY CO., LTD.

Head Office : Gangseo-gu Busan
Homepage Add. : www.dki21.co.kr
Main Products : Reducer, Gear
TEL : +82-51-832-1602

DONG NAM ENGINEERING CO., LTD.

Head Office : Saha-gu Busan
Homepage Add. : www.dongnam-eng.com
Main Products : Electric Control Panel
TEL : +82-51-204-3984

DONGNAM PRECISION IND. CO., LTD.

Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products : Multi Core Tube, Sus Cable Tray & Cover, LNG Line Out Fitting
TEL : +82-51-831-3500

DONG SUNG HIGHTECH.

Head Office : Gangseo-gu Busan
Homepage Add. : www.dshitech.com
Main Products : Shutter Grill, P-Chamber, Diffuser, Frie Damper, Volume Damper
TEL : +82-51-831-9561

DONGYANG G.T.S.

Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products : Compressed Centellen Board, Metal Inserting Gasket
TEL : +82-51-831-6505

DONGYANG HYDTEC CO., LTD.

Head Office : Gangseo-gu Busan
Homepage Add. : www.dongyang-hyd.com
Main Products : Rudder & propeller Truck, Block lifter, Gripper Jack System
TEL : +82-51-831-6185

DONGYANG METAL CO., LTD.

Head Office : Sasang-gu Busan
Homepage Add. : www.dy-metal.co.kr
Main Products : Swing bolt assembly, Fittings
TEL : +82-51-814-5157

DONGYOUNG ELECTRIC CO., LTD.

Head Office : Gangseo-gu Busan
Homepage Add. : www.dyelectric.com
Main Products : Main Switchboard, Emergency Switchboard
TEL : +82-51-261-9800

DSB ENGINEERING CO., LTD.

Head Office : Youngdo-gu Busan
Homepage Add. : www.dseng.com
Main Products : Totally Enclosed, Lifeboat, Herged Crarity Davit
TEL : +82-51-412-5937

DSE BEARING CO., LTD.

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

DSK CO., LTD.

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

DUYOUNG INDUSTRIAL MACHINES CO., LTD.

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

EM SYSTEC CO., LTD.

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

FRIEND CO., LTD.

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

GEO MAEK SHOT&PAINT CO.,LTD.

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

GEORIM ENGINEERING CO., LTD.

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

GISUNG ENGINEERING CO., LTD.

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

G. M. TEC CO., LTD.

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

G.S HIGH-TECHER CO., LTD.

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

G&S PRECISION IND CO., LTD.

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

HAE DONG METAL CO., LTD.

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

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

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

HAE SUNG INDUSTRIAL.

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

HAEWON INDUSTRIES CO.

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

HAEWON IND. CO., LTD.

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

HAEYANG FAMILY CO., LTD.

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

HAEYANG METAL CO., LTD.

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

HAEYANG PROPELLER CO., LTD.

Head Office : Gangseo-gu Busan

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

HANCHANG TRANS CO., LTD.

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

HANJULEVEL.

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

HANLA IMS CO., LTD.

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

HANLA IND CO., LTD.

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

HANMAUM KI-GONG CO., LTD.

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

HEARTMAN CO., LTD.

Head Office : Saha-gu Busan
Homepage Add. : www.heartman.co.kr
Main Products : Nozzle Tip, Plunger Ass'y, Fuel Injection VV
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 Coalring 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.jymct.co.kr
Main Products : Multi Core Tube, Welded Stainless, Steel Tube
TEL : +82-51-313-4001

JMC HYDRAULICS.

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

JNC HI-TECHNOLOGIES.

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

JOKWANG I.L.I CO., LTD.

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

JONGHAP POLESTAR ENGINEERING CO., LTD.

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

JUNG GONG IND. CO., LTD.

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

JUNG - WOO MACHINERY CO., LTD.

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

KANG BACK INDUSTRY CO., LTD.

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

KANGIL CO., LTD.

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

KANGRIM HEAVY INDUSTRIES CO., LTD.

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

K.C. LTD.

Head Office : Gangseo-gu Busan
Homepage Add. : www.iccp-mgpps.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-Plision 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 : +82-51-414-7891

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/Overfill Alarm System
TEL : +82-51-831-2108

MAX TECH.

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

MCM CO., LTD.

Head Office : Gangseo-gu Busan
Homepage Add. : www.mcm21.co.kr
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

OBOK ELECTRIC CO., LTD.

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

OK KWANG ENG CO., LTD.

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

OK KWANG METAL CO., LTD.

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

ORIENTAL PRECISION & ENGINEERING CO., LTD.

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

ORIENTAL PRECISION MACHINERY CO., LTD.

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

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

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

PACO HITEC CO., LTD.

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

PAL MI METAL IND CO., LTD.

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

TEL : +82-55-552-3840

PANASIA CO., LTD.

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

PI PLUS CO., LTD.

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

POONG JIN METAL CO., LTD.

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

PSM CO., LTD.

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

SEJIN BOLT CO., LTD.

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

SEUNG JIN E.N.G.

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

SEUN STEEL CO., LTD.

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

SEWOONG PRECISION MACHINERY CO., LTD.

Head Office : Gangseo-gu Busan
 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

SHINHWHA 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.PPROPELLER Blade & Hub
TEL : +82-51-831-5991

SIN HUENG FLANGE CO., LTD.

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

SINWEOL GRATING CO., LTD.

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

SMS CO., LTD.

head office : Saha Gu Busan
homepage add : www.sms-marinesystem.com
main products : hatch-pontoon type, folding type, side rolling type, etc. lashing equipment-2/3tier
TEL : +82 51-290-1000

SM POWER TEC CO., LTD.

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

SNP CO., LTD.

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

STACO CO., LTD.

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

STA-JH CO., LTD.

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

STASB CO., LTD.

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

STAUFF KOREA LTD.

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

STBEND CO., LTD.

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

STEEL KOREA CO., LTD.

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

SUHHEUNG ENGINEERING CO., LTD.

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

SUNBO IND CO., LTD.

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

SUNG CHANG CO., LTD.

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

SEOUNG HYUP MACHINERY.

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

SUNG IL CO., LTD.(SIM)

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

SUNG KWANG M/C.

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

SUNGWON ELECTRIC CO.

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

SUNG WON ENTERPRISE. CO., LTD.

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

SUNIL INSTRUMENT CO., LTD.

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

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

Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products : Cargo Line, Ballast Line, Engine Room, I.G Line

TEL : +82-51-831-3777

S&W CO., LTD.

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

TAE HWA INDUSTRY CO.,LTD (THI)

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

TAEHWA KALPA SEAL.

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

TAE KWANG INDUSTRIES.

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

TAESHIN G & W CO., LTD.

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

TAESUNG MACHINERY CO., LTD.

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

TAEWON CO., LTD.

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

TAEWOONG CO., LTD.

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

TAEWOONG TECH CO., LTD.

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

TANKTECH CO., LTD.

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

TK CORPORATION CO., LTD.

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

TMC CO., LTD.

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

TYCO MARINE SERVICES KOREA CO., LTD.

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

U-YOUNG PRECISION IND. CO., LTD.

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

U-YOUNG & TECH.

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

WON KWANG VALVE CO., LTD.

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

WOONG CHEON OUTFITTING CO., LTD.

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

WOOSUNG FLOWTEC CO.

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

WOORYANG B&P IND CO., LTD.

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

Y.C.P CO., LTD.

Head Office : Saha-gu Busan
 Homepage Add. :
 Main Products : Carbon Steel Precision, Tybe for Hydraulic Line Service
 TEL : +82-51-264-9300

YESUNG IND. CO., LTD.

Head Office : Gangseo-gu Busan
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