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KORMARINE 2013 will be open with great eclat at Busan Exhibition & Convention Center (BEXCO) , and Monthly KORSHIP will keep you updated with the latest news swiftly during the show as the official media of KORMARIE 2013 and we appreciate you cooperation in advance.

KORMARINE 2013 will run from October 22 to October 25 Busan Exhibition Convention Center (BEXCO) .
Our daily news will have a circulation of 6,000 every day during the show.

Contact Monthly KORSHIP or K. Fairs for inquiries or suggestions for the daily news article related to KORMARINE 2013 or advertisement in the print Edition. (Deadline Date: September 25th 2013)

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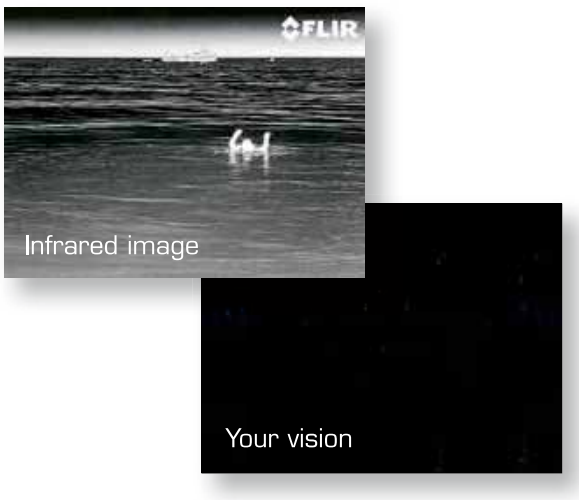

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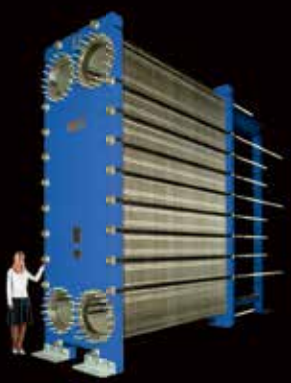

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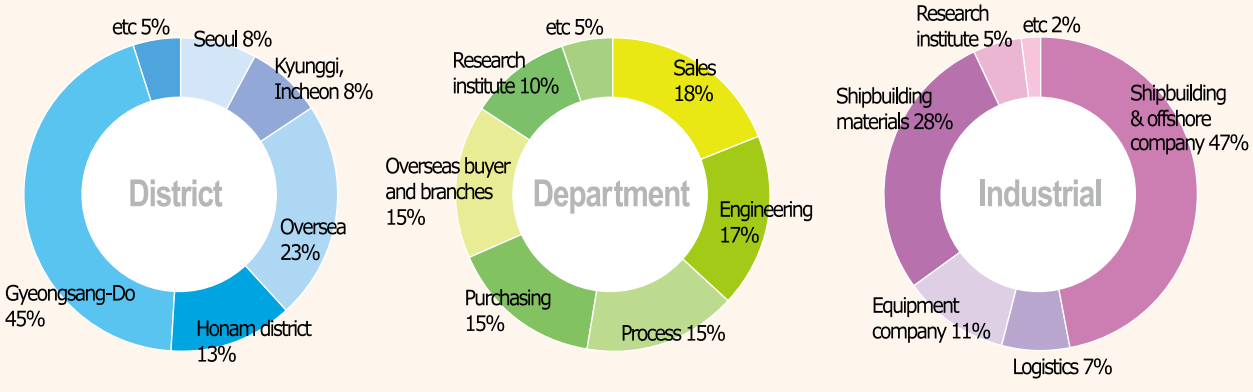

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HHI developed membrane type LNG cargo containment system

Hyundai Heavy Industries(HHI) completed development of membrane type LNG cargo containment system and received the type approval of design from American Bureau of Shipping(ABS) and Norway-based DNV.

This cargo containment system has the welded dual metal barrier to prevent the leakage of LNG, unlike previous cargo containment systems using the adhesives. In addition, this cargo containment system applied the insulation board that provides excellent insulation performance and strength, reducing the LNG vaporization rate to more than 10% compared to existing products. Named as 'Hyundai Membrane LNG cargo containment system', it will be commercialized after final performance test and used as large-capacity fuel tank for LNG carrier, LNG-FPSO, LNG fuel supply vessel, and LNG-powered propulsion system.

HHI has focused on achieving technology independence in LNG carrier construction sector. Specifically, HHI successfully developed the independent LNG cargo containment system which drastically reduced the costs by streamlining the process in November, 2012.

With the development of this cargo containment system, HHI has put itself in a better position to win new orders amid an expected upturn in new orders for LNG carriers, spurred by the increasing demand for eco-friendly LNG after the nuclear crisis in Japan and the expectations of export approval for Shale gas in the United States.

Bird's eye view of LNG FPSO fitted with membrane type LNG cargo containment system

An official from HHI said, "With the successful development of the membrane type LNG cargo containment system, which follows the development of independent LNG cargo containment system at the end of last year, we can build various cargo containment systems tailored to the requirements of customers. If this LNG containment system, which we developed independently, is installed on board vessel, we will be better placed to win new orders without having to pay royalties."

현대중공업, 멤브레인형 LNG 화물창 개발

현대중공업은 멤브레인형 LNG화물창에 대한 개발을 완료하고, 미국 선급(ABS)과 노르웨이 선급(DNV)으로부터 설계 승인을 받았다.

이번에 현대중공업이 개발한 화물창은 접착제를 사용하던 기존 방식과 달리 금속 재질을 용접해 이중 방벽을 쌓음으로써 LNG 누설을 원천적으로 차단한 것이 특징이다. 게다가 단열성과 강도가 우수한 단열판을 적용함으로써 LNG 기화율을 기존 제품 대비 10% 이상 낮출 수 있다.

'현대 멤브레인 LNG화물창'으로 명명된 이 화물창은 최종 성능 시험을 거쳐 상용화 될 계획이며, 향후 LNG선, LNG-FPSO는 물론 LNG연료공급선, LNG연료추진시스템의 대용량 연료탱크로도 사용될 것으로 보인다.

현대중공업은 지난 2012년 11월 공정단순화로 비용을 크게 줄인 독립형 LNG화물창 개발에 성공하는 등 LNG선 건조분야 기술 자립화를 위해 그동안 노력해 왔다. 특히 일본 원전사고 이후 친환경 LNG에 대한 수요증가와 미국 셰일가스 수출승인 기대 등으로 LNG 선의 발주증가가 예상되는 가운데 잇따른 LNG 화물창 개발로 수주 경쟁력을 한층 높일 수 있게 되었다.

현대중공업 관계자는 "지난해 말 자체 개발한 독립형 LNG 화물창에 이어 멤브레인형 LNG 화물창 개발에 성공함으로써 고객 요구에 맞는 다양한 화물창 제작이 가능해졌다"며 "독자 개발한 화물창이 실제 선박에 탑재되면, 더 이상 로열티를 내지 않게 돼 수주 경쟁에서 우위를 점할 수 있을 것으로 기대하고 있다"고 말했다.

Korea Exim Bank and KR sign MOU to increase cooperation in shipbuilding and offshore plant sectors

Korea Exim Bank signed an agreement with Korean Register of Shipping(KR) to increase cooperation in shipbuilding and offshore plant sector on April 30.

Having signed the agreement, Korea Exim Bank will facilitate the KR to participate in the ship finance while KR will provide technical consultation to Korea Exim Bank in relation to shipbuilding and offshore plant, and both companies agreed to expand cooperation on overseas projects and training for employees.

Korea Exim Bank will use the technology of KR to increase its support to eco-friendly vessels and push forward effective measures to improve the related systems. Supported by Korea Exim Bank, KR will speed up the pace of entry into overseas markets.

Hong Yeong-pyo, Vic-President of Korea Exim Bank, said, "I anticipate this convergence of finance and technology will ease

the path to the advancement of ship finance, shipbuilding and offshore industries."

Ma Jin-seop, head of the operation division at KR, said, "We will keep working closely with Korea Exim Bank to shore up the slumping shipbuilding and offshore industries."

한국수출입은행, 한국선급과 조선 · 해양 플랜트 상호 협력을 위한 MOU 체결

한국수출입은행(KoreaEximBank)은 지난4월30일한국선급(KR)과조선/해양플랜트분야상호협력을위한 업무협약을 체결했다.

이번 업무협약을 통해 한국수출입은행은 선박금융 제공 거래에 대해 KR의 선급참여를 지원하고, KR은 한국수출입은행에 조선과 해양플랜트 산업 관련 기술자문을 제공하며, 해외 프로젝트와 임직원 교육 등에 대해서도 상호 협력키로 합의했다.

한국수출입은행은KR의기술력을활용하여친환경선박에대한지원비율을확대하는등지속적인제도개선을추진하고,KR은수은의지원사격아래해외시장 진출에 박차를 가할 예정이다.

한국수출입은행홍영표부행장은이날서명식에서"금융과기술의융합으로선박금융을고도화하여조선·해양산업 발전에 기여할 것"이라고 말했다.

KR마진섭사업본부장은"수은과의지속적인협력을통해침체된조선·해양경기회복에실질적인도움이 될 수 있도록 최선을 다하겠다"고 화답했다.

SSME held a naming ceremony for its first offshore plant

Sungdong Shipbuilding & Marine Engineering(SSME) held a naming ceremony for the FSO(Floating Storage and Offloading) ordered from Vietnam-based PTSC at its Tongyeong headquarters on April 29. The naming ceremony drew about 100 people, including Kim Yeon-shin, President of SSME, Do Van Hau, President of Petro-Vietnam National Oil and Gas Group(PVN), the holding company of PTSC, Vu Khanh Truong, Director of PVN, Nguyen Quoc Thap, Vice-Chairman of PVN, Nguyen Hung Dung, President of PTSC, etc. This facility, ordered in 2011, will be deployed for the oil field project in southeast Vietnam, and is a part of Bien Dong 1 project that will receive an injection of USD 800 million of funding.

This FSO was christened 'PTSC Bien Dong 01' at the naming ceremony. PTSC Bien Dong 01', which is the first facility built by SSME in the offshore sector, measures 170m in length, 32.4m in width with a storage capacity of 350,000 barrels, which are enough to fuel approximately 850,000 mid-size vehicles, and can accommodate 50 crews. PTSC(Petro-Vietnam Technical Services Company), which placed its first order to any Korean shipyard this time, is the largest subsidiary of PVN(Petro-Vietnam National Oil and Gas Group).

An official from SSME said, "Following our delivery of shuttle tanker not long ago, we was awarded this FSO project, taking a first step in making inroads into the offshore sector, the high-value and high-tech sector, bringing the business structure of SSME to the next advanced level and developing new growth engines for future. So, SSME has become the fifth domestic shipyard to enter the global offshore market."

성동조선해양, 첫 해양플랜트 명명식 개최

성동조선해양은 지난 4월 29일 통영 본사에서 베트남 PTSC로부터 수주한 FSO(Floating Storage and Offloading)의 명명식을 가졌다.

이날 명명식에는 성동조선해양 김연신 대표이사와 PTSC의 모회사인 베트남석유가스공사(PVN)의 도 반 하우(Do Van Hau) 대표이사, 부칸 쭈옹(Vu Khanh Truong) 이사, 응웬 꾸옥 탑(Nguyen Quoc Thap) 부회장, PTSC의 응웬 훙 덩(Nguyen Hung Dung) 대표이사 등 100여명이 참석해 성공적인 건조를 축하했다.

지난 2011년 수주한 이 설비는 총 8억 달러가 투자되는 '벤동(Bien Dong) 1 프로젝트' 중 하나인 베트남 남동부 유전개발에 투입될 예정으로, 프로젝트의 명칭을 따 'PTSC 벤동(Bien Dong) 01'로 명명되었다.

성동조선해양의 오프쇼어 분야에서의 첫 건조 실적인 'PTSC 벤동(Bien Dong) 01'은 길이 170m, 폭 32.4m의 규모로 50명의 인원을 수용할 수 있고, 중형승용차 약 85만대의 주유 분량인 35만배럴의 원유를 저장할 수 있다.

한국 조선소에 해양설비를 발주하는 것은 성동조선해양이 처음인 PTSC(Petro-Vietnam Technical Services Company)는 베트남석유가스공사(PVN) 산하의 최대 규모 자회사이다.

성동조선해양의 관계자는 "얼마 전 셔틀탱커를 인도한 데 이어 이번 FSO 건조로 고부가치, 고기술 분야인 오프쇼어 시장에 첫발을 내딛는 시발점인 동시에 성동조선해양의 사업구조 고도화와 미래 신성장 동력 확충을 위한 계기가 될 것으로 보인다"며 "성동조선해양은 이로서 한국 조선사 중 세계 오프쇼어 시장에 진출하는 다섯 번째 조선사로 자리매김하게 되었다"고 말했다.

STX Helsinki shipyard delivered the ice-breaking vessel for polar region

STX Group announced on April 25 that it held a hand-over ceremony at Arctech Helsinki Shipyard, the subsidiary of STX Europe, for the ice-breaking vessel ordered by Sovcomflot, Russia's largest state-owned shipping company. This hand-over ceremony was attended by Finnish President Sauli Niinistö, Korean Ambassador to Finland Park Dong-seon, Russia's Ambassador to Finland Alexander Rumyantsev, Sovcomflot Chairman Sergey Frank, STX Europe President Kim Seo-joo, etc.

Named after Russian Navigator Aleksei Chirikov, this ice-breaking vessel measures 99.9m in length, 21.7m in width, and can operate breaking the polar ice up to 1.7m thick at the temperature of -35℃.

This vessel is the second unit out of the 2 polar ice-breaking vessels which were ordered from Sovcomflot in 2010. After delivery, this vessel will be used for rescue operations and transportation of cargo to supply the Arkutun Dagi offshore oil platform in Sakhalin, Russia.

Arctech Helsinki Shipyard, located in Finland, was formed in 2010 by STX Europe and Russia's largest state-run shipping group USC(United Shipbuilding Corporation) and is stepping up the effort to win new vessel orders from Russia based on its differentiated technology in special purpose vessels for polar regions, etc.

Esko Mustamäki, the Director of Arctech Helsinki Shipyard, said, "This vessel, a multi-purpose ice-breaking vessel incorporating the state-of-art technology, is the result of the constant cooperation between Arctech Helsinki Shipyard and Sovcomflot. We will fully leverage our world's best technology for vessels operating in polar regions to tap into the niche market and put ourselves in a better position to win new orders for high value-added vessels."

STX 헬싱키 조선소, 극지용 쇄빙선 인도

STX그룹은 STX유럽 자회사인 아크텍 헬싱키 조선소(Arctech Helsinki Shipyard)에서 러시아 최대 국영해운선사인 소브콤플로트(Sovcomflot)사가 발주한 쇄빙선에 대한 인도식을 개최했다고 지난 4월 25일 밝혔다.

이날 인도식은 사울리 니니스토(Sauli Niinistö) 핀란드 대통령, 박동선 주핀란드 한국대사, 알렉산더 루미얀체프(Alexander Rumyantsev) 주핀란드 러시아대사, 세르게이 프랭크(Sergey Frank) 소브콤플로트 회장, 김서주 STX유럽 사장 등이 참석한 가운데 열렸다.

러시아 항해사의 이름을 따 '알렉세이 키리코브(Aleksei Chirikov)'로 명명된 이 선박은 길이 99.9m, 폭 21.7m 규모로 영하 35℃의 극한 상황에서 최대 1.7m 두께의 얼음을 깨며 항해할 수 있다. 이 선박은 지난 2010년 소브콤플로트사로부터 수주한 극지용 쇄빙선 2척 중 두 번째 선박으로 인도 후 러시아 사할린 지역 아쿠툰 다기(Arkutun Dagi) 해상유전 플랫폼 지원을 위한 화물 운송 및 구조 작업 등에 이용될 예정이다.

한편 핀란드에 위치한 아크텍 헬싱키 조선소는 STX유럽과 러시아 최대 국영조선그룹인 USC사가 2010년 설립해 극지용 특수 선박 기술 등 차별화된 경쟁력을 바탕으로 러시아 선박 수주를 위해 박차를 가하고 있다.

에스코 무스타마키(Esko Mustamäki) 아크텍 헬싱키 조선소 이사는 "이번 선박은 최첨단 기술을 접목한 다목적 쇄빙선으로 아크텍 헬싱키 조선소와 소브콤플로트의 지속적인 협력의 산물"이라며 "앞으로도 세계 최고 수준의 극지 운항용 선박 건조 기술력을 바탕으로 틈새시장을 공략해 고부가가치 선박의 수주 경쟁력을 높여갈 것"이라고 말했다.

MOTIE selected the 100 key technologies for offshore plant

The Ministry of Trade, Industry and Energy (MOTIE) announced the technology acquisition roadmap for offshore plant industry to help secure the 100 key technologies related to offshore plant. This technology roadmap was laid out with the involvement of about 50 experts from the industry and research institutes to push forward the strategy which MOTIE announced in a bid to spur the advancement of offshore plant industry.

The offshore plant market is expected to be worth USD 320 billion by 2020, growing rapidly from USD 140 billion in 2010. The offshore plant is important for the shipbuilding industry making transition to high-value and stable industrial structure. Particularly, the demand for offshore plant has been rising steadily despite the recent downturn in the shipbuilding market. MOTIE has brought together approximately 50 experts from shipyards, universities, research institutes, Korea National Oil Corporation(KNOC), etc., over the last 10 months in an attempt to lay out the offshore plant technology roadmap and select the 100 key technologies.

The 100 key technologies were categorized based on the 4 sectors of offshore plant – drillship/drill rig/FPSO, LNG FPSO/FSRU, Subsea/OSV – and the period which was divided into the short term(within 3 months, 30

technologies), mid-term(within 5 years, 57 technologies) and long-term(over 5 years, 14 technologies), depending on the difficulty of development.
MOTIE will provide support for the systematic development of the 100 key technologies according to the technology roadmap and actively promote the advancement of offshore plant and localization of marine equipment.

산업통상자원부, 해양플랜트 100대 전략기술 선정

산업통상자원부는 해양플랜트 100대 전략기술을 선정하고, 이를 체계적으로 확보하기 위한 "해양플랜트산업 기술 로드맵"을 수립 및 발표했다. 이 기술 로드맵은 지난해 산업통상자원부가 발표한 "해양플랜트산업 발전 전략"을 이행하기 위해 산학연 전문가 50여명이 참여해 수립한 것이다.
해양플랜트 시장 규모는 지난 2010년 1,400억 달러에서 2020년 3,200억 달러로 급성장할 것으로 예상되고 있다. 해양플랜트는 주력산업인 조선산업의 고부가가치화와 안정적 발전을 위해 중요하다. 특히 최근 조선경기 침체에도 불구하고 해양플랜트 수주는 지속적으로 증가하고 있다.
산업통상자원부는 해양플랜트 기술로드맵 수립과 100대 전략기술 선정을 위해 지난해 5월부터 약 10개월간 조선사, 대학, 연구소, 석유공사 등 전문가 약 50명으로 구성 및 운영해왔다.
100대 전략기술은 해양플랜트를 드릴쉽/드릴리그, FPSO, LNG FPSO/FSRU, Subsea/OSV 등 4대 분야로 나누고, 개발 난이도 등에 따라 단기(3년 이내, 30개), 중기(5년 이내, 57개), 장기(5년 초과, 14개)로 구분했다.
산업통상자원부는 이번에 수립된 기술로드맵에 따라 100대 전략기술을 체계적으로 개발하여 해양플랜트산업 육성과 기자재 국산화에 적극 추진할 계획이다.

DSME and POSTECH signed MOU for industry-university collaboration

Daewoo Shipbuilding & Marine Engineering (DSME) entered into an MOU for industry-university collaboration with POSTECH, the science & technology research-oriented university, to promote the development of shipbuilding and offshore industries on April 26.
The signing ceremony, held in DSME's Okpo shipyard, was attended by the officials of both organizations, including Goh Jae-ho, President of DSME, and Kim Yong-min, President of POSTECH. Having signed this MOU, DSME and POSTECH pledged to build systematic industry-university collaboration system which covers the joint research aiming to spur advancement of shipbuilding and offshore industries, training programs designed to help expand professional capabilities, technical information and research workforce exchange.
Goh Jae-ho, President of DSME, said, "It is an honor to sign this MOU with the world-renowned POSTECH. I hope that this MOU will provide an opportunity to lay the cornerstone for DSME and POSTECH to develop together."
Kim Yong-min, President of POSTECH, said, "Businesses and educational institutes are the building blocks that underpin the success of society and country. I hope that POSTECH and DSME work closely and mutually help to achieve successful global leadership."

Goh Jae-ho, President of DSME, and Kim Yong-min, President of POSTECH, are posing for photo after signing an agreement on the industry-university collaboration.

DSME and POSTECH launched the PM(Project Management) program to foster professional manpower for offshore plant sector thrust into limelight as future locomotive, and are currently providing the training to the personnel related to the project management including the procurement, design, production, etc.

대우조선해양-포스텍, 산학협력 MOU 체결

다음 대우조선해양은 지난 4월 26일 과학기술연구중심대학인 포스텍(Postech)과 조선해양산업분야 발전을 위한 산학협력 협약을 체결했다.
옥포조선소에서 열린 이날 협약식은 대우조선해양 고재호 사장과 포스텍 김용민 총장 등 양 기관 관계자가 참석한 가운데 향후 조선해양산업 발전을 위한 공동연구와 전문역량 강화교육, 연구인력 및 기술정보 교류협력 등 상호 유기적인 산학협력체계 구축을 약속했다.
대우조선해양 고재호 사장은 "세계적인 명성의 포스텍과 MOU를 체결하게 되어 영광으로 생각한다"며 "이번 협약식을 통해서 대우조선해양과 포스텍이 상호 발전하는 토대를 마련하고 성장하는 계기가 되길 바란다"고 인사말을 전했다.
포스텍 김용민 총장은 "사회가 발전하고 국가가 발전하려면 기업과 교육기관이 발전해야 된다"고 강조하며, "포스텍과 대우조선해양이 세계를 리드해나가는데 상호협력하고 연구하는데 많은 도움이 되길 바란다"고 말했다.
한편, 최근들어 해양플랜트 사업이 국가의 미래 사업으로 각광받고 있는 가운데 대우조선해양과 포스텍은 지난해 해양프로젝트 전문인력 양성을 위한 'PM(Project Management) 전문가 육성 교육'을 시작으로 조달, 설계, 생산 등 프로젝트 관리와 연관이 있는 인원을 대상으로 위탁교육을 진행 중에 있다.

CEO Hogan to leave ABB for private reasons

ABB Chief Executive Officer Joe Hogan has decided to leave ABB for private reasons on May 10, 2013. A date for his departure has not yet been decided. Hogan will continue to lead ABB until a successor is announced.

"Joe is a great and successful CEO and has done a remarkable job of leading the company through the deepest economic crisis in living memory. ABB today is in a much better position than it was when he joined five years ago," said Chairman Hubertus von Grünberg. He added, "Under Joe's leadership ABB's competitiveness has significantly improved by investing boldly in measures to drive growth and innovation, and by carefully managing costs."

Hogan joined ABB as CEO in September 2008. During his time at the helm, ABB has invested about $ 20 billion to strengthen the company. Major investments have been made in acquisitions and in R&D to help secure ABB's technological leadership in power and automation.

"I have informed the board that I have decided to leave ABB. This has been a difficult decision as I leave behind a strong and talented Executive Committee and a cohesive Board whose support I could always count on. I look forward to making a smooth transition with as little disruption as possible to the positive momentum that ABB has established," CEO Hogan said.

ABB 조 조건 CEO 사직

ABB 최고경영자인 조 호건(Joe Hogan)이 ABB를 떠나기로 결정했다. ABB는 사퇴일자가 아직 결정되지 않았으며, 후임자가 발표될 때까지 당분간 ABB를 이끌어 나갈 것이라고 전했다.

후버르투스 본 그륀베르크(Hubertus von Grünberg) ABB 회장은 "그는 훌륭하고 성공적인 CEO이며, 모든 이들이 기억하고 있는 깊은 경제위기 속에서도 회사를 이끄는데 주목할 만한 성과를 이뤄왔다. 5년 전 조 호건이 합류했을 당시보다 ABB의 위상은 더욱 높아졌다."라고 언급했다. 덧붙여 "조의 리더십 하에서, ABB 경쟁력은 성장과 혁신을 주도하며, 대담한 투자와 비용 관리를 통해 현저히 향상되었다"고 말했다.

조 호간은 2008년 9월에 ABB CEO로 선임되었으며, 재임 기간 동안 ABB는 회사를 강화하기 위해 약 200억 달러를 투자했다. 주요 투자는 인수부문 이었으며, 전력과 자동화 기술 리더십을 확고히 하고자 R&D에서도 이뤄졌다.

조 호건 CEO는 "ABB를 떠나기로 한 결심에 대해 이사회에 알렸다. 강력한 재능있는 집행위원회와 항상 의지할 수 있는 응집력 강한 이사진을 뒤로하고 떠나기로 한 것은 어려운 결정이었다. ABB가 세워온 긍정적인 모멘텀에 가능한 적은 영향과 원활한 인계를 위해 최선을 다하겠다"고 말했다.

Techcross achieved KRW 75.1 billion in sales from BWMS market

Techcross announced at the General Shareholders' Meeting in March that it registered KRW 75.1 billion in sales from the Ballast Water Management System(BWMS) sector last year, which is a three-fold increase compared to 2011(KRW 27.1 billion)

Techcross has established a leading position in BWMS market and captured more than 50% share in the Japanese market alone. Furthermore, Techcross has gained reputation for its excellent technology and supplies its products to major domestic shipyards such as Hyundai Heavy Industries(HHI), Samsung Heavy Industries(SHI), Daewoo Shipbuilding & Marine Engineering(DSME), etc. This year, Techcross plans to move ahead vigorously with its sales strategies to target China, the biggest market for BWMS.

Techcross set an annual sales target in excess of KRW 100 billion from BWMS this year. As the commercial vessel market is showing signs of recovery, Techcross is riding with tail wind.

An official from Techcross said, "The newbuild market has been key driver for the growth of BWMS sector so far. So, Techcross will make another giant leap forward when the existing vessel market, much larger than newbuild market, opens up."

Meanwhile, the Ministry of Oceans and Fisheries(MOF) signed an agreement with Techcross on April 30 to spur the technology development for next-generation BWMS. MOF announced that it selected the technology leader Techcross in an open bid for the project aiming to develop the next-generation BWMS with an investment of KRW 12 billion that would spread over the next 5 years.

테크로스, BWMS 시장에서 지난해 751억 실적 달성

테크로스는 지난 3월 주주총회에서 Ballast Water Management System (BWMS) 부문의 지난해 영업 실적이 2011년(271억원) 대비 3배 성장한 751억 원을 거두었다고 발표했다.

BWMS 시장을 리딩하고 있는 테크로스는 일본 시장에서만 약 50%가 넘는 시장점유율을 기록했으며, 국내 조선소에도 그 기술력을 인정받아 현대중공업, 삼성중공업, 대우조선해양 등에 제품을 공급하고 있다. 올해 테크로스는 가장 큰 BWMS 시장인 중국을 타깃으로 활발한 영업 전략을 펼칠 계획이다.

테크로스는 올해 BWMS 매출로 1000억원을 넘어서겠다는 목표를 세웠다. 최근 상선 시장이 서서히 회복되는 분위기가 감지되고 있어, 그 동안 조선 불황기임에도 불구하고 매년 놀라운 성장을 거듭하고 있는 테크로스에 더욱 힘을 불어 넣고 있다.

테크로스의 관계자는 "현재까지 BWMS 시장의 성장을 견인한 것은 신조선 시장이다. 따라서 신조선 시장보다 훨씬 규모가 큰 현존선 시장이 본격적으로 열리게 되면 테크로스는 또 한번 큰 도약을 할 것"이라고 말했다.

한편 해양수산부는 차세대 BWMS를 개발하기 위해 지난 4월 30일 테크로스와 기술개발 협약을 체결했다. 해양수산부는 올해부터 5년간 120억 원의 예산을 투입해 차세대 BWMS를 개발하기로 하고, 최근 공개경쟁을 통하여 기술력이 가장 앞선 테크로스를 개발사업자로 선정했다고 밝힌바 있다.

HHIC launched 3 guided missile patrol boats for the Navy

Hanjin Heavy Industries & Construction (HHIC) held a launching ceremony for 'Han Mun Sik boat', 'Kim Chang Hak Boat', 'Park Dong Jin Boat', the guided missile patrol boats of the Navy, in Yeongdo shipyard on April 24. The ceremony was attended by major military officials, including Baek Seung-joo, Vice-Minister of National Defense, Goo Ok-hoe, Army Training & Doctrine Command of Navy, Jeong Ho-seop, Operations Command, and officials from shipyards, including Choi Seong-mun, President of HHIC, and navy sailors.

To pay tribute to the spirit of the patriots who scarified their lives for the country during the Korea War, these guided missile patrol boats were named after the lieutenant major Han Mun-sik who made great contribution to the recapture of Changrindo off the coast of the West Sea, sergeant first class Kim Chang-hak killed in action during the naval battle in the Straits of Korea, and sergeant first class Park Dong-jin killed in action during the operation to recapture Deokjeokdo and Yeongheungdo.

The guided missile patrol boat procurement has been pushed forward as part of the next-generation high speed patrol boat project(PKX, Patrol Boat Killer eXperimental) which aims to replace the old Chamsuri class high speed patrol boats and pay tribute to 6 warriors, including the lieutenant commander Yoon Yeong-ha, who were killed in action during the second Battle of Yeonpyeong in 2002. In 2007, HHIC built and launched Yoon Yeong Ha boat, the first of the series.

These guided missile patrol boats, which were launched on the same day, measure 63m in length and 9m in width, weighing 450 tons, and can accommodate about 40 crews and sail at a maximum speed of 40 knots(74km/hr). Moreover, these vessels are equipped with indigenous combat system such as electronic warfare system, including the target acquisition and tracking radar. Armed with anti-ship missile Haesung with a range of 150km and 76mm naval guns, these guided missile patrol boats are the state-of-art high speed warship capable of anti-ship and anti-aerial combat and high speed mobile strike.

한진중공업, 해군 유도탄 고속함 3척 진수

한진중공업은 지난 4월 24일 해군의 유도탄 고속함인 '한문식함', '김창학함', '박동진함'의 동시진수식을 가졌다. 이날 행사는 백승주 국방부 차관과 해군 구옥회 교육사령관, 정호섭 작전사령관을 비롯한 군 주요 인사와 최성문 한진중공업 사장 등 조선소 관계자, 해군 장병들이 참석한 가운데 부산 한진중공업 영도조선소에서 거행되었다.

해군은 유도탄 고속함의 명칭과 관련하여 영해수호의 정신을 기리기 위해 6.25전쟁 당시 서해 창린도 탈환작전의 수훈자인 한문식 중령과, 대한해협 해전시 전사한 김창학 중사, 덕적도 · 영흥도 탈환작전에서 전사한 박동진 중사의 이름으로 명명했다.

유도탄고속함은 해군이 지난 2002년 제2연평해전에서 전사한 윤영하 소령 등 6용사의 희생을 기리고 노후된 기존 참수리급 고속정의 대체전력을 확보하기 위한 차기 고속정 사업(PKX, Patrol Boat Killer eXperimental)의 일환으로 추진해 왔으며, 2007년 한진중공업이 초도함인 '윤영하함'을 건조 진수한 바 있다.

이날 진수한 유도탄고속함은 길이 63m, 폭 9m의 경하중량 450톤급 규모로 40여명의 승조원을 태우고 최대 40노트(시속 74km)로 운항 가능하며, 탐색 및 추적 레이더를 비롯한 전자전 장비 등 국내개발 전투체계를 갖췄다. 특히, 사정거리 150km에 이르는 대함유도탄 '해성'과 76mm 함포를 탑재하여 해상 고속 기동타격 및 대함 · 대공의 중장거리 전투능력을 갖춘 최신예 고속 전투함이다.

HHI developed a small robot for shipbuilding

Hyundai Heavy Industries(HHI) announced that its production technology research institute developed a small robot capable of welding the ship block and successfully completed the site application test.

This small robot's arm measures 50cm long, 50cm wide, 15cm high when it is folded, weighing only about 15kg, and therefore can be carried by operators at the site and perform a variety of tasks even in narrow space.

Existing robots used in the construction of vessels are so heavy and bulky that they can neither be transported without crane nor be used in complex work site. By contrast, this robot, developed by HHI, consists of 6 joints and is capable of carrying out most tasks which can be performed by human.

Particularly, this versatile robot fitted with magnet can be affixed to the wall surface and ceiling. Moreover, this robot is easy to operate and brings productivity gains as one person can operate and manage 2 to 3 robots simultaneously. HHI is on track to deploy this robot to the vessel construction site from the second half of this year.

Robot for shipbuilding, developed by HHI

현대중공업, 선박 건조용 소형 로봇 개발

현대중공업은 사내 생산기술연구소에서 선박의 블록(Block; 단위 구조물)을 용접하는 소형 로봇을 개발해, 현장 적용 테스트를 성공적으로 마쳤다고 밝혔다.

이번에 현대중공업이 개발한 로봇은 팔을 접었을 경우, 크기가 가로 50cm, 세로 50cm, 높이 15cm 정도로 작고, 무게는 약 15kg에 불과해 작업자가 직접 들고 다닐 수 있으며, 사람이 작업하기 어려운 협소한 공간에서도 다양한 작업이 가능하다.

기존의 선박 건조에 사용하던 로봇들은 무거운 중량 때문에 크레인을 사용하지 않고는 옮기기 어렵고, 부피가 커서 좁고 복잡한 작업공간에서 사용할 수 없었다. 하지만 이번에 현대중공업이 개발한 이 로봇은 팔이 6개의 관절로 이루어져 사람이 할 수 있는 대부분의 작업이 가능하다.

특히 로봇 몸체에 부착된 자석을 이용하면, 벽면과 천장에 붙은 상태로도 작업할 수 있어 활용도가 뛰어나다. 뿐만 아니라 조작도 간편해 작업자 한 사람이 2~3대의 로봇을 동시에 작동 및 관리할 수 있어 생산성을 향상시킬 수 있다는 회사측 설명이다. 현대중공업은 이 로봇을 올해 하반기부터 선박 건조 생산현장에 본격적으로 투입할 계획이다.

KR entered into a MOU with Samjin Shipbuilding Industries

Korean Register of Shipping(KR) signed a MOU with Samjin Shipbuilding Industries at its Qingdao branch in China to build solid mutual cooperative system in shipbuilding and offshore sectors.

Under this MOU, KR is designated as major classification society to increase technical assistance for design review, strength evaluation, etc., to maintain the standards for all new-build vessels, as well as promote mutual development and friendship.

At the signing ceremony, Go Jae-Hyun, KR's Qingdao branch manager and Jung Kwang-Suk, President of Samin, along with Jo Eun-Je, KR's director of the headquarters in China, and etc. attended and promised to proceed with a cooperation for mutual development and related businesses to promote technical progresses in shipbuilding and offshore industries.

Go Jae-Hyun, KR's Qingdao branch manager, said, "I am pleased that this MOU will provide opportunity for build stronger ties with Samjin Shipbuilding Industries. We will make our best effort to ensure close cooperation and mutual development."

한국선급, 삼진선업유한공사와 MOU 체결

한국선급은 중국 칭따오지부에서 삼진선업유한공사(Samjin Shipbuilding Industries)와 조선 · 해양 분야의 상호 긴밀한 협력체계 구축을 위한 양해각서를 체결했다.

이번 양해각서 내용에 따르면 양측은 신조 수주하는 전 선박에 대하여 KR을 주선급 기관으로 지정하며, 도면검토 및 강도평가 등에 대한 기술지원, 기타 상호 발전 및 우호증진을 통한 상

생의 협력체계를 구축할 계획이다.
이 날 협약식에는 조은제 KR 중국지역 본부장을 비롯해 고재현 칭따오 지부장, 정광석 삼진선업유한공사 사장 등이 참석해 조선해양 산업의 기술발전에 대한 공동연구 및 관련사업의 협력 추진을 약속했다.
조 본부장은 "이번 MOU 체결을 통해 삼진선업과의 우호를 더욱 증진할 수 있는 계기가 되어 기쁘게 생각한다"며 "앞으로도 양측이 긴밀히 협조하여 상호 발전할 수 있도록 최선을 다하겠다"고 밝혔다.

SK Telecom and DSME unveil the world's first LTE-based remote marine communication system

SK Telecom announced that it completed the development of the world's first LTE-based communication system for the sea test of vessels at remote location in collaboration with Daewoo Shipbuilding & Marine Engineering (DSME) and would launch commercial services. This communication system for the sea test of vessels located remotely enables the voice and wireless data transmission at sea up to the distance of 100km over the LTE network, and has been commercialized for the first time in the world.
This communication system combines the world's best LTE infrastructure/operation technology of SK Telecom with the DSME's remote signaling technology for marine application. Harnessing their technologies, both companies successfully developed the world's first offshore LTE router optimized for effective marine operations and extended the signaling distance up to 100km offshore after the repeated tests on vessels at sea. As a result, DSME is expected to attain the competitive edge, build vessels of even better quality and drastically reduce the costs.
In shipbuilding process, the sea trial at a long distance is given a great importance. This service enables remote monitoring/sea trial of vessels at a long distance and rapid response to emergencies, thus creating a more effective offshore operation environment, and will help improve the quality of vessels. In addition, the ship construction time is expected to be drastically shortened as the LTE-based ultra fast wireless network enables the transmission of various data between the ship and onshore location, allowing the tasks to be handled in real time.
Both companies will closely to build various fusion/convergence offshore smart environment, using the information and communication technology(ICT), with an aim to increase productivity and achieve the unrivalled competitiveness in the global market.
Lee Dae-hyeong, a research fellow of the Central Research Institute at DSME, said, "I anticipate the even safer work environment, drastic cost-savings and greater productivity brought about by the real-time communication system, built in cooperation with SK Telecom, enabling the voice and data transmission on the vessel undergoing the sea test during the shipbuilding process."

SK텔레콤-대우조선해양, 세계 최초 LTE 기반 원거리 선박 통신 서비스

SK텔레콤은 대우조선해양과 세계 최초로 LTE 기반 원거리 해상 시운전 선박 통신시스템 개발을 완료하고, 정식 서비스를 시작한다고 밝혔다. 이번에 선보이는 원거리 해상 선박 시운전 선박 통신서비스는 LTE망을 활용해 최대 100km에 달하는 원거리 해상에서도 음성통화는 물론 LTE급 무선데이터 서비스를 자유롭게 이용할 수 있도록 구축된 최첨단 서비스로, 국내는 물론 세계 최초로 상용화되었다.
SK텔레콤의 세계 최고 수준 LTE인프라 구축 및 운용 기술에 대우조선해양이 보유한 선박용 원거리 신호기술을 적용, 해상에서도 원활히 작동할 수 있도록 최적화된 '해상 LTE 라우터'를 최초로 개발하는 한편, 양사 기술진이 함께 선박 대상 테스트를 해상에서 수시로 직접 실시하는 등 지속적인 노력을 통해 신호 도달거리를 최대 해상 100km까지 확장했다.
따라서 이번 서비스 개발은 대우조선해양의 차별화된 경쟁력으로 자리잡을 것으로 기대되고 있는데, 우선 건조되는 선박의 품질 향상과 함께 큰 폭의 비용 절감이 기대된다. 보통 선박 건조시 원거리 해양에서의 시험 운전이 큰 비중을 차지하는데 이번 서비스를 통해 시운전 선박의 원격 모니터링 및 원거리 해상에서도 시운전 업무 처리가 가능해지는 것은 물론 위급 상황시 긴급한 대처가 가능해지는 등 육상에서와 같은 업무 환경이 구축됨으로써 선박의 품질 향상에 크게 기여할 것으로 예상된다.
또한 LTE기반의 초고속 무선 인터넷망을 통해 선박 건조 관련 다양한 데이터를 해상과 육상간 상시 전달할 수 있게 됨에 따라 실시간 업무처리가 가능해져 이를 통한 큰 폭의 공기 단축 효과도 얻을 수 있을 것으로 기대된다.
향후 양사는 ICT기술을 적극 활용한 다양한 융복합 해상 스마트 환경 구축을 위해 상호 노력을 함께 하는 한편, 이를 통해 확보한 산업 생산성 향상을 바탕으로 세계 최고 수준의 경쟁력을 만들어 낼 계획이다.
대우조선해양 이대형 중앙연구소 전문위원은 "SK텔레콤과의 협력을 통해 건조 선박의 해상 시운전 시 음성통화, 데이터 송수신 등 실시간 연락 체계 구축이 가능해져 높은 수준의 원가 절감 및 생산성 향상 효과가 기대되는 한편 더욱 안전한 업무 환경을 제공할 수 있게 되었다"고 이번 서비스의 의미를 설명했다.

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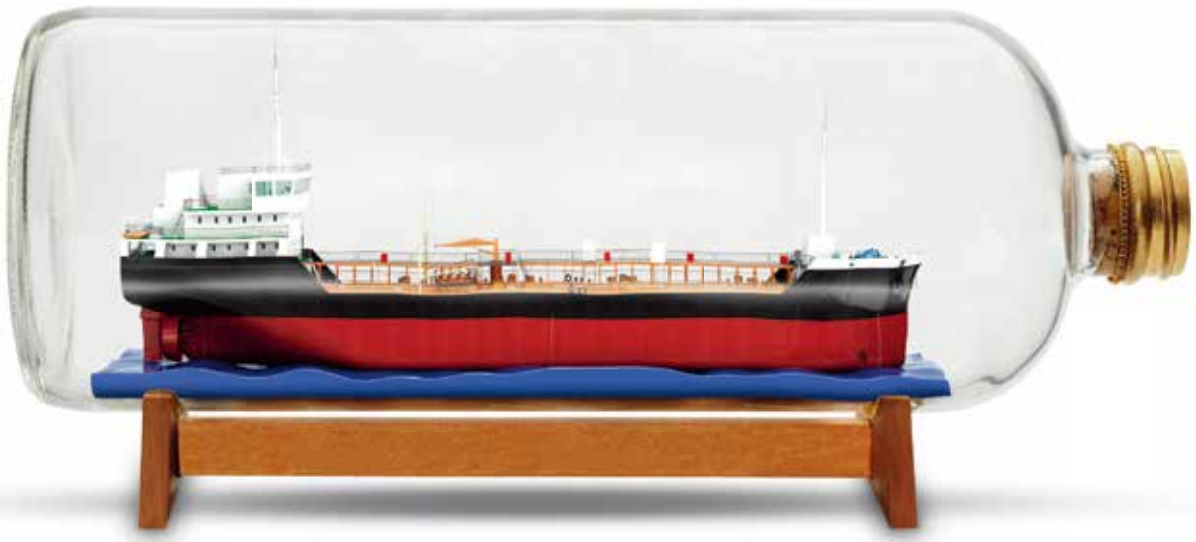
Ships are not still



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.

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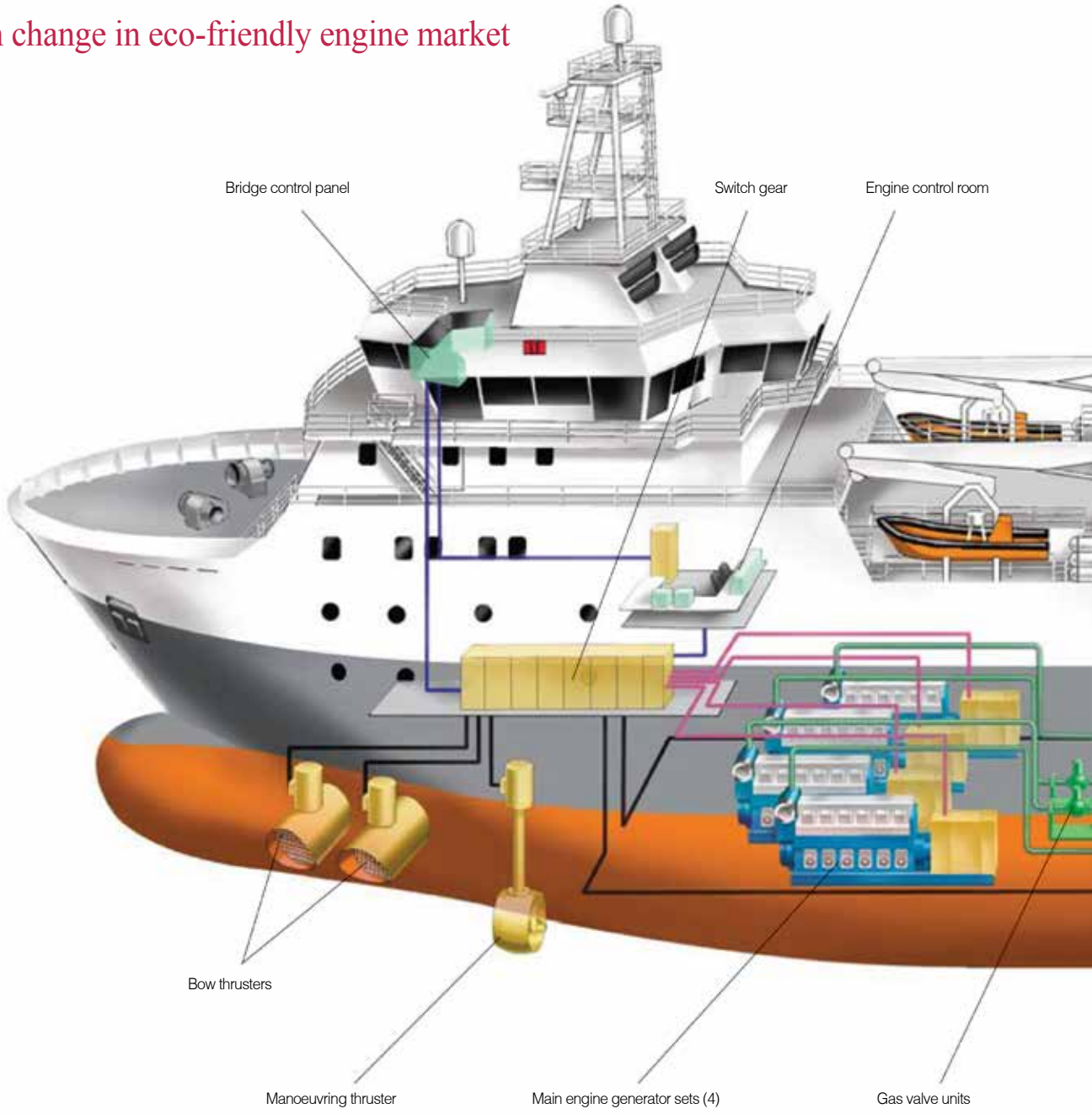
LNG-powered vessels poised for full-fledged commercialization

- Paradigm change in eco-friendly engine market

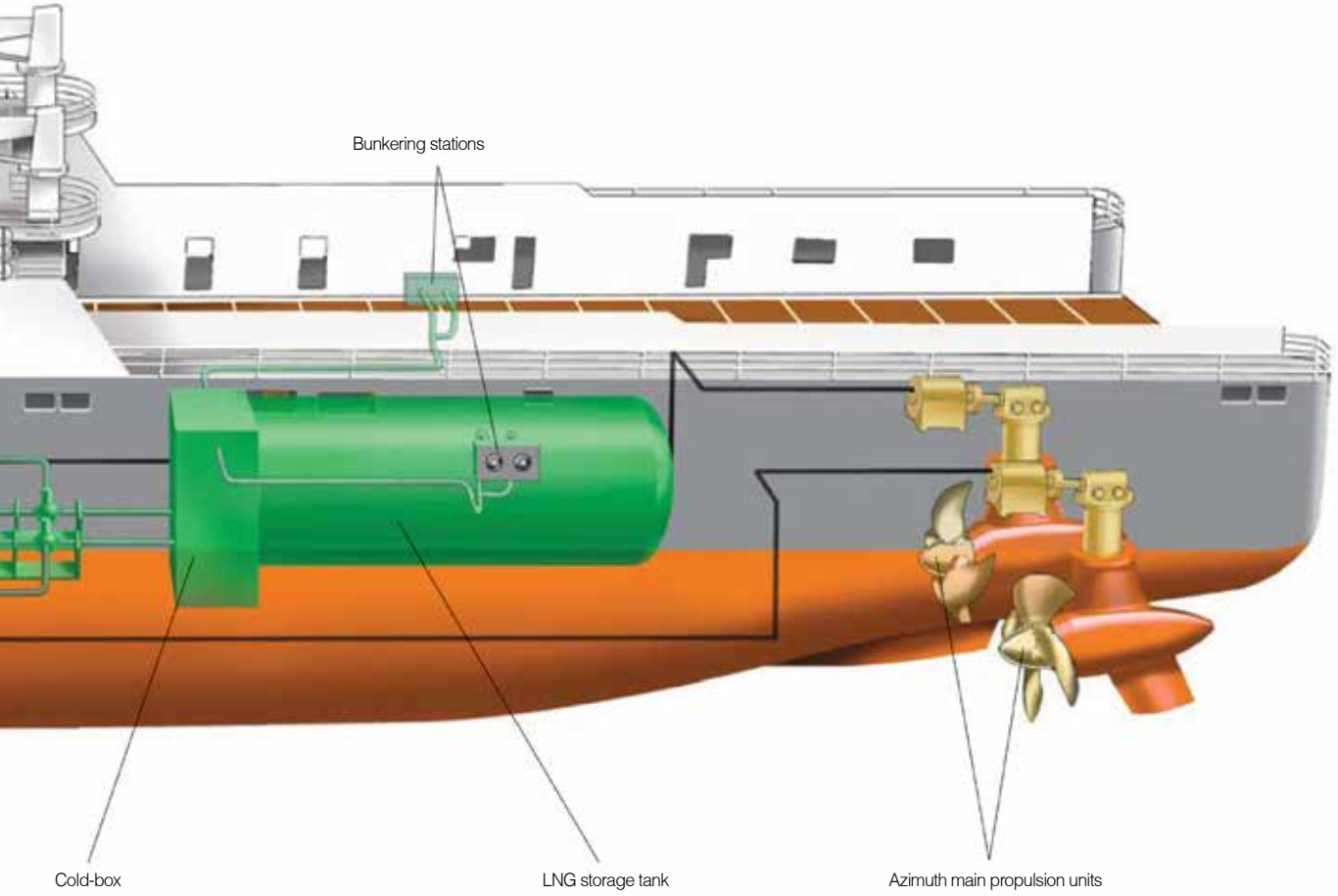


Safe and cost-eff ective gas storage and handling with LNG Pac. (Source: Wärtsilä Corporation)

Eco-friendly vessels has become an irreversible trend worldwide. The International Maritime Organization(IMO)'s regulations on maritime pollutions from ships are expected to be enforced rigorously from 2015. According to the shipbuilding industry, approximately 25% of diesel for ships is expected to be replaced with LNG in the period between 2015 and 2020.

Major engine makers, such as Hyundai Heavy industries(HHI), MAN Diesel&Turbo, STX Heavy Industries, have focused on developing the engines emitting little SOx, NOx., the major sources of environmental pollution. The most fundamental solution is to replace the marine fuels with LNG. Engine makers have already completed the development of LNG-powered engines.

The vessels fitted with LNG-powered engines are being commercialized quickly in North Europe. LNG-powered marine engines are expected to be fully commercialized in the next few years despite the technical barriers hindering the application to shipbuilding industry unlike the LNG- powered engines of vehicles.



Eco-friendly vessels have come into limelight in the shipbuilding industry which is also required to comply with the regulations designed to reduce greenhouse gas emissions worldwide. The construction and operation of small and medium-sized vessels powered by LNG began in 2000. Finland and Europe have been spearheading the design and construction of LNG-powered vessels.

Recently, even Ro-Ro vessels, type of vessel carrying the cargo, are being designed to use LNG as fuel, and projects are underway to convert the conventional vessels into LNG-powered vessels. LNG-powered engines have found applications mostly in small and medium sized vessels so far. However, it will not be long before the LNG-powered engines are installed in large vessels amid the development and commercialization of high output LNG engines. According to the related industry, more than 10 LNG-powered vessels will be built yearly at domestic shipyards within the next 5 years, and thereafter, most new vessels will use LNG as fuel for propulsion. According to the DNV report, LNG-powered vessels emit little sulfur dioxide(SO_2) and fine dust compared to existing vessels powered by heavy oil or diesel fuel, and can reduce nitrogen oxides(NOx) emissions by more than 85% to 90% and greenhouse gas emissions by over 15% to 20%.

The commercialization of LNG-powered vessels is gathering speed as the IMO's marine fuel regulations are being enforced more rigorously to reduce greenhouse gas emissions. Particularly, shipyards are busily trying to cope with strict regulations arising from the designation of major coasts - such as the certain part of U.S. and Canadian waters - as the emission control area(ECA).

Fast transition to LNG-powered vessels

Currently, the research into LNG-powered vessels is vigorously pursued in Europe, particularly in Norway, a major shipping country. European shipyards have speeded up the conversion of both new vessels and existing vessels to LNG-powered vessels. China is also said to be developing and operating the LNG-powered tugboat, led by the China Gas in collaboration with China's domestic shipyards.

Sang-Bae Cha, Manager, Sales & Promotion, MAN Diesel & Turbo Korea, said, "LNG is an attractive solution. LNG is an eco-friendly fuel emitting little SOx and drastically reducing the NOx, CO_2 emissions, and can meet the ever stricter requirements in the law and regulations related to marine environment. In addition, ship owners may benefit from current low price of LNG from economic standpoint."

Shipyards, engine makers, energy companies, etc., have high expectations for LNG-powered vessels. Shipyards have already made enormous investments in LNG-powered vessels. Due to the chicken vs. egg debate between shipyards and energy companies, it will take a little more time until the LNG bunkering is commercialized. Thus, the industry sources point out that the government, energy companies, and shipyards need to work together to ensure swift response to the advent of the eco-friendly ship and LNG bunkering markets nationwide.

Meanwhile, the U.S.-based TOTE Shipping placed an order for the world's first LNG-powered containership. The success in the construction and operation of this LNG-powered vessel is expected to have a significant impact on LNG-powered containership and gas engine markets in the period ahead.

LNG-powered engines key to greater competitiveness

In Korea, the development of LNG-powered vessels is led by major domestic shipyards, such as Hyundai Heavy Industries (HHI), Daewoo Shipbuilding & Marine Engineering(DSME), STX Offshore & Shipbuilding, etc. These shipbuilding giants have already achieved considerable success in the production area such as LNG storage tank, fuel supply system, etc.

HHI is developing and commercializing the technologies independently to secure unique competitiveness in the construction of LNG-powered vessels, and is focusing on the development of medium and large-sized LNG-powered engine to cement its position as a leading engine maker.

Last year, HHI proved its unique competitiveness in the market for eco-friendly LNG-powered vessels when it won an order from the ship owners of Brunei and Greece for the construction of LNG-powered vessels fitted with dual fuel diesel electric(DFDE) engines. The propulsion system of these vessels, which HHI developed in 2007, will adopt the dual fuel diesel electric(DFDE) engine which can run on both diesel and gas fuel.

HHI developed the 'G-type engine' jointly with MAN Diesel&Turbo and the large-scale dual fuel engine jointly with Denmark-based. Particularly, 'G-type engine' was installed in the 319,000-ton very large crude carrier of Greece-based Almi, and is scheduled to be installed in the 5,000-tonTEU containership of Greece-based Thenamaris in April this year.

Domestic shipyards gain top spot in the construction of LNG-powered vessels

The world's first large-scale LNG-powered vessel project is being carried out by DSEC, the subsidiary of Daewoo Shipbuilding & Marine Engineering. DSEC signed a contract with the U.S.-based National Steel & Shipbuilding Company (NASSCO) for the design and material package supply for the 5 units of 3,100TEU containerships in December last year. The ship owner is the U.S.-based shipping company TOTE. DSEC plans to start the designing and material supply from January next year. These containerships will apply the design developed by DSEC, and measure 233.0m in length and 32.2m in width. Moreover, these vessels will be fitted with DFDG(Dual Fuel Diesel Generator) developed domestically and ME-GI(MAN Electronic Gas Injection) engine developed by MAN Diesel&Turbo.

In addition, DSME announced that it signed a contract with the Canada-based Teekay, a shipping company, to build 2 units of 173,000m3 LNG carriers on December 14. These vessels, which measure 291.4 m in length and 46.4 m in width, have a carrying-capacity of 173,000m^3. Particularly, they are the world's first LNG carriers equipped with the eco-friendly LNG-powered engine(ME-GI Engine) incorporating the Eco-Design concept developed by MAN Diesel&Turbo.

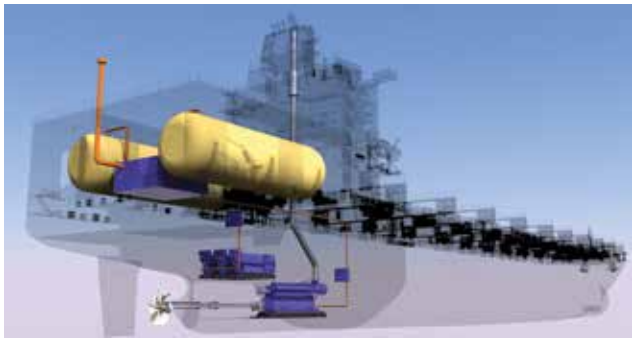


Figure 1. Bird's eye view of the LNG-powered containership to be designed by DSEC

Heightened interest in LNG bunkering

There has been a heightened interest in the bunkering for the stable operation of LNG-powered vessels in the shipbuilding industry. According to the data published by Korea Gas Corporation, the global demand for LNG as fuel for LNG-powered vessels will reach approximately 20 million tons yearly by 2030.

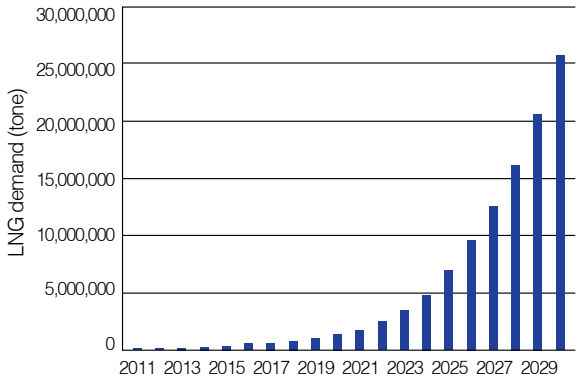
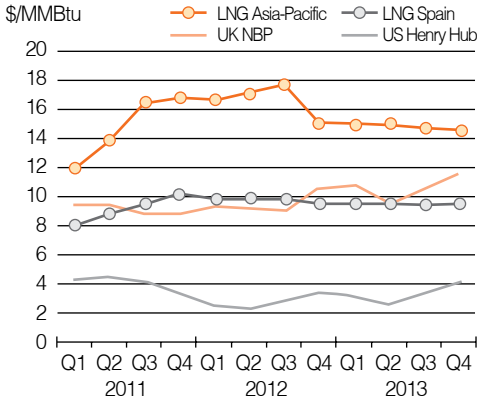


Figure 2. Outlook of the global demand for LNG as fuel for LNG-powered vessels (source: Korea Gas Corporation)

Outlook for LNG prices in 2013

The short-term charterage is expected to decline in the second half of this year after peaking at USD 150,000/day last year. As the delivery of more than 20 new transport vessels is scheduled in 2013, the short-term charterage is expected to fall to USD 125,000/day on a monthly average in 2013.

The industry sources expect that the LNG supply prices in Asia will still remain high in 2013 due to the growing demand for spot goods and high oil prices. According to Poten&Partners, the international oil prices are expected to be in the range of USD 100/bbl this year, albeit slight decrease compared to the previous year.



Source: Poten & Partners, Global LNG Outlook, Jan. 2013

(Unit: 1 million tons)

NO.	Region	2012	2030
1	North America	-	21
2	South America	-	10
3	Europe	0.37	24
4	FSU(Floating Storage Unit)	-	7
5	Africa	-	5
6	Middle east/South east Asia	-	12
7	East Asia	-	81
Total		0.37	160

Table 1. Outlook of the global demand for LNG bunkering by region (Source: : DNV)

Bunkering refers to the transfer of fuel to replenish the vessel's bunker or tank for the purpose of operating the propulsion or control system of vessel. There are 3 types of bunkering which are currently considered or entered the phase of commercial application. 'Tank lorry/Tank container to ship' method is suitable for small-scale bunkering, and the 'Terminal/Station to ship' method is suitable for small and medium-scale bunkering. Meanwhile, the 'Ship to Ship' method based on floating offshore LNG bunkering is currently discussed.

- *Tank lorry/Tank container to ship bunkering: It refers to the bunkering to LNG-powered vessel from LNG tank lorry, etc., on onshore location.*
- *Terminal/Station to ship bunkering: It refers to the bunkering to LNG-powered vessel from gas storage tank at onshore location.*
- *Ship to ship bunkering: It refers to the bunkering to LNG-powered vessel from tanker barge or storage vessel at sea.*

In relation to the commercialization in bunkering sector, Gasnor, the subsidiary of Shell, makes supply of 50m^3 LNG to the tank trailer each time in Norway, and the coastal countries bordering the Baltic Sea are already operating the LNG-powered vessels and bunkering facilities. Moreover, countries, such as Singapore, Hong Kong, United States, China, etc., are starting to develop the LNG bunkering technology and launch the related projects.

Currently, the 'Tanker to ship' and 'Terminal to ship' bunkering are being applied in Norway, and the bunkering is expanding to other regions amid the expanded bunkering of LNG-powered vessels. Particularly, the Sweden-based AGA built the world's first bunkering vessel enabling the ship-to-ship bunkering of LNG to the LNG-powered passenger ships of Viking Line, and started the operation in March 2013. Depending on the effectiveness of this vessel, the need for additional LNG bunkering vessel will be determined.

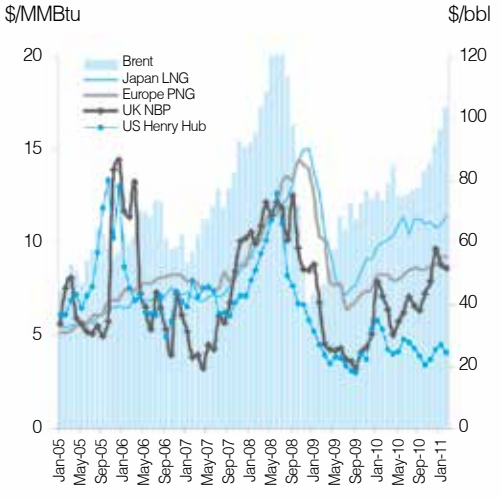
The LNG-powered vessel and bunkering markets are expected to witness rapid growth due to the environmental regulation and economic benefit from cheaper LNG compared to the oil.

In Korea, the Korea Gas Corporation already signed a MOU with the 4 major domestic shipyards on the bunkering project to supply the fuel to the LNG-powered vessels last year in an attempt to make headway into the bunkering market of Asia.

Trends of international LNG prices

The spot price of natural gas in Asia and Europe has remained stable since 2010 after plunging temporarily in 2009. In North America, natural gas price has been lowered to USD 4/MMBtu amid the soaring production of nonconventional gases, including the shale gas.

With the oil prices staying at a high level, there has been a decrease in the transaction of high cost long-term PNG(Piped Natural Gas) and an increase in the spot purchase of LNG or a spike in the transaction arising from the difference in natural gas prices among the regions based on the flexible volumes under long-term LNG contract, and as a result, the price balance has increased in international LNG market.



Source: UK National Grid, US EIA, WGI

Licensor	Type of Engine	Stroke	Progress
MDT	51/60DF	4Stroke	Establishment of equipment: Completed by December, 2012. Development of the No. 1 engine: The commissioning was completed in April, 2013. Test bed: Secured 1 unit(another 1 unit is scheduled for expansion) Annual production capacity: 24 units/year → 50 units/year is possible if the capacity is expanded.
MDT	ME-GI	2Stroke	Establishment of facility: Scheduled for June, 2014 Annual production capacity: 24 units/year

Table 2. Gas engine facility and production capacity of STX Heavy Industries

STX Heavy Industries - 9,000kW hybrid engine

STX Heavy Industries anticipates rapid growth of market for LNG-powered vessels and gas engines, spurred by rigorous emission control regulations for ships, regulation designed to reduce greenhouse gas emissions, and cheap LNG price. Thus, STX Heavy Industries plans to expand its reach into the market for vessels and offshore structures equipped with the propulsion engines using LNG as fuel, as well as the LNG carrier market.

STX Heavy Industries developed the next-generation hybrid engine for LNG-powered vessels in April. This 'STX-MDT 51/60DF' engine is designed to run on both gas and heavy fuel and has an total output of 9,000kW with 1,000kW per cylinder, and use the LNG as main fuel for the HFO(Heavy Fuel Oil)-based diesel engine. 'STX-MDT 51/60DF' engine will be installed in the 170,000CBM LNG carrier currently being built at Jinhae shipyard of STX Offshore & Shipbuilding for Russia's Sovcomflot.

Interview

The best guide for eco-friendly vessel

Wärtsilä Corporation

Tomas Aminoff, Director, Technology Strategy Wärtsilä Finland

Wärtsilä is a global leader in complete lifecycle power solutions for the marine and energy markets. By emphasising technological innovation and total efficiency, Wärtsilä maximises the environmental and economic performance of the vessels and power plants of its customers. In 2012, Wärtsilä's net sales totalled EUR 4.7 billion with approximately 18,900 employees.

- SHIP POWER - Wärtsilä is the leading provider of ship machinery, propulsion and manoeuvring solutions.
- POWER PLANTS - Wärtsilä supports its customers throughout the lifecycle of their installations.
- SERVICES - Wärtsilä is a leading supplier of power plants for the decentralised power generation market.

Q: Outlook for the eco-friendly LNG engine market: Do you expect an increase in the demand for eco-friendly LNG vessels and engines?

A: Until 2011 Natural Gas as fuel for vessel was mostly connected to LNG carriers and to a handful of OSV's and ferries in Norway. However in 2011 and beyond we have seen a rapid increase of orders for Dual Fuel engines across a wide area of vessel types and geographical areas. During the last few years there have been orders for Cruise Ferries, FPSO's, Chemical tankers, Inland Water Vessels, Tugs, Coast Guard and tour vessels that all have LNG as the primary fuel and have selected Wärtsilä Dual Fuel engines as their prime movers. Equally impressive is the increase in the geographical area both regarding yard countries as well as where the vessel will operate once built. In addition to the traditional Norwegian market there is a strong presence in the Baltic region, North America and also an increasing interest in Asia where for example the first LNG powered tugs will come into operation in China.

With the up-coming environmental rules, increasing costs related to conventional fuel as HFO, MDO and MGO and the shale gas revolution that is improving the availability for gas and simultaneous decreasing the market price for the same will all drive LNG as fuel for shipping.

Wärtsilä delivers propulsion machinery for the new M/S Viking Grace passenger ferry to be built for Viking Line by STX Finland at the shipyard in Turku.

Q: What is the current status of eco-friendly(LNG, hybrid, dual) engine development at your company?

A: Today we have a full range of Dual Fuel engines starting from Wärtsilä 20DF with approximately 1MW to Wärtsilä 50DF with an output 17MW. The medium speed engine range have been in marine service since 2002 and today we have more than 7 million of service hours collected on these engines. In addition we have announced a low speed Dual Fuel engine program that will cover the typical Merchant fleet.

Q: Please provide an overview of the eco-friendly(LNG, hybrid, dual) engine development at your company.

A - Major features: Wärtsilä has always been the forerunner for gas burning engines and is in addition to the marine market also the market leader for gas burning combustion engines for land based Power Plants. For these two markets Wärtsilä has developed gas burning engines since the mid 80's when the High Pressure Gas Diesel engine was introduced. In the early 90's spark ignited gas only engines. In mid 90's the Wärtsilä Dual Fuel engine capable of running on both liquid as well as gaseous fuels was developed. The Wärtsilä Dual Fuel engine entered Service for the first time in the Marine market in the early 2000 century. Where all three gas engine technologies today remain in Wärtsilä's portfolio for land based application, Wärtsilä have decided to concentrate on Dual Fuel technology for its marine based customers because of the technologies superior combination of emission compliance (NOx and SOx), fuel flexibility, safety (low pressure) and lowest installations cost through low pressure gas handling system and in built redundancy through multi fuel capability.
In 2012 Wärtsilä also announced the development of a gas burning 2-Stroke Low speed engine based on the same successful concept as the Medium Speed engines, i.e. Dual Fuel with Low pressure. This engine will have the possibility to revolutionize the merchant industry.

A - Differentiated competitiveness: Wärtsilä is the only company offering a full range of gas engines. In addition Wärtsilä 34DF is the only Dual Fuel engine today that has received EPA approval.

A - Examples of successful application: Viking Grace, a 2500 passenger cruise ferry with ice class 1A that came into operation in January 2013 equipped with Wärtsilä 8L50DF and Wärtsilä LNGPac LNG bunkering, storage and handling system is clearly a groundbreaking vessel. The LNG bunkering of this vessel will take place during the one hour the vessel stays in the port of Stockholm at the same time as 2500 passenger and up to 800 cars are loaded and un-loaded. This is possible thanks to the fast bunkering speed from the Wärtsilä LNGPac. Another pioneer will be the passenger ferries for Quebec under construction at Fincantieri in Italy. This will be the first LNG powered ferries in North America and is expected to pioneer the ferry industry there. These vessels will be powered by Wärtsilä 34DF and also be equipped with the Wärtsilä LNGPac for gas handling.

Q: What is the target market(or vessel type) which your company is focusing on in the fields of eco-friendly vessels/offshore plants?

A: Today the demand is universal and we see an interest from all geographical areas and several vessel types. The biggest interest is coming from vessels with natural gas as cargo or ones that are to operate in environmental controlled areas.

The Wärtsilä`s 34DF tri-fuel engine is the ultimate 'fuel flexibility' engine.

Q: What is your company's future growth strategy in the market for eco-friendly vessels/offshore plants (or engines)?
A: Gas is becoming increasingly important and Wärtsilä has invested heavily in developing its gas related portfolio. The biggest single investment is the acquisition of Hamworthy. Through this acquisition we got world class gas handling, both for cargo handling and for fuel handling systems as well shore based equipment as small scale reliquefaction station that can be used for bunkering. With this we have a unique capability for the industry to offer the whole infrastructure from natural gas or LNG throughout the vessel to the funnel equipment.

Q: What is your company's plan for eco-friendly engine (technology development or R&D plans)?
A: Right now the focus is on the low speed DF technology. On the medium speed engine side there is a continuous development on power density, efficiency and to minimize all kind of emissions.

MAN Diesel & Turbo -Eco-friendly engine recognized worldwide

MAN Diesel & Turbo is the world's leading provider of large-bore diesel engines for marine and stationary applications and industrial turbomachinery. As a member of the German MAN Group, with over 250 years of history, MAN Diesel & Turbo focuses on the development, design and production of low speed two-stroke diesel engines, medium speed four-stroke diesels, turbomachinery and high-quality parts.
Catching up with the trend of the market, MAN Diesel & Turbo developed the G-type engine series 2 years ago, which is the latest type of eco-friendly engines enabling the fuel cost-savings through bigger propellers with lower speed and improved engine efficiency. These engines have already become a popular choice among the ship owners for most commercial vessel types. MAN Diesel & Turbo is constantly working to design and develop engines that offer higher fuel cost-savings and lower exhaust gas emissions. MAN Diesel & Turbo develops equipment to reduce the fuel costs, and aims to provide eco-friendly and cost-effective propulsion solutions.


Figure 3. ME-GI by MAN Diesel&Turbo

MAN Diesel & Turbo has also gained a good reputation within the LNG-powered engine sector. MAN Diesel & Turbo's two-stroke ME-GI engine

Figure 4. Model of TOTE's containership equipped with ME-GI, the world's first LNG-powered vessel

for LNG-powered vessels has been well received and acknowledged by the marine market for its excellent technology. MAN Diesel & Turbo presented the engine to its customers on November 9th, 2012, and on April 17th, 2013, when the Engine Division of Hyundai Heavy Industries (HHI) and Japan's Mitsui Engine respectively converted the existing ME engine to ME-GI and conducted various tests. Furthermore, MAN Diesel & Turbo has already completed the TAT (Type Approval Test). Towards the end of 2012, MAN Diesel & Turbo successfully received order for the first ME-GI (8L70ME-GI) engine in a 3,100TEU containership of the U.S.-based TOTE. It is considered to be a landmark event in the shipbuilding industry.
The eco-friendly ME-GI engine perfectly resolved the drawback of the existing LNG-powered engines. MAN Diesel & Turbo explains that the four-stroke DF engine, which has been commercialized, has the risk of knocking and misfiring, methane slip, reduction of power output, limited load increase , limitation for the methane number, etc. The Diesel principle of the ME-GI engine is the optimum solution to all these challenges.

Competitive advantage of the ME-GI engine

The ME-GI engine is based on the conventional two-stroke MAN B&W engine technology, with its inherent high reliability, low maintenance requirement and simplicity. The diesel combustion principle eliminates the risk of methane slip, knocking and misfiring, and gives a more stable combustion without pressure fluctuations during the operation on gas fuel.

In addition, the MAN B&W ME-GI has unchanged load response, no power reduction and flexible burning of HFO/GO/DO – any HFO/gas ratio can be burned once a small amount of pilot fuel oil is injected to ignite the gas. And a wide range of gas qualities can be employed since there is no requirement for the methane number and no maximum limit for the hydrogen content. The MAN B&W ME-GI enables the port-to-port operation without purging in gas stand-by state under normal operation conditions and is able to meet Tier III, when combined with an EGR (Exhaust Gas Recirculation) or SCR (Selective Catalytic Reduction) system, even during operation on HFO (Heavy Fuel Oil), as well as the gas fuel.

– Full power & performance
– Full load response
– Full fuel flexibility
– Gas quality flexibility
– Port-to-port gas-mode operation
– Fully integrated control system

Sang-Bae Cha, Manager, Sales & Promotion, MAN Diesel & Turbo Korea, said, "The first ME-GI (8L70ME-C8.2-GI) engines ordered are produced by Doosan Engine, one of the domestic licensees, and scheduled for delivery to the shipyard by in the first half of 2014, and for later installation in the new state-of-the-art containerships of the U.S.-based TOTE. Furthermore, the second ME-GI (5G70ME-GI) ordered, produced by HHI-EMD – the Engine and Machinery Division of Hyundai Heavy Industries, will be installed in the 5 LNG vessels ordered by Teekay at Daewoo Shipbuilding & Marine Engineering."

MAN Diesel & Turbo's 51/60DF, the MAN dual-fuel four-stroke medium-speed engine, was installed in the LNG carriers ordered by Spainish-based Elcano and built by STX Offshore & Shipbuilding in 2010. The largest Russian shipowner, Sovcomflt, placed the second order of the dual fuel MAN 51/60DF engine for their LNG carrier newbuilding programme comprising of two confirmed vessels with an option for two more vessels. The vessels are currently under construction at STX Offshore & Shipbuilding and will commence commercial operation this year.

Figure 5. A ceremony of TAT (Type Approval Test) held at HHI

Meanwhile, the 35/44DF is in the final phase of development and is undergoing the final test at MAN Diesel & Turbo's headquarters in Germany. Besides, the 28/32DF engine, converted to an LNG engine from the best-selling 28/32 engine, is undergoing a revision to its design and is scheduled for delivery in 2014.

Sang-Bae Cha, Manager, Sales & Promotion, MAN Diesel & Turbo Korea, said, "We are making efforts to ensure that the LNG can be used as fuel for all types of vessels, such as LPG carriers, RoRos, tankers, containerships and LNG carriers. LNG as a fuel is cost-effective, and can be the strategy for fulfilling the requirements of environmental regulations. Clearly, MAN Diesel & Turbo has developed the engines applicable to all types of vessels." He added, "The retrofit market for the vessels powered by LNG is also expected to see a growth. We are close to the contract for the conversion of Qatar's 45 LNG carriers equipped with conventional MAN B&W ME engine to LNG-fuelled LNG carriers. ME-GI can be easily retrofitted on existing ME, ME-B and ME-C engines."

The ME-GI add-on platform is basically finalized for MAN B&W complete engine model portfolio and the detailed design is ready for 70-bore engines. The detailed design for other bores will be made as orders are placed - it is mainly a matter of scaling. Currently, MAN is developing the ME-LGI technology, which makes the engines capable of running on other green fuels like LPG, Methanol, Ethanol and DME (Dimethyl ether). Additionally, MAN Diesel & Turbo is proceeding with the development of 35/44DF and 28/32DF medium speed engines, aims to complete the development of 23/30DF engine by 2015, and is on track to develop other types of engines incorporating the dual fuel technology consecutively.

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DeltaV™ upgraded with Electronic Marshalling capabilities

Emerson Process Management Korea held an event to celebrate the launch of 'DeltaV™ SIS CHARMs technology' on May 3, drawing about 250 people from shipyards, engineering and construction companies. This event offered the demonstration of DeltaV™ SIS CHARM to help visitors have better understanding of the Electric Marshalling concept and the state-of-art safety system of Emerson.

Emerson Process Management, an innovative global leader in industrial automation, drew the world's attention once again.

Emerson announced 'DeltaV™ SIS (Safety Instrumented System) with Electronic Marshalling CHARMs technology', which combines the stability with the reliability of existing DeltaV™ SIS and provides innovative installation flexibility in space-constrained areas such as ship or offshore plants.

Boudreaux Mike, Director of Platform Business Development at Emerson, said, "This new technology provides excellence performance even when the existing systems are replaced, as well as the new system. Simplifying the system design, it shortens the development time and reduces the maintenance/repair costs by 10 to 20%."

DeltaV™ SIS CHARM, unveiled first time in June, simplifies the design, installation, wiring, and commissioning of SIS project while providing the improved performance and the benefits of space savings. Particularly, the new Logic Solver Architecture based on HCD(Human Centered Design) uses the electronic marshalling and

Event for the launch of 'DeltaV™ SIS CHARMs technology'

CHARM technology to eliminate the need for existing marshalling, thus improving the efficiency of both installation and commissioning.

The new DeltaV SIS architecture includes the followings:

- *CSLS(CHARM Smart Logic Solver) that implements all safe logics*
- *New CHARM signal converter replacing the I/O connections to the logic analyzer terminal block*
- *LSN(Local Safety Network) communicates among 16 units of CSLS*
- *SZ controller communicating between LSN and BPCS(basic process control system)*

Boudreaux Mike, Director said, "Currently, we are focusing on the oil & gas, and chemical markets, and have already started the design for various projects. We expect tangible outcomes from the next year. This system has the advantage of reducing the installation footprint and shortening the time

needed to complete the design, particularly in the offshore applications which requires flexible engineering in limited space."

To help address the complexities faced by customers in projects, Emerson has combined the CHARM for the process control with the capabilities of DeltaV SIS which provides integration of engineering, maintenance, etc., with physical separation for safety and control. Particularly, it can be easily integrated with DeltaV and be implemented as standalone SIS solution with connectivity to various DCS. Thus, Emerson is targeting two sectors and plans to expand its reach gradually from DeltaV-based DCS integration system to the standalone solutions.

The photo shows Lee Byeong-seok, EPC Sales Manager, Lee Yong-ha, Business Director Emerson Process Management Korea, Boudreaux Mike, Director Platform Business Development, and J, Mani, Senior Marketing Manager(from the left).

DeltaV SIS
Characterization Modules

CHARM capacity expansion

The new CSLS provides extends the previous 16 I/O limit per logic analyzer to 96 I/O CHARM capacity, although it provides the same functionalities as the existing SLS 1508 logic analyzer. All inputs, which are software-assignable to one of all logic analyzers on LSN, drastically increase flexibility in configuration and wiring, and at the same time, all logics on the network are continuously implemented within 50 milliseconds(1/1000 seconds).

CSLS uses the same implementation logic as conventional SLS 1508 logic analyzer and has the configuration with the same Control Studio application. Also, it can directly download the existing SLS 1508 configuration onto new CSLS. The input from safety system can be integrated into the facility's BPCS by using the SZ controller, while the overall safety logics are implemented within the CSLS. Thus, it can implement additional process control and communicate through the BPCS. In addition, it can use both DeltaV highway and Modbus TCP/IP communication protocol with SZ controller output, and therefore can easily integrate the new DeltaV SIS system into competitive DCS.

This CSLS technology is specially designed for use with the DeltaV SIS system based on the existing CHARM technology. The new DeltaV SIS system, to be released initially, will include the CHARM encompassing a broad range of I/O types. Emerson plans to add even more I/O types by including the I.S. CHARM for CSLS.

KR named Jeon Yeong-gi as Chairman

Korean Register of Shipping(KR) held a ceremony to mark the inauguration of new Chairman at its Busan headquarters on April 3, drawing about 500 people including KR's employees, guest and visitors. Jeon Yeong-gi, who came aboard as Chairman of KR, said, "I will be at the forefront of the effort to break down the authoritarianism and promote active communication with employees, so that all people can work happily at KR."

KR appointed Jeon Yeong-gi(former General Manager) as new Chairman in an extraordinary General Meeting at the Korea Chamber of Commerce & Industry on September 27, who won 46 votes from 86 members present at the Meeting.

Jeon Yeong-gi, the new Chairman, graduated from Seoul National University, Dept of Naval Architecture, and obtained Master's and Ph.D. Degree in Naval Architecture at the U.S. Stevens Institute of Technology. He joined KR in 1981 and served as General Manager of KR's branch in London, President of International Cooperation Division and Director of Technology Research Institute, etc., and was in overall charge of the Technical Support Division at KR from after 2007.

He is well recognized as an expert in international maritime affair for his extensive experience with international classification activities and overseas sales. Specifically, he served as KR representative in the General Policy Group(GPG) of International Association of Classification Societies(IACS) and the IACS' Uniform Standards Operation Team handling the hull strength, restorability and drillship sectors, and participated in international technology activities at International Maritime Organization(IMO) and on-site inspections. He puts an added emphasis on communication and rationality. He has quiet, tenacious and generous personality, and has the full confidence of KR. In particular, he received the highest scores for 5 consecutive years in KR's evaluation of employees which was performed by external organization, thus proving his qualification and ability to serve as the Chairman of KR.

A ceremony was held to mark the inauguration of KR's new chairman. The photo shows Oh Gong-gyun(left), the outgoing Chairman of KR, and Jeon Yeong-gi(right), the incoming Chairman of KR.

Jeon Yeong-gi, Chairman of KR, said, "KR is facing a crisis amid the persistent downturn in global offshore industry and excessive competition among classification societies. Under those circumstances, I feel much pressure because I have to fulfill all these challenges as Chairman of KR. I will focus on diversification of business by adding refresh momentum to new growth business, maintain strong relationship with the Ministry of Oceans and Fisheries and related organizations as part of effort to create an environment for coexistence and cooperation."

He added, "I will make my utmost effort to help achieve the registry tonnage of 100 million tons and KRW 80 million in sales and join the ranks of the world's top 5 classification societies based on 3S strategies that focus on the growth driven by smart business, expansion of capabilities based on smart infrastructure, and creation of organization culture that puts the communication and harmony above anything else."

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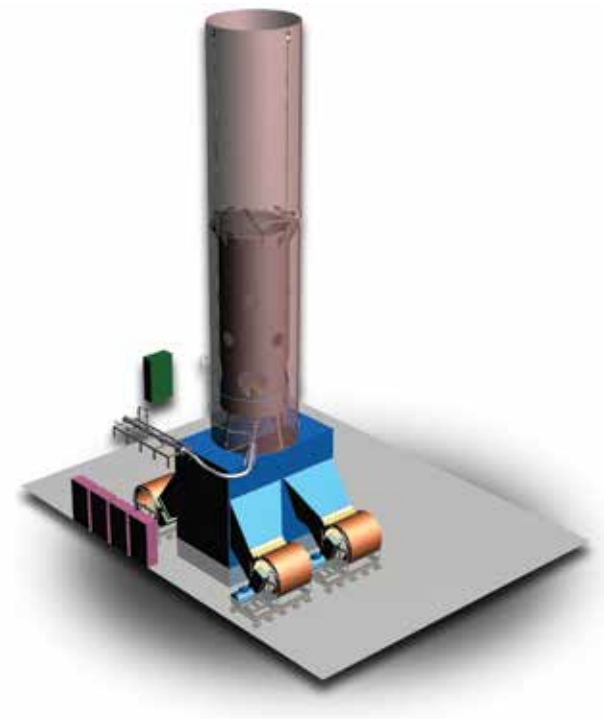
Alfa Laval gas combustion unit for LNG carriers gives owners economical alternative

Alfa Laval's recent acquisition of gas combustion technology provides owners of LNG carriers using dual-fuel diesel electric(DFDE) engines or low-speed diesel(LSD) engines with a compact gas combustion unit(GCU) that has lower installation costs and operating expenditures than comparable units. Moreover, the Alfa Laval GCU comes backed by the company's global sales and service network.

The growing global demand for LNG has increased the demand for new LNG carriers. While LNG carriers have recently been touted as the global shipping industry's most profitable sector, LNG shipping companies continue to look for ways to lower costs as a measure to ensure long-term profitability. While steam propulsion has been the mainstay on LNG carriers for decades, rising fuel costs, environmental regulations and the continuing shortage of qualified seagoing engineers are forcing LNG ship owners to re-evaluate critical systems onboard.

As more countries look to LNG for power generation and production needs, LNG shipping companies must determine how best to build new LNG carriers or retrofit existing vessels to ensure long-term profitability. The selection of DFDE or LSD engines as economical green alternatives to the traditional steam propulsion systems onboard is one example of fuel-saving and environmental conservation efforts undertaken by LNG ship owners. This use of these engines provides additional means with which to regulate LNG cargo tank pressure. In some cases, this is accomplished by re-liquefaction but, in most cases, gas combustion units have been introduced to burn excess boil-off gas safely. According to industry estimates, approximately 85% of all LNG carriers using either two- or four-stroke dual fuel engines today have some type of combustion chamber to regulate the pressure in the cargo tanks by burning excess boil-off gas from the cargo tanks under safe and controlled conditions. With its recent acquisition of gas combustion technology from Snecma, part of the Safran Group, Alfa Laval is well positioned to meet the future needs of LNG carriers. The Alfa Laval GCU offers LNG ship owners a smart way to lower total cost of ownership further.



"The Alfa Laval GCU is not, by any means, new technology," admitted René Fich Jespersen, Alfa Laval's General Manager, New Boiler & Global Sales Support, Marine & Diesel Division. "The big news here is that LNG ship owners can rely on Alfa Laval as a well-known partner who is focusing on providing what is essential for the marine industry to succeed in this competitive business environment and who has the infrastructure in place to ensure the delivery of the service and support required."

By extending the company's broad portfolio of products and solutions for the marine industry with the Alfa Laval GCU, Alfa Laval now offers a comprehensive LNG carrier product range, which includes Aalborg marine boiler systems with dual-fuel burners, waste heat recovery systems, inert gas generators and heat exchangers that are widely used by the LNG industry.

Simple, streamlined design for 100% natural BOG disposal

Why consider the Alfa Laval GCU over comparable gas combustion units? Jespersen said that the unit has the simplest design overall with fewer parts than comparable systems, straightforward operation, compact design, no pilot fuel and the smallest footprint in the business, all of which translates into cost-effective installation and operation.

Available in four standard sizes, Alfa Laval GCU handles capacities of 3, 4.5, 6 and 9 t/h methane using either single or dual combustion chambers. In addition, the Alfa GCU is approved by major classification societies, including American Bureau of Shipping, Bureau Veritas, Det Norske Veritas and Lloyd's Register.

Lowest OPEX

According to Jespersen, the Alfa Laval GCU provides the LNG industry with the lowest possible operating expenditures for gas combustion technology. When asked how this is possible, he points to these facts: No oil is needed for ignition of the flame; the reduced parts count and smaller footprint; and, no perforated dome, refractory lining or expansion joints required.

Fewer parts translate into reduced installation and maintenance costs. Unlike other gas combustion units, the Alfa Laval gas combustion unit has low-noise fans that serve a dual purpose – both as combustion air fans as well as dilution air fans for exhaust gas. This effectively does away with the need for separate combustion air fans and dilution air fans along with the associated ductwork, cabling and silencers.

Operating costs are reduced because the Alfa Laval GCU uses an electrical ignition device that enables fast start-up. This eliminates the requirement for a marine diesel oil(MDO) or distillate marine fuel(DMA) system with the requisite tank, pilot and oil lines. The self-purging burner is another example of smart design that reduces maintenance costs because it has no rotating parts. It also promotes safety due to its ability to handle combustion under conditions with high excess air and/or high inert gas content.

Without the additional fans and oil system required for other GCUs, the overall space requirement of the all-stainless-steel combustion chamber for the Alfa Laval GCU is much smaller than that required for other GCUs.

Available immediately

All this good news begs the question: Why then aren't all LNG ship owners with DFDE or LSD engines installing Alfa Laval GCUs onboard? Jespersen is candid in his assessment.

It is Jespersen's belief that ship owners, operators and yards will benefit immediately from Alfa Laval's acquisition of the LNG carrier gas combustion unit because they can now take full advantage of the company's global sales and service network.

The Alfa Laval GCU is available for sale immediately from Alfa Laval, either on its own, together with inert gas generators or boilers, or as part of a turnkey solution with a broad range of Alfa Laval marine equipment.

Boston to host AVEVA World Summit 2013

AVEVA announced today that the AVEVA World Summit 2013 is being held from 30 October - 1 November in Boston, Massachusetts, USA. Customers from across the world's process plant, power and marine industries are invited to the Summit, which is once again being held as a single global event.

"Responding to delegate input, we have evolved the Summit to include dedicated agendas for plant Owner Operators, EPCs and shipbuilders" explained Mat Truche-Gordon, Executive Vice-President – Business Strategy and Marketing. "Focusing on the business needs of our core customer groups in dedicated sessions, while bringing together key decision makers from across industry sectors in the joint sessions, will help our delegates target the topics specific to their industry and learn from the exchange of ideas only offered by a global, multi-industry event."

As befits a leader in the high technology software industry, AVEVA will host the Summit's gala dinner on Thursday 31 October at one of the world's largest science centres, the Museum of Science, Boston. It is Boston's most visited cultural institution. Located on the Charles River, it offers inspiring and unique views of the Boston and Cambridge skylines.

Siemens' solutions for better efficiency

Siemens presented innovative solutions under the slogan, "Making Things Right – Connecting Productivity and Efficiency", during the Hannover Messe 2013, drawing the attention from related industries.

Siemens showcased many new products with high efficiency and productivity during the Hannover Messe. As an industrial partner with extensive experience and technology, Siemens offers a wide array of solutions covering the whole spectrum of the needs ranging from the product design/planning, through the engineering/production, to the maintenance and modernization.

During this exhibition, Siemens presented some solutions worthy of paying attention to in the period ahead. First, it is the brand new Simogear gear motor(109x129) capable of increasing the torque limit up to 5,000Nm with bevel gear motor, offshore gear motor and helical motor. This product incorporates innovative technology, achieving high performance and high efficiency which Siemens pursues, and can meet the requirements of IE3 for ultra high efficiency.

Besides, the existing Simotics product lineup added new products that reduce the energy costs and CO_2 emissions. For the high voltage motor Simotics HV, the H-compact Plus was changed innovatively. In the low voltage sector, the Simotics XP explosion-proof motor of 1MB10 series are used, which conforms to the efficiency requirement at IE2 and IE3 levels. In addition, the DT-Configurator, the drive technology, allows the users to select the fan, pump, compressor, and the products optimized for their current conditions. In particular, Simatic S7-1500 controller product lineup provides the highest efficiency and productivity, and furthermore, enables the integration with TIA Portal to provide the excellent system performance and highest engineering efficiency. Siemens has further refined the engineering framework based on the integration type safety hardware and solutions.

Siemens booth in Hannover Messe 2013

The intelligent and integrated Industry Services offered by Siemens for all phases of machine and plant lifecycles are closely intermeshed with the product business. At the Hannover Messe, proactive condition-based maintenance is taking center stage, in particular inspections via remote service. Using the examples such as Condition Monitoring or Simatic Remote Services, Siemens will show how machines and plants can be preventively monitored, downtimes reduced, and the availability of industrial plants increased through IT-based services.

Siemens expects its new plant monitoring solution to provide even greater value-added to both machine manufacturers and plant operators. For example, the new module of Siplus CMS2000 status monitoring system added the input function using the vibration sensor, enabling far wider monitoring of plants. Moreover, the Sinema Server network management system enables quick diagnosis of failure in infrastructure network.

Sitop UPS1600 undisrupted DC power supply system with the intelligent battery control provides comprehensive diagnosis and operation data to the users. Furthermore, it enables perfect system integration in TIA(Totally Integrated Automation) and makes the engineering convenient in TIA Portal.

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Marine solar power system for green ship technology

S-MARINE SYSTEM Co., Ltd.

As the environment regulations are being enforced more rigorously worldwide, the shipbuilding and offshore industries are also facing the challenge to fulfill their responsibility and obligation to reduce CO_2 emissions, the main culprit of global warming. The International Maritime Organization (IMO) has made mandatory the EEDI(Energy Efficiency Design Index) in the ship construction phase and EEOI(Energy Efficiency Operational Indicator) in the ship operation phase to slash greenhouse gas emissions since the start of 2013.

The stumbling blocks hindering the use of eco-friendly solar and wind energy in the shipbuilding and offshore industries have been the unfavorable marine conditions such as the salt-induced corrosion, lightweight design, interference with various equipment/materials, and smallness of hull area available for offshore solar or wind energy systems. However, the maritime powerhouses, such as Japan Europe, and United States, etc., have already started the application of solar photovoltaic and wind energy system to various ships such as yacht, boat, ferry, cruise ship, car carrier.

'Han River Ara', the nation's first commercial vessel powered by solar energy

Photovoltaic hybrid system

S-Marine System, which specializes in turn-key engineering, has developed the solar photovoltaic and wind power technology for green ships since 2009. Its business consists of 3 segments: the outfit segment(windscreen, awning, panorama window, balcony module, fence, etc), offshore plant segment(glass fire rate heated roof, glass fire wall & door, etc), and yacht/boat offshore leisure segment(handrail, auto door, spiral stair, etc).

The marine photovoltaic hybrid system, the mainstay product of S-Marine System, is the solar power generation system incorporating the photovoltaic technology of BIPV(Building integrated photovoltatic) applicable to vessels and offshore plants. The solar panels serve the functions of external outfitting materials while gathering the solar energy and converting it to electricity. This system is based on SIPV(Ship intergrated photovoltatic) integrated with the external outing materials of vessel, and has the advantage of high efficiency, efficient use of limited area, simple maintenance and repair, etc. S-Marine System has proceeded with the effort to commercialize its solar glass which functions as the external outfitting material for ship based on the structure and design using the existing basic outfitting such as awning, deck, handrail, wing bridge, shelter, roof, windscreen, panorama window, glass balustrade, glass balcony, etc.

For the vessels with solar photovoltaic system, the electric power generated by SIPV can be supplied in two ways. First, the electric power can be supplied to the hull lighting system or electrical device load. Second, the ESS(Energy Storage system) can store the electricty for use during both emergency and non-emergency situation. In both cases, S-Marine System's photovoltaic hybrid system is designed for connection with the basic electrical system of hull.

Commercialization of SIPV

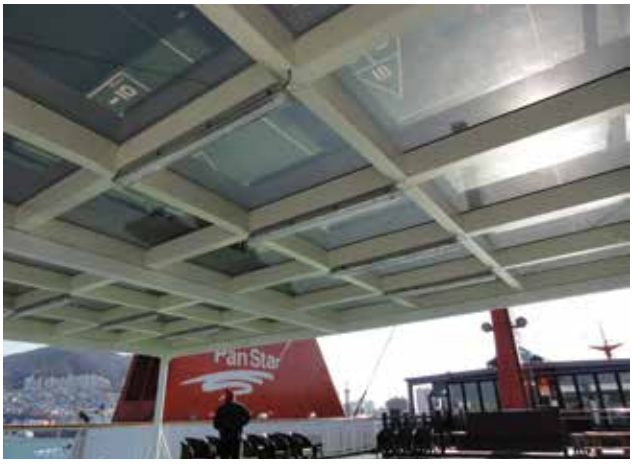
S-Marine System's products consist of solar panel, inverter, controller, and special mounting structure, and can be integrated with the external outfitting materials into a single unit. Particularly, S-Marine System has the ship solar decking technology(patent) and the cable encased mounting frame technology which have been commercialized in the ship solar photovoltaic sector. Moreover, this solar photovoltaic hybrid system can be applied to the offshore plants which require the engineering, as well as the vessels.

In 2009, S-Marine System's SIPV system was already installed in the form of mono crystalline solar panel and energy storage systems(ESS) on board the Han River Ara, a 780-ton multi-purpose passenger ship, which uses the solar energy to power the electrical lighting system of the hull and LED board.

This stand-alone power generation system of S-Marine System consists of 96 solar photovoltaic modules covering an area of 10m in length and 5m in width to produce 10kW

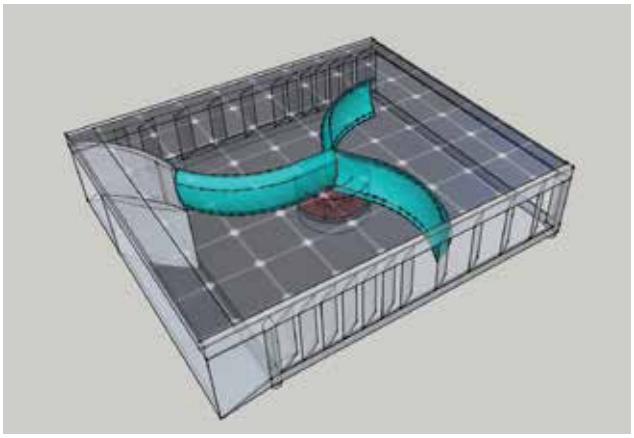
Schematic diagram of SIPV system

of electricity. The electricity generated by this system is used to power all lighting, ventilation, air handling system, and large full-color LED display. Particularly, this stand-alone power generation system includes the specially designed stand-alone inverter and controller to operate the solar photovoltaic power generation system during day and night, using the marine battery. In this way, the perfect stand-alone solar photovoltaic power generation system for ship is achieved. This stand-alone power generation system was installed in large commercial vessels for the first time across the country, and applied the lightweight aluminum deck mounting structure suitable for vessels.



Transparent thin film solar system by Panstar Dream

In March 2012, S-Marine System supplied the world's first transparent thin film solar panel, which offers the view of the outside, for the M/V Panstar dream, a mid-size ferry operating regularly between Busan of Korea and Osaka of Japan. Particularly, it achieved the SIPV(Ship intergrated photovoltatic), using the roof of open deck, without need for separate installation space. S-Marine System is pushing forward cooperation with 2 large domestic shipyards to apply this system to small and medium-sized vessels, ferries, and even large ships. Moreover, S-Marine System is developing the ship model jointly with the related company in the field of green yacht and boat.



Slim vertical solar hybrid wind power

Next-generation eco-friendly solution

Marine System is currently developing the 'solar hard sail' and 'slim vertical solar hybrid wind power', the next-generation eco-friendly solutions. The solar hard sail has been developed jointly with small and medium-sized research institutes in shipbuilding sector. Recently, the board type sail is applied to the sail yacht, using the CFRP(carbon FRP), instead of the fabric sail.

S-Marine System is developing the solar photovoltaic power generation system outfitting the solar panel on the surface of hard sail and combining the hard sail and ordinary fabric sail structures to capture the solar photovoltaic energy, using the lifting force and momentum of wind. The company will begin the commercialization in the second half of 2015.

In addition, S-Marine System is developing a system integrating the lightweight solar panel of aesthetic design with the flat type wind power generator and its enclosure, which captures the energy by using the wind generated during the sailing of vessels such as yacht, boat, fishing boat, etc. The company plans to start the commercialization from the second half of 2014.

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NATIONAL INSTRUMENTS

Rolls-Royce and Bestway unveil new energy-efficient ship designs

Combining proven European ship design and systems experience with Chinese capabilities in ship building, Rolls-Royce is delivering a range of new commercial ship designs.

Rolls-Royce

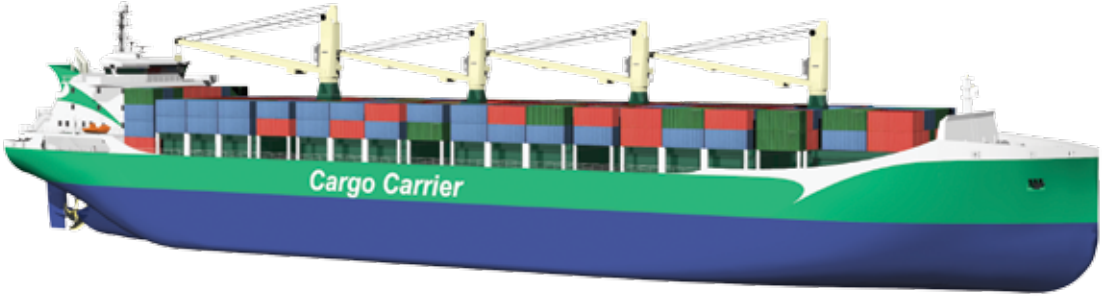
The global shipping industry is now firmly committed to using vessel designs and systems that will cut greenhouse gas emissions. China is also entering a green era, with national policy supporting energy efficiency and environmental protection, with the target of cutting CO_2 emissions per unit GDP by 40-45 per cent by 2020.

To meet the evolving low emissions requirements of the global, intra-regional and inland shipping trade, particularly in Asia, Rolls-Royce and Bestway formed a Joint Project Team (JPT) in Shanghai at the start of 2011. The first of the new designs have now emerged.

They range from 2,500 to 100,000 deadweight tonnes (dwt), including the 4100 Series ro-ro carriers (from below 9,000 – 11,000dwt and above), the 4400 Series container carriers (up to 2,000teu), the 4600 Series general cargo carriers (up to 40,000dwt), the 6400 Series LNG carriers (up to 40,000m^3) and the 4800 Series bulk carriers (up to 100,000dwt). All are designed to comply with and exceed future emissions targets.

"As more international emissions controls are progressively introduced, the marine industry is collaborating to ensure that designers, equipment manufacturers, yards and owners work together to create highly efficient vessels that improve operating costs while reducing harmful environmental impacts," said, Arne Magne Vik, JPT Technical Director. "Through our collaboration with Bestway, we are well placed to lead this charge."

JD 4801 bulk carrier - 37,000dwt



JD 4601 cargo carrier - 37,000dwt

The designs benefit from the combined design and systems expertise of both companies in producing highly efficient vessels tailored specifically for the future merchant shipping market, in which low emissions and reduced operating costs are key drivers. This includes the application of Liquified Natural Gas (LNG) - fuelled propulsion, which is gaining acceptance globally as a marine fuel, and where Rolls-Royce has accumulated significant experience with 23 gas-powered vessels now in service or on order.

With the exception of the general cargo/bulk designs, which have diesel-only systems at the moment, all designs have the propulsion options of either conventional diesel/hybrid or gas. Those designs featuring Rolls-Royce Bergen gas engines already meet IMO Tier III requirements for nitrogen oxide (NOx), sulphur oxide (SOx) and carbon dioxide (CO_2) emissions, which come into force in 2016.

With the Energy Efficiency Design Index (EEDI) being mandated from 2013, each design has been given an EEDI rating calculated using MEPC 1/Circ 681. However, they are subject to change, as the formulae have not been fully clarified for some vessel types.

Ro-ro vessels in the JD4100 model range feature a low drag hull form and sea-friendly bow with twin Promas integrated propellers and rudders. Three are based on the same 150m hull design, have a deadweight of 9,000dwt and carry 200teu on the upper deck with 1,800 lane-metres, but have different stern ramp arrangements. Diesel or gas propulsion can be specified.

Lane-metre capacity of the gas-powered JD4103GF is reduced by 50m, as some cargo space is lost to the gas tank. The 166.6m long JD4104GF, with a deadweight of 11,000dwt, 21,000 lane-metres and capacity for more than 250teu, is currently the largest in the family. It has the same propulsion system as its smaller sister, which comprises of twin Bergen B32:40L8PG main engines, rated at 3,220kW, and a Bergen C26:33L6AG 2,000kW auxiliary generator, hence the slightly slower service-speed of 15.6 knots. Range for the gas-powered ships is 6,000nm, with 6,500nm for conventional diesel power. EEDI ratings range from 19.4 to 15.9, although they do not yet apply to ro-ro vessels.

The JD4400 series container vessel family so far comprises two designs able to carry 2,250teu and 2,194teu respectively. Both are 198.5m long with a deadweight of 30,000dwt. There is an extra cost for the LNG system and a reduction in cargo handling of 56teu to make room for the gas tank. However, the extra capital cost and the theoretical loss of earnings are more than offset by the fuel economies and lower emissions of the LNG-fuelled variant, which has an EEDI of 12.2. It is powered by a single Bergen B35:40V 16PG, driving a single Promas system with CPP, supplemented by three Bergen C26:33L9AG generator sets, powering through a power-take-in (PTI). The diesel-powered JD4401 drives a FP Promas system and has a 1 knot faster

JD 4104 GF ro-ro cargo carrier - 9,000dwt/2,100lm

JD 4103 GF ro-ro cargo carrier - 9,000dwt/1,750lm

JD 4401 container carrier - 2,000teu

Much of the ship design work is undertaken in Shanghai.

service speed of 18.5 knots with an EEDI of 13.

Adopting a similar hull design and propulsion arrangements are the JD4601, a 37,000dwt handy size bulker, and the JD4801, a 37,000dwt general cargo carrier. Both vessels are 180m long, with a beam of 29.8m and an EEDI of 4.4. Propulsion power is provided by a 6,250kW diesel, driving a FP Promas system for a service speed of 14 knots.

The final designs are small LNG carriers with capacities from 5,000 to 40,000m^3, ideal for the anticipated demand in smaller vessels to supply LNG bunkering points as the world's LNG infrastructure develops. All have an EEDI of 23.1, a range of 1,500nm and a service speed of 13 knots. Smallest is the 5,000m^3 JD6401, with a length of 99.9m and 18.4m beam. Main engine is a Bergen C26:33L8PG, rated at 2,160kW, which drive a single Promas system, and a Bergen C26:33L6AG genset. Both engines are able to run on boil-off gas (BOG) or LNG from twin 80m^3 storage tanks. A hybrid shaft generator provides the electrical power, which can be used to increase propulsion power or for redundant propulsion.

The larger JD6405 with 10,000m^3 capacity can be specified with either gas or dual fuel propulsion. It is a shallow draft design well-suited for rivers and coastal waters and has a length of 124.9m and a 22.4m beam with 4.5m draught. Propulsion power is provided by twin 1,620kW Bergen C26:33L6PG engines driving Promas systems and running on LNG stored in two 120m^3 tanks. The dual-fuel version incorporates two 425kW diesel gensets that can also provide extra power and emergency propulsion through a hybrid shaft generator system.

6401 LNG carrier – 5,000m^3

6405 LNG carrier – 10,000m^3

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Automation maximizes performance for shale wells

Although automation technology has been used for many years to improve well performance in oil and gas production, the technology continues to evolve, benefitting both operations and production. Large drilling programs in the shale plays of North America have created many free-flowing wells. Maintaining optimal performance for so many sites can prove difficult for any production group.

Emerson Process Management

Bob Sherven, Shell International Exploration & Production Inc., Houston
David Mudry, Vinson Process Controls, Dallas
Al Majek, Emerson, Houston

Control system

In the northern Louisiana portion of the Haynesville shale play, Shell International Exploration & Production Inc. has met with success in controlling the free-flow stage of well lifecycles. Each well is equipped with the control system shown in Figure 1. Flow from a well is manipulated with a single automated choke valve.

Measurements taken to obtain this control include delta pressure (DP) and flow rate from an orifice run feeding a sales pipeline, and static pressure and temperature of the flowline feeding a separator.

Several requirements had to be met to obtain the degree of control needed. The electronic platform must include customized proportional-integral-derivative (PID) control loops and coded algorithms; it must also be capable of performing American Gas Association style flow computations and communicating with an existing supervisory control and data acquisition (scada) system. The units must be rugged enough for harsh environments and, because of the lack of electrical power in the area, capable of functioning on a solar-powered system (Figure 2).

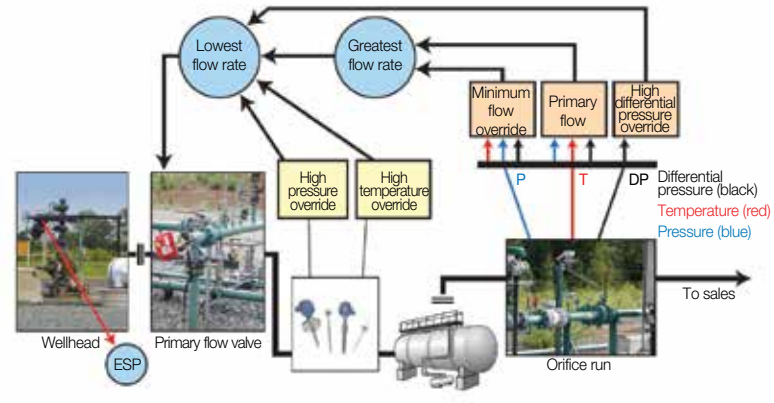

Figure 1. Automated choke-controlled system

Figure 2. Solar power is often required for remote automation.

For this application, Shell selected the Emerson Remote Operations Controller (ROC) 800 series of equipment. Production Manager, a software product of Vinson Process Controls, provides the user interface and enables operators to access and modify the system.

The primary focus of the system (Figure 3) is to maintain a steady flow from the well to the sales line, based on an operator-specified set point. Multiple overrides come into play, depending on operating conditions.

Flow ramp

An automated start-up sequence can be used when a well is first started to achieve minimum flow in a consistent, fast, and easy way. After the well is online, an operator can gradually ramp up the flow to the desired rate.

For example, the start-up sequence can bring a well to an initial flowing condition of 2 MMscfd of natural gas. An operator may want to reach 10 MMscfd over an 8-hr period. After an operator enters a desired end flow rate and time duration, the valve set point will automatically increase by an increment of 1 MMscfd/hr ((10–2 MMscfd)/8 hr) until 10 MMscfd is reached. At any time, a set point entered to reduce flow causes prompt reaction and is not subject to a ramping function.

Liquid loading

Whenever slug flow is present, liquid loading and subsequent unloading of the well must be addressed. As the well produces water, gas flow through the sales line decreases. The system's primary flow control programming responds to this change and opens the choke to compensate.

As the well unloads (water decreases), the gas flow increases quickly. The primary flow control programming will compensate and begin to close the choke; the reaction time, however, tends to be too slow. It is best to return production to an optimal level quickly and avoid tripping the well offline as a result of a high sales line pressure.

To accomplish this, the DP of the orifice run is monitored. The DP override can be tuned for faster response; therefore, it can return the well to normal flow control rapidly.

Another issue associated with producing water is ensuring that the well flow rate exceeds critical velocity. Critical velocity, determined by Turner and Coleman equations (1, 2), implies the minimum rate of flow required from the well to lift liquids. Flow at less than critical velocity enables water to collect in the well, eventually curtailing production. In this case, a flow rate value can be

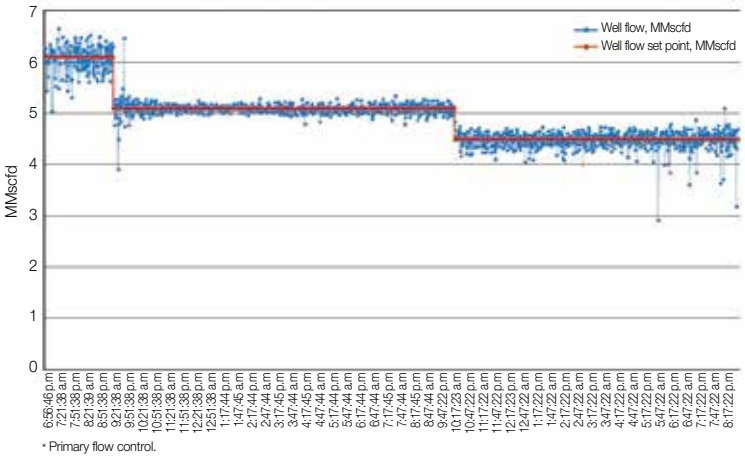

Figure 3. Haynesville well: Flow response (Primary flow control)

entered manually or automatically calculated by the ROC unit using tubing ID, as well as real-time tubing and flowline pressure values.

The programming instructions within the ROC will select between the greater of the primary flow control and the critical velocity set points. In this way, flow will be maintained at the operator-specified set point until the critical velocity is reached. The control system then works to maintain the flow at sufficient rate to continue extracting liquids.

Transient flow conditions

Wells in the Haynesville shale play tend to reach vertical depths of up to 13,000 ft. Bottomhole pressures reach 10,000 psig with temperatures around 325° F. The maximum-allowed temperature of a typical sales pipeline is 140° F. A gas engine-driven cooler (Figure 4) reduces the surface temperature of the product.

Figure 4. Gas-driven cooler reduces temperature to an acceptable range

To prevent the well from tripping offline because of a wave of high temperature production, a high-temperature override PID loop responds rapidly to reduce the set point. Reducing the flow through the heat exchanger helps to maintain the average temperature at an acceptable level.

Other issues may exist away from the wellsite. Downstream gas-treating plants sometimes experience problems that cause the pipeline to back up. A PID loop will reduce flow and prevent high-pressure surges from tripping the well. PID loops in both cases can be tuned as necessary to

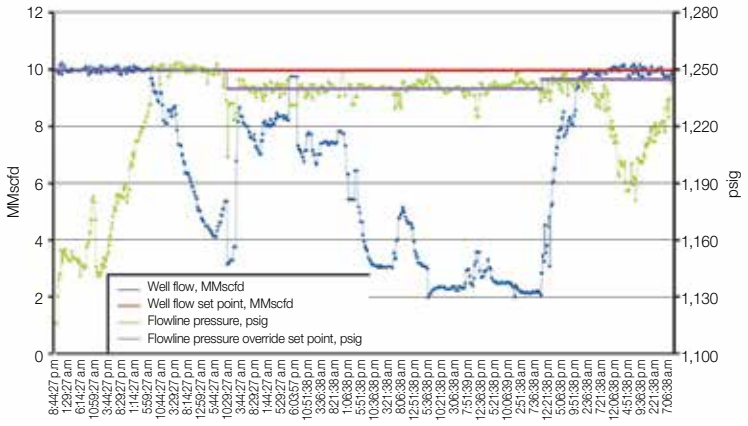

Figure 5. Haynesville: Flow with pressure override

adjust the flow to an acceptable rate. The reaction time is much less than that possible with the primary flow control-loop configuration

Figure 5 shows a response to high pressure. In this example, the well was flowing at about 10 MMscfd when a pressure spike to around 1,250 psig caused a sudden flow reduction. The flow eventually resettled around the primary flow set point with a new pressure control point determined by the operator.

The following four factors affect the preferred well flow rate:

1. High DP detected on the sales meter.
2. Water production, which may require that the primary flow rate set point be set to reflect critical velocity.
3. High temperature to the separator, which requires that the temperature be reduced to remain within the allowable temperature range of the sales pipeline.
4. High pressure to the separator, which requires that the flow rate be reduced to avoid high pressure shutdowns.

The programmed instructions of the ROC select the lower rate of these competing approaches to control the automated choke, ensuring that the well is maintained under control without violating any of the other conditions.

To assist safe operation, switches on site and a remote scada command can initiate an emergency shutdown (ESD) mode, overriding all other programmed instructions, and attempt immediate closure of the choke.

Economic benefits

The shale boom has greatly intensified the need to hire personnel in the oil patch. Work is sometimes delayed until skilled personnel can be hired or contracted or until other employees can be trained. In addition, local infrastructures are stressed by the influx of vehicles and people into the producing areas.

Consequential traffic problems have become a major incentive to reduce driving time. In this case, the control system both reduces time spent on the road and frees trained personnel from hours of rote effort, enabling them to tend to other wells.

Benefits of the control system include the following:

- *Eliminates driving to restart a well that otherwise would have tripped offline because of high temperature or high pressure short term conditions.*
- *Enables personnel to get a well online in a faster and safer manner.*
- *Eliminates extensive time at a wellsite to perform actions to achieve an optimal flow rate.*

Avoiding deferred production is another benefit. Because gas production flows to a pipeline, downstream problems of any type require reducing flow or shutting down the well. This automated system makes it possible to remotely modify set points and quickly return wells to operation.

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Gas-diesel conversions for power plant applications

Wärtsilä's gas-diesel (GD) technology was introduced in 1987 with the Wärtsilä 32GD, the first gas engine in the Wärtsilä portfolio. This technology has been used mainly in offshore applications, but has later found applications in the power plant sector.

Wärtsilä Corporation

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GD technology makes it possible to run a power plant on either associated gas or crude oil, where the gases could contain heavy hydro-carbons, or heavy fuel oil to provide the operator with fuel versatility and security against gas supply disturbances. The system accommodates daily/frequent variations in gas quality and quantity.

GD- power plants

In power installations, the economic viability of gas is becoming ever more apparent. At the same time, emission issues related to the use of liquid fuels are becoming more complex. Not surprisingly, therefore, the use of gas to generate power is rapidly increasing, although in order to convert older LFO /HFO operated installations to natural gas, there needs to be a reliable supply of gas available. Nevertheless, the conversion of a

Figure 1. The Wärtsilä solution for re-injecting associated gas into the oil well. This maintains the pressure, enhances oil production, and can even be used as a means of storing gas for later use.

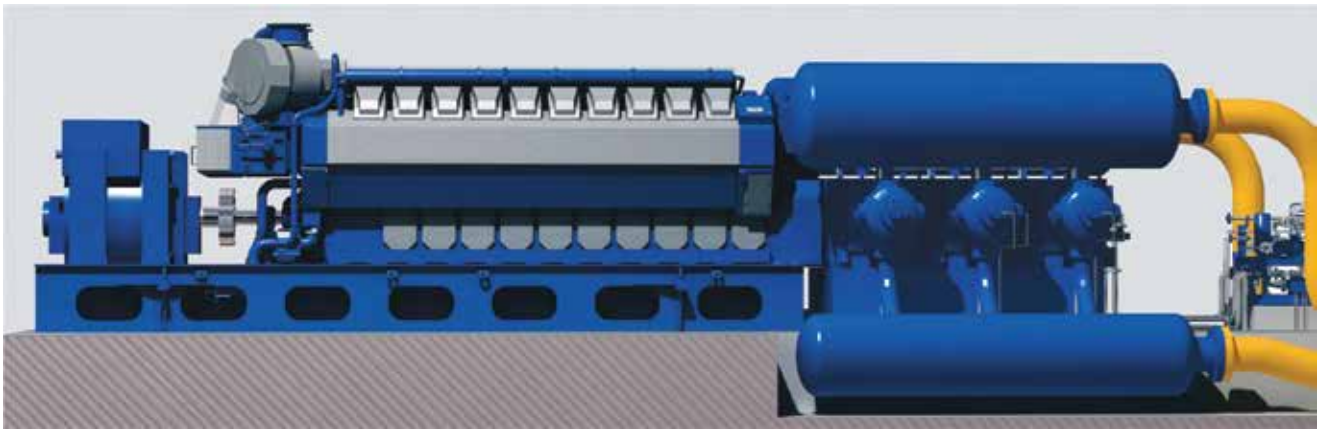


Figure 2. Gas re-injection combined with power generation.

HFO plant to natural gas offers several benefits that make this upgrading feasible for many customers. Currently, a conversion project can be offered using most of the Wärtsilä 32, Vasa 32 and Vasa 46 engines. Typically, the two main drivers for fuel change are:

- Reduced emissions and fees
- Reduction of fuel costs

The GD conversion concept

Wärtsilä`s gas engine portfolio (GD, SG and DF types) is well known, and if the current total running hours are, for example, less than 10,000 hours, a GD conversion is feasible. In any case, the number of engine parts that need to be changed is limited. Diesel engines provide one of the best heatrates, while GD engines in addition to this also enable the use of most gas types available on the market.

There are a number of factors to take into account when considering a gas conversion. The most logical place to start is to establish whether or not the existing engines on site can be converted, or if they should be exchanged for new ones. Converting an existing engine is usually economically more feasible than installing a new one, especially since a conversion basically brings the same benefits as a new engine. For example, the same warranty is granted as for a brand new engine.

Furthermore, there are also savings to be made on maintenance costs since the running hours are reset to zero (0). However, with smaller installations, e.g. below 10 MW, it would most likely be more cost effective to install new engines.

The plant equipment required for operating on gas can be divided into six main areas:

- Gas delivery
- Gas compressor
- High pressure gas
- High gas pressure oil
- Control
- Electrical feed

Each gas conversion is installation specific, and requires a basic engineering evaluation before a detailed offer and scope can be given. The scope can encompass a turnkey delivery that includes the installation and commissioning of the plant. The plant's gas supply and gas line connection to the gas delivery system is normally the responsibility of the customer. The most important benefits of such a conversion are lower emissions, improved plant efficiency, and the fact that all the work can be done on site.

Currently there is an upsurge in demand for gas conversion installations, based on an increase in gas supply. In countries without pipeline gas, liquefied natural gas(LNG) offers a potential alternative solution.

Gas conversions are yet another example of Wärtsilä's ability to help owners and operators throughout the lifecycle of their investment, and the company can offer a broad variety of possibilities to meet each customer's specific requirements. Wärtsilä is also supporting its customers in gas conversions by providing relevant training courses on gas operation.

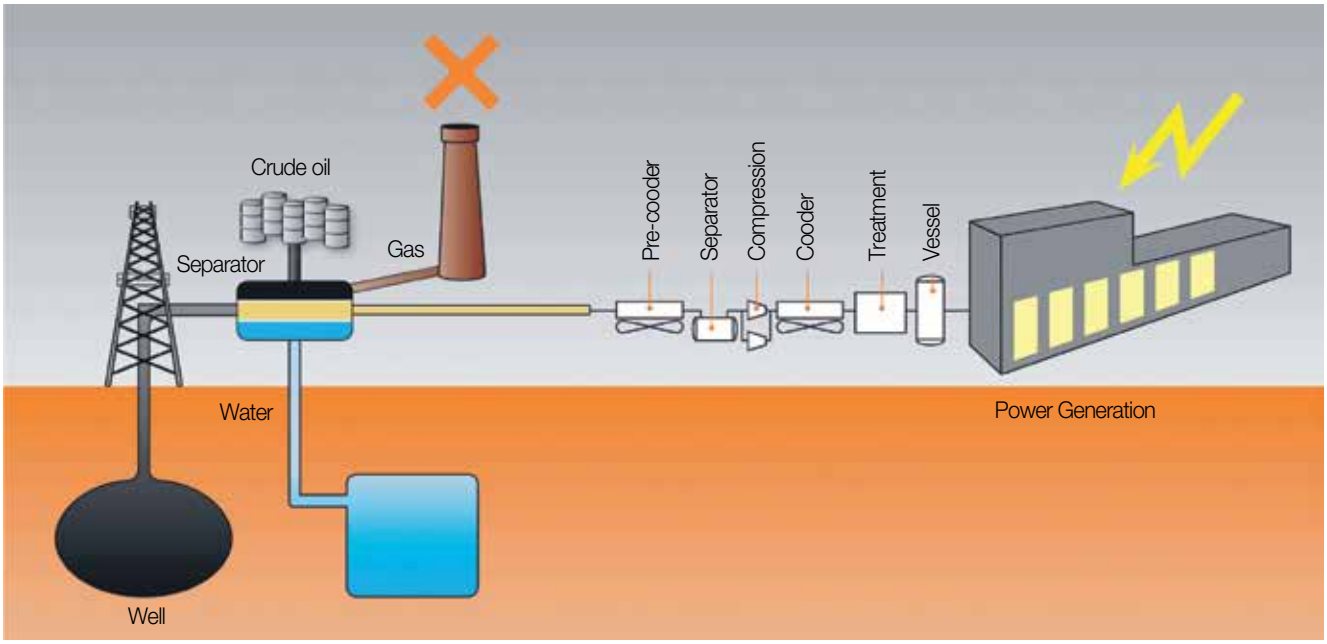


Figure 3. W2W: The Waste To Wire schematic process.

Eden Yuturi Conversion Project

In 2008, PETROAMAZONAS EP (PAM), an Ecuadorian state owned oil company, initiated a mission named "Optimisation Generation Electric-OGE" that they also nominated as a Waste to Wire, or Well to Wire (W2W) project.

During the crude oil extraction process, crude oil, water, and associated gas come to the surface, where they are then separated at the production facilities (see Figure 3). Given the unstable condition of the associated gas (both in terms of composition and supply) it is usually vented or flared. The World Bank-led 'Global Gas Flaring Reduction Partnership' estimates that globally this amounts to approximately 150 billion cubic meters of gas each year, causing some 400 million tons of carbon dioxide emissions. That is equivalent to 30 per cent of the European Union`s total gas consumption.

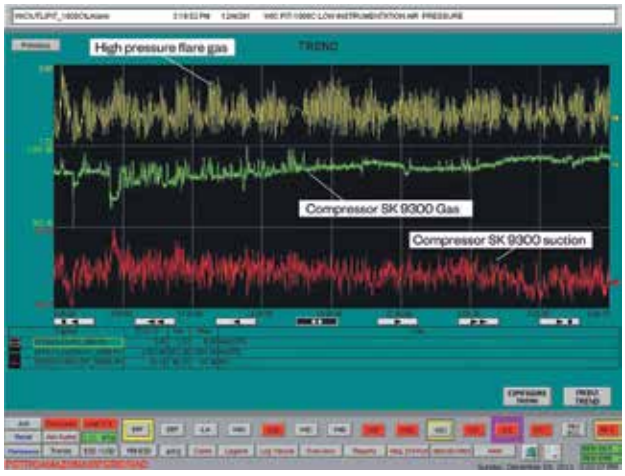


Figure 4. Associated gas supply characteristics.

It is important to point out that associated gas is quite different to natural gas, in that its composition and volumes change significantly over time. If you add to this the fact that the supply of associated gas is extremely unstable (see Figure 3), it becomes clear why in most cases the oil companies prefer to simply vent or flare it.

In order to reduce gas flaring at the Eden Yuturi site, PETROAMAZONAS EP and Wärtsilä entered into a joint development agreement aimed at developing an integrated "gas/crude" product, able to cope with the dynamic condition of associated gas. In line with the technological developments, PAM and Wärtsilä jointly developed the Clean Development Mechanism (CDM) programme as a means to co-finance the project. The objectives of the project are to mitigate the environmental impact through reducing the exhaust and noise emissions; to develop and implement a flexible solution that

will adjust to the challenging conditions of associated gas; and to replace the use of diesel/crude oil for power generation by utilizing the associated gas.

Technology

Thanks to Wärtsilä's multi-fuel technology, associated gas can be converted to electricity instead of being continuously flared into the atmosphere. This technology offers a unique degree of fuel flexibility, permitting the engines to run on any combination of liquid fuel and associated gas. This is essential for oil and gas companies operating in environments where the associated gas volumes and composition are constantly changing. This flexibility in the utilization of associated gas serves to maximize power production while, at the same time, reducing greenhouse gas emissions.

Although the first phase of the project has been completed, PAM and Wärtsilä are already looking at taking the "energy efficiency" concept to a next phase by developing new state-of-the-art technological features. The overall goal is to eliminate any waste, thereby allowing PAM to reduce the "carbon footprint" per barrel of crude oil extracted.

The Project Outcome

The conversion of the Eden Yuturi power plant from crude oil-fuelled to associated gas-fuelled operation enabled PAM to utilize associated gas that was being flared. Four 18-cylinder Wärtsilä Vasa 32 low nox gas (LNGD) engines in V-configuration generating 20 - 24 MW power were converted, and the hand-over to PAM took place in November 2011. Every 1 million cubic foot per day of flare gas optimised for power generating represents approximately 160 barrels of crude oil per day. Thus, PAM expects to save up to 640 barrels thanks to the project. As PAM likes to say: it increased the net crude oil production by an average of one well without having gone through the drilling process.

The PETROAMAZONAS EP and Wärtsilä cooperation succeeded in developing an "in-house" Ecuadorian Project Team and Project Implementation Structure capable of taking a project from an idea to commercial operations. This has been duly recognized by the government of Ecuador, which has now decided that this vehicle should be used to implement energy efficiency projects throughout the country's petroleum sector.

Figure 5~6. Gas Flaring at Eden Yuturi before and after the GD conversion.

Furthermore, technological solutions were developed and implemented that focused on mitigating the challenges of quantity and quality fluctuations in the delivery of associated gas. At the same time, PAM's power supply matrix was re-engineered so that today more than 60 MW of capacity has been installed to operate with associated gas. This will be increased to 70 MW in phase three. The other critical technical achievement of the project has been the transformation of isolated power generation systems towards a distributed power system, by installing low environmental impact underground cables.

Wärtsilä's multinational team can reflect on a successfully implemented solution for PAM. It has also created an international benchmark for oil sector energy efficiency and consequently, a business model that focuses on long term sustainable prosperity.

Carbon Finance

The gas conversion is expected to save over 1Mt of CO_2 emissions over 10 years by using previously flared gas for power generation. In parallel with Wärtsilä's delivery of the gas conversion project, the Development and Financial Services group at Wärtsilä assisted PAM in the successful registration of the project under the UN's Clean Development Mechanism. During the 2½-year process Wärtsilä's carbon finance experts guided the PAM CDM team in the CDM registration process, and arranged the sale of Certified Emission Reductions from the project. The income from the Certfied Emission Reductions provides an ancillary income stream for PAM over at least 10-years and was one of the key elements in the investment decision.

Figure 7~8. Aksa Samsun before and after the GD conversion.

Aksa Samsun conversion project

Aksa Enerji Uretim A.S, a part of Kazanci Holding, is one of Wärtsilä's biggest customers in Turkey. This energy sector company operates diesel and gas power plants, wind farms, hydro-electric plants, solar energy, biogas and landfills, as well as distributing and selling electricity.

The company made an agreement with Wärtsilä in early 2000 for the supply of a 120MW power plant, equipped with seven 18-cylinder Wärtsilä 46 engines, to the Turkish city of Samsun on the Black Sea. The Samsun region has industry, but is also an agricultural area and the local authorities pay considerable attention to environmental impacts. The emission levels from the big factories and power plants were, therefore, of high concern already at that time and the Wärtsilä power plant was equipped with SCR and SOx scrubber systems.

With the tightening of Turkey's environmental legislation, the company was anxious to convert the engines to use more environmentally friendly fuel. At the same time, however, it had to be kept in mind that the rated output from the engines could not suffer any losses.

Additionally, operating costs needed to be reduced to make the plant's operations more economical. Since the engines were running for only 5000 hours each, only minor modifications to the engines were preferred. Wärtsilä's suggestion for the challenge was a GD concept, which could cope with all the requirements with improved engine efficiency, yet still be able to provide not only back up fuel flexibility with HFO and LFO, but also natural gas/HFO fuel sharing.

As the undersea natural gas pipeline from Russia already exists in the city of Samsun, the set up was clear, and the GD concept was proposed as a means of continuing the plant's operation under the tight emission laws. The EEQ contract to convert six of the power plant's engines to GD operation was signed in November 2009, and the project team's involvement began accordingly. The seventh engine was relocated to Cyprus by Aksa Enerji during the execution of the GD conversion project in order to make room for the first Wärtsilä 50SG engine.

Safety is the driving force

Safety is imperative when using high pressure gas as a main fuel. The fuel oil system, gas detection and automation system, and the fire fighting system were designed according to stringent safety regulations. Different ratings and areas of Ex-zones were determined, and even the access road to the power house building had to be changed due to the compressor house design and location. Ex-proof components were considered for all electrical and automation parts, when located inside the Ex-zone.

A new gas feed arrangement with double wall piping, a new HFO injection system, a control oil system for 370 bar pressure, and a new improved engine control were added to the engine. Basically, therefore, very minor modifications to the engine itself were required.

For external systems, the conceptual design was made through close co-operation between Wärtsilä and Aksa Enerji A.S Uretim. A 'Safety Concept with a Cause & Effect' study was made by Wärtsilä and Aksa Enerji based on the Wärtsilä GD concept and local regulations, and this was used as a design and execution guideline. The safety concept emphasizes all the necessary aspects and measures included in the GD power plant concept to achieve an acceptable safety level.

An optimal gas feed system based on the local conditions was calculated and designed by Wärtsilä experts together with Aksa Enerji A.S Uretim's gas department. The gas itself is good quality Russian natural gas with high low heat value(LHV), a low consistence of inert gases,

Figure 9. Pressure testing of the gas pipeline.

and high methane number(MN). Two high pressure gas compressors supply the six Wärtsilä 46GD engines via an engine wise gas valve skid, which is also able to share the load upon request from the Wärtsilä plant control system.

The gas feed piping inside the power house is double walled to enable proper ventilation for the safe evacuation of any possible gas leaks. A reliable, sufficient, and safe gas feed into the engine is an important factor, but the gas blow down and venting can not be overlooked. Because of maintenance or other planning reasons, the gas flow must be able to be led out (blow down) from the system back to the gas grid. This must be a safe and controllable operation. There is a further need for emergency venting of the gas flow into the atmosphere, which has to be well planned so that it is activated in accordance with the plant controls, etc.

A project specific gas valve skid was tailored by the project team to achieve the optimal reliability and performance for operation with a very low, <2 bar, pressure drop over the skid. The gas valve skids were further located inside the gas tight individual cabinet, which is continuously ventilated and furnished with gas detection equipment that issues a gas alarm in case of any leak or malfunction of the skid.

Testing and commissioning took place in autumn 2011, engine by engine, by the Wärtsilä commissioning team assisted by the Aksa Enerji team. Start up of the GD engine is carried out using LFO or HFO, and then ramped up to 25% to 30% on fuel sharing mode prior to change over to full gas operation with an HFO fuelled pilot. After a few days tuning, the 17 MW was reached with very good heat rate figures.

Furthermore, the key issue, the exhaust gas emissions, were accepted by the local authorities, who are continuously monitoring the plant`s exhaust gas emissions via engine wise emission sensors installed on each exhaust gas stack. So, in other words, the production of electricity can continue with far lower levels of exhaust gas emissions, while providing financial benefits through lower operation costs. An additional advantage is that HFO no. 4, or even no. 6, can be used as a pilot fuel to reduce the operational costs even more.

New automation

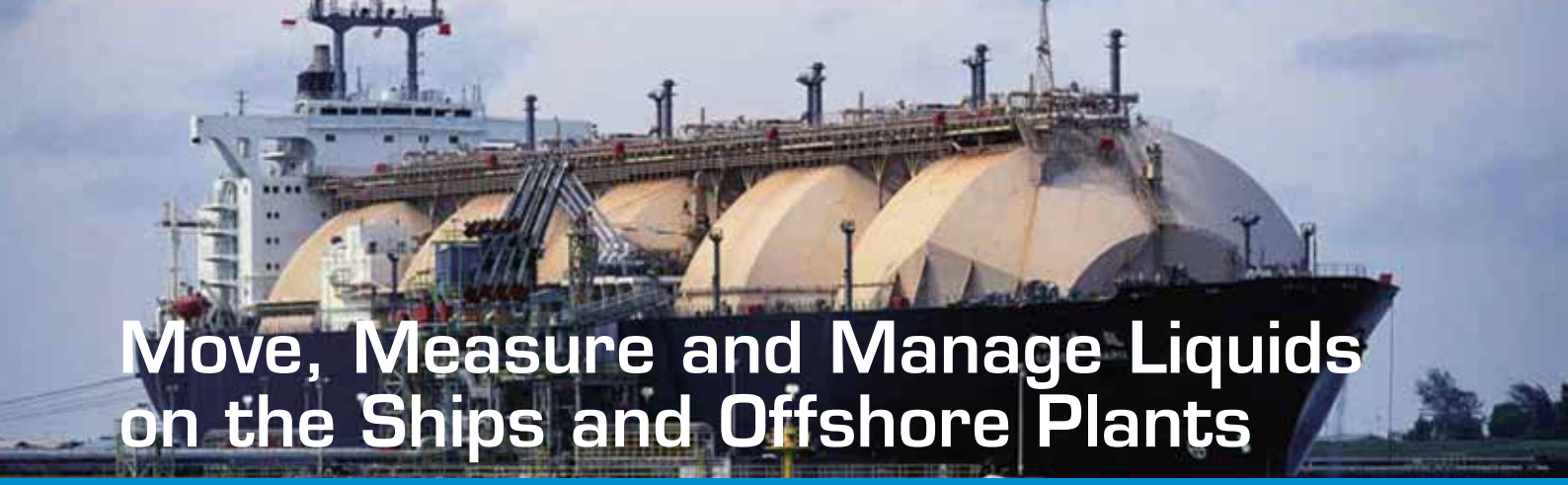
No conversion project is without a challenge or a surprise of some kind. This is especially true when something new has to fit into an existing environment. The engine and plant automation and monitoring systems were renewed totally, so old panels, sensors, etc were disconnected and removed prior to assembly of the new ones, which were also partly interconnected to the existing systems.

In addition, considerable quantities of safety equipment, including detectors, sensors, limit switches, and so on, were installed based on the required safety concept. Once the dismantling and installation work was finalised, the software needed to be updated to the final revision, and once again this was based on the safety concept and the final setting of the equipment.

Overall, however, through close and open co-operation with the customer, the Wärtsilä organizations in Finland and Turkey, and other stakeholders meant that no major surprises occurred - even though the project specific and tailored design was developed during the project itself.

Fuel flexibility

Wärtsilä products are flexible and easily adaptable for utilizing gas as a main fuel. This makes the converting of power plants to gas operation very interesting, for example in terms of lower operation costs, less exhaust gas emissions, fuel flexibility, and short payback time. This is especially important now when the gas grids are expanding and emission levels are being tightened globally. The GD concept requires very few engine modifications, and provides considerable benefits with real fuel flexibility.



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Electric propulsion: A new era for bulk carriers

Main propulsion and thruster drives on a Japanese bulk carrier supplied by Vacon

Vacon Korea Ltd.

In the past bulk carriers have utilized diesel-mechanical propulsion. However, with developments in electric propulsion technology this now offers many advantages, such as high redundancy, flexibility in equipment layout, energy savings and reduced exhaust gas emissions. After long-term studies, Japanese ship-owner Mukaishima Dock Co., Ltd. decided to build a bulk carrier with electric propulsion, mainly for steel transportation on the Inland Sea of Japan. This vessel ushers in a new era of electric propulsion for bulk carriers.

The electric propulsion system on Mukaishima Dock's bulk carrier was integrated by the 712 Research Institute in Wuhan, China. With its high-level technical skills and know-how, the 712 Research Institute overcame competition from many companies with global reputations as well as local companies in Japan and was selected as electric propulsion system supplier for Mukaishima Dock's bulk carrier. Thanks to Vacon's outstanding performance and sophisticated application solutions for marine electric propulsion systems, 712 Research Institute and the Japanese ship-owner selected Vacon as supplier of the main propulsion and thruster drives.

Benefits for the environment

The main propulsion and thruster on this bulk carrier, with a 499 gross tonnage, utilize variable speed electric propulsion, which saves energy and is environmental-friendly. The high level of automation and flexible maneuverability reduce fuel consumption, improve the living comfort of the crew, and enable the vessel to manage with a smaller crew than a conventional bulk carrier.

Compact VACON® NXC cabinet drive for harsh environment The vessel has two main propellers and one bow thruster. The main propulsion motor has a power of 375 kW and a rated speed of 1,800 rpm. The bow thruster motor has a power of 200 kW and a rated speed of 1,800 rpm.

The main propulsion drive is a 12-pulse, air-cooled VACON NXC cabinet drive and the bow thruster drive is a 6-pulse, aircooled VACON NXC cabinet drive. Two sets of 12-pulse main propulsion drives form a quasi 24-pulse structure to reduce harmonics and to meet the classification society requirement for THDu < 5%. As the VACON NXC cabinet drive is designed on the same technology platform as the VACON® NXP series, it is modular and very compact. Heat dissipation is the core issue in designing the VACON NXC

control cabinet; comprehensive, strict tests have been carried out to ensure the drive cabinet has a long service life in a harsh environment. The main propulsion and bow thruster drive cabinets are located in lower hull, which sets high requirements regarding the footprint and heat dissipation from the drive cabinet. The VACON NXC cabinet operates reliably in these conditions.

With the in-built marine application software, the VACON NXC cabinet drive has fast torque and power limitation functions as well as a power control mode, making it extremely suitable for the operating conditions for electric propulsion. In addition, because both the main propulsion and the bow thruster drive cabinets are equipped with a brake unit and a brake resistor, the energy regenerated by the motors can be dissipated in the brake resistor through the brake unit when the vessel is decelerating sharply or doing a crash stop.

Additional electric propulsion projects in the pipeline

During its first year of operation, Mukaishima Dock's bulk carrier has aroused much attention and interest in Japanese media and among ship-owners. The original design goals of reduced fuel consumption, low exhaust emissions, energy savings and environmental-friendliness have been achieved and verified in operation. In terms of fuel consumption, the vessel was ranked fifth in a comparison made of 100 vessels in Japan.

The electric propulsion system on this vessel functions very reliably. Japanese ship-owner Mukaishima Dock is highly satisfied and plans to order additional bulk carriers of this type, with the electric propulsion system integrated by 712 Research Institute. The preferred choice of propulsion drives will be VACON NXC cabinet drives. All in all, the successful building of this ship highlights the promising market prospects for electric propulsion on bulk carriers.

In detail

Electric propulsion systems enable new, more flexible arrangements and more efficient integration of a ship's energyusing systems, because they allow the same power plant to support both propulsion and other requirements. As a result, ships can be redesigned to provide more space below deck, for passengers or cargo for example. Almost 100% of all new large commercial-ocean going vessels are electrically propelled, including many large cruise ships such as the Queen Mary 2.

Mukaishima Dock's electric propulsion bulk carrier, with 499 gross tonnage and 1,800 deadweight tonnage, was built in Qingdao Shipyard located on Jimo Island in Shandong Province, China. Construction of the vessel began in March 2010, the ship was launched in September and sea trials took place in November 2010. This environmental friendly vessel received a special subsidy from the Japanese government. (Photos courtesy of Mukaishima Dock Co., Ltd.)

A bulk carrier, bulk freighter, or bulker is a merchant ship specially designed to transport unpackaged bulk cargo, such as grain, coal, ore, and cement in its cargo holds. Since the first specialized bulk carrier was built in 1852, economic forces have fuelled the development of these ships, causing them to grow in size and sophistication. Today's bulkers are specially designed to maximize capacity, safety, efficiency, and to be able to withstand the rigours of their work. Today, bulkers make up 40% of the world's merchant fleets and range in size from single-hold mini-bulkers to mammoth ore ships able to carry 400,000 metric tons of deadweight (DWT). (Source : Wikipedia)

&. Plimsoll line = a line on a ship's hull indicating the maximum safe draft, and therefore the minimum freeboard for the vessel in various operating conditions, invented by and named after Samuel Plimsoll (1824 – 1898), a British politician and social reformer.

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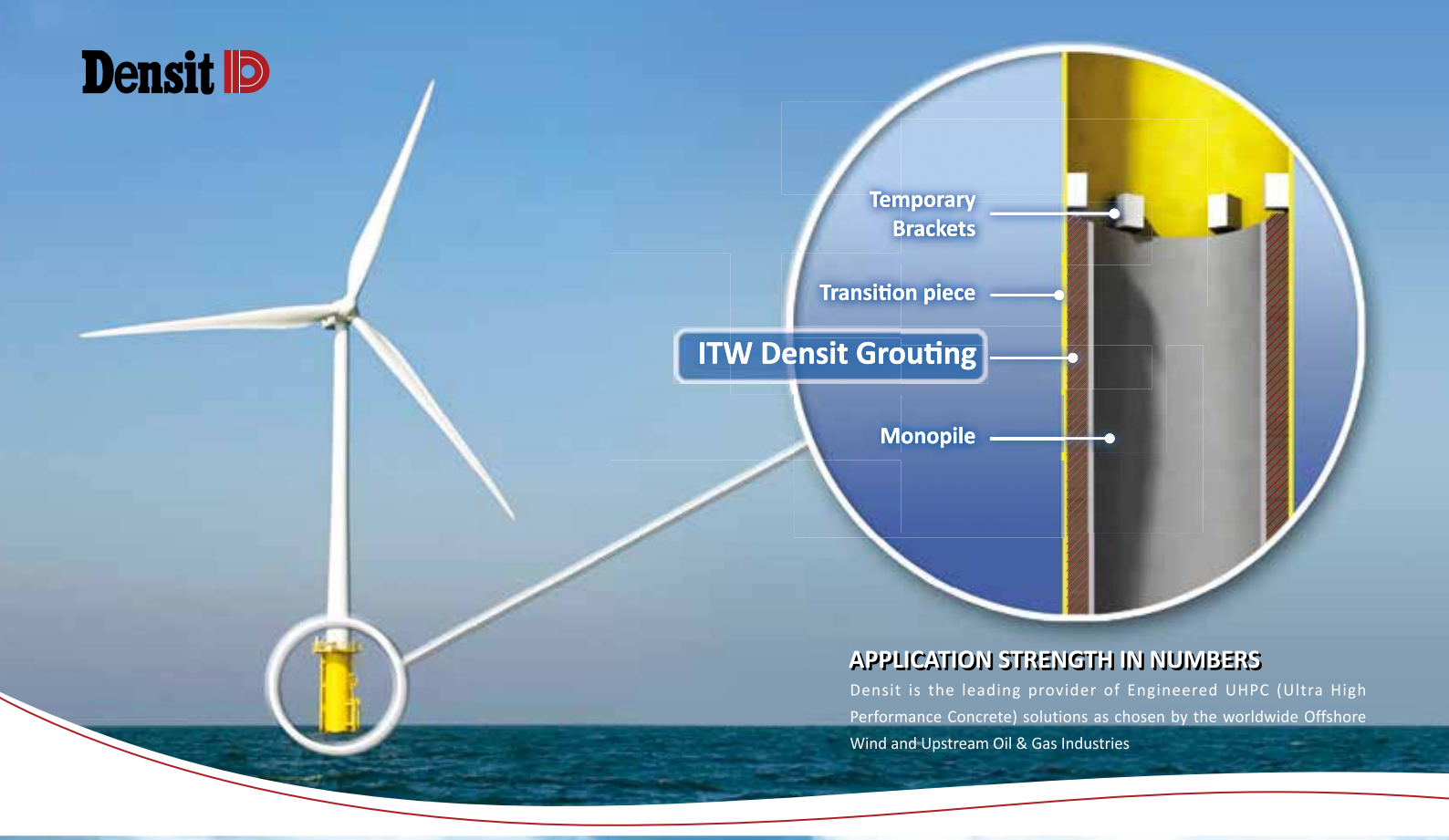

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HHI clinched an order for 18,400TEU containership, the world's largest

Hyundai Heavy Industries(HHI) won an order for 18,400TEU very large containership, the world's largest. This mega order follows the USD 700 million contract which HHI signed with CSCL(China Shipping Container Lines) to build 5 units of 8,400TEU containerships in Shanghai, China on May 6.

These containerships measure 400m in length, 58.6m in width, and 30.5m in height, which is 4 times as large as a soccer field, and have carrying capacity of 18,400 containers, each 20 feet long. These vessels will be delivered to the ship owner on a staggered basis from the second half of 2014. This year, HHI has secured orders for 10 very large containerships with the capacity of 10,000TEU or higher, including the 5 units of 14,000TEU containerships ordered from Canada-based Seaspan in January.

HHI opened up the market for very large containership in 2005 when it won an order for a 10,000TEU containership for the first time worldwide, and won an order for the world's largest containership this time.

These very large containerships will be fitted with the ME-Engine, developed independently by HHI, which automatically controls the fuel injection based on the sailing speed and environment, thus reducing the fuel consumption and CO_2 emissions. In addition, these vessels will be built into an optimized type improving the fuel efficiency during the operation and incorporate various eco-friendly technologies such as the Eco-Ballast, the ballast water treatment system developed by HHI.

An official from HHI said, "We are seeing an upturn in the demand for eco-friendly and high efficiency vessels and will move forward with R&D to develop new ship models, eco-friendly engines and smart vessels and expand technological capabilities as part of effort to cement our leadership in the market and increase customer satisfaction."

HHI has won orders worth USD 9.7 billion(including the orders placed at Hyundai Samho Heavy Industries) from the shipbuilding and offshore plant sectors so far this year, achieving 41% of its annual new order target of USD 23.8 billion.

13,100TEU containership built by HHI

현대중공업, 1만 8400TEU급 세계 최대 컨테이너선 수주

현대중공업이 세계 최대 규모인 1만8,400TEU 초대형 컨테이너선 수주에 성공했다. 현대중공업은 지난 5월 6일 중국 상하이에서 CSCL(China Shipping Container Lines)사와 1만 8400TEU급 컨테이너선 5척, 총 7억 달러 규모의 수주계약을 체결했다.

이번에 수주한 컨테이너선은 길이 400m, 폭 58.6m, 높이 30.5m로 축구장 4배 크기이며, 20피트 컨테이너 1만 8400개를 실어 나를 수 있다. 현대중공업은 오는 2014년 하반기부터 이들 선박을 차례로 선주사에 인도할 예정이다. 이로써 현대중공업은 지난 1월 캐나다 시스판사로부터 1만 4000TEU급 컨테이너선 5척을 수주한데 이어, 올 들어 1만TEU급 이상 초대형 컨테이너선 10척을 수주하게 됐다.

현대중공업은 지난 2005년 세계 최초로 1만TEU급 컨테이너선을 수주함으로써 초대형 컨테이너선 시장을 열었으며, 이번 수주로 세계 최대 컨테이너선 수주 기록도 보유하게 됐다.

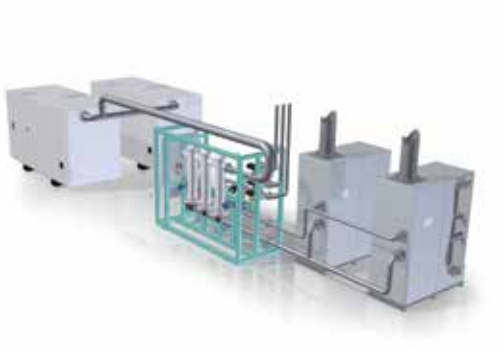
초대형 컨테이너선에는 현대중공업이 자체 개발한 ME-엔진을 탑재, 운항속도 및 환경에 따라 자동으로 연료를 조절해 연료 소모량과 탄소배출량을 줄일 계획이다. 또한, 운항 중 연료 효율을 높일 수 있는 최적화된 선형으로 건조되며, 현대중공업의 선박평형수 장치인 '에코밸러스트'도 탑재되는 등 다양한 친환경선

박 기술이 적용된다.
현대중공업 관계자는 "친환경 고효율 선박에 대한 고객들의 요구가 높아지고 있다"며 "신선형과 친환경 엔진, 스마트십 개발 등 지속적인 연구개발과 기술력 확보로 시장선도 및 고객 만족에 더욱 노력하겠다"고 밝혔다.

현대중공업은 지금까지 조선해양플랜트 부문(현대삼호중공업 포함)에서 총 97억 달러를 수주, 올해 목표인 238억 달러의 41%를 달성하며 순항하고 있다.

Air products related to the contract worth USD 6 million to supply the nitrogen generation system to Samsung and Daewoo

Air Products has signed an important supply agreement with leading shipyards Samsung Heavy Industries (SHI) and Daewoo Shipbuilding & Marine Engineering (DSME). The contract covers delivery of nitrogen generator sets for use on the large-scale Australian offshore Ichtys LNG Project, and confirms Air Products' position as a world leader in the liquefied natural gas (LNG) equipment field. Air Products previously signed a contract with Shell for a similar delivery to the company's huge Prelude LNG Project. The newest contract, with Samsung and DSME, has a minimum value of NOK 35 million (US $6 million).
Tom Cantero, CEO and Managing Director of Air Products Norway said, "We are very glad that Samsung and DSME have recognised the high quality of our nitrogen generator sets and we look forward to future cooperation. There is growing global demand for LNG and we feel that the positive trends within this segment will accelerate in coming years. We find ourselves very well positioned to play a key role in this development as Air Products has a very clear focus, a dedicated team and a strong work ethic."
LNG is gaining a reputation as an environmentally friendly source of energy that has now been adopted by a number of sectors, including commercial shipping, which is seeing an influx of LNG powered and dual-fuel vessels. The latter use diesel fuel to start up power generation and then switch to LNG. Another important driver for LNG demand has been the widespread distrust of nuclear power generation following the 2012 earthquake disaster in Japan.
The Inpex manufacturing facility in Darwin Harbour, Australia, will contribute towards meeting Japan's LNG requirements. When the plant is launched in 2017, it will supply 70% of its 8.4 million ton annual production to Japan through a pipeline. The offshore plant consists of a drilling unit and a production vessel, both of which will be equipped with nitrogen generator packages from Air Products.



"Our agreement with Samsung is the result of intense work and development. We feel that our specially developed membrane-based nitrogen generator sets are setting the industry standard for use in the LNG sector. The contract to supply to the world's leading developers of LNG production plants confirms the quality of our products," Tom Cantero adds.
Air Products was the first company to introduce compact systems for membrane-based production of nitrogen for use onboard ships and offshore installations. Initially the equipment was used as a method for choking gas during loading and unloading in order to prevent explosions onboard the vessels. However the product has been shown to have additional uses, such as treatment of water in ballast tanks, extended preservation of food during transport, and increasing the lifetimes of ships' tanks.

Nexans makes breakthrough in Malaysia offshore sector with subsea umbilical order

On April 18, 2013 Nexans has made a breakthrough in the Malaysia offshore sector with the award of a major contract by Persada Engineering to supply an electro/hydraulic subsea umbilical for Sarawak Shell Berhad's F29 field development.

The 22 km Nexans umbilical will be installed in a water depth of around 100 m to provide communication and control functions for the F29 field development. Nexans will be responsible for the supply and transportation of the umbilical, together with accessories as required, in a fast-track 72-week contract. The F29 umbilical will be manufactured at Nexans' specialized facility in Halden, Norway.

"This umbilical contract for Persada Engineering is a very important development for Nexans as it brings us right back into the Malaysian offshore sector with a project for a very influential end-customer; Sarawak Shell Berhad," said Jon Arne Häll, Technical Director Hybrid Underwater Cables, Nexans Norway. "Nexans' capability to design, manufacture and deliver complex subsea umbilicals is already well established in the Americas and Europe and this is a great opportunity to show what we can do in Asia."

넥상스, F29 유전개발 프로젝트에 엄빌리칼 케이블 공급계약

넥상스는 페르사다 엔지니어링(Persada Engineering)사와 사라와크 쉘 베르하드 (Sarawak Shell Berhad) F29 유전 개발에 설치될 전기유압식 해저 엄빌리칼 케이블 공급 계약을 체결했다고 지난 4월 18일 발표했다.

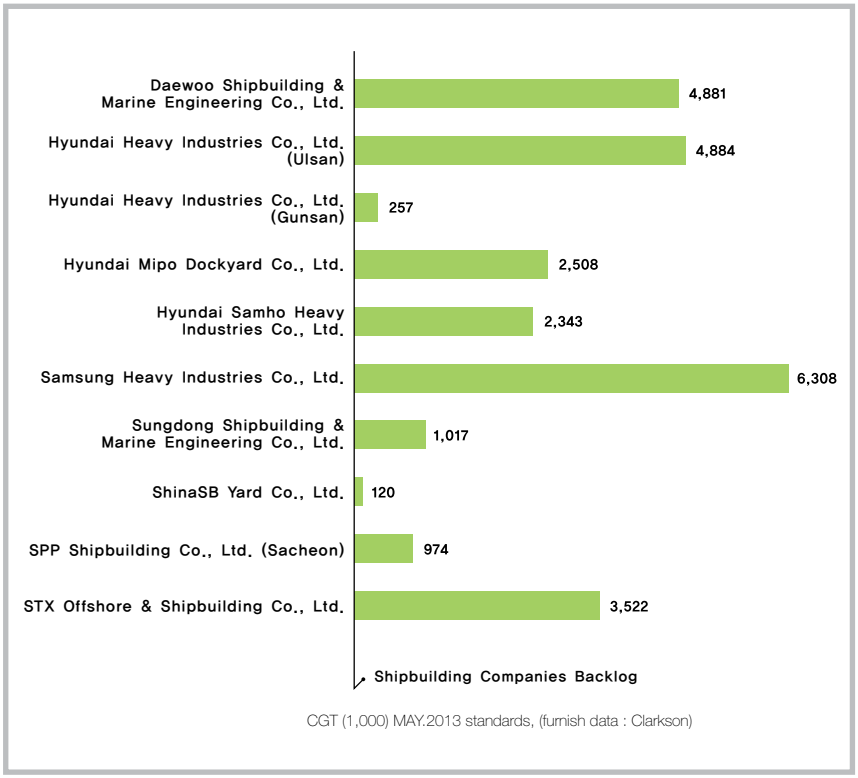
이번에 수주한 엄빌리칼 케이블은 수심 약 100m 해저에 설치 되어 F29 유전개발에 필요한 통신 및 제어 기능을 담당하게 된다. 넥상스는 72주안에 이뤄지는 조기 달성 계약에 의거, 엄빌리칼 케이블과 관련 악세서리의 공급 및 운반을 책임지게 된다. 한편 F29 엄빌리칼 케이블은 넥상스 노르웨이 할덴 공장에서 제조될 예정이다.

넥상스 노르웨이의 하이브리드 해저케이블 기술 임원인 욘 아르네 할(Jon Arne Häll)은 "페르사다 엔지니어링과 체결한 엄빌리칼 계약은 넥상스의 첫 말레이시아 오프쇼어 진출이라는데 그 의의가 크다."면서 "복잡한 해저 엄빌리칼 케이블의 설계, 제조 및 납품에 대한 넥상스의 능력은 이미 미국과 유럽에서 잘 검증되었으며, 이제는 아시아에서 우리가 무엇을 할 수 있는지 보여 줄 수 있는 좋은 기회"라고 넥상스 노르웨이의 하이브리드 해저케이블 기술 임원인 욘 아르네 할(Jon Arne Häll)은 말했다.

The newbuild bulker market is showing strong performance this year despite the prolonged sluggishness in shipbuilding industry. Recently, major overseas ship owners are placing the orders for large-scale capesize bulkers in a row, and the new order placement for small and medium-sized bulkers is also increasing except for the panamax class bulkers.

According to the data published by Clarkson, new orders for capesize bulkers this year exceeded 29 units which were recorded last year.

Amid the upturn in new orders for capesize bulkers, there has been a sign of upswing in new orders from the handysize and handymax bulker sector which remained sluggish for a while. However, new orders for panamax bulkers still remain flat, and it will take more time until the overcapacity of panamax bulker is resolved compared to other vessel types.



Domestic shipyards have received new orders for various kinds of vessels such as bulker/tanker, LNG carrier and very large containership based on their strength in eco-friendly and high fuel-efficient vessels. Particularly, domestic shipyards have seen their new order intake increase 22.5% year-on-year to 2.56 million CGT in the first quarter of this year alone, accounting for 39% of all new orders placed worldwide.

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

Photo: Daewoo Shipbuilding & Marine Engineering Co., Ltd.

Offshore plant orders awarded to domestic shipyards in 2011-2012

Date		Type	Number of vessel	Amount	Ship owner	Delivery	Shipyard
2011	January	Drillship	1 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	KRW 1 trillion	Noble Drilling, U.S.A	On a staggered basis until Sep 2013	Hyundai Heavy Industries
		Deepwater drillship	1 vessel	-	Atwood Oceanics, U.S.A	Second half of 2013	Daewoo Shipbuilding & Marine Engineering
	February	Offshore facility carrier	1 vessel	KRW 265 billion	Dockwise, Netherlands	October 2012	Hyundai Heavy Industries
		FPSO for the North Sea	1 vessel	USD 1.2 billion	BP (British Petroleum), U.K	Early 2015	Hyundai Heavy Industries
		Platform Supply Vessel	1 vessel	-	-	2012	STX OSV
		Fisheries Research Vessel	1 vessel	EUR 35 million	Ministry of Fisheries and Marine Resources, Republic of Namibia	Early 2012	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 vessels	KRW 1.2 trillion	Aker Drilling, Norway	Second half of 2013	Daewoo Shipbuilding & Marine Engineering
		Drillship	2 vessels	USD 1.1 billion	Ship owner, U.S.A	-	Samsung Heavy Industries
		Platform Supply Vessel	1 vessel	-	Norsea Group AS, Norway	June 2012	STX OSV
		Platform Supply Vessel	1 vessel	-	-	2012	STX OSV
	April	Drillship	1 vessel	-	Fred Olsen Energy, Norway	August 2013	Hyundai Heavy Industries
		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 vessels	USD 200 million	European Navigation, Greece	2013	STX Offshore & Shipbuilding
	May	Drillship	2 vessels	USD 1.12 billion	Rowan, U.S.A	Second half of 2013	Hyundai Heavy Industries
		Deepwater drillship	1 vessel	-	Vantage Drilling, U.S.A	Late May, 2013	Daewoo Shipbuilding & Marine Engineering
		Offshore Platform (Top side)	-	USD 414 million	Statoil, Norway	-	Samsung Heavy Industries
		FPSO	1 vessel	USD 636 million	Teekay Petrojarl, Norway	Mid 2013	Samsung Heavy Industries
		Platform Supply Vessel	2 vessels	KRW 120 billion	Farstad Shipping, Norway	First half of 2013	STX OSV
		FSO	1 unit	-	PTSC, Vietnam	Early 2013	Sungdong Shipbuilding & Marine Engineering
		LNG-FPSO	1 unit	USD 3.026 billion	Royal Dutch Shell, U.S.A	2016	Samsung Heavy Industries
	June	Platform Supply Vessel	2 vessels	KRW 150 billion	Island Offshore, Norway	First quarter, third quarter of 2013	STX OSV
		LNG-FSRU	2 units	USD 500 million	Höegh 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
		Drillship	1 vessel	USD 680 million	Ocean Rig, Greece	November 2013	Samsung Heavy Industries
	July	Drillship	2 vessels	USD 1.1225 billion	Maersk, Denmark	July 2014	Samsung Heavy Industries
	August	LNG-FSRU	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 hallf of 2014	Daewoo Shipbuilding & Marine Engineering
		Well Intervention Vessel	2 vessels	USD 420 million	Eide Marine Services AS, Norway	2013	STX Finland
		Drillship	1 vessel	KRW 600 billion	Noble Drilling, U.S.A	Second half of 2014	Hyundai Heavy Industries
	October	Fixed Offshore Platform	-	USD 1.4 billion	Chevron, U.S.A	Second half of 2014	Daewoo Shipbuilding & Marine Engineering
		Drillship	1 unit	USD 550 million	Offshore drilling company, Americas	-	Daewoo Shipbuilding & Marine Engineering
		Platform Supply Vessel	1 unit	-	Troms Offshore Supply AS, Norway	First half of 2013	STX OSV
		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

	November	Pipe Laying Support Vessel	2 units	USD 500 million	Odebrecht, Brazil	August of 2014	Daewoo Shipbuilding & Marine Engineering
	December	Offshore facilities (Gas platform and various facilities)	-	USD 900 million	Major multinational oil companies	2nd half of 2014	Hyundai Heavy Industries
2012	January	CPF (Central Processing Facility)	-	KRW 2.6 trillion	Australia / INPEX	4th quarter of 2015	Samsung Heavy Industries
		Semi-submersible rig	1 unit	USD 620 million	Norway / Odfjell	by mid 2014	Daewoo Shipbuilding & Marine Engineering
	February	LNG-FSRU	-	-	Norway / Hoegh	-	Hyundai Heavy Industries
	March	Offshore Platform	1 unit	USD 560 million	Danish / DONG E&P A/S	April 2015	Daewoo Shipbuilding & Marine Engineering
		FPSO	1 unit	USD 2.0 billion	INPEX / Australia	April 2016	Daewoo Shipbuilding & Marine Engineering
	April	Drillship	1 vessel	USD 645 million	Ensco 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
		Drillship	1 vessel	USD 655 million	Diamond Offshore Drilling Limited., U.S.A	4th quarter of 2014	Hyundai Heavy Industries
	June	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
	July	Drillship	1 vessel	USD 645 million	Ensco plc	-	Samsung Heavy Industries
		Gas Compression Platform	1 unit	USD 420 million	(Letter of Award)	Second half of 2015	Hyundai Heavy Industries
	Aug	LNG-FSRU	8 vessels	-	Excelerate, U.S.A	Between early 2015~2017	Daewoo Shipbuilding & Marine Engineering
	Sep	Drillship	1 vessel	USD 620 million	Rowan, U.S.A	First half of 2015	Hyundai Heavy Industries
		Drillship	1 vessel	USD 623 million	-	-	Samsung Heavy Industries
	Oct	Drillship	4 vessels	USD 2.06 billion	Transocean, U.S.A	One-by-one from mid 2015	Daewoo Shipbuilding & Marine Engineering
		Drillship	1 vessel	USD 560 million	Atwood Oceanics, U.S.A	-	Daewoo Shipbuilding & Marine Engineering
		LNG-FSRU	1 vessel	USD 270 million	Hoegh LNG, Norway	First half of 2015	Hyundai Heavy Industries
	Nov	Drillship	1 vessel	USD 700 million	-	2nd half of 2015	STX Offshore & Shipbuilding
	Dec	offshore platform (Top side)	1 unit	USD 1.77 billion	Statoil, Norway	The end of 2016	Daewoo Shipbuilding & Marine Engineering
2013	Jan	Gas Production Platform (topside)	1 unit	USD 1.1 billion	Statoil, Norway	Mar 2016	Hyundai Heavy Industries
		LNG-FSRU	1 vessel	-	BW Maritime, Singapore	2015	Samsung Heavy Industries
	Mar	Floating Production Unit (FPU)	1 unit	USD 1.3 billion	Total, France	First half of 2016	Hyundai Heavy Industries
		Tension Leg Platform (TLP)	1 unit	USD 700 million	Total, France	First half of 2015	Hyundai Heavy Industries
	Apr	FPSO	1 unit	USD 1.9 billion	Chevron, U.S.A	-	Hyundai Heavy Industries

*Note : Based on the press release and public announcements of each shipyards, internal estimation of Monthly KORSHIP (estimation until Apr 15, 2013)

Floating refinery at sea

Offshore energy development has already heating up. The potential value of offshore resources is estimated at USD 22 trillion yearly. The offshore plant industry has a very bright outlook, unless the offshore resource development comes to an end.

The Floating Production Storage and Offloading (FPSO) worth more than a trillion KRW a unit is the centerpiece of offshore plant. FPSO is a vessel that refines and stores the oil received from semi-submersible rig or drillship, etc., offloads the oil onto the shuttle tanker or other transfer locations. As the whole processes, such as production, storage and offloading, are carried out altogether, FPSO is called the 'floating refiner'. Recently, there has been heightened interest in LNG-FPSO amid the vigorous offshore LNG development.

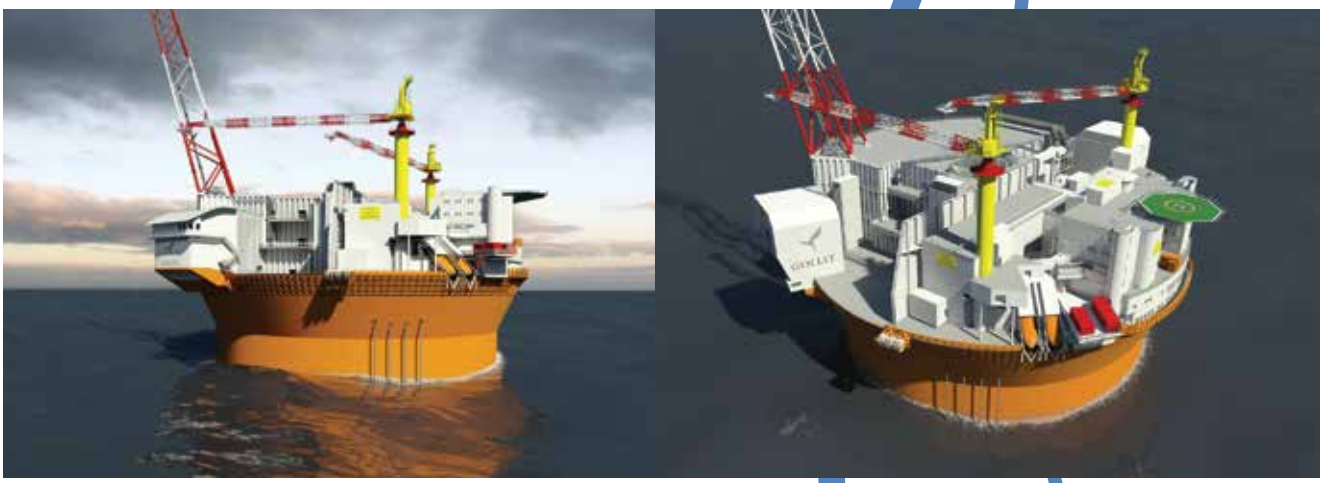
Noble Seillean FPSO in Brazil

FPSO Peregrino is one of the biggest and most technologically advanced oil production ships in the world. ABB supplied a complete power distribution solution for the entire production process.

The Kwame Nkrumah FPSO on the Jubilee Field in Ghana.
(Source: Tullow Oil plc)

'Agbami FPSO' ordered by Chevron and built by Daewoo Shipbuilding & Marine Engineering(DSME)

Bird's eye view of the Goliath FPSO of Hyundai Heavy Industries(HHI). Goliath FPSO has a cylindrical design to withstand the freezing cold weather and strong waves.



Bird's eye view of HHI's FLNG-FPSO

FPSO with a capacity of 2 million barrels, built by Samsung Heavy Industries(SHI)

This FPSO, ordered by French oil giant Total S.A. in December 2007, was christened 'Pazflor FPSO' after the name of the crude oil field in Angola where the facility will be finally installed.

Daewoo Shipbuilding & Marine Engineering(DSME) has won orders for 3 FPSOs worth USD 4.235 billion, including Pazflor FPSO, Clov FPSO, etc., from Total since 2003, starting with the top side of Dalia FPSO.

'USAN FPSO', built by HHI in November, 2010

New Product

APC NetShelter SV Rack Solution

Schneider Electric Korea

Schneider Electric introduced the APC NetShelter SV, an affordable rack solution with industry proven design and seamless integration of essential rack accessories. The NetShelter SV is offered in multiple heights, widths and depths to meet the challenges that businesses face in their IT environments.

The APC NetShelter SV is optimized for basic enclosure applications such as typical small and medium business IT needs and co-location cage environments. Features of the NetShelter SV include:

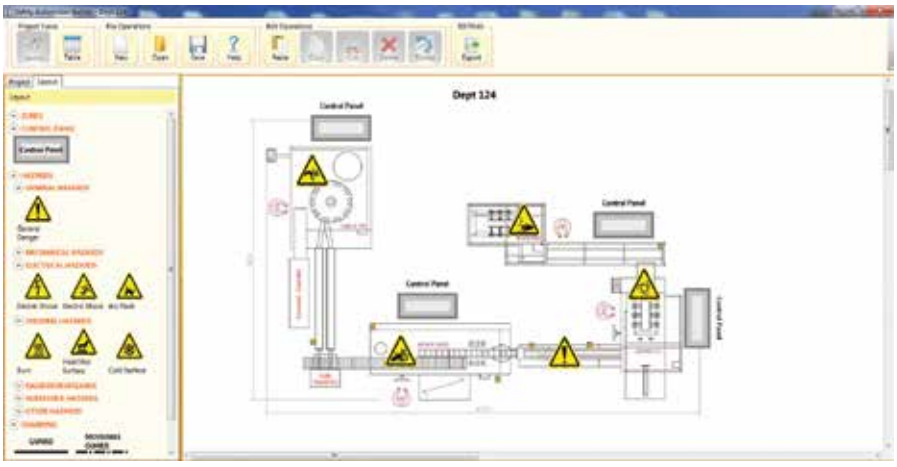
- *Seamless integration with rack PDU and cable management systems including tool-less installation of vertical rack PDUs and cable management in the rear of the cabinet which does not take up any of the costly U-space. Vertical mounting rails are fully adjustable, making the cabinet adaptable to many typical IT applications.*
- *Compatibility guaranteed with vendor neutral rear accessory mounting brackets which are compatible with all EIA-310 compliant 19 inch equipment.*
- *Available in various widths and depths to meet any specific equipment requirements.*
- *Design includes cable access roof, removable side panels and pre-installed leveling feet and casters.*

The NetShelter SV joins the complete family of racks and enclosures available from Schneider Electric. These solutions allow IT deployment wherever and whenever it is needed, saving space, cost and deployment in both IT and non-IT dedicated spaces. For small IT environments Schneider Electric's Small IT Solutions Designer allows custom configuration and solution design for edge environments like network closets and server rooms. For more information on rack and enclosure offerings from Schneider Electric please click here.

-TEL: +82-2-2630-9700
-http://www.schneider-electric.com

Simplify Machinery Safety-System Design Tools

Rockwell Automation Korea



Rockwell Automation announced the release of two new tools to help machine and equipment builders (OEMs), and manufacturers save time when designing machinery safety systems. The Rockwell Automation Safety Automation Builder (SAB) configuration software and Safety Functions pre-engineered design documents help users navigate the safety-system design process and apply best practices.

The SAB tool is available as a free download from the Rockwell Automation website. It guides manufacturers through the safety-system design process by providing options for layout, safety performance level (PL) analysis based on ISO 13849-1 using IFA's SISTEMA (Safety Integrity Software Tool for Evaluation of Machine Applications), and product selection using Allen-Bradley safety-automation products.

The SAB software automates the safety-selection process to help speed system design and minimize human error. With the SAB tool, users import an image of machinery and answer questions using a drop-down menu and help screens to identify and select the necessary safeguards. The software then compiles all product selections, generates a bill of materials, and compiles necessary data to populate SISTEMA. SISTEMA indicates the attained PL of the safety system using ISO 13849-1 through an automatic calculation. As part of the process, users also receive a SISTEMA project file.

To support the SAB tool, Rockwell Automation has also released new Safety Functions, which are pre-engineered design documents containing detailed information for each safeguarding method, including specific functionality, PL and required input, logic and output components.

Rockwell Automation is launching a broad range of Safety Functions in three phases; the first six are now available. Each function includes a safety-relay (Allen-Bradley Guardmaster safety relay) version and a programmable safety controller (Allen-Bradley GuardLogix programmable automation controller) version for the safety logic element.

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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 Indutrial Boiler, Exhaust Gas Boiler
TEL : +82-55-269-7701

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

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

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

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

KOREA HYDRAULIC CO.
Head Office : Gangseo-gu Busan
Homepage Add. : www.enpos21.com
Main Products : Electtric 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 : Naviagtion/Signal LT, EX-Plosion 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 Addressor 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 Seperator, 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 Absorper, Gasket
TEL : +82-55-327-9652

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

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

MIJOO INDUSTRY CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products :
TEL : +82-51-831-1588

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

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

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

MT.H CONTROL VALVES CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products :
TEL : 82-51-974-8831

MYTEC CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. : www.imytec.com
Main Products : Heat Exchanger, Pressure Vassel
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.seilseres.com
Main Products : VRC system, ODME
TEL : +82-51-831-1858

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

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

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

SEWOONG PRECISION MACHINERY CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products :
TEL : +82-51-831-0595

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

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

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

SHINHWA INTERIOR & TECHNOLOGY CO., LTD.
Head Office : Saha-gu Busan
Homepage Add. :
Main Products : Marine Furniture
TEL : +82-51-441-1294

SHINKWANG ACE ELECTRIC CO., LTD.
Head Office : Kimhae Gyeongsangnam-do
Homepage Add. : www.skace.com
Main Products : Cable Tray, Accessories

TEL : +82-55-332-3315

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

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

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

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

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

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

SIN HUENG FLANGE CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products : Flange for ship
TEL : +82-51-831-6167

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

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, Celing 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, Ballasst 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

WOOYANG B&P IND CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. : www.wooyangshot.com
Main Products : Deck Outside Monting Item, Engine Room Mounting Item
TEL : +82-51-831-5000

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

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

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

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

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

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

YOUNG NAM IND.
Head Office : Saha-gu Busan
Homepage Add. :
Main Products : Wire lope drum, BASE PLATE ASS'Y
TEL : +82-51-264-7983

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

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

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

YOUSUNG GALVANIZING CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. : www.iyousung.co.kr
Main Products : Hot Dip Galvanizing of Marine.
TEL : +82-51-831-5482

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

YU KYUNG CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products : Pipe Spool, Portable Tank Unit, Heating Coil Unit
TEL : +82-51-831-2674

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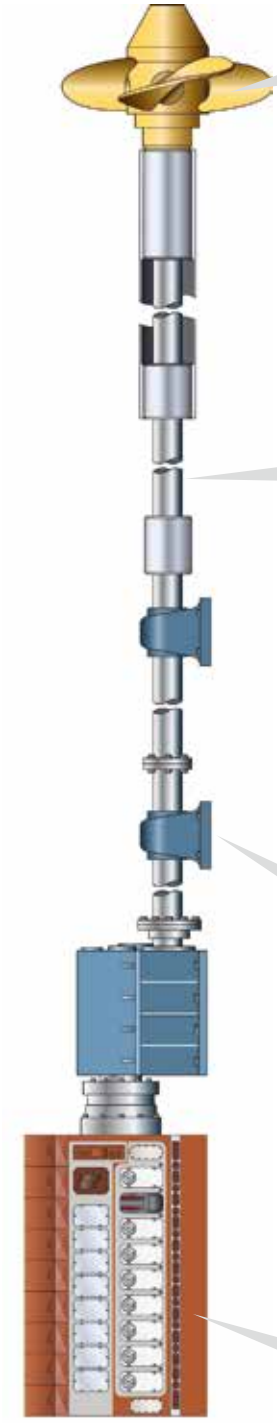
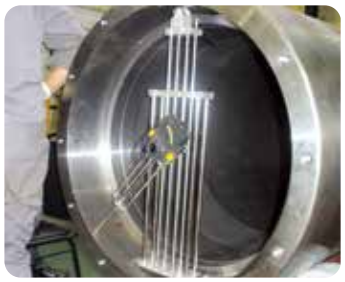


PROPELLER

LEVALIGN Ultra

STERN TUBE

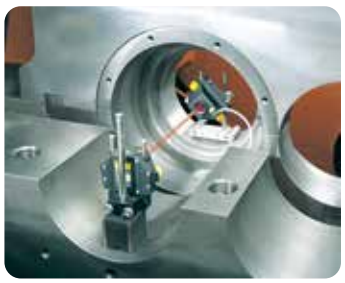
CENTALIGN Ultra
(unmounted shaft)



LONG SHAFT

ROTALIGN Ultra
(mounted shaft)

CENTRALIGN Ultra
(unmounted shaft)



MAIN ENGINE

ROTALIGN Ultra
(mounted crank shaft)

CENTRALIGN Ultra
(unmounted crank shaft)

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