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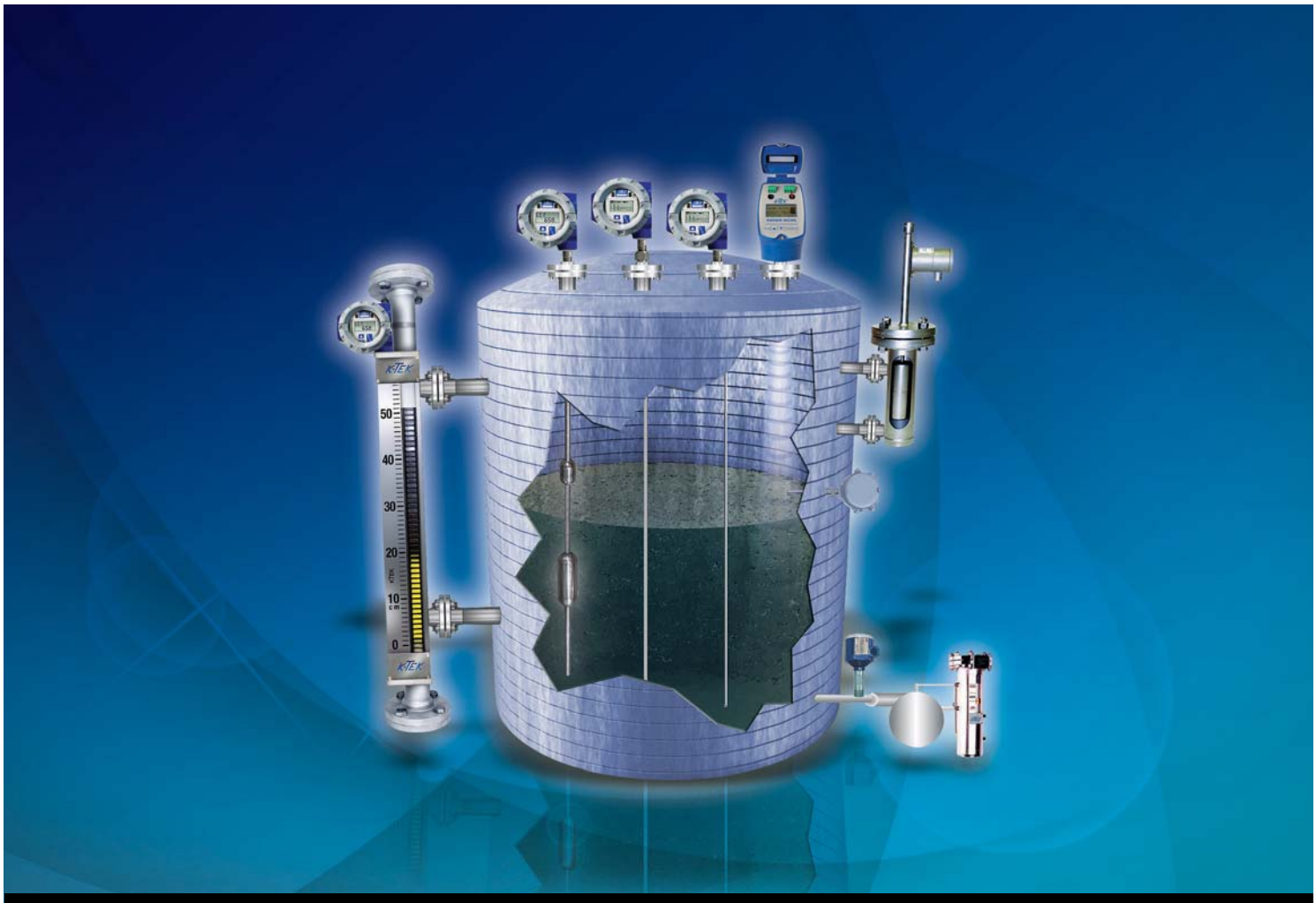

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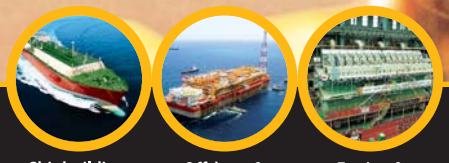

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Location Changwon Convention Center

Host Gyeongsangnam-do, Changwon-si, Tongyeong-si, Geojae-si

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Show Management STAVIS KOREA, TRADE COMMUNITY

Sponsor Ministry of Knowledge Economy, KOSHIPA, The Society of Naval Architects of Korea, The Korea Shipowner's Association, KR, The korean Society of Marine Engineering, KAOPE Korea Association of Offshore Plant Enterprises, Korea Marine Equipment Research Institute, Marine Equipment Korea, Society of Naval Architects & Marine Engineers, Singapore, CISIA China International Ship Industry Association, KOPLA, Turkish Association of Ship Industrialists

Composition and Products

[Shipyard and Shipbuilding Material and Equipment]
Shipyard, Shipbuilding material and equipment, Shipyard manufacturing facility, Engine equipment, Ship navigation device, Marine communication security device, Marine safety / rescue / fire prevention equipment, Marine pollution removal equipment and environment technology etc.

[LNG Carrying Vessel and Marine Plant]
LNG pump, Compressor, Valve, Marine plant related material, equipment, and device

[Marine, Port, Transport Equipment]
Marine transport, Port automation facility, Logistics facility and equipment, Transport related equipment and system

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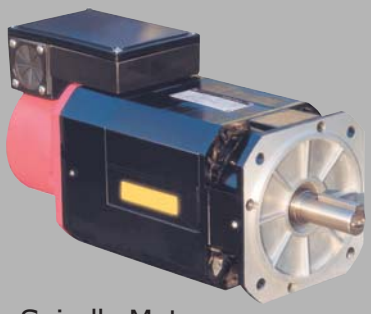

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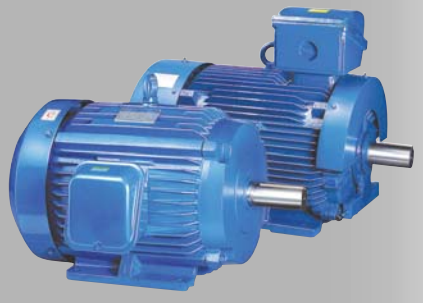

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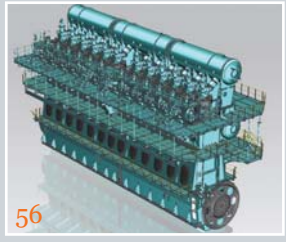

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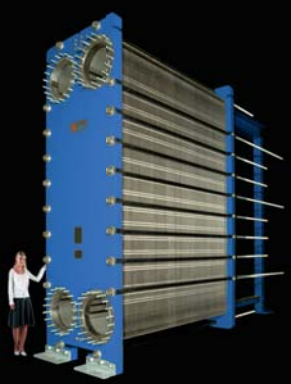

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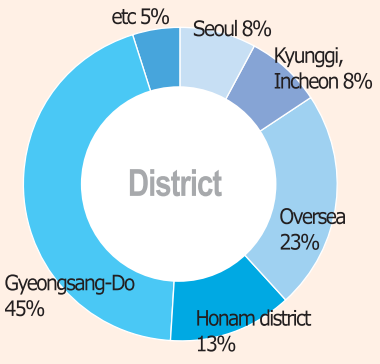

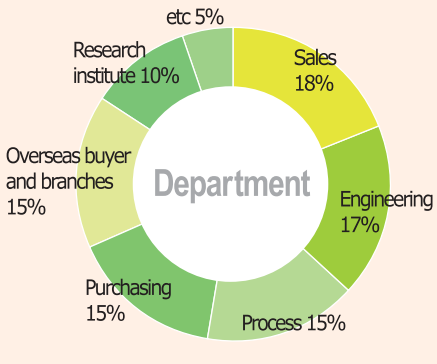

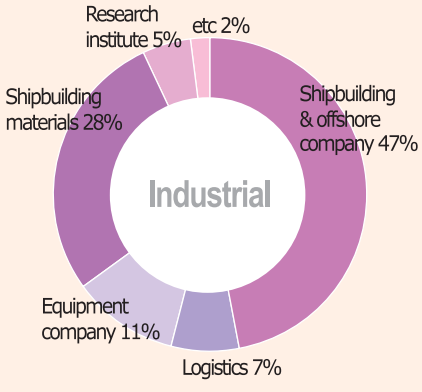

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South Jeolla Provincial Government held the offshore industry development forum in the National Assembly

South Jeolla Provincial Government held the a forum which was centered around the theme, 'Development of offshore plant industry' in the National Assembly Library in a bid to effectively respond to the steady growth of global offshore plant industry and cope with the government policies. The forum attracted domestic experts in offshore plants, delegates from companies and relevant organizations, government officials and others.

This forum was co-organized by South Jeolla Provincial Government and Mokpo National University, and was attended by approximately 100 persons, including Jeong Soon-nam, South Jeolla Province's Vice Governor for Economic Affairs, members of National Assembly, officials from the Ministry of Knowledge Economy, professors, and other officials from the industry, universities and research centers.

The forum covered the presentations that provided insight into the offshore plant market/industry, technological outlook, development plans, and in-depth discussion of policies among the invited experts from various fields. This forum provided unique platform to explore the projects that the domestic offshore plant industry would undertake and the strategies to carry out the projects effectively.

As the government announced a series of measures designed to develop the offshore plant industry in May, the research center dedicated to the test and evaluation in the offshore plant sector has become an essential prerequisite for domestic shipyards that plan to make inroads into the global market. South Jeolla Provincial Government is proceeding with a plan to establish the offshore cable test & research center and a research institute for offshore supply vessel (OSV).

Jeong Soon-nam, South Jeolla Province's Vice Governor for Economic Affairs, said, "We are pushing ahead with a plan to set up the institutes dedicated to the research and test in the offshore leisure equipment and offshore plant sectors in an endeavor to help advance the offshore plant industry, the new growth engine for small and medium-sized shipyards - which have been facing difficulties since the outbreak of global financial crisis in 2008 - and stimulate the growth of offshore leisure equipment industry in the South Jeolla Province. We will actively take various measures to revitalize the small and medium-sized shipyards in Jeolla Province while continuing to make request to the government to provide assistance to these industries.

전라남도, 국회서 해양플랜트산업 발전포럼 개최

전라남도는 세계 해양플랜트산업의 지속적 성장세와 정부 정책에 적극 대응하기 위해 국내 해양플랜트 전문가, 기업인, 정부 및 유관기관 관계자 등이 참석한 가운데 '국회 해양플랜트 산업 발전포럼'을 국회 도서관에서 개최했다. 이 포럼에는 전라남도와 목포대가 공동 주관한 것으로 정순남 도 경제부지사, 국회의원, 지식경제부 관계관, 대학교수 등 산·학·연·관 관계자 100여명이 참석했다.

이날 포럼은 해양플랜트산업 시장과 기술전망 분석 및 발전 방안에 대한 주제발표와 각계에서 초청한 전문가들의 심도 있는 정책토론이 이어졌으며, 이를 통해 향후 국내 해양플랜트산업 분야에서 추진할 과제를 발굴하고 효율적인 추진전략을 모색했다.

지난 5월 정부에서 발표한 '해양플랜트산업 발전방안'에 따라 국내 조선업계의 세계 시장 진입을 위해서는 이 분야의 시험 및 평가를 위한 연구센터 구축이 무엇보다도 우선시돼야 한다. 전라남도는 해양플랜트 케이블시험·연구센터 및 해양플랜트 지원선(OSV) 연구센터 구축을 위한 사업계획을 추진하고 있다.

정순남 전남도 경제부지사는 "2008년 국제 금융위기 이후 어려움을 겪고 있는 도내 중소 조선산업의 새로운 성장동력이라 할 수 있는 해양플랜트와 해양레저장비산업 육성을 위해 '서남권 해양레저장비산업 기반' 및 '해양플랜트산업 분야 시험·연구센터' 구축을 추진하고 있다"며 "이들 사업이 정부 지원사업으로 반영될 수 있도록 지속적으로 건의하는 등 전라도내 중소형 조선기업의 활성화를 위해 다양한 시책을 적극 발굴하겠다"고 밝혔다.

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HMD held a naming ceremony for the first vessel of the 5 units of 52,000-ton product carriers (PCs) ordered from the Monaco-based SCORPIO TANKERS INC on July 18.

The No. 2332 vessel, named 'STI AMBER' by the ship owner during the naming ceremony, was designed to reduce energy consumption.

'STI AMBER' built by HMD

HMD, 친환경 선박 성공적으로 인도

현대미포조선은 얼마전 BWTS (Ballast Water Treatment System)가 장착된 아루나(ARUNA)' 사의 5만 6000톤급 벌크선인 6143호를 인도한데 이어 이번에 연료 효율성이 향상된 친환경 선박을 성공적으로 인도함으로써 수주 경쟁에서 우위를 점했다.

현대미포조선은 지난 7월 18일 모나코 '스코피오(SCORPIO TANKERS INC)' 사로부터 수주한 5만 2000톤급 PC선 5척 중 첫 번째 선박 명명식을 가졌다. 이날 행사에서 선주사에 의해 'STI앰버(AMBER)' 호로 이름 붙여진 2332호선은 연료 저감형으로 설계됐다.

Dassault Systemes and SMEDI to Open a Joint R&D Center for Civil Engineering

Dassault Systemes, the world leader in 3D design, 3D Digital Mock Up and Product Lifecycle Management (PLM) and Shanghai Municipal Engineering Design Institute (Group) Co. Ltd (SMEDI), one of the most well-known Chinese public engineering companies, announced that they will jointly open a new R&D center in Shanghai, China, to develop industry solution experiences for civil engineering and infrastructure construction professionals, based on Dassault Systemes' 3DEXPERIENCE platform. Dedicated to bridge projects, water supply and wastewater treatment installations, roads, rail systems, as well as open and underground buildings, the R&D center will open in August 2012.

SMEDI has managed more than 7,000 of the most emblematic Chinese projects, from environmental and water resources engineering projects to structural engineering and large scale transportation infrastructure. SMEDI, with its unique understanding of the civil engineering market, will work together with Dassault Systemes' team of experts to create and validate solution experience specifications, as well as deliver industry standards and content.

Dassault Systemes' 3DEXPERIENCE platform provides civil engineering and infrastructure construction professionals with a unique, open, collaborative environment, enabling them to design, simulate and manage any scale of infrastructure project, reducing errors and bringing projects in on-time and on-budget, safely.

"As the world leader in 3D design, 3D Digital Mock Up and PLM, Dassault Systemes solutions have been successfully deployed in many industries," said Wei Tang, Chairman, SMEDI. "We strongly believe that they can bring significant value in addressing the needs of civil engineering and construction companies, as demonstrated by leading construction customer projects in recent years. Leveraging Dassault Systemes' 3DEXPERIENCE platform for civil engineering, we are confident in our competitiveness in maximizing our productivity and minimizing errors in all our future projects."

"From the very beginning, our 3DEXPERIENCE platform has been inspired by our customers and partners and what they've been telling us about their markets. This is why Dassault Systemes has a long, successful history of partnering with key industry leaders to develop disruptive applications to harmonize human life in the 21st century urban environment," said Dominique Florack, Senior Executive Vice President, Products, R&D, Dassault Systemes. "Our partnership with SMEDI, one of the top players and most established civil engineering companies in China, will help us accelerate the development of world-class industry solution experiences for civil engineering in China and worldwide."

다쏘시스템, 한국에 이어 중국 R&D 센터 개설로 아시아지역 R&D 강화

다쏘시스템은 중국 SMEDI (Shanghai Municipal Engineering Design Institute (Group) Co. Ltd)와 협력해 토목공학 및 인프라 건축 전문가를 위한 R&D센터를 이달 중 개소한다고 밝혔다. 이는 지난 2010년 4월 조선분야에 특화된 글로벌 R&D센터를 대구에 설립한 것에 이어, 상하이에 토목공학에 특화된 R&D 센터를 개소하는 것으로 이를 계기로 다쏘시스템은 아시아 지역에 R&D역량을 더욱 집중할 계획이다.

중국의 새로운 R&D센터는 다쏘시스템의 3D익스피리언스 플랫폼에 기반해 토목공학과 인프라 건축 전문가를 위한 산업 솔루션 경험을 개발하며, 교량건설, 상수도 및 오수처리 설비, 도로, 철도시스템, 지하 건축연구에 주력할 예정이다.

SMEDI는 1954년도에 설립된 이래 7,000여개의 프로젝트를 중국에서 담당했으며, 솔루션 경험 전문가인 다쏘시스템의 팀원들과 함께 산업 기준과 콘텐츠를 전달하고 다양한 솔루션 경험을 만들어 나갈 예정이다. 다쏘시스템의 3D익스피리언스 플랫폼은 토목공학과 인프라 건설 전문가들에게 유일하고 개방적이며 협업적인 환경을 제공하며, 설계 및 시뮬레이션을 지원한다. 또한 어떤 규모의 인프라 프로젝트든 관리가 가능하며, 시스템의 오차를 줄이는 동시에 시간과 예산에 맞춰 프로젝트를 안전하게 수행할 수 있도록 돕는다.

웨이 탕 SMEDI 회장은 "3D 솔루션 분야의 글로벌 리더인 다쏘시스템의 솔루션은 이미 많은 산업분야에서 입증되었다. 그 동안 선도적인 건축 고객사의 프로젝트를 성공적으로 이끌었던 것처럼 토목공학 및 건축 회사들의 니즈를 정확하게 파악하고 중요한 가치를 전달할 것으로 기대한다"며 "토목공학에 다쏘시스템의 3D익스피리언스를 적용함으로써 우리는 미래 프로젝트에서 생산성을 최대화하고 오차를 줄이며 경쟁력을 강화해 나갈 전망이다"고 말했다.

한편 다쏘시스템은 조선산업에 특화된 대구의 글로벌 R&D센터에도 역량을 집중하고 있다. 한국을 중심으로 아시아지역의 조선 분야 고객들을 보다 긴밀하게 지원하기 위해 설립된 대구의 다쏘시스템 글로벌R&D 센터는 높은 기술력을 갖춘

R&D 엔지니어와 산업 전문가들이 팀을 결성해 조선 산업을 위한 혁신적인 산업 솔루션 경험 개발 및 지원을 하고 있다.

또한 폭넓은 연구 및 기술력을 바탕으로 지역 내 세계적인 조선소 고객들의 요구 사항을 맞추고, 활용성은 더욱 높이면서 해당 기업들의 경쟁력 강화에 기여하고 있다. 현재 대구 R&D 센터의 직원은 개소 때보다 두 배 이상 늘어난 33명이며 향후 연구인력을 확충할 계획이다.

HVS, holds delivery ceremony of M/V "Venture Pearl"

PT PANN (Indonesia) has taken delivery of M/V "VENTURE PEARL" having Hull No.S010, a 56,000 DWT bulk carrier from Hyundai-Vinashin Shipyard (HVS) on 10 Aug 2012.
At the ceremony, after an honorable short presentation about Yard's general information, T. W. Park, Vice President of HVS, and F. X. Koeswojo, Division Head of PT PANN Leasing, on behalf of the parties, signed the delivery documents in the presence of many distinguished guests.
By the successful delivery, we believe that with this newbuilt vessel meeting the latest international standard and customers' technical demand, it will enhance PT PANN's competitive advantages in the world shipping market to increase their prosperity.

KR relocates to Busan

Korean Register (KR) is poised to pioneer a new era with the relocation to Busan.
The relocation is scheduled for August 20 to 23. The new address of KR is 36, Myeongji Ocean City 9-ro, Gangseo-gu, Busan City.
However, the New Growth Industry Division (new growth industry team, new growth technical support team, environment plant team, renewable energy team, vessel technology team, vessel task team), certification institute (system certification team, product certification team), ship and offshore system research institute (maritime research team, convergence research team) will remain in Dajeon office building within Daedeok Industrial Complex.
The official opening ceremony will take place at the new office building from 10:30 on September 13 (Thursday), and a concert will be held on the eve of the opening ceremony at the Haeundae Movie Hall for the invited customers.
The new telephone numbers of KR's Headquarters in Busan are +82-70-8799-8898, and +82-70-8799-7114/8114.

KR, 부산 신사옥 이전

Korean Register(KR)이 부산 신사옥으로 이전하여 새로운 부산시대를 맞이한다.
이전 일정은 8월 20일부터 23일이며, 한국선급의 신사옥 주소는 부산광역시 강서구 명지오션시티9로 36이다. 단, 신성장산업본부(신성장산업총괄팀, 신성장기술지원팀, 환경플랜트팀, 신재생에너지팀, 함정기술팀, 함정업무팀), 인증원(시스템인증팀, 제품인증팀), 선박해양시스템연구원(해사연구팀, 융합연구팀)은 현재 대덕단지내의 대전 사옥에 잔류한다.
공식 준공식은 9월 13일(목) 오전 10시 30분부터 신사옥에서 개최되며, 12일에는 해운대 영화의 전당에서 전야제인 고객초청음악회를 개최한다. 한국선급의 부산이전에 따른 대표번호는 1566-1682, 070-8799-8898, 070-8799-7114/8114이다.

SSME built the nation's first Tuna Purse Seiner

Sungdong Shipbuilding & Marine Engineering (SSME) built the nation's first Tuna Purse Seiner incorporating the state-of-art technology. SSME held a naming ceremony for 'SAJO COLUMBIA', a 1,900-ton vessel, at Tongyeong, South Gyeongsang Province on July 26.
This vessel, which measures 79.6m in length, 14.5m in width, 8.5m in height, can sail at an average speed of 15.4 knots and is equipped with the facility to refrigerate the tuna for making thinly sliced filet of tuna, as

Tuna Purse Seiner built by SSME

well as the canned tuna products. In addition, this vessel is fitted with the cutting-edge equipment such as the fish finder, sonar, various radars, satellite communication equipment and others.

This marks the first time that a domestic shipyard built the Tuna Purse Seiner. Although tuna fishing boats were built previously in Korea, this Tuna Purse Seiner is the first indigenous model.

Deep-sea fishing vessels had been built mainly at overseas shipyards over the last 20 years. However, this Tuna Purse Seiner, built by SSME, heralds the resumption of deep-sea fishing vessel construction at domestic shipyards.

Sajo Industry, the ship owner, owns a total of 6 tuna purse seiners, including 'SAJO COLUMBIA' and 1 unit of the same model that will be delivered in the second half of 2012.

Meanwhile, the naming ceremony was attended by Ha Seong-yong, President of SSME, Lee Gap-sook, President of Saju Industry, and Lee Il-hyang, honorary Chairman, and others.

성동조선해양, 국내최초 참치선망선 선보여

성동조선해양이 국내 최초로 첨단기술을 적용한 참치선망선을 제작했다. 성동조선해양은 지난 7월 26일 경남 통영에서 1,900ton급의 참치선망선(Tuna Purse Seiner) '사조 콜롬비아(SAJO COLUMBIA)' 호의 명명식을 가졌다. 이 선박은 길이 79.6m, 폭 14.5m, 높이 8.5m의 규모에 평균 15.4노트로 운항되며 기존 통조림용뿐 아니라 횟감용 참치를 겸용으로 냉동보관할 수 있는 설비를 탑재하고 있다. 또한 어군탐지기, 소나(음파탐지기) 및 각종 레이더와 위성통신장비 등 최첨단 장비도 갖추고 있다.

국내 조선사에서 참치 선망선을 제작한 것은 이번이 최초다. 과거 국내에서 참치잡이선의 건조가 있었으나 현재의 '선망선' 형태는 국내에서 개발된 최신선형이다. 또한 지난 20년간 원양어선은 해외에서 주로 건조해왔으나 이번에 사조산업이 성동조선해양에게 참치선망선 건조를 의뢰하면서 다시 국내 건조가 재개된 것이다.

이번 선박을 발주한 사조산업은 '사조 콜롬비아' 호와 성동조선해양으로부터 2012년 하반기에 인도받을 예정인 동형선 1척을 포함하여 총 6척의 참치선망선단을 보유하고 있다. 한편, 이 날 명명식에는 성동조선해양 하성용 대표이사와 이 선박을 발주한 사조산업 이갑숙 대표이사, 이일향 명예회장 등이 참석해 자리를 빛냈다.

Busan Metropolitan Government held the opening ceremony for Offshore Plant Equipment R&D Center

Busan Metropolitan Government and the Ministry of Knowledge Economy (MKE) held the opening ceremony for Offshore Plant Equipment R&D Center at Korea Institute of Industrial Technology (KITECH) in Gangseo-district, Busan on Aug 28. The Offshore Plant Equipment R&D Center is a research organization that will play a pivotal role in the localization of offshore plant equipment and provide support to companies in a bid to promote development of offshore plant industry. The ceremony was attended by about 200 officials from related organizations, academic societies and industry, including Heo Nam-sik, Mayor of Busan Metropolitan Government.

The market for offshore plant, used for drilling and offshore energy production, is witnessing fast growth on the back of the rising demand for energy worldwide and the sustained high oil prices. Korea won orders worth USD 25.7 billion for offshore plants last year, thus emerging as the world's largest builder of offshore plants.

However, Korea has a heavy reliance on high-end foreign engineering and core equipment, and therefore, a sum of money equal to 50% of the contract is being drained to foreign countries. Thus, it is urgent to indigenously develop core technologies for offshore plant equipment.

The shipbuilding/marine engineering equipment manufacturers are seeking to diversity their business by expanding into the offshore plant equipment industry as the placement of new orders for offshore plants increases while the shipbuilding market conditions remains sluggish amid the slump in new orders for ordinary commercial vessels. In this situation, it is urgent for the government to provide the support.

The government held an emergency meeting in May and adopted the measures to develop the offshore plant industry. Specifically, the government plans to expand investment in offshore plant industry and raise the ratio of local engineering, equipment, etc., from current 40% to 60% by 2020 and set the new order target of USD 80 billion which is more than a three-fold increase from the current level.

As the first step, Offshore Plant Equipment

R&D Center under the umbrella of Korea Institute of Industrial Technology (KITECH) was established. Offshore Plant Equipment R&D Center, located at the southeastern regional headquarters of KITECH, will focus on developing core technologies for offshore plant equipment and offering both technical and marketing support for small and medium-sized equipment manufacturers.

In the first place, the government will secure KRW 5 billion from the government coffers this year, select 100 strategic equipments for localization, and map out the roadmap for developing the equipment technology. Besides, the government will launch the designing process for the establishment of Offshore Plant Equipment R&D Center within the R&D hub in Gangseo district, Busan.

In addition, Offshore Plant Equipment R&D Center will enter into an MOU (Memorandum of Understanding) with SINTEF, the largest research organization in Norway, in September for cooperation and hold an international symposium on offshore plant in November as part of the technology exchange encompassing the joint R&D, exchange of professional manpower, technical cooperation, etc., with overseas research institutes that have the world's leading technologies, and at the same time, will proceed with the development of indigenous core technologies and provide support effectively to companies.

An official from Busan Metropolitan Government said, "Offshore Plant Equipment R&D Center will play a key part in helping build up competitiveness of the nation's offshore plant industry which has a heavy reliance on overseas core equipment and design technology, create high value-added for the future, and promote co-growth in related industries. We will expand the Offshore Plant Equipment R&D Center in the period ahead and establish the Korea Offshore Plant Technology Center, a hub organization that controls entire processes of offshore plant industry, and create the offshore plant cluster."

부산시, 해양플랜트 기자재 R&D센터 개소식

부산시와 지식경제부는 지난 28일 부산 강서구에 위치한 한국생산기술연구원에서 해양플랜트산업 육성을 위한 해양플랜트 기자재 국산화와 기업지원 기능의 핵심 연구기관인 해양플랜트기자재 R&D센터 개소식을 개최했다. 이날 개소식에는 허남식 부산시장을 비롯 관련기관 · 학계 · 업계 등 200여 명이 참석했다.

최근 세계 에너지 수요가 상승하고 고유가가 지속됨에 따라, 해양에너지를 시추 및 생산하는 해양플랜트 시장이 급성장하고 있으며, 우리나라의 경우, 전년도 해양플랜트 건조 수주액이 257억 달러로 세계1위의 해양플랜트 건조국으로 부상하고 있다.

그러나 고부가가치의 엔지니어링 및 핵심기자재는 대부분 외국에 의존하고 있어 수주액의 50% 이상을 외화로 유출하고 있는 실정으로, 해양플랜트기자재 핵심기술 개발 및 국산화가 시급한 상황이다.

더욱이 해양플랜트 수주물량 증가에 반해, 일반상선의 감소에 따른 조선경기 침체로 조선해양 기자재업계는 해양플랜트 기자재산업으로의 사업다변화를 모색하고 있으며, 이에 대해 정부차원에서의 지원이 시급한 실정이다.

이에 정부는 지난 5월 비상대책회의를 열고 '해양플랜트산업 육성방안'을 마련, 해양플랜트산업에 대한 투자 확대로 엔지니어링, 기자재 등 국내 수행비율을 현재 40%에서 2020년까지 60%로 높이고, 수주금액도 800억 달러로 3배이상 늘이는 것을 목표로 정한 바 있다.

이에 대한 첫 단계로 한국생산기술연구원 산하 해양플랜트기자재 R&D센터를 설립하게 되었으며, 한국생산기술연구원 동남권지역본부에 센터 개소식을 시작으로, 해양플랜트 기자재 핵심기술 개발과 중소 기자재업체 기술 및 마케팅 지원 등 본격적인 활동을 시작한다.

정부는 우선 올해 국비 50억원을 확보해 기자재 국산화 100대 전략 품목을 선정하여 기자재 기술 개발 로드맵을 마련하는 한편, 부산시 강서구 R&D허브단지에 해양플랜트 기자재 R&D센터 기반구축을 위한 설계에 착수한다.

또한 오는 9월 노르웨이의 최고 연구기관인 SINTEF와 상호협력을 위한 MOU 체결, 11월 해양플랜트 국제 심포지엄 개최 등을 통하여 세계 일류 기술을 보유한 해외 연구기관과의 공동 연구개발, 전문인력 교류 및 기술협력 등 선진 기술교류를 수행함과 동시에 독자적인 원천기술 개발 및 효율적인 기업지원 활동을 진행할 예정이다.

부산시 관계자는 "해양플랜트 기자재 R&D센터가 핵심기자재와 설계기술 대부분을 해외에 의존하고 있는 우리나라 해양플랜트산업이 경쟁력을 갖추고, 미래의 고부가가치 창출과 더불어 연관산업 동반성장을 견인하는 중추적인 연구기관으로서의 역할을 할 것으로 보고, 향후 해양플랜트 기자재 R&D센터를 확대 개편하여 해양플랜트산업의 전 과정을 컨트롤하는 허브기관으로 한국해양플랜트 기술원을 설립, 해양플랜트 클러스터를 구축할 계획"이라고 밝혔다.

STX Dalian delivered the world's largest VLOC

STX Dalian successfully delivered the world's largest vessel. STX held a naming ceremony for Vale Espirito Santo, a 400,000-ton very large ore carrier (VLOC) at the STX Dalian Shipbuilding Complex in Dalian, China, on July 30. The ceremony was attended by Gang Deok-soo, Chairman of STX Group, and Luiz Meriz, President of Vale's China, and other officials.

This VLOC measures 361m in length, 65m in width, and 30.5m in height with the deck space that is 3.5 times the size of a soccer field. This vessel can carry up to 400,000 tons of ore - which is equal to 26,700 dump trucks with the loading capacity of 15-ton - and sail

at a maximum speed of 14.8 knots.
In addition, this VLOC has increased the cargo hold capacity by over 20%, and is equipped with the TIER-II engine which reduces oil consumption per hour compared to existing marine engines, thus dramatically slashing the emissions of harmful gases.
Vale Espirito Santo, a VLOC, will be delivered to STX Pan Ocean and operating on the route between Brazil-China and Europe to transport the iron ore of Vale over the next 25 years.
STX Pan Ocean entered into a long-term transportation contract worth approximately KRW 7 trillion with Brazil's Vale, the world's largest iron ore producer, in September 2009 and ordered 8 units of VLOC for the transportation of the iron ore. This VLOC is the third vessel of its kind delivered to STX Pan Ocean, and 5 additional vessels of the same model will be delivered consecutively in the period ahead.
An official from STX Dalian said, "This naming ceremony for Vale Espirito Santo, the world's largest vessel, comes only 5 days after we held a naming ceremony for Noble Globetrotter II which received a full score in the world drillship performance qualification last week. STX Dalian is cementing its status as the comprehensive global shipbuilding complex that constructs high value-added vessels."

Gang Deok-soo, Chairman of STX Group, celebrates the naming of Vale Espirito Santo.

STX다롄, 세계 최대 초대형 광물운반선 인도

STX다롄이 현존하는 세계 최대 규모의 선박을 건조해 성공적으로 인도했다. STX는 지난 7월 30일 중국 다롄에 위치한 STX다롄 조선해양생산기지에서 강덕수 STX그룹 회장, 루이즈 메리즈(Luiz Meriz) 발레차이나 사장 등 관계자가 참석한 가운데 40만톤급 초대형 광물운반선(VLOC, Very Large Ore Carrier) 발레 에스피리토 산토호(Vale Espirito Santo)의 명명식을 가졌다.
이 초대형 광물운반선은 길이 361m, 너비 65m, 높이 30.5m로 갑판 면적이 축구장 3개 반 크기이며 15톤 덤프트럭 26,700대 분량인 총 40만톤의 철광석을 한번에 싣고 14.8노트의 속도로 운항할 수 있다. 또한 기존 대비 전체 화물창 용적이 20% 이상 증가했고, 기존 선박용 엔진보다 단위 시간당 연료소모량이 적은 TIER-II 엔진을 장착하고 있어 유해가스 배출량을 대폭 낮출 수 있다.
발레 에스피리토 산토호는 STX팬오션에 인도되어 브라질-중국/유럽 간 항로에 투입되어 향후 25년간 발레의 철광석 수송 작업을 수행할 예정이다. STX팬오션은 지난 2009년 9월 세계 최대 철광석 생산업체인 브라질 발레(Vale)와 약 7조원에 달하는 장기수송계약을 체결하고 이를 위해 40만톤급 초대형 광물운반선 8척을 발주한 바 있다. 이 광물운반선은 STX팬오션이 발주한 초대형 광물운반선 중 세번째로 인도받는 선박이며 앞으로도 5척의 동형선을 순차적으로 인도 받을 예정이다.
STX다롄 관계자는 "얼마 전 드릴십인 노블 글로브트로터2호(Noble Globetrotter II)의 명명식을 개최한 이후 5일 만에 다시 세계에서 가장 큰 선박 발레 에스피리토 산토호의 명명식을 거행했다"면서 "STX다롄이 첨단 해양플랜트는 물론 고부가가치선박을 건조하는 글로벌 종합 조선생산기지로서의 면모를 확고히 다져가고 있다"고 말했다.

Acquisition of high pressure inverter division of Rockwell Automation, Harbin Jiuzhou Electric

Rockwell Automation announced it has agreed to purchase the assets of the medium voltage drives business of Harbin Jiuzhou Electric Co., Ltd. The purchase price is RMB 530 million (approximately 83 million U.S. dollars). Closing is expected in October.
The acquisition strengthens Rockwell Automation's presence in the Asia-Pacific motor control market by adding significant capabilities in design, engineering and manufacturing of medium voltage drive products. It also provides access to grid-tie inverter technology. Jiuzhou has successfully served as Rockwell Automation's contract manufacturer for seven years, in addition to its own well-established customer base.
"Jiuzhou's medium voltage drives business accelerates our emerging markets strategy," said Mike Laszkiewicz, vice president, general manager, Rockwell Automation power control business. "It will enhance our position in the critical Asia-Pacific region by strengthening capabilities in the mid- and higher-power rated product lines."
"This acquisition demonstrates an evolution and commitment to growing the long-term customer relationships we established as a contract manufacturer for Rockwell Automation," said Dr. Li Yin, Jiuzhou chairman of the board. "Our customers will benefit from Rockwell Automation's advanced manufacturing, research and development capabilities, and global distribution. Our employees will now join a successful, global leader in technology that offers a competitive and comprehensive product and service portfolio

in the automation industry. We're pleased to culminate our successful business relationship with Rockwell Automation."

Rockwell Automation employs more than 1,900 people in China, working among its 35 sales offices, five training centers, manufacturing facilities, a global research and development center and a software development center. More than 6,000 Chinese students are also trained annually, through Rockwell Automation laboratories and an award-winning educational program offered at more than 50 universities throughout 20 provinces.

Jiuzhou serves customers in the electric power, petrochemical, steel, metallurgy, municipal, cement and construction industries. Its medium voltage business will be aligned with the Rockwell Automation Control Products & Solutions operating segment.

Harbin Jiuzhou Electrical Co., Ltd. focuses on research and development, manufacturing, sales and services of high power, electrical and electronic equipment. Products include medium voltage drives, direct current power supplies, switch gear and wind inverters. Jiuzhou was established in 2000 and is registered in Harbin.

로크웰 오토메이션, Harbin Jiuzhou Electric의 고압 인버터 사업부 인수

로크웰 오토메이션은 Harbin Jiuzhou Electric의 고압 인버터 사업부 자산을 인수한다고 밝혔다. 인수가는 5억 3000만 위안(약 8천300만 달러)이며, 인수절차는 오는 10월에 완료될 예정이다.

이번 인수를 통해 로크웰 오토메이션은 고압 인버터 제품의 설계, 엔지니어링 및 제조 역량을 보강함으로써, 아시아 태평양 지역의 모터 제어 시장에서 로크웰 오토메이션의 입지를 강화하고, Grid-tie 인버터 기술에도 한 걸음 더 다가설 수 있게 되었다. 지난 7년간 계약 제조 파트너로서 로크웰 오토메이션과 성공적인 파트십을 가져온 Jiuzhou사는 탄탄한 고객층을 확보하고 있는 건실한 기업이다.

로크웰 오토메이션의 전력 제어 사업부의 총괄 책임자 겸 부사장인 마이크 라즈키에비츠 (Mike Laszkiewicz)는 "Jiuzhou 고압 인버터 사업부 인수로 로크웰 오토메이션의 신흥시장 전략이 가속화 될 것"이며, "중간 및 고압 제품 라인의 성능을 보강함으로써, 아시아 태평양 지역에서 로크웰 오토메이션의 입지를 강화할 것입니다."라고 덧붙였다.

Jiuzhou의 이사회장인 리 인(Li Yin)은 "이번 인수로 로크웰 오토메이션의 앞선 제조기술과 연구 및 개발 역량 그리고 글로벌 공급 능력은 우리 고객들에게 혜택을 가져다 줄 것"이라며, "로크웰 오토메이션과의 성공적인 비즈니스 협력관계가 이와 같은 결실을 맺을 수 있게 되어서 기쁘게 생각한다."라 말했다.

로크웰 오토메이션은 중국 내에서만 1900명 이상의 직원을 고용하고 있으며, 35개의 대리점과 5개의 교육센터를 포함해 제조 설비, 글로벌 R&D 센터 및 소프트웨어 개발 센터를 운영하고 있다. 로크웰 오토메이션 연구소와 중국의 20개 지역에 위치한 50여개 대학교에서 제공하는 교육 프로그램을 통해 매년 6000여명이 넘는 대학생들이 교육을 받고 있다. Jiuzhou 사는 전력, 석유화학, 철강, 금속, 지자체, 시멘트 및 건설 분야에서의 비즈니스를 운영하고 있으며, 이번 인수를 통해 Jiuzhou의 고압 인버터 사업부는 로크웰 오토메이션의 제어 제품 & 솔루션(Control Products & Solutions) 비즈니스로 통합될 예정이다.

Principals of Rethymnis & Kulukundis take delivery of the first vessel constructed at DSME Shandong Shipyard

Principals of Rethymnis & Kulukundis Ltd., the UK-based shipbrokers and agents, have taken delivery of the first vessel built at Daewoo Shipbuilding and Marine Engineering's (DSME) new shipyard at Yantai, Shandong, China.

The 58,518 dwt Astra Centaurus, built to Lloyd's Register class, is the first of two DSME-designed supramax bulk carriers constructed by DSME Shandong to the latest environmental and structural standards. The second ship, Astra Perseus, is expected to be delivered in September 2012.

According to Dimitris Monioudis, the Technical Director for Rethymnis and Kulukundis, the shipbuilding project was a testament to the strong commitment of the stakeholders, which started at the pre-contract stage and continued throughout the design and construction of the ship.

Lloyd's Register's contribution to this groundbreaking project went beyond the traditional scope of classification services, particularly with regard to the implementation of design features that helped to reduce the vessels' wind resistance ? enhancing their potential energy efficiency -- and in supporting Rethymnis and Kulukundis's selection of the appropriate ballast-water management system.

The 58,518 DWT Astra Centaurus.

"Society is demanding safer, cleaner ships

and we are using our experience and technical expertise to support their construction," said Nick Brown, Lloyd's Register's Area General Manager and Marine Manager, Greater China.

The machinery arrangements were verified by Lloyd's Register to be in accordance with EC Directive's aimed at reducing the emission of SOx while in port. The ship is able to operate on distillate fuels in accordance with the latest California Air Resources Board (CARB) regulations, is equipped with an approved UV ballast-water treatment system and records a comprehensive inventory of hazardous materials in accordance with Lloyd's Register's Green Passport service.

Astra Centaurus and her sister ship have been designed to incorporate Lloyd's Register's Environmental Protection 'EP' notations, which recognises their enhanced features and demonstrates the owner's commitment to, and investment in, environmentally friendlier ships.

The duo was contracted in 2010 and is designed to comply with IACS's Common Structural Rules and constructed in accordance with ShipRight Construction Monitoring procedures, while the accommodation arrangements comply with the International Labour Organization's Maritime Labour Convention (MLC, 2006). Astra Centaurus has been enrolled in SERS, Lloyd's Register's Ship Emergency Response programme.

New Fjellstrand designed WindServer Trimarans for World Marine Offshore to be Classed by GL

As offshore wind developments move further offshore, into deeper waters with more extreme weather conditions, the challenge of providing operations and maintenance (O&M) support safely and cost effectively grows. The Fjellstrand WindServer is one of the new generation of offshore service vessels who will be meeting these needs and Germanischer Lloyd (GL) is very proud to be supporting this growing industry by providing classification services for the first newbuildings of this innovative design.

GL certifies Fjellstrand WindServer for World Marine Offshore

GL will class the order of six of the new vessels, two 30m vessels and four 25m, built by Fjellstrand for Danish shipping company World Marine Offshore A/S. The vessels will have a service speed of 25 knots and the capacity to carry 25 and 12 service personnel, respectively. They are scheduled to enter service in March 2013.

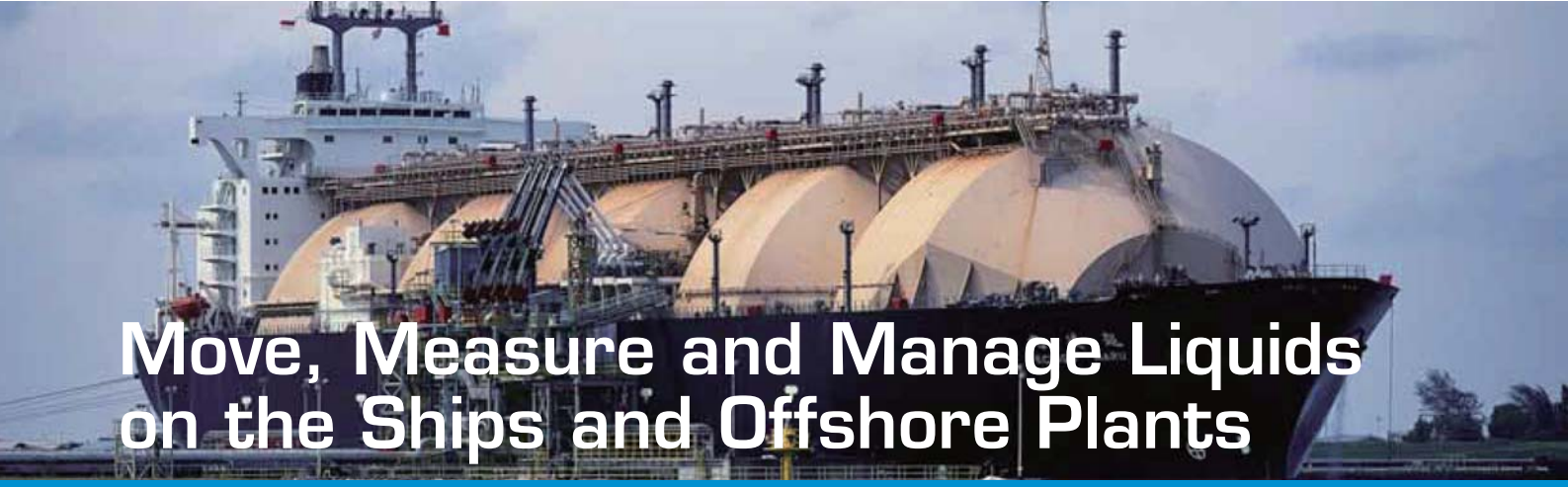
The Fjellstrand WindServer, includes a number of innovative features which have been designed to improve access to offshore installations in rough weather, improve fuel efficiency, ensure the safety of the personnel on board, and reduce running costs. The vessels will be equipped with four engines that power two controllable pitch propellers, giving improved operational flexibility while ensuring redundant capacity.

The vessels will be equipped with ballasting systems allowing them to shift between a rough weather SWATH mode and a light weight transit mode. A fixed stabilisation foil adds to the design's stability - one of a set of permanently integrated motion damping devices that are part of the hull concept and designed to reduce construction and maintenance costs by avoiding complex active motion control systems.

The WindServer was one of 13 shortlisted concepts in the Carbon Trust's Offshore Wind Accelerator access competition. The competition was designed to enhance the safety of workers transferred to offshore wind turbines and increase turbine availability by identifying and developing new access systems. The programme allowed Fjellstrand to undertake extensive tank testing on the new hull form, demonstrating its stability and seakeeping ability in high seas states at both high speeds and stopped.

GL has previously provided classification services for a number of Fjellstrand designed and built passenger catamarans, including the Halunder Jet, a 36 knot, 52m long catamaran which carries some 580 passengers on the nearly four hour journey between Hamburg/Cuxhaven and Helgoland.

In May GL released the first comprehensive set of classification rules for Crew Boats and Offshore Wind Farm Service Craft. The rules were developed by bringing together all of the relevant GL rules, international codes and recommendations which can be used for the classification of Crew Boats. The rules will allow designers to develop vessels built to the individual needs of their clients according to the rules, with full confidence in the fact that their vessel can meet with classification approval. The Rules have been developed in consultation with the flag states and will contribute to the development of international standards for Crew Boats.



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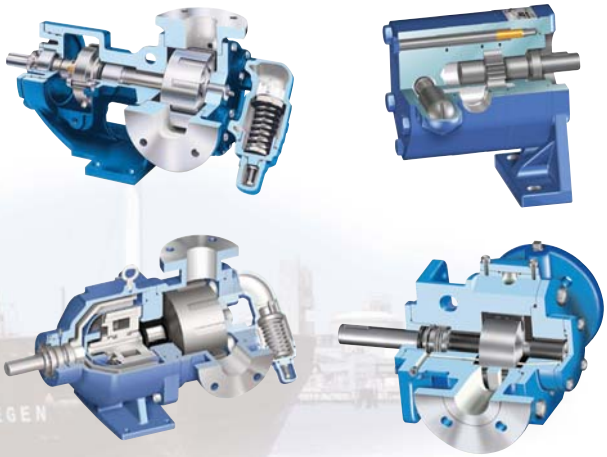

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Chinese shipbuilding industry breaks through the crisis

- Targeting higher order intake of high value-added vessels such as offshore facilities and LNG carriers

New orders for newbuilding vessels have fallen to below last year' levels worldwide, except for the offshore sector, as the orders plummet amid the market downturn in Europe. China, which strived to advance heavy industries as the chief thrust of its industrial development, once overtook Korea to become the world's largest shipbuilder in terms of ship delivery and new orders in 2000s. However, Chinese shipyards see decline in new orders and are going bankrupt one after another recently. To overcome the difficulties, Chinese shipyards are shifting their focus to the offshore and LNG sectors, the high value-added sectors.

World's largest shipbuilding country in 2011

Chinese shipyards account for over 40% of the global shipbuilding market as of 2011. Based on the major indicators, China took the world's top spot with 76.65 million tons of vessels completed, 36.22 million tons of new orders, and 149.91 million tons of existing orders for shipyards as of 2011.

The Chinese shipbuilding industry is dominated by the 19 shipyards under the state-run CSSC (China State Shipbuilding Corporation) and CSIC (China Shipbuilding Industry Corporation). These 19 shipyards comprise more than 40% of the total volumes of ships completed. Particularly, they have independent technologies for bulk carriers, oil tankers, etc., and built

Table 1. World's 3 major indicators and market share for ships in 2011 (Source: Clarkson)

(Unit: 10,000 tons, %)

Indicator	Global total	China	Korea	Japan
Volumes of ships completed	17,002 (100)	7,665 (45.1)	5,291 (31.1)	3,182 (18.7)
New orders	6,942 (100)	3,622 (52.2)	2,656 (38.3)	289 (4.2)
Existing orders	34,610 (100)	14,991 (43.3)	11,070 (32.0)	5,315 (15.4)

Table 2. Trends in new order intake of Chinese shipyards (Source: Clarkson)

Year	Total new order placement worldwide (Unit: 10,000 CGT)	Order intake (share %)
2009	1,646	803 (48.8)
2010	4,456	2,057 (46.2)
2011	3,225	1,035 (32.1)
First half of 2012	877	303 (34.5)

the 400,000-ton iron ore carrier, the world's largest in the bulk carrier sector.

Chinese shipyards witnessed a boom and nearly dominated the global market for commercial vessels in mid 2000s with a swelled orderbook for bulk carriers, oil tankers, their flagship products, which is largely attributed to the low price strategy. In 2010, China outperformed Korea and Japan and emerged as the world's largest shipbuilder. Last year, 1,536 Chinese companies in shipbuilding industry achieved more than CNY 20 million in sales. The combined production of those shipbuilders, parts manufacturers, and repair companies stood at CNY 777.5 billion, a 22.2% increase compared to 2010.

In 2011, the total amount of export and import in the Chinese ship market rose 8.4% year-on-year to USD 45.5 billion. Among them, the export and import increased 8.4% and 7.7% year-on-year to USD 43.69 billion and USD 1.81 billion, respectively. The export of ships was driven by the freight vessels, oil tankers, and containership, accounting for 73.6% of total exports or USD 32.14 billion.

Persistent decline in the next 5 years

The global shipbuilding market was in a deep recession in the first half of this year amid the overcapacity of global shipping companies and the decline in cargo traffic due to the Eurozone crisis. The global newbuilding order backlog, which surpassed 200 million CGT in 2008 during the boom of the shipbuilding industry, has plummeted to 100 million CGT with 5,000 vessels in 4 years. Based on the quantity, the global newbuilding order backlog fell 56% from 11,272 units recorded in the same period of 2008, and shrank 17% from 5,896 units recorded in the beginning of this year. The global shipbuilding industry, still reeling from the global financial crisis that began at the end of 2008, is seeing a drastic decline in new orders.

The new orders placed worldwide stood at only 8.77 million CGT, a 42% level compared to the previous year. The combined order intake of the Chinese shipyards amounted to 3.03 million CGT, a 34.5% level compared to the previous year. Chinese shipyards orderbook for the commercial vessels this year shows a pattern similar to that witnessed in 2009 when the new order placement remained completely flat in the aftermath of global financial crisis. Furthermore, new orders for the vessels other than ordinary commercial vessels fell roughly 25% compared to the corresponding period of the previous year. Meanwhile, the prices of most newbuild vessels began to slide from June last year, except for LNG carriers, and stood at 133.8 at the end of May.

Chinese shipyards were hit hard by the crisis facing the glob-

Figure 1. Rongsheng Heavy Industries

decade, speculate that this sluggishness will persist over the next 5 years. Rongsheng Heavy Industries, which is China's largest private sector shipyard, has found its performance overshadowed by financial problems and is seeing a plunge in new order intake this year. Currently, Rongsheng Heavy Industries has the world's 5th largest order backlog. In addition, China's Zhejing Jingang Shipbuilding has filed for bankruptcy due to the worsening financial conditions and many private sector shipyards of China have already gone bankrupt or are on the verge of bankruptcy.

Many shipyards sprung up in China during the boom years of mid 2000s and the consequent overcapacity in the supply of ships has lead to the tumbling new orders, reduction in the ship finance, and bankruptcy of many Chinese shipyards in a row this year.

Some predict that over 50% of Chinese shipyards will go bankrupt within a few years. As the prevailing opinion is that it would take some time before the shipping market recover in light of current global economic conditions, the Chinese shipyards are facing even more difficulties.

According to China Association of the National Shipbuilding Industry (CANSI), the combined volume of ships built at Chinese shipyards stood at 32.2 million DWT, a 4.2%

al shipbuilding industry, largely due to the mismanagement. Nearly 90% of Chinese shipyards did not receive even a single order this year.

According to South China Morning Post, Chinese shipyards won new orders for only 182 vessels in the first half of this year, a 67.5% decrease from 561 vessels recorded in the same period of the previous year. Shockingly, even Rongsheng Heavy industries, which is China's largest private sector shipyard, received the new order of only 1 vessel this year, excluding the order for 2 units of the barge type drilling rig in May.

Chinese shipyards, which is experiencing the worst year in a

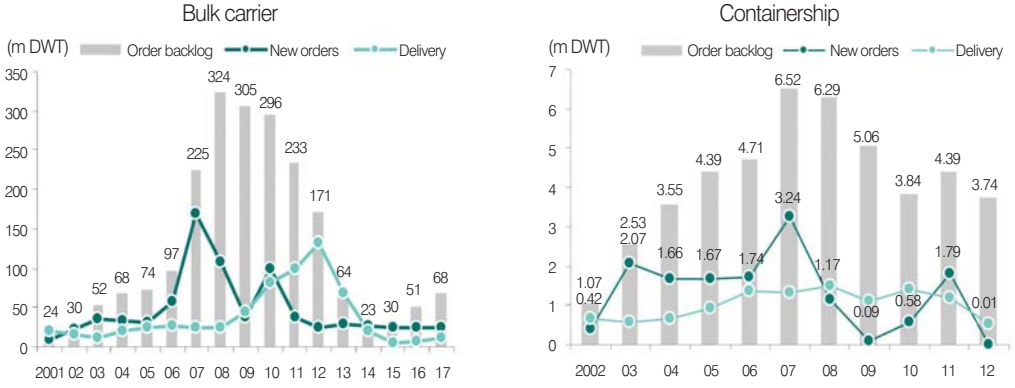


Figure 2. Outlook of the global bulk carrier and containership market(Source: Clarkson)

increase compared to the previous year. However, new orders at the Chinese shipyards amounted to 10.74 million DWT, a whopping 50.3% decrease compared to the previous year. Furthermore, vessels with 2.6 million DWT on order were cancelled in the first half of this year. In addition, Chinese shipyards have been rocked by the increased rescheduling of the delivery date or cancellation of contract amid the worsening shipping market conditions. This year, orders for 2.6 million DWT have been cancelled.

As the shipping market's woes deepen, ship owners are paying only 10% of the contract price of the vessel at the contract signing, instead of 40% which they paid during the shipbuilding boom years. Consequently, Chinese shipyards are borrowing more money from the banks to secure funds for the construction of ships and shipyard operations.

Figure 3. LNG-RV 'Expedient' of the Belgium-based Exmar Marine NV

Current conditions of Chinese shipbuilding industry

Chinese shipyards are recently mulling an entry into the equipment or offshore sectors to expand into new business area amid the order drought and glut of ships on the market. However, Chinese shipyards are likely to face many difficulties as the technology barrier to the entry into the offshore sector, a high value-added sector, is very high.

Wison Offshore & Marine, the subsidiary of the Shanghai-based Wison Group, an engineering company, was recently awarded a contract from the Belgium-based Exmar to build the world's first LNG-FLRS (Floating Liquefaction Regasification & Storage), which heralds China's entry into the offshore plant market. Particularly, the Chinese government has shown a strong will to promote LNG development and foster offshore plant industry as the demand for resources has risen in China.

Figure 4. 40000 DWT product oil tanker by Guangzhou Shipyard International

Guangzhou Shipyard International under the umbrella of CSSC, which had focused on the construction of product carrier and chemical carrier, started taking selective approach in winning new orders and is reviewing its overall work systems to avoid signing the contract likely to erode the bottom line. Guangzhou Shipyard International has adjusted its annual target downward from 20 vessels to 15 vessels and plans to intensively focus on the non-shipbuilding sectors, such ship-repairing, steel structure, elevator, etc., and offshore sector. The non-shipbuilding sector accounted for 11.25% of the company's sales last year and the proportion is expected to rise to 30% by 2015.

Full-fledged foray into the offshore sector

Chinese shipyards began in earnest to expand their share in the global market for offshore drilling facilities. Since 2005, Chinese shipyards such as COSCO, SWS, DSIC, CIMC Raffles, etc., have built offshore drilling facilities, including the jack-up rigs used in shallow water exploration, tender rig, deepwater semi-submersible rigs, cylindrical rigs, etc., based on the orders received, and have increased their share in the market. In September last year, Shanghai Shipyard under the umbrella of CSSC became the first Chinese shipyard to win an order for ultra-deepwater drillship.

Armed with strong price competitiveness, China has clinched

Figure 5. COSCO (Zhoushan) Shipyard

approximately 20% of the offshore drilling facility orders worth USD 72 billion placed worldwide. Particularly, Chinese shipyards surpassed Singapore to take the top spot worldwide in terms of the new orders for jack-up rig in 2009 and received more orders for semi-submersible rigs than the Korean rivals did in 2006 and 2011.

In fact, Chinese shipyards still have a lack of technology and experience in the construction of high value-added platforms such as FPSO, LNG-FSRU, etc., in the offshore sector. However, the prevailing opinion in the industry is that Chinese shipyards are closing the gap.

According to Credit Suisse of Singapore, Korean shipyards and Singaporean shipyards won 11 units and 6 units, respectively, out of the 29 offshore drilling facilities ordered worldwide in the first half of 2012. By contrast, Chinese shipyards won only 3 offshore drilling facility orders in the same period. Still, Chinese shipyards show stronger performance in the shallow water jack-up rigs compared to the deepwater rigs.

In fact, 14 offshore rigs out of 26 offshore rigs ordered worldwide in the second half of last year were jack-up rigs. During that period, Chinese shipyards received the orders for 9 offshore rigs, mostly the jack-up rigs, surpassing Korea and Singapore that won 8 units and 5 units, respectively.

Industry experts predict that the Chinese shipyards will be able to establish leading position in the global market for offshore drilling and production facilities within the next decade if they accumulate the experience with the construction of deepwater rigs, continue the acquisition of overseas technology, and maintain the price competiveness.

Intensive development in offshore sector over the next decade

Recently, China announced a mid and long-term plan to invest a massive amount of money in the offshore sector over many years to develop technologies and establish special industrial complex in a bid to intensively foster the offshore engineering and construction companies that have global influence.

This plan aims to advance the offshore facility construction industry of China for the next 10 years, and specifically, focuses on expanding the size of industry, building up technological competitiveness, and achieving perfect industrial systems.

Particularly, this plan includes mid and long-term development plans, policies, etc., which are necessary for China to turn itself into a global leader into the offshore construction sector.

Ministry of Industry and Information Technology (MIIT), which supervises this project, will map out detailed plans in conjunction with relevant government departments, adding fresh momentum into the effort to achieve the goals and objectives

of the project.
Meanwhile, the Chinese companies that have technology above a certain level in the offshore facility sector include CSSC, CSIC, China International Marine Containers, Shanghai Zhenhua Heavy Industries, Bestway, etc.

Mid and long-term development plan for the offshore sector

The first goal is to expand the size of industry to a global level, increase the annual sales to CNY 200 billion in annual sales and raise the share in the offshore oil/gas development market to 20% by 2015. In addition, China set a target of CNY 400 billion in annual sales and market share of 35% by 2020.
The second goal is to create major industrial clusters and large company groups, so that the offshore facility industrial cluster can be formed. China plans to develop the companies that have global competitiveness by 2015, and increase their annual sales to CNY 20 billion by 2015 and over CNY 40 billion by 2020.
The third goal is to take current technological level to the next advanced level and develop innovative technologies to secure independent design and construction technologies for oil/gas development facilities. In addition, China plans to speed up development of technologies necessary for industrializing offshore renewable energy and underwater resources exploitation facilities while focusing on securing the technologies for offshore wind power, seawater desalination and facilities and expanding independent construction capability.
The fourth goal is to strengthen the systems related to the offshore and enhance the construction capability in the offshore sector with an aim to raise the local content rates to 30% by 2015 and 50% by 2020.
China plans to achieve the ability to supply related systems, such as offshore drilling system, large offshore platform crane, underwater ecosystem, etc., and equip the companies with the ability to independently conduct the design and construction of offshore observation and monitoring facilities, offshore exploration platforms, underwater operation facilities and others.

Growth momentum of LNG market

The shipbuilding industry has seen a steep rise in new orders for LNG carrier, a vessel for transporting liquefied natural gas (LNG), amid the soaring oil prices, preference towards eco-friendly energy, nuclear crisis in Japan, etc. The industry expects that approximately up to 100 LNG carriers will be ordered in the next 3 years.
Total volume of LNG supplied worldwide in 2011 reached 241 million tons in 2011, a 10% increase compared to the previous year. The global market for liquefaction and production facilities is expected to grow fast by 2018. BP of U.K., predicted that 25% of the volumes of gases produced worldwide would be transported in the form of LNG by 2030 and the LNG market would grow at an annual average rate of 4.5% by 2030.
New orders for LNG carriers will continue to increase in 2012 as the supply is not still catching up with the demand. The shipbuilding market will also see an increase in new orders for LNG FPSO considering that this type of vessel

Figure 6. China's first self-built liquefied natural gas carrier 'DAPENG SUN' by Hudong Zhonghua

has the advantage of reducing the costs of initial investment and operations, compared to the fixed offshore platform, and that 22% of natural gas reserves are buried under the sea.

Moreover, LNG-FSRU (Floating Storage Re-gasification Unit) in the category of floating LNG facilities has come into the spotlight as it delivers a high return and reduces the costs of construction compared to the onshore terminal. And the energy shortages are expected to spur the demand for LNG-RV (Regassification Vessel), particularly, in the region where the expensive heavy oil is consumed.

Chinese shipyards' export of offshore plant and energy facilities in the first half of this year jumped 48.1% year-on-year to approximately CNY 950 million. This sharp increase in export is attributed primarily to the Chinese shipyards' growing focus on high value-added vessels and facilities such as large containerships, LNG carriers, drillships, offshore process facilities amid the weakening economic indicators in the shipbuilding industry.

Particularly, Chinese shipyards are expected to win orders for approximately 60 LNG carriers in the next 3 years as the Chinese government expands the import of LNG under its policy that requires the Chinese cargoes to be transported by Chinese vessels built at domestic shipyards. This policy represents Chinese government's effort to beef up competitiveness of domestic shipyards and will help Chinese shipbuilding industry overcome its weakness in terms of shipbuilding experience.

Nantong Mingde Heavy Industry, China's private sector shipyard, recently signed a contract with Cambridge Energy Group to build up to 23 LNG carriers, including 9 units of 140,000 m^3 LNG carriers(including 4 optional vessels), 10 to 12 units of 40,000 m^3 LNG carriers, etc. This shipyard, which has focused on building pure care carrier, product carrier, etc., does not have any experience with the construction of LNG carrier thus far.

However, many in the Chinese shipbuilding industry opine that this contract heralds the full-fledged entry of Chinese shipyards into the LNG carrier market. Nonetheless, Chinese shipyards which have made efforts over the several years still find that the entry barrier to the LNG carrier market still remains high.

Currently, Chinese shipyards have no track record of building LNG carriers, except Hudong Zhonghua under the umbrella of CSSC which has built 5 LNG carriers thus far, and still have inadequate technology to build LNG carriers. By contrast, Korean shipbuilding heavyweights have made a clean sweep of the LNG carrier market with the leading technologies and customized designs. This year, Korean shipbuilding heavyweights won the orders for 14 LNG carriers out of 16 units ordered worldwide until July.

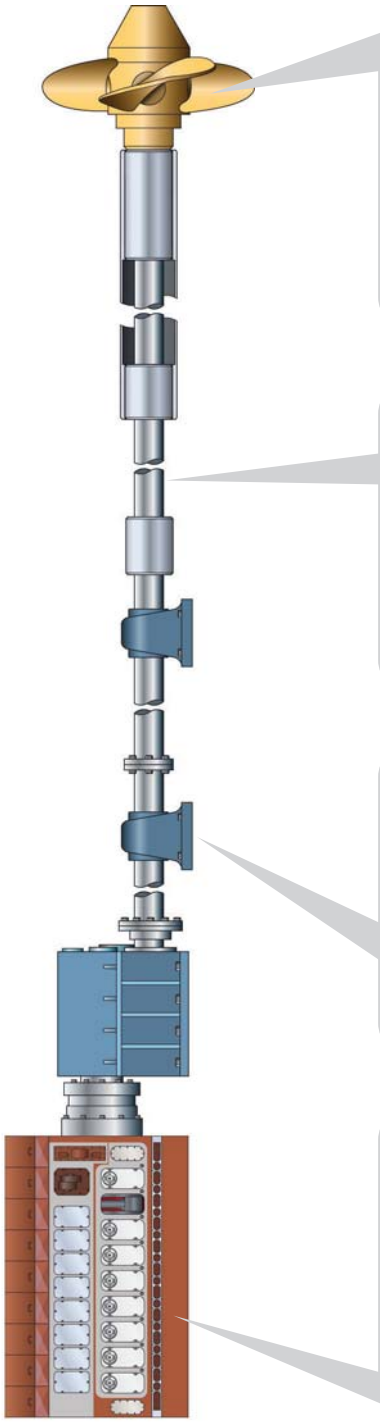
Focus on offshore market after reorganization

The global shipbuilding and offshore markets face somewhat gloomy prospects. The global ship market landscape is undergoing a radical change, such as the soaring demand for vessels such as very large containerships, LNG carriers, etc., while the prices of freight carriers and oil carriers - the sectors which were dominated by Chinese shipyards - are plunging.

The shipbuilding/offshore industries are expected to see a constant decline in the newbuilding prices due to the imbalance between the demand and supply of vessels in the first half of this year.

Meanwhile, 10,000TEU containerships and LNG carriers, etc., are expected to see an increase in new orders and steady growth in the market. Resultantly, Chinese shipyards are expected to gradually increase the export of high value-added vessels.

Marine industry moves forward thanks to laser precision alignment

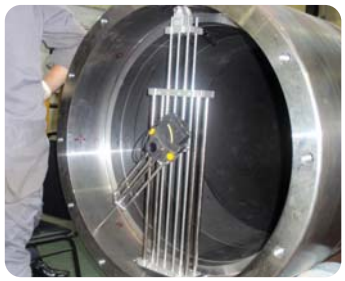


PROPELLER

LEVALIGN Ultra

STERN TUBE

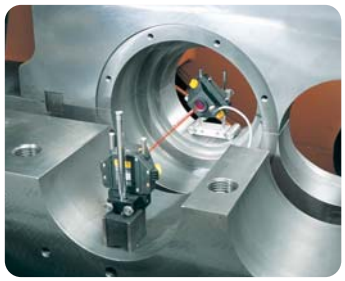
CENTALIGN Ultra
(unmounted shaft)



LONG SHAFT

ROTALIGN Ultra
(mounted shaft)

CENTRALIGN Ultra
(unmounted shaft)



MAIN ENGINE

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GWR enhancing the productivity of FPSO even in extreme environment

Emerson's Rosemount® Guided Wave Radar enables accurate and reliable level measurements in challenging process conditions off the west coast of Africa.

BP Exploration has replaced unreliable level transmitters previously used on a floating production, storage and off-loading (FPSO) vessel with Guided Wave Radar (GWR) transmitters from Emerson Process Management. The more accurate and reliable level readings from Emerson's Rosemount® 5300 Series GWR transmitters have helped BP Exploration increase safety, reduce shutdowns and increase production.

Operating 160 km (100 miles) off the west coast of Africa, the BP FPSO processes and stores oil production for export. At 310 meters in length, it has an oil storage capacity of 1.77 million barrels and can process up to 240,000 barrels per day.

Changing process conditions and the presence of foam and vapor, as well as dirty sticky fluids, made this a difficult application for measuring level. The original GWR transmitters (supplied by another vendor) had compatibility issues with the FPSO's FOUNDATION fieldbus network, and their limited capabilities in detecting low-dielectric hydrocarbons required coaxial probes to increase the strength of the surface signal. Such probes are susceptible to the build-up of sticky solid materials entrained within the production fluid, which led to a significant number of unplanned shutdowns with resulting lost production.

To address these issues, BP Exploration worked with Emerson to replace existing GWR units with Rosemount 5300 GWRs. With Emerson's advanced signal-processing technology that ensures detection of low dielectric fluids, the Rosemount GWR is able to send and receive a cleaner, stronger signal. This allows the use of single-lead probes that increase tolerance to solids build-up and coating, and eliminate trips due to false readings. In addition, the Rosemount 5300's FOUNDATION fieldbus interface made installation and configuration both quick and easy.

The improved level detection enabled by the new instruments has also helped BP Exploration improve safety. The susceptibility of the existing GWRs to material build-up on the co-axial probes and their inability to distinguish the presence of a light hydrocarbon layer on top of the water meant that the level measurements were unreliable. This unreliability compromised one of the layers of protection used to ensure safe operations.

Following the installation of the Rosemount 5300 GWR transmitters, the process data has confirmed the accuracy and reliability of the instruments and their suitability for the widely varying process conditions of the FPSO.

Emerson's Rosemount Guided Wave Radar enables accurate and reliable level measurements in challenging process conditions on the FPSO.

Emerson's Rosemount 5300 Series GWR transmitters have helped BP Exploration increase safety, reduce shutdowns and increase production.

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ENGINEERING YOUR SUCCESS.

New functions maximize compaction in latest Uson marine waste compactor generation

Uson Marine are now introducing the latest generation of their energy saving marine waste compactors with electro mechanical drives.

The new compactors are based on Uson's well-proven UBP-30S, UBP-40/UBP-80, UMCC and UWC-50 models. Offering valuable new functions, combined with the many benefits of electro mechanical drives, they have been developed by Uson Marine to help customers comply with increasingly stringent rules from IMO regarding the management of waste onboard ships and offshore rigs.

The dry waste is sorted into fractions and, using Uson marine compactors, its volume can be reduced by more than 80%. This allows storage onboard where space is limited, prior to landing for disposal ashore.

Innovative new functions

With the new "Double-stroke" function, which is not available in other compactors on the market, the press head is raised prior to the second compaction "stroke", thus temporarily releasing the pressure on the waste. This allows the waste to subside naturally into a more geometrical stack and results in a substantial increase in compaction with the second stroke.

The "Stay-n-Hold" function eliminates expansion of the waste over time and further increases compaction without consuming energy. It also provides storm protection.

Environmentally friendly, energy saving drives

A key advantage of Uson marine waste compactors is their electro mechanical drives, which minimize environmental impact for "clean" and "green" vessels. The drives consume much less energy than their hydraulic equivalents, they are quieter in operation and maintenance costs are considerably lower. In addition, the amount of hydraulic oil carried onboard is reduced and there is no risk of hydraulic leakage and no hazardous waste, such as used oil filters.

Safe, user-friendly operation

Uson Marine dedicated marine waste compactors are specially designed and built for marine and offshore operation and are accompanied by a DNV Maritime Assessment/Verification Report.

The machines have a small footprint and can easily be installed by the crew. They offer user friendly, semi-automatic operation with overload protection and an alarm which sounds when the chambers are full. Inclination tested, and with no loose containers or parts, the compactors will continue to operate reliably in rough seas. A storm position for the press head is a standard feature on most models.

Rugged, maintenance-friendly designs

The rugged designs of Uson marine waste compactors effectively minimize wear and the machines will normally give more than 25 years of service with no deterioration in efficiency after years of operation. They can easily be maintained by the crew, trouble-shooting is simple and spares requirements are low.

Due to the reliability and durability of the machine designs and electro mechanical drives, Uson Marine is able with confidence to provide a 5-year warranty on all its compactors.

‘Marine Tech Korea 2012’ has been turned into a global exhibition

Marine Tech Korea 2012 will be held at Changwon Exhibition Convention Center(CECO) for 4 days from November 13 to 16. This event is expected to draw many shipyards, including the domestic shipbuilding heavyweights such as SHI, DSME, STXOS, etc., and marine equipment manufacturers.

Samsung Heavy Industries(SHI), Daewoo Shipbuilding & Marine Engineering (DSME), and STX Offshore & Shipbuilding (STXOS) confirmed their participation in ‘Marine Tech Korea 2012’ slated for November. As these domestic shipbuilding heavyweights expressed their intention to participate, Marine Tech Korea 2012 is expected to cement its position as a world-leading industrial exhibition. It represents the culmination of the concerted effort of the industries and the government fully dedicated to the development of the shipbuilding and offshore industries, the key industries of South Gyeongsang Province, despite the slowdown in the global shipbuilding industry.

Meanwhile, South Gyeongsang Province recently unveiled the mid and long-term plan to advance the shipbuilding and offshore industries with a focus on offshore plant sector as part of effort to play a key role in helping the nation maintain its status as the world’s largest shipbuilding country in 2020.

Marine Tech Korea 2012, co-organized by South Gyeongsang Province, Changwon City and Geoje City, and sponsored by the Ministry of Knowledge Economy (MKE), will be held at Changwon Exhibition Convention Center (CECO) for 4 days from November 13 to 16, 2012.

Marine Tech Korea 2012 will feature large-scale facilities, including the shipyards, marine equipments, offshore plants, LNG carriers, offshore/port/logistics equipment, and various events, such as the export forum with invited buyers, academic seminars, etc., will be organized in parallel.

Marine Tech Korea, a biennial event which was launched in 2006, provides the opportunity for domestic shipbuilding/offshore companies to make inroads into foreign markets and build relationship with world’s prominent companies.

Marine Tech Korea 2012, the 4th event this year, expanded the space for marine equipment by over 30% and is expected to draw approximately 350 exhibitors from 35 countries and more than 250 buyers from about 40 countries.

The Marine Tech Korea 2012 Office anticipates that many domestic shipbuilding/offshore companies will complete their participation as SHI, DSME, and STXOS confirmed their participation. Moreover, prominent overseas companies and buyers are expressing their intention to participate, which shows that Marine Tech Korea 2012 has been transformed into a global industrial exhibition.

Ryu Myeong-hyeon, Manager of Strategic Industry Department, South Gyeongsang Provincial Office, which is preparing for this show, said, “We are placing primary focus on attracting prominent overseas companies and buyers to help domestic shipbuilding/offshore and marine equipment companies pull themselves out of difficulties amid the sluggishness in the global shipbuilding and offshore industries, and particularly, help ease the transition to the offshore plant industry. We will ramp up our effort to attract domestic and overseas companies as domestic shipbuilding heavyweights confirmed their participation.”

STX Dalian successfully delivered a compact drillship to Noble Drilling

STX is making all-out efforts to diversify its business and transform itself into a comprehensive offshore group encompassing the shipbuilding, offshore, shipping, trade, and energy sector. Recently, STX made inroads into the overseas energy development sector with an aim to turn itself into a comprehensive engineering company.

The 'compact drillship', which STX takes pride in, represents the culmination of technological ingenuity in the offshore plant sector. The compact drillship is smaller in size, but offers the same drilling performance as the existing large drillship and was designed to operate even in the regions with inclement weather such as the North Sea. Above all, this drillship has the advantage of easy operation, lower fuel cost and maintenance cost, and is a low carbon and eco-friendly vessel.

Last month, STX Dalian delivered the drillship to Noble Drilling, the global oil and gas drilling company. STX held a naming ceremony for 'Noble Globetrotter II', the drillship, at the STX Dalian Shipbuilding Complex in China.

The ceremony was attended by President Choi Sung-rak of the Offshore and Shipbuilding of STX Dalian, Noble Drilling Vice-President O'Neil J. Mendoza, and related officials.

This drillship is the second vessel which was additionally ordered from Noble Drilling in August 2010, and measures 189 m in length, 32.2 m in width, and can sail at a speed of 11 knots. This vessel can accommodate 180 crews and drill up to 12,000 m underwater. Unlike the existing large drillships, this vessel is a new-concept 'compact drillship' which dramatically improved the drilling performance and reduced the costs of maintenance. Meanwhile, STX Offshore & Shipbuilding (STXOS) successfully delivered a drillship to Noble Drilling in May, which was ordered in 2008 for the first time in the offshore sector.

Noble Globetrotter II, the 'compact drillship' built by STX Dalian

Using the experience and know-how gained from the construction of the first vessel, STX shortened the construction time and dramatically improved the quality for the second vessel, thus receiving high evaluation from Noble Drilling. Thus, STX is better positioned to win additional orders in the period ahead.

Noble Globetrotter II was deployed to the oil field development project in the U.S. Gulf of Mexico from July and recognized as the best drillship in the global drillship performance evaluation by PFC Energy, an international consulting company specializing in oil and gas industry.

Having successfully delivered this second drillship, STX laid the foundation to turn itself into a shipyard building the offshore drilling facilities based on its experience with the construction of deepwater drillship which has been in high demand even amid the global financial crisis that began from Europe.

Financial institutes help shipyards find their way out of financial difficulties

Financial Services Commission (FSC) is taking measures to provide financial support to domestic shipyards currently in financial straits amid the order drought. As a result, the cash-strapped small and medium-sized shipyards will find relief from difficulties.

FSC held a meeting with the policy lenders, Vice-Governor of Financial Supervisory Service, and officials from commercial banks and provincial banks for 2 days from August 16 to 17 to discuss the matters related to the export and investment of companies.

During the meeting, FSC examined the progress of major policy support measures, listened to the grievances of companies in export and investment sectors, and discussed the financial support measures. In addition, FSC and policy lenders embraced the proposals of the companies and agreed to swiftly take the measures to provide financial support for the export and investment.

Currently, the shipbuilding industry is in deep financial straits to an extent that even the 3 domestic shipbuilding giants are issuing the corporate bonds to secure funds. Not long ago, Daewoo Shipbuilding & Marine Engineering (DSME), Hyundai Heavy Industries (HHI), and Samsung Heavy Industries (SHI) issued large quantities of corporate bonds. In response to that, FSC is allowing the policy lenders and commercial banks to offer financial support to the shipyards in an attempt to relieve their financial woes. Previously, the Korea Eximbank was the sole provider of financial support for export production.

The financial support for export production is offered in the form of loan necessary for the manufacture of large-scale capital-intensive export products such as ships, plants, etc., when there is a time gap between the production and payment. As the Korea Eximbank had been the sole provider of financial support for export production, shipyards had found themselves in financial straits due to the time gap between the ship construction and payment. Consequently, shipyards sought loans from commercial banks or issued corporate bonds to raise money in the form of the working capital.

To help shipyards resolve financial difficulties, FSC took measures to allow commercial banks, such as Korea Finance Corporation, Korea Development Bank, Woori Bank, Korea Exchange Bank, Kookmin Bank, Hana Bank, Shinhan Bank, etc., to offer the financial support for export production.

FSC will launch the financial support program for shipyards in August and start offering KRW 4 trillion from September. Korea EXIM Bank's ship production support program will offer up to 90% of the advance on the contract entered into between domestic shipyard and overseas ship owner.

The interest rates can either be fixed or variable, and will vary, depending on the loan maturity, shipyard's credit rating, and collateral. The loan maturity period will be less than 1 month after the date on which the loan was provided (the date on which the delivery of ship is completed or the due date for the export payment), and is usually 1 year.

FSC speculates that approximately 7 trillion can be offered additionally (KRW 1.6 trillion for the shipyards to support the export production) out of KRW 13 trillion by the end of this year. Approximately KRW 13 trillion will be offered additionally to the export/investment companies by 2014 if the 'financial support measures for the export and investment' are implemented without disruption.

Korean shipyards show sluggish performance in the second quarter this year

HHI and SHI, which are the world's first and second shipbuilders, saw a slight decline in the sales and sharp decrease in the operating income in the second quarter of this year.

HHI and SHI showed sluggish performance in the second quarter of this year in the aftermath of the downturn in the global shipbuilding market conditions and the financial crisis that began in Europe.

HHI registered KRW 13 trillion 700.4 billion in sales and KRW 358.5 billion in operating income in the second quarter of this year based on the Korean International Financial Reporting Standard (K-IFRS). That represents a 2.8% increase in sales and a decrease of 65.20% in operating income, compared to the same period of last year.

SHI also saw its revenue decline. SHI registered KRW 3 trillion 352.4 billion in sales, an increase by 6.0% (KRW 190.5 billion), and KRW 264.3 billion in operating income, a decrease by 22.1% (KRW 74.8 billion), compared to the corresponding period of last year.

STXOS registered KRW 165.4 billion in operating income, a decrease by 30.3% compared to the first half of the previous year. Although STXOS recorded KRW 5 trillion 419.3 billion in sales, a 6.7% increase, its current net income recorded a deficit of KRW 73.8 billion. Like other large shipyards, STXOS was also hit hard by the global financial crisis and subsequent Eurozone crisis that led to the increased proportion of contracts with low profit margins.

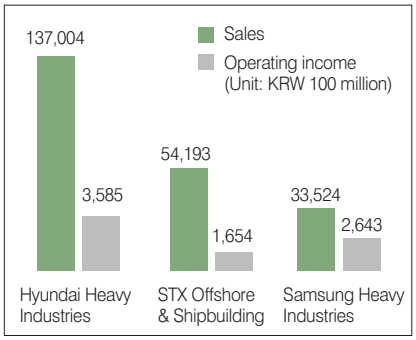
According to HHI, the sales increased by 2.3% as a result of the increased production in the offshore sector and the expansion of facilities in the refining sector, while the operating income and current net income shrank due to the dwindling profitability in the shipbuilding sector and the deficit in the refining sector.

SHI analyzed that the higher sale and the lower operating income, compared to the same period of previous year, were attributed to the decrease in the proportion of high-profit vessels ordered before 2008 and the increase in the proportion of low-profit vessels ordered after 2009.

Although STXOS, which showed poor performance due to the downturn in the shipbuilding and shipping market conditions, is making all-out efforts, such as financial restructuring, etc., to overcome the economic crisis.

The sluggish performance of those shipyards in the second quarter has been expected, and therefore does not raise much concern. However, the greater problem is that the newbuilding prices are keep plunging. Those shipyards are stepping up their effort to diversify their business to improve the performance while focusing on wining new orders for high value-added vessels such as special vessels, offshore plants, etc.

Meanwhile, domestic shipyards swept all orders for FPSO(1 unit worth USD 2 billion) and LNG-FSRU(1 unit worth USD 280 million) placed worldwide in the first half of this year. Furthermore, domestic shipyards won orders for 7 drillships (worth approximately USD 4.4 billion) out of 8 units placed worldwide, 1 LNG-FPSO (worth USD 770 million) out of 2 units placed worldwide, 15 LNG carriers (worth approximately USD 3.1 billion) out of 16 units placed worldwide, 16 LPG carriers (worth approximately USD 800 million) out of 23 units placed worldwide, and 30 tankers (worth USD 1.9 billion) out of 64 units placed worldwide, etc., in the same period, thus cementing their leading position in the high value-added vessel sector.



Sales and operating income of Korean shipyards in the second quarter of 2012

According to the industry, the nation's export of ships fell 20% year-on-year to approximately USD 25 billion due to the decrease in the ship prices and volumes as the ships - which were ordered during the market slump in the aftermath of global financial crisis - were delivered to the ship owners. The export is expected to reach approximately USD 17.5 billion in the second half of this year.

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Shipbuilding industry poised to reach new heights with the shale gas development

Shale gas, which began to be developed in 2000s amid the soaring oil prices and drilling technology development, has recently emerged as an economically viable alternative energy source and is bringing a sea change in the world energy market. The shale gas reserves can be consumed worldwide for 125 years. The full-scale development of shale gas resources will have a dramatic impact on the shipbuilding market in relation to the production, storage, consumption, etc., of gas.

Korea Institute for Industrial Economics and Trade (KIET) published a report on the effect of shale gas boom on the Korea's industry. This report predicted that the demand for high quality energy, which currently stands at 60 million tons this year, would rise to approximately 80 million tons by 2015, and the gas storage facility market would see a rapid growth.

The shipbuilding industry will benefit from the full-scale development of shale gas resources as the international trade of natural gas is expected to increase by over 50% and new orders for LNG carriers, the vessels transporting the liquefied natural gas, will increase. The report also predicted an increase in the demand for the insulation panel that allows the liquefaction amid the increased placement of new orders for LNG carriers. Particularly, the report speculated that the demand for the floating LNG-FSRU would climb due to the high costs incurred for the storage and processing of liquefied natural gas from the onshore facility.

Thus, both government and industry need to actively respond to the world energy market where the focus is being shifted from oil to gas, and must be fully prepared to the full-fledged exploitation of shale gas resources. Moreover, the industries and companies, which are involved in the value chain of shale gas, need to make effort to enter the market and develop technologies. Some expect that the share of natural gas in the global primary energy mix, which stood at 21%, in 2010, will rise to 25% by 2035.

Full-scale development of shale gas

Shale gas refers to the methane gas formed within the shale layer, the sedimentary rock composed of mud and clay, and come under the category of non-conventional energy resources along with the tight sand gas and coal-seam gas. Sales gas is dispersed vastly at a depth of 1,000m, unlike the oil and natural resources, the conventional energy sources, and extracted from the shale rock with a low permeability, and therefore the development costs are high. Major energy developers are hesitating to unlock the shale gas reserves because they are not sure of the economic viability of shale gas wells.

According to U.S. Energy Information Administration (EIA), the technically recoverable shale gas resources are estimated at 6,622tcf (trillion cubic feet), which is 40% of the natural gas reserve and can be consumed worldwide for 125 years. Shale gas is equally distributed geographically worldwide, unlike the natural gas of which reserves are concentrated in the Middle East and Russia.

The development of shale gas resources began in 2000 to cope with the soaring oil prices and secure economically feasible alternative energy source. In 2005, Barnett Shale, in the Texas, U.S.A., became the first shale gas field to be successfully developed, using the horizontal drilling and hydraulic fracturing to extract the natural gas. Shale gas

Table 1. Cost of natural gas and shale gas production by country

(Unit: USD per 1 million BTU)

	Natural gas	Shale Gas
United States	3~7	3~7
Europe	5~9	5~10
China	4~8	4~8
Russia	0~2	
Qatar	0~2	

(source: 2012 IEA, Golden Rules for a Golden Age of Gas)

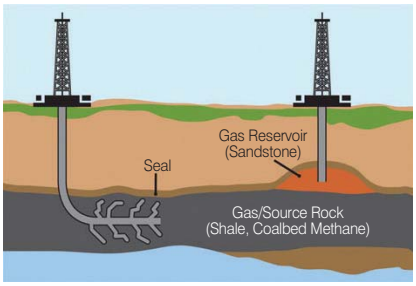

Figure 1. Schematic diagram of shale gas drilling (source: www.pakistanherald.com)

accounted for only 1% of the natural gas production in the United States in 1990s, but its share rose sharply after 2000. In 2010, shale gas provided 24.1% of the natural gas production.

Optimism and pessimism

The greatest problem arising from the shale gas development is the environment pollution that results from the production process. The shale gas development may result in serious depletion of water resources in the shale gas well region, considering that the water volume required for shale gas production is 1,000 times as much as the water volume required by the existing drilling method, and furthermore, the 0.5% chemical additive is likely to contaminate the underground water. In addition, the shale gas development causes the weakening of the soil and increases the seismic hazards, and furthermore, entails the risk of air pollution due to the leak of methane gas while the shale gas is extracted.

There are both optimistic and pessimistic scenarios with respect to the implications of the shale gas development to the world energy market.

From the optimistic standpoint (golden rule case), the shale gas development is expected to gather momentum with the social consensus on the environmental pollution. As the United States, the major importer of natural gas, produces the shale gas, the global gas market is expected to be reorganized from the seller-oriented to the buyer-oriented sites. The demand for gas will rise more than 50% by 2035 with the supply of cheap shale gas, and the gas will account for over 25% of the global energy mix.

From the pessimistic standpoint (low unconventional gas), the shale gas development will be stalled due to the concern about environmental contamination. The skeptics indicate that the share of conventional energy sources, such as coal, oil, gas, etc., will be maintained and the share of hydroelectric power and biomass will dramatically increase if the shale gas development shows sluggish progress.

Shale gas development worldwide

The United States and China are expected to actively develop the shale gas. The United States will become the gas exporting country based on its unmatched shale gas exploration and extraction technology. The break-even point is expected to dramatically improve, climbing from USD 11.50 to USD 6.80 per 1,000ft^3 as the oil majors deploy the capital and technology.

U.S. Department of Energy (DOE) eased the restrictions on the export of natural gas in 2011 and approved the export of LNG. Korea Gas Corporation signed a contract to import 3.5 million tons of gas annually from the United States for 20 years from 2017.

China, where the largest reserves of shale gas reserves are found, is actively introducing overseas technology and capital to develop the shale gas and meet the domestic demand. In China, the shale gas is expected to substitute 37% of natural gas consumption by 2013, while the share of natural gas in China's energy mix, which stood at 2.7% in 2008, will rise to 5.2% by 2020.

Meanwhile, European countries are skeptical about the shale gas development. However, oil majors began to develop shale gas resources and plans to supply the volume of shale gas that accounts for 6% of the European gas consumption by 2015 and increase the production by over 4 times by 2020.

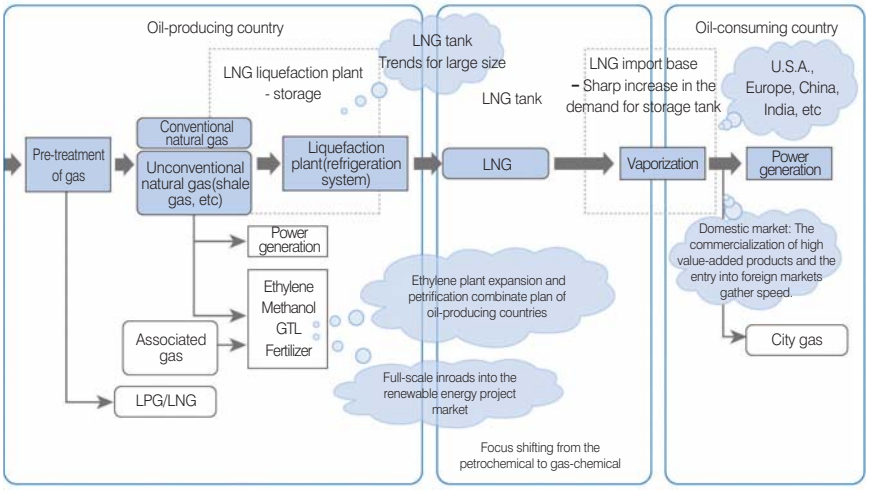

Figure 2. Expansion of gas-related projects and outlook for development (Source: Korea Institute for Industrial Economics and Trade)

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Domestic and overseas trends of equipment technology development for green ship (2)

Green ship has become an irreversible trend worldwide. R&Ds related to green ship have been vigorously conducted in various fields such as the hull design, engine and propulsion system, navigation satellite system, etc., in Korea, too. Here, we will look into current technologies for green ship and future market trends both at home and abroad.

Sung-yoon Kim Senior Researcher
Energy & Marine Research Division
Korea Marine Equipment Research Institute

3rd phase - Zero greenhouse gas emission technology

• Renewable energy application technology

1. Solar photovoltaic technology

Solar photovoltaic power generation is a method of generating electric energy by converting solar radiation directly into electricity using the solar cells and does not emit CO_2. Solar photovoltaic power generation system consists of solar cell (module), PCS (Power Conditioning System), storage battery system, monitoring and measuring units, etc. This system has the disadvantage that it can produce electricity only during daylight hours, and is divided into the independent type, system-linked type, and hybrid type, depending on the system configuration and load type.

The on-board solar photovoltaic power generation system - which can reduce fuel consumption and minimize the emissions of exhaust gas - is undergoing the performance qualification in many countries and has demonstrated the feasibility for the applications to long-distance transportation and navigation.

The solar photovoltaic power generation system can be applied to various types of vessels, such as ferry, containership, bulk carrier, tanker, pure car carrier, etc. Furthermore, the performance qualification test has been conducted on the solar photovoltaic power generation system fitted with large capacity storage battery to ensure stable power supply.

The on-board solar photovoltaic power generation system has excellent power generation efficiency as the sea wind cools the power system and the photovoltaic panels receive larger amount of solar radiation at sea compared to the onshore solar photovoltaic power generation system, and has proven stability against degradation caused by thunderstorm, seawater, etc.

Figure 11. NYK Line equipped with solar photovoltaic power generation system.

2. Wind power technology

Wind power was used to propel the sailboats for a long time. Currently, fossil fuels are widely used to propel the ships that have become large and adopt the propeller engine. As the reduction in CO_2 emissions from ships has become manda-

tory amid skyrocketing oil prices and global warming, fuel-saving and CO_2 emission reduction technologies that use the wind power as main or auxiliary source of propulsion are being actively developed.

The wind power technology uses the wind power to propel the ship directly or indirectly. Traditional sail, wind sail(wind profile) and kite, etc., directly use the wind power as the main source of propulsion. Additionally, the wind power can be used as auxiliary power source for the ship when the wind power generator installed on board ship generates electric power while the ship is at sea or anchored at the dock. R&D related to the on-board wind power applications has been conducted vigorously, but it will take much time until commercialization.

Figure 12. Ship equipped with the kite of Skysails.

Figure 13. Example of wind turbine installation (schematic diagram)

3. Fuel cell & superconducting motor technology

Fuel cell is the next-generation clean power generation system that generates high efficiency (over 40%) and high power density through the direction conversion of chemical energy to electrical energy. Fuel cell directly converts the chemical energy to electric energy, using the oxidation and reduction reaction. Hydrogen is used as fuel, and oxygen is used as oxidizer. Water is the only byproduct and no pollutants are emitted.

Fuel cell has higher power generation efficiency, compared to existing power generation technologies. The on-board fuel cell system uses the fuel cell which substitutes the ship's power generator and main engine, produces electricity and propels the ship.

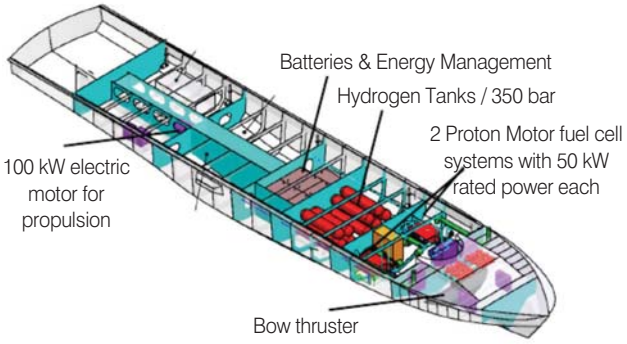

Figure 14. Configuration of on-board fuel cell system

Figure 14 shows the configuration of the fuel cell system with 100kW output which is fitted to a small passenger ship. The fuel cell system consists of hydrogen high pressure container, battery, fuel cell, and electric motor, which substitutes the existing power generator and main engine. The full cell system provides 25MW and 35MW for the ship, and the R&D related to the fuel cell and electric motor is being vigorously conducted.

Trends of regulation in Korea and abroad & technology development

The United States and Canada enforces the air pollution regulations - more rigorous than IMO's Regulations for the Prevention of Air Pollution ? to their coasts. In both countries, the air pollution regulations aim to promote environmental preservation of the Earth and their home countries. The United States and Canada are supporting full support to help develop and commercialize the technology in the first and second phases and commercialize the technology in the third phase.

In Korea, the IMO's Regulations for the Prevention of Air Pollution have yet to be adopted. IMO's Regulations for the

Table 1. Development of domestic technology for green ship

Categories	Title of task	Implementing organization	Progress of task
Ministry of Knowledge Economy (MKE)	Development of medium/low temperature waste heat recovery power generation system for ship	Korean Register of Shipping (KR), Korea Marine Equipment Research Institute (KOMERI), Sungjin Geotech and many others	2011~2016 (5 years)
MKE	Strategy to build up competitiveness of eco-friendly and high efficiency shipbuilding components in the wake of the introduction of ship energy efficiency index system	Korea Marine Equipment Research Institute (KOMERI)	2011 (6 months)
MKE	Development of core technology for reducing the ship resistance and improving the propulsion performance to ensure energy-saving	Korean Register of Shipping (KR), Korea Marine Equipment Research Institute (KOMERI), and many small-to-medium companies	2011~2016 (5 years)
MKE	Development of MCFC system for auxiliary power supply to ship	Korean Register of Shipping(KR) and many small-to-medium companies	2011~2014 (3 years)
Minister of Land, Transport and Maritime Affairs (MLTM)	Project for developing the ship vapor (VOCs) recovery unit (SVRU) and converting the recovered products into fuel	Korean Register of Shipping (KR), Korea Marine Equipment Research Institute (KOMERI), and many small-to-medium companies	2011~2016 (5 years)
MLTM	Green ship exhaust gas post-processing system	Korea Institute of Machine & Materials (KIMM), Korea Marine Equipment Research Institute (KOMERI), and many small-to-medium companies	2011~2016 (5 years)
MLTM	Establishment of green ship TCS system	Korean Register of Shipping (KR), Korea Marine Equipment Research Institute (KOMERI), shipping companies (Hyunda, Hanjin)	2011~2016 (5 years)
MLTM	Designing the solid oxide fuel cell system to provide power to the ship, and laying the technological foundation for the performance qualification	Korean Register of Shipping (KR), and many small-to-medium companies	2009~2012 (3 years)

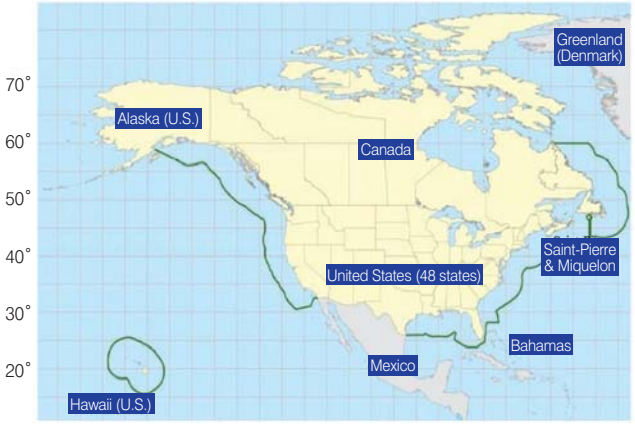

Figure 15. Designation of no air pollutant emission zone within 200 nautical miles of the coast in the United States and Canada.

Prevention of Air Pollution regulate the ships with the engine that has a power output over 150 horsepower. However, the enforcement of IMO's Regulations has been delayed indefinitely in Korea due to the confusion arising from technical problems and lack of awareness.

Although it is unavoidable to apply the IMO's Regulations, particularly to fishing boats, any forcible enforcement is likely to trigger complaints from the cash-strapped fishing fishermen. Furthermore, there is no test equipment, researcher and personnel to evaluate the pollution from fishing boats. However, domestic shipyards completed the technology development in the first phase, and the researches in the second and the third phase are being actively conducted.

SWOT analysis of green ship technology development

• *Strength in the technology for equipment used in green ship*

The ship technology was more advanced than inland transportation technology in the past. For example, the on-board large diesel power generator technology was applied to the onshore power generators, and the fresh water generator (equipment converting the seawater to fresh water) provided the basis for the onshore seawater desalination technology.

Meanwhile, the air pollution control technology for onshore plant have made great strides amid the growing awareness of the air pollution which have worsened since the Industrial Revolution, and this technology is currently being applied to the construction of ships, particularly the green ship.

Domestic technologies for the prevention of air pollution from onshore plant (technology to clean up air pollution from power plants) and enhancing the energy efficiency have reached global levels.

Thus, the nation has adequate technology to develop the equipment used in green ship. In addition, many R&Ds related to renewable energy and fuel cell technology have been conducted, along with the development of professional manpower in related fields. However, the technology to realize the compact on-board facilities is essential for overcoming the space constraints on the ship. That is a difficult technology although it may seem simple.

• *Current domestic green ship and marine equipment industry*

Domestic shipyards maintain the world's top spot in the shipbuilding industry. The shipbuilding industry is particularly different from the automotive industry and other industries. Cars are mass-produced based on model, and the consumers can select what they want.

By contrast, ships are customized based on the type and shape preferred by customers, e.g., European customers, and custom-made strictly according to the specifications of customer. Thus, there is no identical ship, and the requirements of ship owner are very important.

No matter how excellent domestic components/equipment may be available, domestic shipyards have no choice but to use foreign-made components/equipment ? which was designed by the European ship owners - in the design and construction of ship. As a result, domestic shipyards' local content rate of essential components/equipment used in high value-added vessels(LNG carriers, offshore plants, etc) remain below 30%, although they have maintained the top spot worldwide in terms of the design and construction of ship.

There has been a widespread notion that shipyards only have to purchase foreign-made components/equipment without need for investing time and money for the development of components/equipment. In most cases, the investment in the technology development is made by small and medium-sized companies. For marine equipment, the track record in the installation and operation on board ships is considered the most important selection criteria. However, there is no ship that can be used to test the marine equipment in Korea.

Although domestic shipyards build the largest quantity of ships worldwide, the ships are delivered to the ship owner upon completion. The components/equipment which have been developed are not allowed to be installed on board ship without the consent of the overseas ship owner. Thus, domestic companies have to undergo extreme difficulties in installing the localized components/equipment on board ship and commercializing them. Reliability is essential for marine components/equipment. No ship owner would select the components/equipment which do not have the proven reliability.

Trends of domestic green ship industry, conclusion and recommendation

• *Green ship technology development*

Basically, the green ship technology development has gathered speed as the government offers extensive support for R&D and domestic marine manufactures are undergoing a paradigm shift that alters their awareness. Green ship equipment technology lays the foundation for the shipbuilding industry for the next 2 to 3 decades.

Two-pronged approach can be applied to supporting the development of indigenous marine equipment that can be commercialized. The support may be offered in such a way that encourages the heavy industry companies and small-to-medium companies to develop the green ship construction technology and the marine equipment technology, respectively. Particularly, the government needs to put the primary focus of its support on R&D projects and development of parts used in green ship, considering that the commercialization of indigenous products has to be achieved before foreign-made products are commercialized and adopted by overseas ship owners.

• *Expansion of research facilities for green ship development*

The components/equipment for green ship require high initial costs of development and take much time and effort until they are applied to the ship. As mentioned above, the performance qualification of the green ship components/equip-

ment on board ship is important for the commercialization. Thus, the research facilities need to be expanded, particularly in South Gyeongsang Province and Busan where the marine equipment manufacturing companies are concentrated, including the practice ship useful for training the manpower specializing in the operations and repair of commercial vessels or special vessels that can be used for the research into polar regions.

Figure 16. 'Araon', Korea's first icebreaking vessel

• Development of specialized manpower for green ship

The green ship component/equipment sector requires the convergence of various technologies such as mechanics, chemistry, electricity, electronics, etc. Therefore, universities have a limited ability to develop specialized manpower. It is necessary to establish the strategies to strengthen the training and education for those who are engaged in the manufacturing of the components/equipment used in green ship, and the education needs to be practice-oriented, rather than focusing on theories. For that, practice-oriented training courses must be offered, using the dedicated vessel for the performance qualification, to ensure undisrupted supply of technical manpower. In addition, the IMO regulations and their enforcement must be monitored, and furthermore, the roadmap for technology development and detailed strategies need to be mapped out.

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Specializing in large-vessel engines and equipment

STX Heavy Industries was founded in 2004 with a mission of generating customer value through the world's best technology and services. Among a diverse range of industrial offerings, the company specializes in large-sized diesel engine and shipbuilding equipment. From the start, the company had aggressive sales goals.

"Business is good"said, Shon Chang-Kyu, deputy manager of the Engine Designing Team at STX Heavy Industries. "We grew rapidly, with one trillion South Korean won or 863 million US dollars in sales within four years after the launch of our company."

With engine, wire-rod and water treatment businesses as well as cement, environmental, power, steel and chemical plants, STX Heavy Industries is a very successful manufacturer of large-bore diesel vessel engines (equivalent to four million horsepower), ship blocks of 150-tons and deck houses (the superstructures on the upper decks of ships).

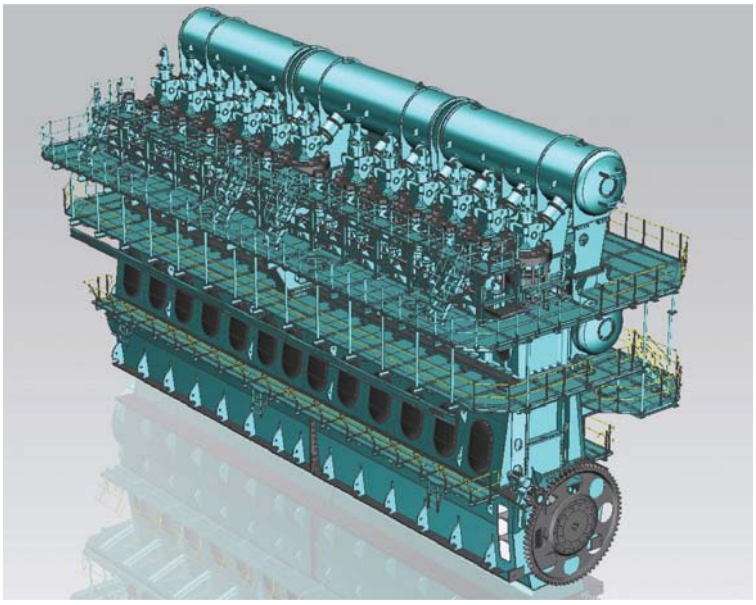
"Our company is well recognized for the technology and value we provide across our product line"said, Chang-Kyu. "This is particularly evident in the large-sized engine installations we do, including LNG carriers, which are tank ships designed to transport liquefied natural gas, and large-sized container ships."

The challenges of assembling large structures

The company's products are designed in accordance with specific customer requirements. Among the various types of equipment that STX Heavy Industries produces, the large-sized container engine presents distinct challenges in the assembly process due to the large number of components required. As a result, significant trial and error can occur when executing the assembly process after design.

For example, the 13,000 TEU (twenty-foot equivalent units) container ship is a vessel that can load 13,000 containers. (Capacity is measured in twenty-foot equivalent units or TEUs, the number of standard 20-foot containers a ship can carry, although today most containers measure 40 feet in length.) Powering a ship that can carry 13,000 full containers requires a big engine, approximately 24 meters (m) long, 11m wide and 14.5m high. Considering this magnitude, if the assembly order is incorrectly applied, a lot of time and labor will be lost in re-assembly, and consequently, the schedule will be delayed, which can be costly.

The company's Technological Research Center of the Engine Designing Department provides an assembly line to address the physical assembly of engines and any associated issues. However,



most issues are identified and corrected digitally today using a 3D virtual assembly process.

STX Heavy Industries optimizes its design and assembly operations process using product lifecycle management (PLM) technology - NX™ software - from Siemens PLM Software.

Ramping up fast

The first engine STX Heavy Industries designed using NX - the MAN B&W 12K98MC-C7 - was for a 13,000 TEU container ship. It is the biggest vessel engine manufactured by STX Heavy Industries.

In February, 2009, STX Heavy Industries generated a video of the engine assembly sequence using NX virtual model data. Specifically, the work process video was created using the modeling, assembly and assembly sequence visualization modules of NX. For visualization, 70 percent of the NX data and 30 percent of the 2D CADAM data (prior system) were used.

In assembling such a large engine, the common problem experienced by many companies is weight. Unless the sequence of assembling the components is optimized, significant time is lost in rework. Moreover, any moderate error can cause significant disruption in the engine assembly process, and likely a great deal of time and money lost.

STX Heavy Industries has virtually eliminated any such disruption by using NX. The sequencing of the virtual assembly process can be executed in the same way as the on-the-spot physical assembly process. The virtual assembly of such a large number of components is made possible through the use of the JT™ data format, which notably reduces file size. As part of its new, highly efficient virtual process, the company upgraded its hardware and operating system to 64-bit technology, which accommodates greater memory requirements.

Business challenges:

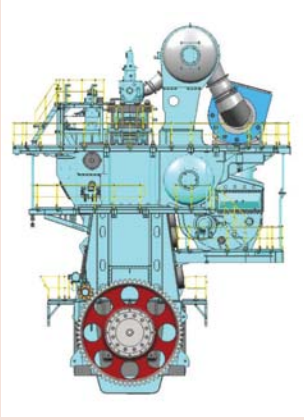
- Introduce visual simulation technology
- Identify and verify optimal engine assembly process

Keys to success:

- Engage NX for the virtual design and assembly of large vessel engines

Results:

- Increased technological prowess
- Virtually assembled largest engine to date in its class, resulting in smooth and efficient on-site assembly
- Reduced costs
- Improved standing with customers
- Significantly enhanced validation process, resulting in a 20-30 percent improvement in work efficiency



"STX Heavy Industries is recognized for technological excellence and market competitiveness, and with NX, we have gained a significant advantage in advancing these attributes with our customers. Specifically, NX enables us to visually simulate the process for the assembly of our large sized engines and secure the packing scheme for the delivery of these engines to the shipyard. As a result of using Siemens PLM Software's solution, we significantly enhanced our validation process, resulting in a 20 to 30 percent improvement in our work efficiency."

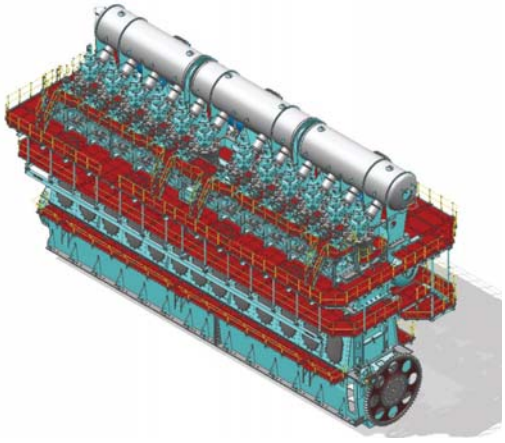
Significantly improving productivity

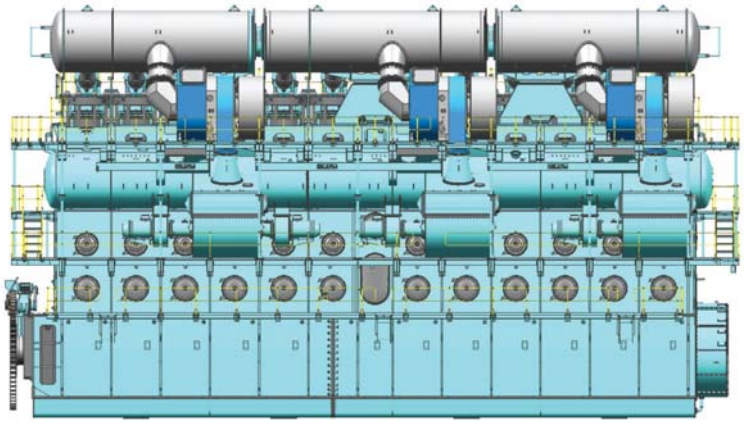
STX Heavy Industries completed the design of the 12K98MC-C7 engine as well as simulated its assembly before delivering it to its sister division, STX Offshore & Shipbuilding Co., Ltd. "The engine is the company's biggest in terms of size and power, as well as its fastest, with an average speed of 25.2 knots"said, Chang-Kyu. "In fact, it is the fastest engine in the world compared to other engines in the same class."

"While the design of the engine is critical to its success, its delivery and setup are key to the integrity of our relationship with customers, and important to our profitability"said, Chang-Kyu. "I am happy to report that the engine was assembled smoothly and quickly on site."

According to Chang-Kyu, visualization is key: "The advanced assembly simulation capabilities of NX are helping us significantly improve productivity and ensure that schedules are met. By finding and correcting errors, interferences and other issues during the design process, unexpected problems are avoided downstream. It is especially important that the assembly order be verified virtually so that the same assembly order is properly executed for the on-site assembly. Prior to NX, the company experienced costly setbacks in this area."

Chang-Kyu concludes, "STX Heavy Industries is recognized for technological excellence and market competitiveness, and with NX, we have gained a significant advantage in advancing these attributes with our customers. Specifically, NX enables us to visually simulate the process for the assembly of our large-sized engines and secure the packing scheme for the delivery of these engines to the shipyard. By securing the assembly order virtually, we have eliminated the on-the-spot burden of physical assembly testing. And we have bolstered our credibility with our customers."He added, "As a result of using Siemens PLM Software's solution, we significantly enhanced our validation process, resulting in a 20 to 30 percent improvement in our work efficiency."





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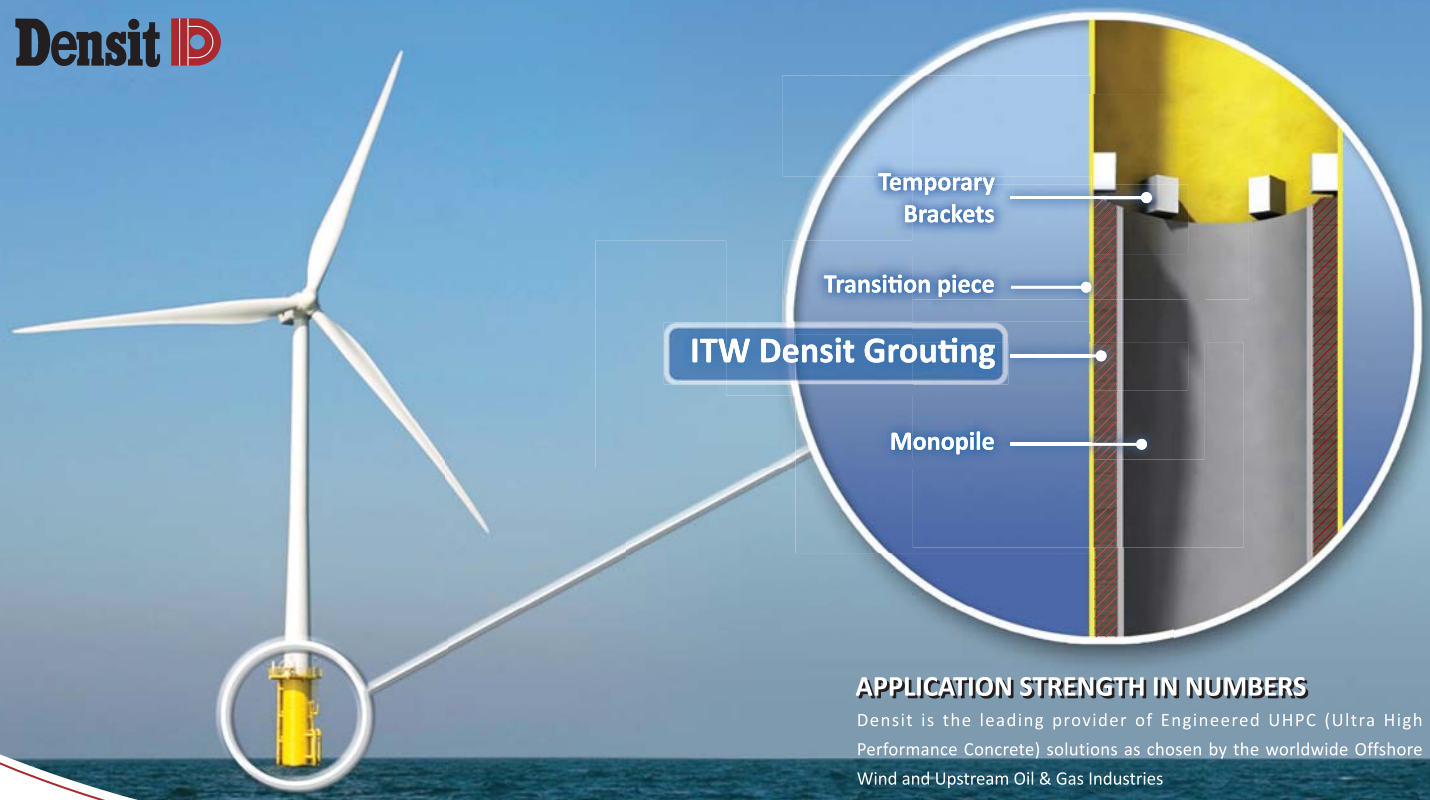

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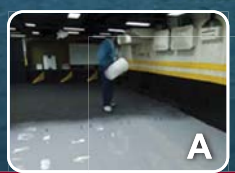

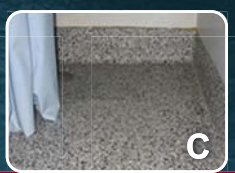

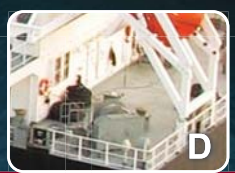

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Every discipline must work live in the 3D Model

SBM Offshore's Schiedam office started its first FPSO design project with AVEVA PDMS. Over the next four years the deployment of AVEVA tools was successfully extended around the globe.

AVEVA Korea

SBM Offshore N.V. designs and provides offshore energy systems on a lease or sale basis for clients mainly active in offshore oil and gas production. The company operates globally with seven units and is listed on the Amsterdam stock exchange. There is a long list of 'firsts' in which the company claims technology leadership or at least to be a trendsetter. At the end of 2010, over 4,100 people worked for the company. In the fiscal year 2010, 3.05 billion US dollars (+3.4% compared to 2009) turnover and a net profit of 276 million US dollars (+20% compared to 2009) were generated. An actual backlog of 15.7 billion US dollars (a new record for the company) is also shown in the annual reports.

The company's business activities include the engineering, supply, and offshore installation of facilities for the production, storage and export of crude oil, gas and liquefied natural gas (LNG). These comprise Floating Production Storage and Offloading systems (FPSOs), Floating Storage and Offloading systems (FSOs), Tension Leg Platforms (TLPs), monohull and semi-submersible Floating Production Units (FPUs), as well as selfelevating Mobile Offshore Production Units (MOPUs).

The portfolio includes all the systems, mostly based on the single-point mooring principle, used to moor crude oil and gas carriers in open seas for the purpose of loading or offloading cargoes. Derived from the same technology are complex mooring systems that anchor the floating production facilities in oil and gas fields.

There are various types of mooring systems, such as fixed heading or weathervaning, permanent or disconnectable. R&D expenditure amounted to 20.7 million US dollars in 2010.

The upgrading and pre-conversion of the 255,272 dwt tanker, Accord, into the P-57 was completed at Keppel Shipyard in Singapore earlier in 2010.The engineering was done in Schiedam. SBM delivered the FPSO to the owner, Petrobras Netherlands. The FPSO operates in the Jubarte Campos Basin which is 70km offshore the state of Espírito Santo, Brazil. Photograph courtesy of Mercator Media.

SBM Offshore operates from four main project execution centres with engineering and project management resources located in Schiedam/Netherlands, Monaco, Houston/Texas (USA) and Kuala Lumpur/Malaysia. Our editor spoke to Frans de Klerk, Department Manager Topsides Design, and Albert te Pas, Discipline Manager of the PDMS Administrator Group, both in the Schiedam office which is part of the SBM Offshore group.

The market de Klerk's group is mainly involved in is the FPSO market. Roughly speaking, a

FPSO is a floating plant. Most of these units are owned by the SBM Offshore group and leased to oil and gas companies. The consequence: SBM Offshore acts as owner operator and the office in Schiedam as EPCI contractor.

The department here in Schiedam, just a few minutes ride by metro from Rotterdam Centraal, mainly designs the process utilities on board the vessel. About 85 people are working in the four disciplines: “piping”, “mechanical equipment”, “structural”, and “PDMS group”. The PDMS group headed by Albert te Pas is basically focused on the administration and development of PDMS from AVEVA plc. headquartered in Cambridge/UK - it is a facilitating group for the other disciplines. This fact already shows the importance of the effective deployment of integrated 3D plant design processes for SBM Offshore.

AVEVA Clash Manager in use in Schiedam. Image courtesy of SBM.

Three projects with a total volume of about two billion US dollars are currently executed simultaneously. ‘Our projects are mainly conversions of trading tankers,’ Mr de Klerk explains and adds: ‘That means we take existing tanker layouts and modify the design and build a new plant on top.’

Settlement of conflicts

In the Schiedam office, 11 AVEVA PDMS licences and 25 AVEVA Outfitting (in the AVEVA Marine suite of applications) licenses are in use. One of the main reasons for the use of PDMS is efficient clash management. Most of the time a clash is caused by two disciplines using the same space, e.g. there is a structural reinforcement and a pipe going through it. ‘Sure, you want to solve this problem before it comes up in the yard,’ Mr te Pas says and refers to AVEVA Clash Manager. With the remark: ‘If you have an access route, for example, which is colliding with a region reserved for maintenance of a piece of equipment, that might be no problem.

But if you do such checks on a weekly basis - and our projects typically last between 12 and 14 months - this clash pops up at least 50 times. With the Clash Manager the user can say: “I approved this clash,” and then he only gets new clashes, the non-critical ones are suppressed,’ says Mr te Pas, giving an insight into the daily work routine. And de Klerk adds: ‘This really saves us a lot of time.’ In total, there are three types of clash management tools in use:

- The one within PDMS.
- On top of that, a slightly more enhanced tool. It was created by SBM Schiedam itself and is used on a daily basis.
- About once a week the AVEVA Clash Manager is used as an application. It works on a separate desktop and has access to a SQL server.

AVEVA Clash Manager is a kind of an umbrella application to check the consistency over the whole project. In that tool, rules and settings are defined to separate non-relevant clashes from real ones. ‘At a certain moment you only have what we call “hot clashes”. These are detected by the PDMS Design Coordinator of the project because he runs the Clash Manager. Together with our Lead Engineers responsible for special plant modules, the PDMS Design Coordinator tries to settle the conflict. If both can’t approve, they have to delegate the problem to the designers of the different disciplines to solve it,’ says Mr te Pas, explaining the procedure.

Global work sharing

Apart from the four SBM execution centers, three subcontractors (in Serbia, in Romania, and in India) and construction yards in Singapore and Brazil benefit from PDMS for project

execution. The PDMS Global application coordinates the worldwide work split. In doing so, a centralized PDMS project owner ("Hub") is defined to connect the other sites as satellites. 'As the admin of the hub, we control everything,' says Mr de Klerk self-confidently. The tasks of the Hub include:

- set-up of PDMS project system environment
- creation of databases
- allocation of databases to satellite locations
- changing access rights (read/write) for satellites
- the definition of synchronization events between the Hub and satellites
- the control of databases with regard to the data quality aspects.

The database set-up includes providing catalogues, material specifications, dictionaries, design tools, and numbering/naming systems to control the other databases. Generally, AVEVA Global updates all model information around the world. 'For instance, if we include additional valves or other pieces of equipment into a catalogue, following synchronization the data also becomes available for the subcontractors,' says Mr te Pas to give an example. Several tools are implemented to check the data quality of the publication mechanism. Otherwise: 'Rubbish in means rubbish out,' stresses Mr te Pas and adds: 'Correct input is a must!'

Hull design

'For the first time, we are using the Hull application and AVEVA Outfitting,' Mr te Pas says. The reason is that in a specific project the hull is designed completely from start. Normally it is a conversion of an already existing project. AVEVA Outfitting has the same basic functionality as PDMS, but with a different nomenclature. The advantage of AVEVA Outfitting is that instead of PDMS it can read in the hull shapes in its database.

It is used to generate plan and section drawings of each discipline, to support the design and to create support detail drawings. The company has decided to move from using PDMS into using AVEVA Marine (hull and outfitting integrated). At this moment, 25 Outfitting licences are rented and five licences are in permanent use for the hull design.

Increasing complexity

Every new project is more ambitious than its predecessor. 'Remember: crude oil of different origins is different. The oils differ in their chemical composition, in their viscosity and so on. All fields where light and clean crude oil is concentrated have already been explored.

Only the difficult ones are left - in deep water, low in quality, which, for instance, means a lot of supply has to be removed, and sometimes the oil is contaminated, which is very dangerous, so safety is a big issue,' says Mr de Klerk. The consequence is that the production facilities require more and more components, but the available space remains the same. Additionally the production rate is going up.

Ten years ago, FPSOs produced 50,000 barrels a day, nowadays it is up to three times as much even though it is a more advanced process. Mr te Pas enters into the argumentation from a different point of view: 'But another challenge is the increased complexity of the project execution - you want to control and monitor what's happening in the project far more.' To meet this extensive requirement, data management is involved. 'For us it means we have to continuously improve our work processes because you have to do everything in a more structured way. A more sophisticated database environment is the consequence.'

Documented best practices, e.g. expressed in templates, are crucial for SBM Offshore. But, as Mr te Pas points out, the biggest advantage is that SBM Offshore is always working in the same engineering-IT environment. It uses its own 'standards', which recur in every project. The effectiveness of standardized processes is tracked over many years. Mr te Pas summarizes: 'We are following AVEVA's philosophy because it is our own philosophy: Every discipline has to work live in the 3D model and then generate drawings.' There is no doubt that this is a clear strategy for integrated processes and workflow management.

Notice

* This article was originally published in digitalPLANT Business + Engineering in 2011. Published here is an updated version.
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Hammelmann High pressure systems in the plant industry

Process pumps - High pressure pumps – Cleaning systems

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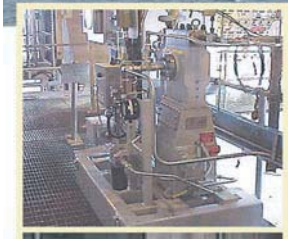

Typical applications

Methanol injection

Fatty alcohol process
LDPE
Wet oxidation
CO_2 extraction
Mill scale removal
Non woven fabrics
Boiler feed pumps
Re-injecting reservoir water

Typical fluids

- Acrylic acid
- Adipoladipinat
- Butane
- Carbon dioxide
- Diesel oil
- Ester
- Ethanol
- Fatty acids
- Glucose
- Glycol
- Inhibitors
- LDHI
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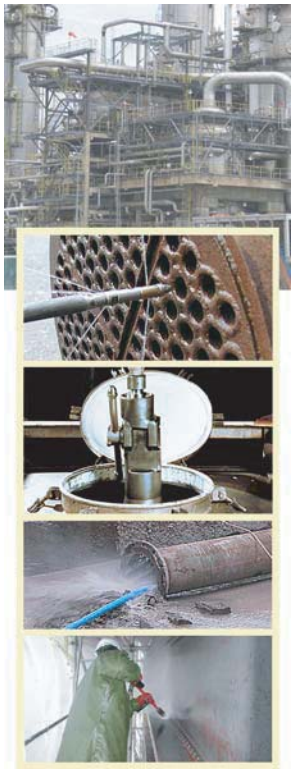
- Abrasive cutting: abrasive entrainment and cutting nozzles, abrasive container, precision cutting components



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Compact, Highly-Efficient, Quick-Starting Steam Generator Systems

Since its inception on October 20, 1930, Clayton Industries has established a world-wide reputation as a leading manufacturer of equipment for industrial process steam generation?both fired boilers and unfired waste heat boilers. Their unique controlled circulation, counter-flow design offers many operational advantages and benefits over conventional boilers. Clayton Industries' design principles and the use of the latest technology in its control systems make them the favorite choice in today's high efficiency energy markets.

Clayton Industries

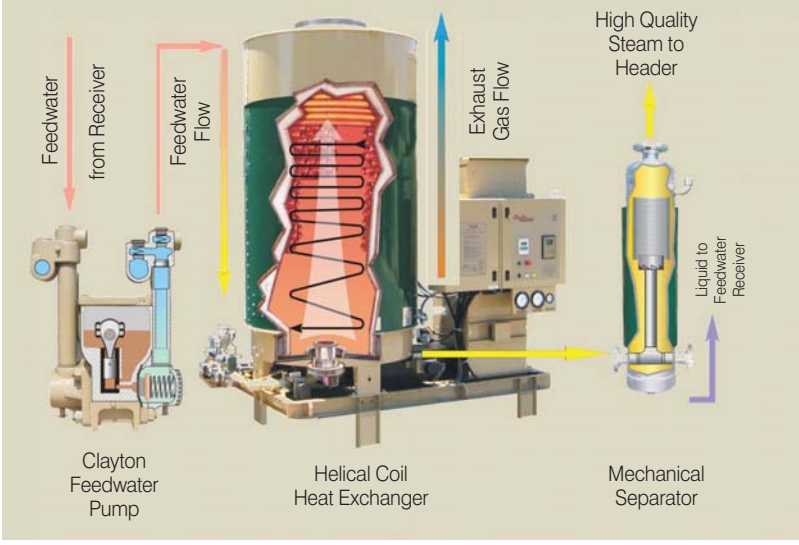
Introduction

The company is headquartered in City of Industry, California, USA and has major manufacturing facilities located in the United States, Belgium and Mexico to serve its diverse worldwide markets. Direct Sales and Service support centers are located worldwide and are provided by carefully selected and thoroughly trained distributors in many areas throughout the world. Clayton understands that new ideas and technology are the driving force in the economies of developed and developing countries around the world. Clayton Industries is ideally positioned to lead this technological revolution through the 21st century and beyond by providing its customers with reliable and highly efficient compact steam generating systems.

Increasing the Productivity of Steam

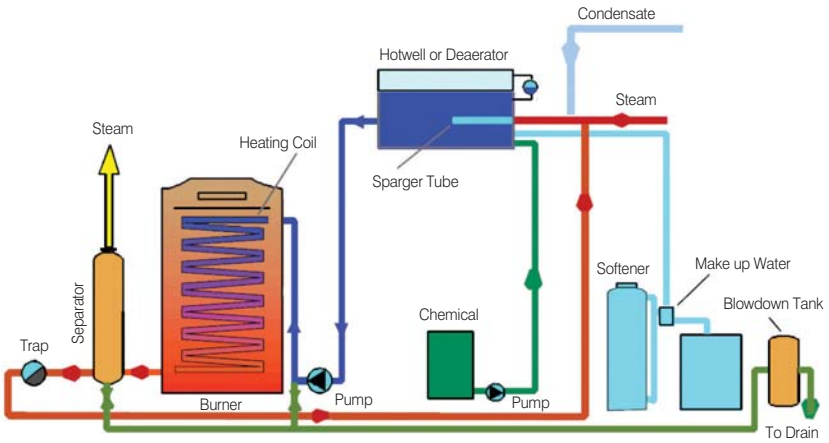
- Making steam is not difficult: In a manufacturing environment, however, the challenge lies in harnessing the energy of steam in a manner that makes it available quickly, cost-effectively and safely.
- This is where Clayton Industries excels: The design of conventional boilers has changed little since the 19th Century. In simplistic terms, water in a vessel or tube is heated by surrounding hot gases. After sufficient heating, the resultant steam is discharged.

All Clayton steam generators and waste heat boilers employ more sophisticated principles: Controlled Circulation and Counter flow heat transfer. A pump continuously supplies feed water to a helical coil heat exchanger, which transfers its heat to the water. The flow of feed water is counter to the flow of combustion gases, an engineering principle that contributes to high fuel-to-steam efficiency. Water leaving the heat exchanger passes through a mechanical separator where the liquid and vapor are separated. Steam exits the separator to the steam header. The principles of Controlled Circulation and Counter flow and the resultant low water content result in many of the advantages provided by Clayton Steam Generators.



Performing with Drill Team Precision

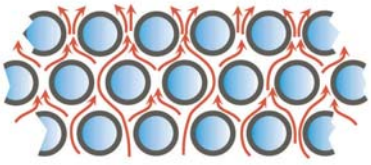
Each component of a Clayton steam generator is designed for optimal utility. The result is a remarkably efficient unit that functions as smoothly and precisely as a drill team. A heavy-duty positive displacement diaphragm pump provides precise water control. Superbly engineered and ruggedly constructed, a Clayton pump is pack-less and seal-less: features that contribute to its remarkable dependability.



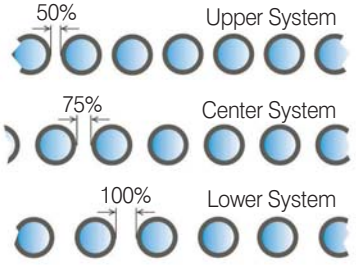
System Design - Monotube, Forced Flow, Steam Generator Schematic

A single high-grade carbon steel continuous-coil heat exchanger employs a staggered configuration and spacing of coil sections to help ensure turbulent and high velocity gas flows that facilitate high rates of heat transfer.

A feedwater cooled combustion chamber extracts radiant energy and maintains a cool outer shell. The third critical component in a Clayton steam generator is a fixed-vane separator that yields the driest saturated steam available. Exceptional water separation is achieved at all steam production rates when high velocities of steam and water pass through the separator nozzle. A steam trap diverts excess water to a feedwater receiver where it is used to preheat feedwater. Other components include a burner and blower assembly that assure complete combustion and delivery of maximum heat to the coil.



Staggered tube spacing
creates turbulent gas flow



Varying tube spacing
ensures high gas velocity

Efficiency by Design

- Fuel Efficient, Quality Steam, Low Blowdown

The Clayton focus on innovation in steam generation technology pays off for users in an abundance of very practical ways... benefits that translate into improved performance on the production or processing line, and in measurable cost savings as well.

As a result of unique design and easily proven operational advantages, Clayton steam generators are noted for fuel efficiency, rapid start-ups, compact size and reduced weight, delivery of high quality steam, safety, and fuel burning versatility. Clayton generators run on natural gas, light oil, heavy oil, propane, bio-gas, hydrogen, or combinations of these fuels.

Another benefit of innovative design: reduced blowdown. The amount of water removed from the system to maintain an acceptable level of total dissolved solids (TDS) is greatly reduced compared to conventional boilers. This results in significant savings in fuel, water and chemicals - savings in blowdown are typically 90% or greater.

Start Fast, Finish Strong

- Fast Start, Rapid Response

Efficiency is proven on the factory floor. Among the operating features of Clayton steam generators that are valued most by industrial customers are quick starts and rapid response to changing load demands.

Where conventional boilers require extended start-ups, a Clayton steam generator can be brought to a full head of steam in as little as five minutes. The quick start and response capabilities result primarily from the low water content, forced circulation and helical coil design.

What's more, corporations worldwide frequently favor multiple Clayton generators over a single, high capacity conven-

tional boiler. Why? Because Clayton units, with their small "footprints," can be added to a production line with minimal disruption. Steam remains available when a single unit is down for maintenance or repair. Best of all, fluctuating loads are not a problem. A single Clayton generator can be fired to meet low demand, and others brought on line rapidly as steam requirements increase.

Clayton steam generators are conclusive proof that time saved is fuel saved and time and fuel cost money.

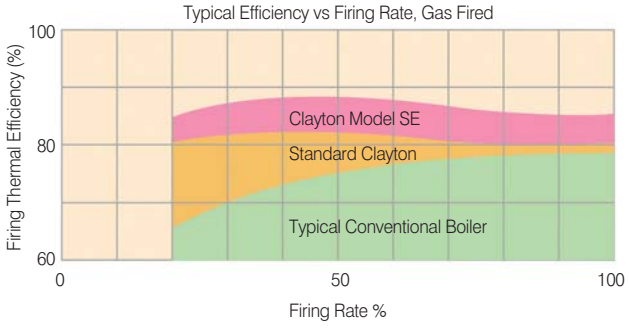
Preventing Problems Boosts Efficiency

- Scale and Soot Control

Clayton recognizes that controlling familiar steam production problems contributes to production or processing line efficiency. That's why a Clayton steam generator has features designed to inhibit the build-up of scale and soot.

Because scale and soot act as insulators that inhibit heat transfer, both result in wasted fuel. One-sixteenth of an inch of scale requires 15% more fuel; 1/32 of an inch of soot requires 12% more. Thicker build-ups affect fuel consumption more drastically.

Further, a Clayton steam generator provides an automatic indication of scale build-up: an increase in feed pump pressure. When a pressure increase is noted, the operator can take immediate corrective action. In addition, Clayton offers an optional built-in steam soot-blower that permits fast, easy cleaning of the heating surface.



Consider the Advantages of Small

- Low Weight/Space, Safety

"Good things come in small packages," right? And if proof is ever needed, it's as close as the nearest Clayton steam generator.

Because every Clayton unit, from smallest to largest, incorporates counterflow and controlled circulation design, they occupy considerably less floor space than conventional boilers of equal capacity. Additionally, a Clayton steam generator is considerably lighter than its conventional counterpart. The weight difference can be as much as 75%.

The economic advantages to the user are apparent. Clayton steam generators can be installed more quickly. Their small footprint requires less space on the plant floor or utility room.

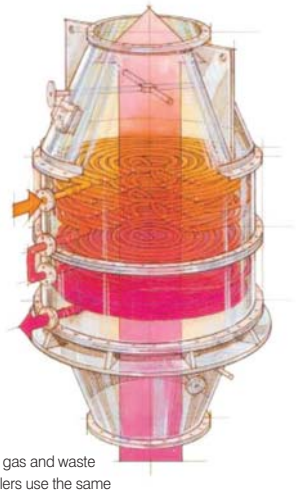
Another advantage: The Clayton design provides unparalleled safety. There has never been, nor can there be, a steam explosion of a Clayton steam generator. Clayton steam generators: Smaller size. Bigger results.

Heat Recovery Delivers Additional Cost Benefits

In a great many applications, heat is a necessity. In any application, wasted heat is wasted money. That's why Clayton offers a complete line of heat recovery systems used worldwide in marine, industrial and power plant operations.

Recovering heat from engines, turbines, ovens and furnaces, Clayton Waste Heat Steam Generators (WHSGs) and Exhaust Gas Boilers (EGBs) work with input temperatures as low as 480°F (250°C), and as high as 3,500° F (1,925°C). Available in a variety of steam/water flow configurations, WHSGs and EGBs, like the company's standard steam generators, employ the proven Counterflow and Controlled Circulation heat exchanger concept. They are equally simple, durable and reliable.

Co-generation makes extensive use of this Clayton technology. Here EGB systems recover heat from reciprocating engines and put it to work meeting a factory's processing or production needs.



Exhaust gas and waste heat boilers use the same proven design as the fired steam generators.

Among the Reasons A Single Source Satisfies

A single source satisfies in a multitude of ways. Among the

Three 600 BHP and one 300 BHP steam generators in a midwestern utility plant.

Three 350 BHP steam generators in a Spanish pharmaceutical plant.

variety of creatively designed products and responsive services designed to meet the special needs of industry:

- SigmaFire™, a line of steam generators in the 10 to 200 boiler horsepower range (100 to 1,940 KW). SigmaFire steam generators use proven Clayton design features in small, light, quiet-running modular units that are quickly and easily installed.
- Emissions control units designed to meet whatever your emissions restrictions may be. These optional systems can reduce NOx levels to as low as 9 ppmv and CO to 50, depending on the particular generator and the emission control system chosen.
- Fluid heaters that produce steam in a manner that frequently eliminates the need for licensed boiler operators, that may be required by the operation of conventional boilers.
- Rental skid-mounted steam generation systems configured to meet emergency or temporary steam requirements. This popular program includes packages from 30 to 300 BHP.
- Compusteam PLC Control Systems for automated steam generator control, standard on many models. This system offers numerous advantages, including a simplified panel, improved steam pressure management, and compatibility with remote monitoring and plant control systems.
- Feedwater analysis and treatment that prolongs equipment life and helps assure optimal steam production. Specially trained Clayton personnel can recommend a program customized to meet your requirements and arrange delivery of the only chemicals compounded specifically for Clayton steam generators.

Summary

The Clayton Steam Generator incorporates many design features that make it inherently more efficient than conventional firetube boilers for the production of steam. The forced-flow, monotube construction is significantly different from the multiple pass firetube design used in conventional boilers. The Clayton unit is more compact and contains a small fraction of the steam and water under pressure. This allows quicker start-up and shut-down with less heat loss, which in turn saves fuel. Also, with less water and steam under pressure, there is less stored energy and no potential for a dangerous steam explosion.

The steam generator requires a pump for flow through the heating unit. The pump, which has the ability to recycle hot condensate at elevated pressure and temperature, permits conservation of additional heat.

Clayton provide economy over conventional boilers that may amount to fuel savings of up to 20%. Other features inherent in the Clayton design can contribute additional savings of up to 10%, with overall fuel savings possible in the 20 to 50% range depending on specific customer circumstances.

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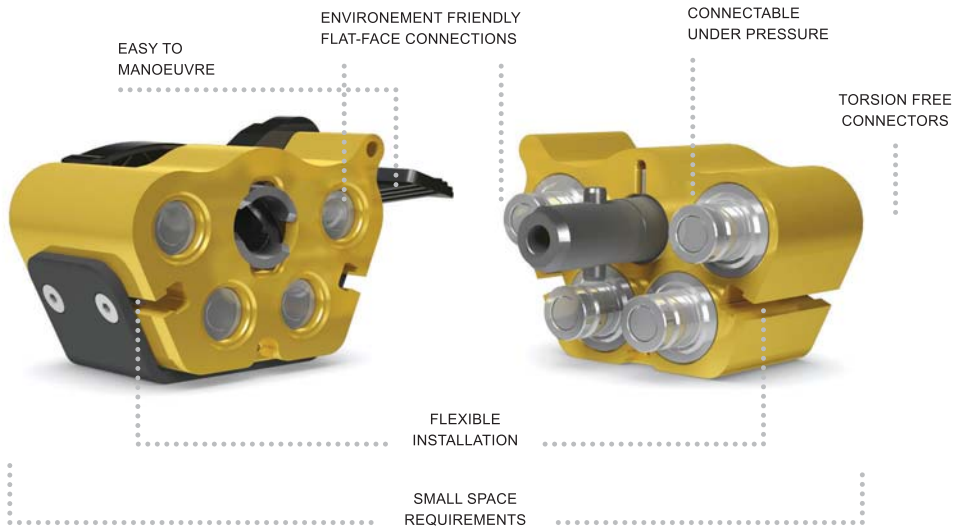

Products

- MultiX Duo 10 = 2x 3/8" (DN10)
- MultiX Duo 12.5 = 2x 1/2" (DN12.5)
- MultiX Quattro 10 = 4x 3/8" (DN10)
- MultiX Quattro 12.5 = 4x 1/2" (DN12.5)
- MultiX Quattro 10/12.5 = 2x 3/8" (DN10) + 2x 1/2" (DN12.5)
- MultiX Quattro 12.5/19 = 2x 1/2" (DN12.5) + 2x 3/4" (DN19)

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. Connectable under pressure
. Self-aligning hose connectors

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Excelerate Energy Enters Into a Shipbuilding Option Agreement with DSME for Eight New FSRUs

Excelerate Energy announced it has entered into a shipbuilding option agreement with Daewoo Shipbuilding and Marine Engineering (DSME) for the delivery of up to eight Floating Storage and Regasification Units (FSRUs) between early 2015 and early 2017 on Aug 7, 2012.

The agreement affords Excelerate, the world's largest operator of regasification vessels and developer of LNG import solutions, the ability to increase its fleet of nine FSRUs as global demand for LNG import solutions continues to expand rapidly.

The initial options are for 173,400 m^3 LNG FSRUs that will measure 294 meters in length and 46 meters in width and will be capable of a baseload send-out capacity of 800 MMcf/d with peaking capacity in excess of 950 MMcf/d. The FSRUs will be based on Excelerate's ninth FSRU under construction at DSME and committed to the Petrobras VT3 project. The company has the option for smaller or larger capacity vessels depending on the future requirements of the market. The new vessels will incorporate Excelerate Energy's proven Energy Bridge™ Technologies and will represent the largest and most capable FSRUs in the world.

"Excelerate Energy is very pleased to continue its longstanding relationship with DSME in building the industry's leading FSRUs which, in long-term service, have proven to be safe, efficient and reliable components of our comprehensive suite of LNG import solutions," said Edward Scott, Excelerate Energy's Senior Vice President of Development. "As we see our existing assets being committed to projects and the worldwide market continuing to grow, we believe this is the right time to partner with DSME in order to continue to provide LNG import solutions in a timely and efficient manner."

Excelerate has developed and commissioned six LNG import facilities worldwide, with a seventh facility entering service in the fourth quarter of 2012 and an eighth terminal currently in advanced stages of development in Puerto Rico. Looking forward, Excelerate has a significant project development portfolio for both floating regasification as well as floating LNG production projects. The additional vessels will support the advancement of these projects.

Excelerate Energy, 대우조선해양과 8기 LNG-FSRU 옵션 계약

세계 최대 LNG-RV 및 부유식 LNG 인수 터미널 솔루션 업체인 Excelerate Energy는 대우조선해양과 8기 LNG-FSRU의 건조를 위한 옵션 계약을 체결했다고 지난 8월 7일 발표했다. 납기는 2015년 초부터 2017년 초까지이다. Excelerate Energy는 현재 9기의 LNG-FSRU 선대를 이미 보유 중이며, 앞으로 부유식 LNG 인수 터미널에 대한 수요가 전 세계적으로 급속히 확대될 것으로 보고 있다.

Excelerate Energy의 새로운 옵션 물량은 대우조선해양이 이미 건조 중인 자사의 LNG-FSRU를 기본으로 하는 173,400m^3 규모로 설계 및 건조될 예정이다.(하루처리량 22,500,000m^3의 세계 최대 용량의 재기화 시스템 탑재) Excelerate Energy는 향후 시장 수요에 따라 LNG-FSRU 이외에도 부유식 LNG 생산설비(LNG-FPSO)에 대한 프로젝트 개발도 적극 추진 중이다.

한편 대우조선해양은 지난해 8월 Excelerate Energy로부터 동급의 LNG-FSRU 1기를 2억8000만 달러 이상 규모로 수주한 바 있다. 특히 이번 LNG-FSRU는 대우조선해양이 독자적으로 설계하며, 최고 속도 18노트 및 LNG-RV 겸용으로 사용할 수 있는 것으로 전해졌다.

BP awards Emerson multi-million-dollar contract to provide automation technology and services

Emerson Process Management has been awarded a $ 23 million contract by BP to supply integrated control and safety systems for two new bridge-linked platforms for the Clair Ridge project. Clair Ridge is located in the North Sea to the west of the Shetland Islands, U.K. It is being developed by BP and its co-venturers ConocoPhillips, Chevron and Shell.

In addition to providing automation technology, Emerson will serve as the project's main automa-

tion contractor (MAC) under its global agreement with BP. As MAC, Emerson will conduct front-end engineering and design (FEED) for the integrated control and safety system, as well as other services that include automation engineering, installation, acceptance testing, commissioning, configuration, and start-up support.

The integrated Emerson solution will use Emerson's PlantWeb™ digital plant architecture, including its DeltaV™ digital automation system, DeltaV SIS™ process safety system, and AMS Suite predictive maintenance software. These digital automation technologies will support BP's Field of the Future® program for enhancing operating efficiency and oil recovery.

The DeltaV digital automation system will control and monitor platform operations using FOUNDATION fieldbus and Emerson's Smart Wireless communication technologies. The DeltaV SIS system will perform process and emergency shutdown functions, if needed, plus fire and gas detection to enable secure control of oil production on the platform. Emerson will also provide a high fidelity process model, an operator training system, and on-going support for the automation system. The integrated control and safety systems will have embedded device management capabilities provided by AMS Suite to enable remote management and diagnostics of valves and instruments from an onshore location.

Wellhead monitoring and control functions will take advantage of Emerson's Smart Wireless technology, which helps reduce engineering and cabling costs as well as installed weight on the offshore platforms. A separate wireless plant network will support applications such as mobile workers and video streaming for flame detection.

The Clair Ridge project is one of four new oil and gas projects being developed by BP and its co-venturers. These BP projects involve a total investment of almost £10 billion in the UK's oil industry over the next five years and will help to maintain BP's production from the North Sea for decades to come

에머슨, BP와 북해 오일 생산 관련 자동화 기술 및 서비스 계약 체결

에머슨 프로세스 매니지먼트는 BP와 2,300만 달러 규모의 계약과 함께, Clair Ridge 프로젝트에서 사용되는 두 가지의 새로운 브릿지 연결형 플랫폼을 위한 통합 제어 및 안전 시스템을 공급하기로 했다. Clair Ridge는 영국 셔틀랜드 섬의 서쪽, 북해 지역에 위치해 있으며, BP와 공동 투자자인 ConocoPhillips, Chevron 및 Shell에 의해 개발되고 있다.

에머슨은 자동화 기술을 제공할 뿐만 아니라, BP와의 국제 협약 하에, 프로젝트의 주요 자동화 계약자(MAC)로서의 역할을 담당할 계획이다. MAC으로서 에머슨은 통합 제어 및 안전 시스템 프론트-엔드(front-end) 엔지니어링과 디자인(FEED)을 담당하며, 이외에도 자동화 엔지니어링, 설치, 합격 판정 시험, 커미셔닝(commissioning), 환경설정 및 스타트업 지원을 포함한 여러 서비스를 제공할 예정이다.

에머슨은 DeltaV™ 디지털 자동화 시스템, DeltaV SIS™ 프로세스 안전 시스템 및 AMS Suite 예측 유지관리 소프트웨어를 포함한 PlantWeb™ 디지털 아키텍처를 이용한다. 이러한 디지털 자동화 기술은 BP의 'Field of the Future® 프로그램'을 지원하여 가동 효율성과 오일 유회수를 향상시킨다.

DeltaV 디지털 자동화 시스템은 FOUNDATION fieldbus와 에머슨의 스마트 무선 커뮤니케이션 기술을 사용하여 플랫폼의 운영을 제어 및 감시한다. DeltaV SIS 시스템은 프로세스와 긴급 가동 중지 기능을 수행하며, 필요시 플랫폼의 오일 생산을 안전하게 제어하기 위해 화기와 가스를 탐지한다. 통합 제어 및 안전 시스템은 AMS Suite에 의해 제공되는 내장형 기기 제어 기능을 가지며, 밸브와 기기를 내륙에서도 원격으로 제어하고 진단한다.

또한 유정을 모니터링 및 제어하는 기능은 에머슨의 스마트 무선 기술을 사용하게 된다. 이 기술은 엔지니어링과 케이블 비용을 줄일 수 있는데, 별도의 무선 플랜트 네트워크는 화기 탐지를 위한 모바일 작업자 및 비디오 스트리밍과 같은 애플리케이션을 지원한다. 한편 BP는 에머슨과 Micro Motion® Coriolis 질량 유량계 공급에 대한 추가 계약도 체결했다.

Clair Ridge 프로젝트는 BP와 공동 투자자들이 진행 중인 네 가지의 새로운 오일 및 가스 프로젝트 중 하나이다. 이러한 BP 프로젝트를 통해 앞으로 5년 간 영국의 오일 산업에 총 £ 100억 가까이 투자될 예정이다.

STXOS won an order worth KRW 335 billion for 4 units of container Ro-Ro vessels

STX Offshore & Shipbuilding (STXOS) announced on July 19 that it secured an order for 4 units of 45,000 DWT container Ro-Ro vessels from the Italy-based Ignazio Messina & C. S.p.A. These vessels will be built at Jinhae shipyard of STXOS and delivered to the ship owner on a staggered basis from June 2014 to December of the same year.

These container Ro-Ro vessels, ordered to STXOS this time, are a hybrid vessel capable of carrying both containers and cars. Headquartered in Genoa, Italy, Ignazio Messina & C. S.p.A, the ship owner, is a shipping company that specializes in container Ro-Ro vessels and operates the fleets on the route of Mediterranean Sea, Middle East, and East/West/ South Africa.

4,300 TEU containership built by STXOS

STX조선해양, 3,350억원 규모 컨테이너-로로선 4척 수주

STX조선해양은 이탈리아 이그나지오 메시나(Ignazio Messina & C. S.p.A.)로부터 45,000DWT급 컨테이너-로로선 4척을 수주했다고 지난 7월 19일 밝혔다. 이번에 STX가 수주한 선박은 STX조선해양 진해조선소에서 건조되어 2014년 6월부터 12월까지 차례로 인도될 예정이다.

이번에 STX조선해양이 수주한 컨테이너-로로선은 컨테이너와 자동차를 모두 운반할 수 있는 하이브리드 선박이다. 선주사인 이그나지오 메시나는 이탈리아 제노아에 위치한 컨테이너-로로선 전문 선사로 현재 지중해, 중동, 서남동 아프리카 루트에서 선대를 운영하고 있다.

Rolls-Royce gas engines to power Norwegian cruise ferries

Rolls-Royce announced that it has signed a contract with shipowner Fjord Line A/S to install Liquefied Natural Gas (LNG) based power and propulsion systems in two cruise ferries being built at the Bergen Group Fosen AS yard in Norway on 24 July 2012. Each vessel will be equipped with four gas engines, powering a highly efficient Promas integrated rudder and propeller propulsion system.

The gas-only fuelled engines will reduce Nitrogen Oxide (NOx) emissions by about 90% while Sulphur Oxide (SOx) and particulates emissions will be negligible. Emissions from Rolls-Royce gas engines are already within the limits of IMO (International Maritime Organisation) Tier III environmental legislation, due to come into force in 2016.

Rolls-Royce General Sales Manager - Merchant & Navy Engines, Odd Magne Horgen, said "These vessels will be the first international LNG-fuelled passenger vessels in operation and we are very pleased to be a part of this ground breaking project. Rolls-Royce technology will drastically reduce emissions delivering significant efficiency gains to the customer."

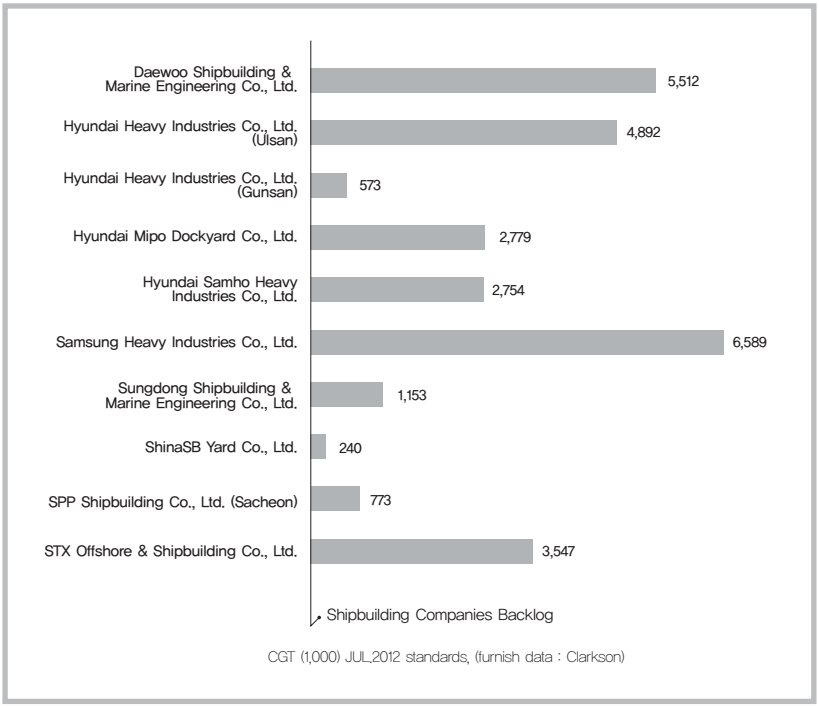
Chief Executive of Fjord Line A/S Ingvald Fardal, said "Fjord Line has a clear environmental strategy and choosing single fuel gas engines makes us pioneers in the cruise ferry industry. We will have the first

and the largest cruise ferry ever to run on LNG as the sole fuel type. Rolls-Royce is the leading manufacturer of these well proven gas engines and we are very pleased to have their technology onboard."

Each of the vessels will have a deadweight of 4,000 tonnes and a length of 170 metres. They will have 309 cabins, and room for 1,500 passengers and 600 cars. Rolls-Royce will deliver the gas systems during 2012, and the passenger ferries will begin regular service between the west coast of Norway and Denmark in the summer of 2013.

Ship prices fell to their lowest level since 2004 as new orders, delivery, and order backlog, the 3 major indicators of the shipbuilding industry, showed a significant decrease in the first half of 2012. According to Clarkson Research, the global order backlog decreased 30% year-on-year to 147 million CGT and the prices of newbuilding vessels fell from 190p in 2008 to 132p in June this year.

New orders stood at 3.9 million DWT (77 vessels) in May, an increase by 100% from 1.8 million DWT (58 vessels) recorded in the previous month. However, the industry expects that the quantity will increase due to the low cost competition from Chinese shipyards. This year, new orders for newbuilding vessels stood at 16.5 million DWT (373 vessels) worth USD 22.3 billion in the period between January and May this year, which is a 47% decrease compared to the previous year.



In May 2012, new orders placed at Chinese shipyards amounted to 6.5 million DWT, and the new orders placed at the Korean shipyards and the Japanese shipyards stood at 5.7 million DWT and 3.7 million DWT, respectively. Based on CGT, Korean shipyards won the orders amounting to 2.8 million CGT while the Chinese shipyards and Japanese shipyards won the orders amounting to 2.1 million CGT and 0.8 million CGT, respectively, which represent an approximately 50% decrease compared to the previous year. Meanwhile, new orders for tankers were valued at USD 3 billion (70 vessels) in the same period, which represents a 14% increase compared to the previous year.

Photo : Hyundai Samho Heavy Industries 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 (including 1 optional vessel)	KRW 590 billion	Diamond Offshore Drilling Limited, U.S.A	Mid 2013	Hyundai Heavy Industries
		Offshore Plant	-	USD 900 million	RasGas, Qatar	Late 2013	Hyundai Heavy Industries
		Drillship	2 vessels (including 2 optional vessels)	KRW 1 trillion 140 billion	Noble Drilling, U.S.A	On a staggered basis until late September 2013	Hyundai Heavy Industries
		Deepwater drillship	1 vessel	-	Atwood Oceanics, U.S.A	Second half of 2013 Marine Engineering	Daewoo Shipbuilding &
	February	Offshore facility carrier FPSO for the North Sea	1 vessel -	KRW 265 billion USD 1.2 billion	Dockwise, Netherlands BP (British Petroleum), U.K	October 2012 Early 2015	Hyundai Heavy Industries Hyundai Heavy Industries
		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 vessel (including 2 optional vessels)	KRW 1 trillion 200 billion	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 (including 1 optional 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 (including 2 optional vessels)	USD 200 million	European Navigation, Greece	2013	STX Offshore & Shipbuilding
	May	Drillship	2 (including 1 optional vessel)	USD 1.12 billion	Rowan, U.S.A	Second half of 2013	Hyundai Heavy Industries
		Deepwater drillship	1 (including 1 optional vessel)	-	Vantage Drilling, U.S.A	Late May, 2013	Daewoo Shipbuilding & Marine Engineering
		Offshore Platform (Top side of offshore platform)	-	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	Around 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	Around KRW 150 billion	Island Offshore, Norway	First quarter, third quarter of 2013	STX OSV
		LNG-FSRU	2 units (including 2 optional vessels)	USD 500 million	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

2011	August	LNG-FSRU (Floating Storage and Regasification Unit)	1 vessel	USD 280 million	Excelerate Energy, U.S.A	First quarter of 2014	Daewoo Shipbuilding & Marine Engineering
	September	Semi-submersible Rig	2 units	USD 1.1 billion	Songa Offshore, Norway	Second 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 unit (optional vessel awarded on January 19)	Approximately 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	Approximately 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	STX OSV
	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

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

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- CSA 22.2 No. 137-M1981
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- NEMA 4X (pending)

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- NEMA 4X - Outdoor rated (Pending)

Certifications & Ratings:

- Class I, Div 1, Groups C, D
- UL 844
- UL 1598
- CSA 22.2 No. 137-M81
- UL 8750
- IP66 rated
- NEMA 4X

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Offshore energy resource development rides the crest of a wave

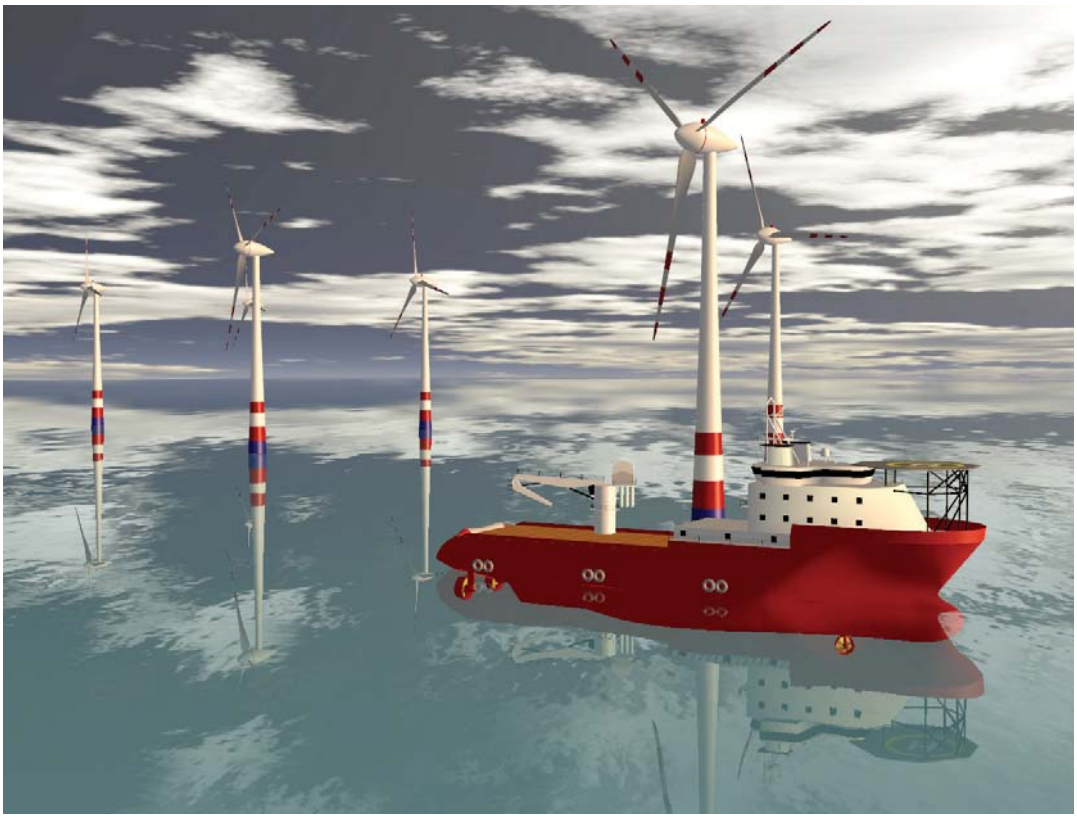
- OSV is winning the largest orders

Spotlight

Developed by STX OSV, PSV 09 is an eco-friendly model with excellent navigation performance and high fuel efficiency which makes it highly preferred in the offshore supply vessel sector.

Offshore Supply Vessel (OSV) is a vessel that supports the installation and operation of offshore plant in the project that aims to develop offshore energy resources such as oil and gas, etc. As the offshore energy development projects draws attention worldwide, the offshore plant market has emerged as the blue ocean to be unlocked.

In Korea, STX OSV stands out among other shipbuilders in this market. STX OSV won orders for 4 offshore special purpose vessels in May alone this year, which attests to its independent shipbuilding technology and expertise.



Offshore Supply Vessel and wind park (Source: GL Group)

STX OSV vessel OSCV 11 design

The Viking Lady has been designed by Wartsila and is equipped with a complete, integrated Wartsila propulsion and power electronics system. (Source: Oddgeir Refvik)

Keppel Singmarine delivers Anchor Handling Tug/Supply vessel, Sea Cheyenne, to its owner Gulfmark Offshore, on time and to their full satisfaction.
(Source: Keppel Corporation)

'Halul 40' built by ITAL THAI Marine
(Source: www.haluloffshore.com)

Offshore Support Vessel UT 741 design

This vessel, built by STX OSV, was designed to carry out the installation of SURF (Subsea, Umbilicals, Risers, Flowlines) that transports the oil and gas, produced from under the sea bed, to the offshore storage facility.

LNG powered Offshore Supply Vessels
(Source: Harvey Gulf International Marine)

The bridge of the Caspian Provider, a
Rolls-Royce UT 755 LC. (Source: SIMEK)

This vessel is an OSV which Island Offshore ordered to STX OSV. This vessel measures 84.3m in length, 17m in width with a deadweight tonnage (DWT) of 3800, and features the UT 717 CD design of Rolls-Royce.

STX OSV to Build "Green" Advanced Trawlers

Polar fisheries research vessel, a special purpose vessel, ordered to STX OSV last year

New Product

Innovative Plate Technology: Plat Heat Exchanger

DHP ENGINEERING LTD.

Plate heat exchangers have more than 100 years history and its structure is composed of a fixed frame, a movable frame and corrugated plates which are in between the two frames. Hot liquid and cold liquid go through between the corrugated plates in turn. To prevent leaking, gaskets are mounted around the plates and tightening bolts are used to put the plates together. There is heat transfer between the two liquids through the plates. This is the main principle of a plate heat exchanger.

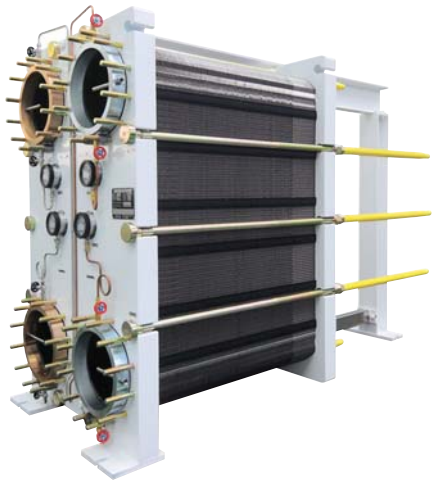
The arrangement of two liquids is that the cold liquid goes upward and hot liquid goes downward in order to increase heat transfer efficiency. There is an advantage to use plate type heat exchangers over Shell & Tube type heat exchangers, that is to say, the corrugations in the plates increase the liquid turbulence to a low Reynolds number and the liquids flow is counter flow so that the heat transfer efficiency is always 3~5 times higher than Shell & Tube type heat exchangers.

The main components of the Plate Heat Exchangers

- The plate pack comprises of a number of heat plates, according to the heat transfer surface required.
- Gaskets on the plates ensure that the fluid channels are securely sealed from each other.
- The direction of flow within the exchanger is determined by the gasket.
- The frame enclosing the plate pack is held together with tightening bolts.
- Connections for incoming and outgoing fluids are usually in the fixed frame of the heat exchanger
- In the case of multi pass flow, connections have to be in the fixed frame and the movable frames.

Single Pass: As single pass has the counter flow and the nozzle is mounted on the fixed frame, only frame can be moved for maintenance so it is easy for the maintenance and increase or decrease in capacity.
Single Pass & Multi Pass: If the temperature is much different between inlet and outlet and the allowable pressure loss between hot side and cold side is much different, the performance can be enhanced by increasing overall heat transfer coefficient, making one side to be 1pass and the other side to be multi pass.

Heat Exchangers (Marine)



Newly Developed 'Perfect seal' Gasket
- International Patent Right Registered (28 Countries)
- 3-Dimentional Pressure Dispersion System
- 300% Higher Friction Force (Up to 50 bar)
- Good keeping of Tightened Plate Pack
- Guarantee Longer Life Time of Gaskets

Multi Pass: If the flow rate is quite less than heat transfer rate and the pollution level is not much, the advantage is that the heat transfer effect can be increased significantly by designing both hot side and cold side to be multi pass but the disadvantage is that the piping of nozzle part in the movable frame should be corrected when it is necessary to expand the heat exchanger capacity

Single & Multi-Multi Pass: This is an efficient heat exchanger that can make possible the heat exchange for more than 3 types of the fluid by one unit of the heat exchanger using a separator frame. It is mainly used for sterilizer in food industry.

Special Feature

- Cost Savings

DHP Plate Heat Exchangers save costs, with their high efficiency, low investment, compact installation and simple maintenance.

- High Heat Transfer Coefficients

DHP Plate Heat Exchangers provide high rates of heat transfer, due to the turbulence inducing shape of the plates. The special gasket configuration of the plates prevents any mixing of the media being processed. In the port area both fluids are separated by double gaskets. Additional safety is ensured by the leakage gap.

- Adhesive-Free Gasket

DHP developed adhesive-free gaskets. The optimum gasket setting in the gasket groove and the fixing of the gaskets by pressed indentations, allow high resistance against pressure and enable a quick and simple gasket replacement.

- Flexibility

DHP Plate Heat Exchangers can be adapted to changing process conditions. If process conditions change plates can be added or removed easily. This eliminates the need for costly re-investment.

- Low Product Content

This small volume of liquid in the Plate Heat Exchangers is the reason for the low weight of the equipment. It enables a faster start up and shut down of the complete plant, than conventional heat exchangers.

- Compact Design

DHP Plate Heat Exchangers are of compact design. For example, 200m^2 of heat exchange surface require a Plate Heat Exchanger of only approx. 3m length, 2m height and 1m width. For a shell and tube heat exchanger to achieve the same duty, about 600m^2 of heat exchange surface would be required.

- Reliable Gasket Structure

DHP's new development of 'Double Seal' gasket system overcomes the limitation of ordinary plate heat exchanger. (3 times high-pressure endurance)

-TEL: +82-55-338-4304
-http://www.daewon-phe.co.kr

New Product

Shell Launches Breakthrough Engine Oil for Shipping Industry

Shell Korea

Shell launched Shell Alexia S4, its most innovative marine engine oil in a generation. Unlike conventional cylinder oils, it can be used across a wide range of vessel and engine types, fuel specifications, loads and climates - from the Antarctic to the Amazon to the Suez Canal. This means vessels no longer need to carry multiple oils. Shell Alexia S4 also works effectively at any vessel speed, including slow and ultra slow - especially important to modern ships that have to vary speeds to reduce fuel consumption and meet strict timetables.

"Shell Marine Products has a proud heritage of working with our customers for over 100 years. We have developed a smarter engine oil to meet the evolving needs of the modern shipping industry," said Surinderdeep Singh, General Manager of Shell Marine Products. "Shell Alexia S4 offers operational simplicity, cost reduction potential and proven performance under tough conditions."

The new formulation better protects engines, which can reduce maintenance and oil use, and reduces the need to shut down engines for repair. All this can deliver simpler operations and lower costs to today's vessel operators, facing a competitive market and increasingly tougher emissions regulations.

Shell scientists developed Shell Alexia S4 based on their unique 20 year understanding of oil stress -the factors which degrade lubricants and stop them working. The new formulation, with an innovative combination of additives, went through rigorous testing at Shell's Marine Innovation Centre in Hamburg, Germany. Tests in laboratory engines under simulated slow steaming conditions demonstrated up to a 20% improvement in overall engine wear compared to other oils tested. It was also extensively tested during more than 25, 000 hours of field trials, by customers and the engine manufacturers MAN and Wartsila.

Here it proved its ability to protect engines running on distillates and residual fuels containing 0.2% to 3.75% sulphur content in a range of locations and climates, including the Antarctic, the Middle East and South America. With technical support and a switch to Alexia S4, one specific trial showed a 33% reduction in oil feedrate. Alexia S4 will be available to customers from 1 August 2012.

-TEL: +82-2-3149-5500
-http://www.shell.co.kr

New energy chains extend the possibilities for circular movements

igus Korea Co., Ltd

igus presented the new “e-spool” for users looking for space-saving energy chains or requiring solutions that are more durable than cable drums. The system links two different energy chains in a unique way: a standard “e-chain” from the E2 or E4 series is routed via a spool and - thanks to the integrated return spring - always ensures the exactly correct length and tension of the energy chain. In its initial position, the chain compactly wound up.

The “twisterband” connects the spool with the shaft bracket, which serves as the interface to the permanently installed cables. In “classic” cable drums this task is usually taken over by sliding contacts.

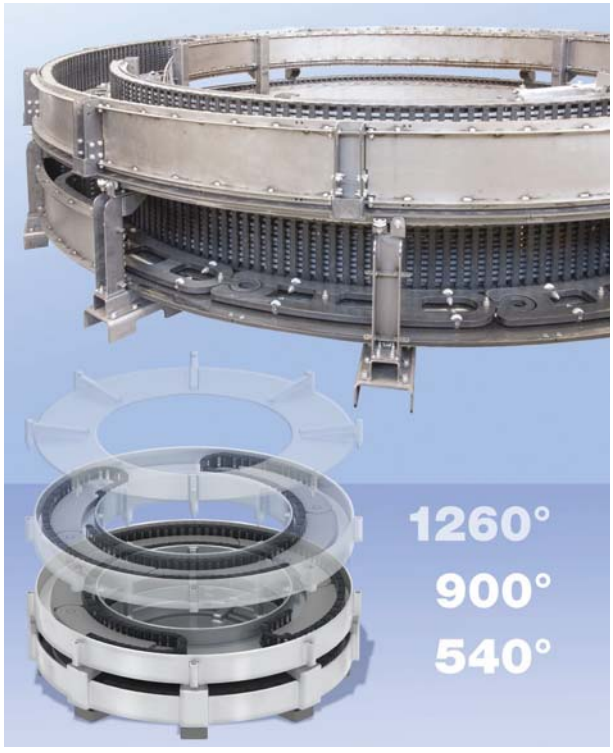
The “e-spool” concept is far more flexible here, because in contrast to sliding contacts, cables for data, compressed air and fluids can be connected without interruption and be replaced or modified at any time. The “twisterband” TB 30 provides sufficient space for cable diameters of up to 16 mm. If more space is required, the “twisterband” can route cables to both sides of the chain drum.

These concrete advantages make the “e-spool” a complete modular replacement for classic cable drums. In addition, the “e-spool” can be just the solution where space is tight: additional space for storing the chain, as is the case with freely suspended or zigzag applications, is no longer required.

The “e-spool” becomes a truly multi-dimensional solution when three-dimensional chains such as the igus “triflex” are used - in this case energy chains can supply in any direction. The “e-spool” can be used in lifting platforms, sorting lines, mobile cranes, platform applications or assembly or process cranes with grippers.

The maximum travel of the “c-chain” is currently 50 m in horizontal applications and 30 m in upright applications at speeds of up to 3 m/s and an acceleration of up to 30 m/s^2.

The application possibilities are as varied as the modular system: from handling systems, filling and removal devices, feeders, pick & place through linked systems and portals to intelligent conveyer belts and transport systems.



The new MRM (Multi-Rotation Module), rotational movements of up to 900 degrees and more can be realised in heavy machinery, cranes or offshore applications.

The igus modular system for circular movements is rounded off by the existing “twisterband” series for rotational movements up to 7000 degrees in tight spaces, and the large “ex stock” range “twisterchain” (rotary angle of up to 540 degrees) as well as the tried-and-trusted single-layer RBR modules.

-TEL: +82-32-821-2911
-http://www.igus.kr

BMEA (Busan Marine Equipment Association)
Member List

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

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

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

BO KYOUNG IND., CO.
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Homepage Add. :
Main Products : O-ring, Sealing, Gasket
TEL : +82-51-831-4615

BOKYUNGTL CO., LTD.
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Homepage Add. :
Main Products : Rudder Body, Winch, Crane
TEL : +82-51-832-0801

BO MYUNG METAL CO., LTD.
Head Office : Saha-gu Busan
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TEL : +82-51-831-9500

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TEL : +82-51-831-3607

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Main Products : E/R Package unit, Pipe Group Unit
TEL : +82-51-831-0090

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Main Products : Pipe Insulation System, FRP Weather Door
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DAESUNG IND CO.
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Main Products : VENT SYS, OIL TANK, Out Fitting
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HAE SUNG INDUSTRIAL.
Head Office : Saha-gu Busan
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HAEWON IND. CO., LTD.
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TEL : +82-51-312-2161

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

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

HAEYANG PROPELLER CO., LTD.
Head Office : Gangseo-gu Busan

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

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

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

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

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

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

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

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

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

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

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

HWA SHIN PRECISION CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products : Life Boat Winch
TEL : +82-51-831-9839

HYOSUNG STEEL TECHNOLOGIES CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products : Steel plute cutting, Hy Auto or Manual
TEL : +82-51-831-5093

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

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

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

ILDO MACHINE ELECT CO., LTD.
Head Office : Saha-gu Busan
Homepage Add. :
Main Products : Heavy Electric Parts
TEL : +82-51-266-6066

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

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

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

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

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

JEONG HWA ACCOMMODATION SYSTEM CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. : www.jeonghwa21.com
Main Products : Wooden Furniture
TEL : +82-51-974-8000

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

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

JIN IL BEND CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products :
TEL : +82-51-832-1919

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

JINYOUNG METAL CO., LTD.
Head Office : Sasang-gu Busan
Homepage Add. : www.jymct.co.kr
Main Products : Multi Core Tube, Welded Stainless, Steel Tube
TEL : +82-51-313-4001

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

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

JOKWANG I.L.I CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. :
Main Products :
TEL : +82-51-602-0200

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

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

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

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

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

KANGRIM HEAVY INDUSTRIES CO., LTD.
Head Office : Changwon Gyeongsangnam-do
Homepage Add. : www.kangrim.com/
Main Products : Marine 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
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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

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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
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SM POWER TEC CO., LTD.
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SNP CO., LTD.
Head Office : Saha-gu Busan
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Homepage Add. : www.staco.co.kr
Main Products : Wall Panel, Celing Panel, Unit Toilet, Marin Door
TEL : +82-51-831-7000

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Homepage Add. :
Main Products : Welding Fittings (Butt Welding)
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Head Office : Jinhae Gyeongsangnam-do
Homepage Add. :
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Head Office : Saha-gu Busan
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Main Products : Hyd' System & Engineering, Hyd' Clamp & Test
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STBEND CO., LTD.
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Main Products : Steel Grating
TEL : +82-51-831-1811

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Head Office : Saha-gu Busan
Homepage Add. : www.sunboind.co.kr
Main Products : Tank Top Unit, Engine Room unit, Sater Strainer Silenser
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SUNG CHANG CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. :
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SUNG IL CO., LTD.(SIM)
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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
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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
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SUN KWANG P.S.P INC. CO., LTD.
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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
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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
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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
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TK CORPORATION CO., LTD.
Head Office : Gangseo-gu Busan
Homepage Add. : www.tkbend.co.kr
Main Products : Fittings (Elbow, Tee, Reducer, Cap)
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U-YOUNG PRECISION IND. CO., LTD.
Head Office : Kimhae Gyeongsangnam-do
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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
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WOONG CHEON OUTFITTING CO., LTD.
Head Office : Jinhae Gyeongsangnam-do
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Homepage Add. :
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Main Products : Steering Gear, Deck Machinery, Auto Filter
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Homepage Add. : www.yoowonmtech.com
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Head Office : Gangseo-gu Busan
Homepage Add. : www.younginele.com
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YOUNG NAM IND.
Head Office : Saha-gu Busan
Homepage Add. :
Main Products : Wire lope drum, BASE PLATE ASS'Y
TEL : +82-51-264-7983

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

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

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

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TEL : +82-51-314-0757

YU KYUNG CO., LTD.
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