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New Year's Greeting

The Monthly KORSHIP which marks the 7th anniversary this year has made remarkable strides. About 35,000 employees in 1,000 or so companies, including domestic/overseas shipyards and enterprises related to marine equipment, facilities and equipment, etc., have signed up to receive the issues of MONTHLY KORSHIP. We extend our sincerest gratitude to our readers.

The shipbuilding and offshore industries faced difficulty in 2014 amid global economic slowdown. As the proverb says "Crisis is an opportunity", it is time that we should pool the wisdom to show the latent energy of the world's largest shipbuilding country. The Monthly KORSHIP will do more to help promote growth and development of domestic shipbuilding industry this year that has the KORMARINE exhibition on maritime event calendar.

We wish all of you in shipbuilding and offshore industries a wonderful New Year filled with success.

On the New Year's Morning All employees of the Monthly KORSHIP



신년인사

올해로 창간 7주년을 맞는 월간 KORSHIP은 그 동안 비약적인 성장을 거듭해왔습니다. 현재 국내외 조선소를 비롯해 조선해양 기자재, 설비 및 장비 등 약 1,000여개 기업에서 약 35,000여 명의 종사자들이 구독하고 있습니다. 월간 KORSHIP을 아껴주신 모든 분들께 감사의 말씀을 전합니다.

최근 글로벌 경기 악화로 인해 2014년 조선해양 산업은 다소 어려움을 겪어야 했습니다. '위기는 곧, 기회다'라는 격언처럼 이럴 때일수록 조선강국의 저력을 보여줄 수 있는 지혜를 모아야 할 것입니다. 올해는 특히 KORMARINE 전시회가 개최되는 해로 월간 KORSHIP 역시도 국내 조선산업의 성장과 발전을 위해 더욱 분발하겠습니다.

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NEWS

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Emerson Reports Full Year and Fourth Quarter 2014 Results

Emerson announced that net sales in fiscal 2014 declined less than 1 percent, as 3 percent underlying sales growth and 1 percent contribution from acquisitions was offset by divestitures. Growth was led by a 6 percent increase in Climate Technologies and 7 percent growth in Process Management. Profitability reached new highs as gross profit margin expanded 110 basis points to 41.4 percent, reflecting more favorable business and technology mix flowing through to record segment margin. The margin improvement funded accelerated strategic investment programs, and drove stronger than expected earnings per share of \$3.75, up 6 percent excluding charges in both years.

"Operationally, we closed 2014 with a strong finish, as profitability, earnings growth and cash generation met or exceeded our targets communicated at the start of the year," said Chairman and Chief Executive Officer David N. Farr. "Once again, global business investment struggled to sustain momentum, with growth fading through the year as economic uncertainty increased. I am very pleased with how we executed in this environment, delivering solid results while maintaining our strategic investment programs to continue to position Emerson for stronger longterm growth and enhance shareholder value."

Process Management net sales grew 8 percent in the quarter, with underlying sales up 5 percent, supported by continued strength in global energy and chemical markets. Growth was strongest in North America, up 13 percent, as investments in oil and gas production and processing projects remained robust. Market conditions were mixed in Asia, up 1 percent, as strength in Southeast Asia and India was balanced by declines in Australia and China on challenging comparisons.

Europe was flat, with improvement in Russia offset by project timing in the North Sea region. Segment margin expanded 130 basis points to 25.3 percent, benefiting from significant favorable currency comparisons. Recent order trends have been robust, with growth of 12 percent in the quarter, excluding 9 percent unfavorable currency translation, reflecting resilience of global energy investments and providing strong momentum into next year. "Global business investment continues to be stubbornly slow, as several economies struggle to institute the critical reforms required for sustained growth," Farr said.

에머슨, 2014 회계연도 및 4/4 분기 실적 결과 보고

에머슨 그룹은 3%의 기초 매출 성장 및 1%의 인 수 기여도가 매각으로 인해 상쇄되면서, 2014년 회계 연도의 순매출이 1% 이하 소폭 감소되었다 고 발표했다. 그룹의 전반의 성장은 6% 증가한 기 후 기술(Climate Technologies) 부문과 7% 증가한 프로세스 매니지먼트(Process Management) 부문 이 주도했다.

에머슨 그룹의 수익성은 매출 총 이익률이 41.4% 까지 110 BP(basis points: 0.01%) 확대되면서 최 고치에 도달했는데, 이는 비즈니스와 기술이 한결 유리하게 조합되면서 사상 최대의 사업 부문 이익 을 기록했다는 점이 반영된 결과입니다. 수익성 개 선은 전략적 투자 프로그램의 가속화를 뒷받침했 고, 2년 간의 감손 비용을 제외하면 주당 순이익을 예상보다 높게 상승시켜 \$3.75로 6%까지 끌어올 렸다.

강력한 전환율이 반영된 OCF(영업 현금 흐름)는 37 억 달려로, 사상 최고치였던 전년도 기록을 뛰어 넘 으며 예상치를 상회했다. 배당금 및 자사주 매입을 통해 주주들에게 반환된 현금은, 4년 연속 60%를 넘겼습니다. 금일 기준, 4/4분기 현금 배당은 9% 증 가된 \$0.47로 예상되는데, 이는 연간으로 환산시 \$1.88로 산정되며, 2014년 FCF(잉여 현금 흐름)의 44%에 해당하는 수치이다.

에머슨 그룹의 회장이자 CEO인 David N. Far는 "수 익성, 실적 성장, 현금 생성이 올해 초 논의된 목표



David Farr, CEO of Emerson

"As such, we are planning conservatively for a 3 to 4 percent global gross fixed investment growth environment. The accelerated growth investments are starting to generate solid returns, as seen in our strong order trends, which will help drive improved underlying growth next year despite the absence of better economics. I am encouraged by the progress on our strategic initiatives across the businesses that continue to strengthen our position for long-term value creation."

를 충족 혹은 능기한 것을 감안했을 때, 에머슨은 운영면에서 2014 회계연도를 강력하게 마무리했다 고 할 수 있다. 반복되는 사안이지만, 전반으로 경제 적 불확실성이 증가되면서 성장이 부진해 짐에 따 라, 전 세계의 사업 투자는 유지만으로도 고전을 겪 는 양상을 나타냈다. 이러한 환경 속에서도 에머슨 은 견고한 결과를 산출하는 성과를 이루었고, 전략 적 투자 프로그램을 지속적으로 유지함으로써, 강력 한 장기 성장 및 주주 가치 향상의 기반을 마련할 수 있었다. 이는 매우 고무적인 결과라고 생각한다" 고 말했다.

특히 프로세스 매니지먼트(Process Management)는 국제 에너지 및 화학 시장에서 지속적 강세에 힘입 어 4/4분기 동안 순매출 8%, 기초 매출 5% 상승을 기록했다. 지역 별로는 북미가 13%로 가장 높은 성 장을 보였는데, 이는 오일 및 가스 생산/처리 프로 젝트에 대한 투자가 계속 강하게 유지되었기 때문 이다. 1% 성장한 아시아의 경우, 동남 아시아 및 인 도의 강세가 수치 비교가 어려운 호주 및 중국의 하 락으로 인해 상쇄되면서, 혼합된 시장 조건이 나타 났다. 또한, 유럽은 러시아에서 상승하긴 했지만 북 해 지역의 프로젝트 시기가 늦춰지면서 보합세를 나타냈다.

2015년 전망에 대해 Far 회장은 "글로벌 경기가 지속적으로 둔화되고 있는 가운데, 우리는 지속적 성장에 필요한 중대한 개혁을 도입하기 위해 노력 하고 있다. 실제로 전세계의 고정 투자 예산 총액은 3~4% 성장이 예상되며, 이러한 글로벌 환경에서 에머슨은 신중하면서도 보수적인 접근법을 취할 계획이다. 한편, 강력한 수주 동향에서 보이는 것처 럼 성장 투자 가속화는 견고한 수익성을 창출하기 시작했는데, 이를 기반으로 경제 환경은 개선되지 않더라도 내년도 기초 성장은 향상될 것으로 전망 된다. 부가적으로 에머슨의 모든 사업 부문 전반으 로 진행 중인 전략적 이니셔티브는 대단히 고무적 인 성과를 보이고 있기 때문에, 우리는 장기적으로 가치 창출을 강화할 수 있을 것으로 기대된다"고 말 했다.

Daewoo Shipbuilding & Marine Engineering (DSME) held a steel-cutting ceremony to build the 3,000-ton submarines on November 27. The event was attended by about 100 officials including Korean Navy Chief of Staff Hwang Gi-cheol, delegates from the Korean Navy, Defense Acquisition Program Administration (DAPA), Agency for Defense Development (ADD), etc.

DSME has proceeded with development and design work for 6 years since 2007 and formed the Jangbogo-III project team in March 2014 in systematic cooperation with DAPA and Korean Navy. Specifically, DSME has pressed ahead with its R&D efforts on 39 types of major equipment to be mounted on submarine and is now embarking on full-scale production.

DSME launched the nation's first submarine program to produce submarines in 1987 with German technology and became a submarine exporter when it delivered 3 submarines to Indonesia in 2011. With the construction of 3,000-ton mediumsized submarines, DSME will become the 12th shipyard worldwide to design and build submarines independently. DSME President Goh Jae-ho said, "Jangbogo-III pro-

ject, the core of Navy's military strength, will help elevate the nation's status and open up the medium-sized submarine market, playing a key part in the nation's creative economy. DSME will stake its fate on the construction of Turtle Ship(the world's first ironclad battleship known as 'Geobukseon') of the 21st century."

Jangbogo-III submarines will be launched in



2018 and fully deployed in 2020 after the 2-year sea trials. DSME has built 17 submarines, including 3 units delivered to Indonesia, 9 units of Type 209, 3 units of Type 214, and 2 units of 3,000-ton submarines, since it won an order for Jangbogoham, the first batch of Type 209 in 1987.

대우조선해양, 중형잠수함 장보고-III 건조 착수

대우조선해양은 지난 11월 27일 황기철 해군참모 총장을 비롯해 해군, 방위사업청, 국방과학연구소 등 관계자 100여명이 참석한 가운데 3,000톤급 잠 수함(장보고-III 프로젝트) 건조를 위한 강재절단식 (Steel Outling Ceremony)을 가졌다.

 비 39종에 대해 연구개발을 추진하면서 이번에 본 격적인 생산에 들어가게 됐다.

대우조선해양은 지난 1987년 독일로부터 잠수함 건조 기술을 전수 받아서 지난 2011년 인도네시아 에 3척의 잠수함을 수출하는 잠수함 수출국이 됐고, 이번 3,000톤급 중형잠수함 건조를 통해 세계 12번 째로 자체 설계 및 건조가 가능한 조선소로 자리매 김 하게 됐다.

대우조선해양 고재호 사장은 "해군의 핵심전력인 장 보고- III 사업은 국가 위상을 격상하고 중형 잠수함 시장을 개척해 창조경제에 이바지하게 될 것"이라며 "대우조선해양은 21세기 거북선을 건조한다는 사명 감으로 회사의 사운을 걸고 최선을 다하겠다"고 말 했다.

향후 장보고-비 잠수함은 2018년 진수되어 2년간 의 전력화 과정을 마친 후 2020년에 실전 배치될 예정이다.

한편 대우조선해양은 1987년 209급 잠수함 1번함 인 장보고함을 최초 수주한 이래 209급 9척, 214 급 3척, 인도네시아 잠수함 3척, 이번 3,000톤급 잠 수함 2척 등 총 17척의 잠수함을 수주 및 건조하고 있다.

NEWS

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KOGAS signed MOU with HHI for closer cooperation in marine equipment sector

Korea Gas Corporation (KOGAS) and Hyundai Heavy Industries (HHI) entered into a MOU (Memorandum of Understanding) to promote cooperation for technology development and commercialization on December 9. This signing ceremony was attended by Yang Yeong-myeong, Executive Director of KOGAS Energy Technology R&D Center, and Kim Joo-tae, Vice-President supervising the Engine Machinery Division of HHI.

Having signed this MOU, both companies laid foundation for cooperation on joint technology development and commercialization as part of strategy to spur development of LNG and marine equipment industries and accommodate government policy to promote new energy industry.

The cooperation will focus primarily on early commercialization of cutting-edge

한국가스공사, 현대중공업과 조선기자재 사업 협력키로

한국가스공사와 현대중공업은 지난 12월 9일 기술 개발 및 사업화 협력 양해각서(MOU)를 체결했다. 이 날 조인식은 한국가스공사 양영명 연구개발원장 과 현대중공업 엔진기계사업 대표 김주태 부사장이 참석해 진행됐다.

양사는 MOU 체결을 통해 정부의 에너지 신산업 추

technologies by pressing ahead with R&BD (Research & Business Development) that includes development of natural gas and diesel mixed combustion technology for island region, along with development and validation of environmentfriendly LNG-diesel mixed combustion

railway vehicle, in order to help underpin 'eco-friendly energy independence island' policy of the Ministry of Trade, Industry and Energy (MOTIE).

An official from KOGAS said, "I hope that closer cooperation of both companies will lead to development of the world's best LNG-

진 정책에 부흥하고 LNG와 조선기자재 산업을 상호 발전시키기 위한 전략의 일환으로 상호 공동기술개 발 및 사업화를 위한 협력 기반을 마련하게 됐다. 협력분야는 LNG를 중심으로 산업통상자원부의 친 환경에너지 자립섬 정책을 지원하기 위해 도서지역 천연가스 및 디젤 혼소 기술개발, 친환경 LNG-디젤 혼소 철도차량 개발 및 실증 등을 포함한 R&BD를 진행해 첨단기술을 조기 상용화하는 것에 초점이



related technologies, helping spur advancement of both LNG and equipment industries worldwide."

Meanwhile, KOGAS is building a collaboration system to work closely with domestic companies and buttress their position in global LNG equipment market.

맞추어져 있다.

한국가스공사 관계자는 "양사 협력을 통해 세계 최 고 수준의 LNG관련 기술을 개발하여 세계 LNG산 업과 기자재 시장에 커다란 기여를 했으면 한다"고 밝혔다.

한편 한국가스공사는 이번 MOU 체결과 같이 세계 LNG 기자재 시장에서 국내 기업활동 지원을 위해 기업과의 협업체계를 구축하는데 노력하고 있다.

KR elects Dr. Park Bum-shik as new Chairman and CEO

On 4 December, in Seoul, at an extraordinary meeting of the general assembly, the Korean Register (KR) elected Dr. Park Bum-shik, formerly COO (Chief Operating Officer) of the Korea P & I Club as its new Chairman & CEO.

Dr. Park graduated from the Korea Maritime University with a bachelor's degree in navigation science and later gained a doctorate degree in business administration from the same school. Dr. Park's career has included being head of the maritime division at Pan Ocean Shipping Co., Ltd., and executive vice president of Wilson Korea Insurance. He has served as COO of Korea P & I Club since 2006.

Dr. Park has contributed to KR for a number of years as an external director and so has a good knowledge of the classification society and its activities. He is well versed in maritime affairs and has extensive knowledge of international business as a former overseas business director of a major shipping company. Dr. Park is also an expert in marine insurance.

Dr. Park said, "It is my job to build on the continuing success of KR and drive its growth to become one of the top performing classification societies in the world. I plan to achieve that through facilitating a flexible organization culture, a global business infrastructure and sustainable growth through financial stability. My role is to provide the support our staff members need to enable them to perform at the top of their

한국선급, 박범식 신임회장 선임

한국선급(KR) 제22대 회장에 박범식 한국선주상호 보험조합 전무이사가 선출됐다.

한국선급은 지난 12월 4일 대한상공회의소에서 임 시총회를 열고 회장선임을 위한 비밀투표를 실시한 결과, 참석회원 총 77명 중 무효표 1표를 제외한 총 76표 중 50표를 획득한 박범식 전무이사가 신임회 장으로 선임됐다.

박범식 신임회장은 한국해양대학교 항해과 출신으 로 동 대학 경영학 박사 학위를 받았으며, 범양상선 해시본부장, 윌슨코리아 손해보험중개(주) 대표이사 game. I am delighted and honored to be elected and I look forward to leading the

를 거쳐 2006년부터는 한국선주상호보험조합 (KP&) 전무이사를 역임해왔다.

박 회장은 2009년부터 한국선급의 사외이사로 적 극적으로 활동하며 한국선급의 성장과 발전 과정에 기여해온 점이 선박 안전과 직결되는 선급 업무의 수장으로써 적임이라는 평가를 받았다.

항해사로서의 승선경험과 해운회사에서의 국제경 험과 더불어 해상 보험 전문가로서의 역량과 조직 의 경영책임자로서 건실한 성장을 이끌었던 경험을 두루 갖춰 한국선급을 반석 위에 올려놓을 것으로 기대되고 있다. Korean Register into the next phase of its ongoing growth and development".

박 회장은 "지금 한국선급은 세월호 참사 이후 극심 한 혼란기에 처해 있고 대내외적으로 많은 어려움 을 겪고 있다. 이러한 상황에서 회장직을 맞게 되어 무한 책임을 느낀다. 빠른 시일 내에 조직을 재정비 하여 여객선 사고방지 시스템을 강화하겠다"고 말했 다. 덧붙여 "회장이 아닌 대표 사원이라는 각오로 모 든 역량을 다하여 사회적 책임과 윤리경영 강화 및 소통과 화합에 힘써 온화한 조직문화를 구축하고, 마지막으로 효율적인 조직체계 구축을 통해 상생과 협력의 산업 생태계 조성에 앞장서 글로벌 사업 인 프라를 구축하겠다"고 각오를 밝혔다.

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DSME had discussion with Chevron on future course of business

Goh Jae-ho, President of Daewoo Shipbuilding & Marine Engineering (DSME), recently met with top executives of Chevron, including George Kirkland, Vice Chairman of Chevron, in a visit to Chevron's headquarters located in California, the United States. Both companies had discussion on current projects underway and future cooperation.

DSME has maintained strong relationship with Chevron for almost 2 decades since it built the South Nemba platform in 1995. Currently, Chevron is proceeding with Mafumeira Sul and Wheatstone projects and recently awarded a contract to DSME for onshore plant. Both companies exchanged views on the need to simplify immigration and customs procedures to ensure early

대우조선해양, 오일메이저 셰브론과 향후 사업 방향 논의

대우조선해양 고재호 사장은 최근 미국 캘리포니아 셰브론(Chevron) 본사를 찾아 조지 커크랜드 (George Kirkland) 부회장을 비롯한 최고 경영진을 만났다. 양사는 발주된 프로젝트에 대한 현황 및 향 후 협력사항에 대해 논의했다.

대우조선해양과 셰브론은 1995년 사우스 넴바 플 랫폼 건조를 시작으로 20년 가까이 깊은 신뢰 관계

participation in FEED (Front End Engineering Design) phase and undisrupted ocean construction works. In addition, DSME called upon its subsidiary Shinhan Machine to make thorough preparation for the on-

shore plant facility project which was recently awarded, and both companies pledged friendly partnership.

An official from Chevron said, "I hope that the ongoing project will be finalized in a timely manner to ensure the production of oil and gas at the local site early than scheduled, and the resulting revenue will

를 유지하고 있다. 현재 마푸메이라 술, 휘트스톤 프 로젝트를 진행 중에 있으며 최근에는 육상 플랜트 를 대우조선해양에 발주했다.

양시는 FEED(Front End Engineering Design) 단계 조기 참여, 원활한 해양 공사를 위한 입출국 및 통 관 절차 간소회에 대해 의견을 나누었다. 또한 최근 발주한 육상 플랜트 설비를 주로 맡게 될 신한기계 에 철저한 준비를 부탁했으며 앞으로도 우호적인 파트너십을 이어갈 것을 약속했다.



be used to award another project to DSME."

Chevron has awarded 13 projects worth USD 12.3 billion to DSME which became a partner when it built the platform for Chevron's South Nemba project in 1995.

세브론 관계자는 "현재 진행하고 있는 공사를 제때 마무리해 현지에서 계획보다 빨리 오일과 가스를 생산할 수 있길 바란다"며 "그 수익을 통해 또 다른 프로젝트를 DSME에 발주하길 기대한다"고 말했다. 한편 셰브론은 지난 1995년 사우스 넴바 프로젝트 로 첫 사업파트너가 된 이래 현재까지 123억 달러 규모의 13기 프로젝트를 대우조선해양에 발주했다.

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SSME developed innovative welding system

Sungdong Shipbuilding & Marine Engineering (SSME) announced on December 12 that it began the field application of the world's first extension synchro welding system which it developed independently.

Outfitted with digital control unit that maintains power and voltage at constant level, this extension synchro welding system has welder's work radius unconstrained by the distance between welding machine and welding torch, unlike the existing analog welding system which has the work radius limitation caused by the power loss and output instability proportional to the distance between welding machine and welding torch.

Specifically, this extension synchro welding system increased the work radius of welding machine from 30~50 m to more than 100 m and achieves uniform welding quality even at a long distance, thus increasing the range for

성동조선해양, 혁신적인 용접 시스템 개발

성동조선해양이 세계 최초로 '익스텐션 싱크로 용접 시스템(Extension synchro welding system)'을 개발해 현장적용을 시작했다고 지난 12월 12일 밝혔다. 기존의 아날로그 용접과 방식은 용접기와 용접토치 사이의 거리가 길어질수록 전력손실과 출력불안정 현 상에 따른 용접품질 저하로 작업반경의 제한이 있었 으나, 이번에 개발한 용접 시스템은 전력과 전압을 일 정하게 유지하는 디지털 제어 시스템을 탑자해 용접 stable welding with single welder. Moreover, this extension synchro welding system brings productivity increase with welding quality improvement and cost-saving benefit. This welding system culminates the R&D efforts of SSME over

the last 1 year and 8

months. SSME has installed about 200 sets since September. Interlocking with existing network digital welding system, this welding system has proven

performance and user-friendliness. An official from SSME said, "This extension synchro welding system will bring cost-savings worth more than KRW 10 billion each

기와 용접토치 간의 거리 제약 없이 용접이 가능하다. 이 시스템의 개발로 기존 30~50m이던 용접기의 작업반경이 100m 이상으로 확대되었으며, 원거리 에서도 균일한 품질의 용접이 가능하게 되어 한 대 의 용접기로 안정적인 용접을 할 수 있는 영역이 넓 어진다. 생산성의 향상은 물론, 용접 품질과 원가절 감 두 마리의 토끼를 잡을 수 있게 된 것이다. 성동조선해양이 1년 8개월의 연구개발을 거쳐 완성 한 이 용접시스템은 지난 9월부터 현재까지 약 200



year and reduction of working hours in large block if it is applied to all systems of welding, an integral and essential part of shipbuilding process. We will develop upgraded welding system to further strengthen our competitiveness in shipbuilding."

세트가 현장에 설치되었으며, 기존에 개발된 네트워 크 디지털 용접 시스템과의 연동으로 성능은 물론 사용자의 편의성도 입증되었다.

성동조선해양 관계자는 "선박 건조에서 절대적인 비 중을 차지하고 있는 용접의 모든 시스템에 적용될 경우 연간 1백억원 이상의 비용절감 및 대형 블록 에서의 작업 시수를 줄일 수 있다"며, "앞으로도 업 그레이드 된 용접시스템 개발로 선박건조 경쟁력을 향상시킬 계획"이라고 밝혔다.

Sovcomflot's new LNG carrier is named SCF Melampus

On 16 December a naming ceremony was held for the LNG carrier SCF Melampus, the third tanker in a series of state-of-theart vessels to be built under a partnership agreement between Sovcomflot and the shipyard STX Offshore & Shipbuilding. The first two tankers of the series, Velikiy Novgorod and Pskov, have already been put into operation on long-term contracts with Gazprom, with the design of SCF Melampus a continuation of this project. These ships have been constructed to adhere to all requirements of the charterer on ecological safety and energy effectiveness.

Atlanticmax LNG carriers have a load capacity of



170,200 cubic metres and are equipped with triple-fuel diesel electric power generation systems. The ships have the enforced ice class 'Ice2' and are designed to operate at low temperatures and in harsh climatic conditions. LNG carriers of this type are able to transport gas from the majority of existing export terminals.

Sovcomflot will receive the fourth LNG carrier in the series, SCF Mitre, in the sec-

ond quarter of 2015.

"Gas transportation is a strategic priority for the development of Sovcomflot, whose specialists have the required experience and expertise in LNG shipping. SCF Group and Royal Dutch Shell have enjoyed many years of mutually beneficial cooperation, on the basis of bilateral relations as well as during large-scale international projects. We are grateful to our respected partners for the trust they have shown in operating these modern ships over the course of ten years." said Evgeniy Ambrosov, Sovcomflot's Senior Executive Vice-President. "SCF Melampus is a hightech LNG carrier, one of the best tankers in its class, with a unique design and technical specifications. I am sure that we will continue to provide reliable and safe LNG transportation for our charterer".

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3 types of vessels built by HSHI were honored with the world-class product designation

The 3 types of vessels built by Hyundai Samho Heavy Industries (HSHI) were selected by government as the World-Class Products. This world-class product designation culminates the effort of HSHI to carve out larger share of global market based on its technological competitive edge in commercial vessel sector.

HSHI announced that its 3 types of vessels, such as medium-sized containership (3000 to 8000 TEU), pure car and truck carrier (PCTC), and very large ore carrier (VLOC), were awarded world-class product certification in 2014 World-Class Product Certification Award organized by the Ministry of Trade, Industry and Energy (MOTIE) at COEX in Samseong-dong, Seoul on December 8.

Last year, HSHI captured 24.3% and 27.3% shares in the market for mediumsized containerships and PCTCs, respectively, taking the top spot worldwide. In the VLOC market, HSHI claimed the 4th spot

현대삼호중공업 선박 3종 '세계일류상품' 선정

현대삼호중공업이 건조하는 선박 3종이 정부가 인 정하는 세계일류상품에 선정됐다. 창립 이후 상선 분야에서 쌓아온 기술경쟁력을 토대로 세계시장점 유율을 꾸준히 확대해온 데 힘입은 결과다. 현대삼호중공업은 "지난 8일 서울 삼성동 코엑스에 서 열린 산업통상자원부 주관 '2014 세계일류상품 with 7.4% share. To promote exports, MOTIE awards the world-class product certification to product that ranks within 5th in terms of global market share or captures more than 5% share among the products with annual global market worth USD 50 million or annual exports worth over USD 5 million.

This certification brings the number of HSHI's word-class vessels to 5, including the ultra-large containership with a capacity of over 8000 TEU and crude oil carrier with a capacity of over 80,000 DWT which earned the world-class product designation in 2007.

An official from HSHI said, "We have climbed to the 4th spot worldwide with an

인증서 수여식'에서 중형컨테이너운반선(3000 ~8000 TEU급)과 지동차운반선, 초대형광탄석운반 선 등 3종이 신규 인증을 획득했다'고 밝혔다. 현대삼호중공업은 지난해 중형컨테이너선과 자동 차운반선 분야에서 세계시장점유율 24.3%와 27.3% 를 차지해 1위를, 초대형광탄석운반선은 7.4%로 4 위를 기록했다. annual production capability of about 50 vessels by expanding the shipbuilding volumes steadily since our establishment. With strong focus on technology development and relentless quality improvement to ramp up competitiveness, we have seen steady growth in our new order intake and added more vessels to our list of worldclass products."

산업통산자원부는 수출 활성화를 위해 세계시장 규 모가 연간 5,000만 달러 이상이거나 수출 규모가 연간 500만 달러 이상인 상품 중 세계시장점유율이 5위 이내이면서 5% 이상인 제품에 대해 세계일류 상품으로 선정하고 있다.

현대삼호중공업은 지난 2007년에도 8000 TEU 이 상 초대형 컨테이너선과 8만 DWT 이상 원유운반선

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이 세계일류상품으로 선정된 바 있어 인증 선박은 총 5종으로 늘어나게 됐다. 현대삼호중공업의 한 관계지는 '창립 이후 건조물 량을 꾸준히 확대해 지금은 연간 50여 척의 선박을 건조하는 세계 4위의 조선전문기업으로 성장했다" 며, "끊임없는 기술개발, 품질개선으로 경쟁력을 강 화해온 결과 고객들로부터 발주가 이어져 세계일 류상품에 선정되는 선박이 늘어나고 있다"고 소감 을 밝혔다.

•••• World's first high speed LNG fuelled RoPax ferry to be powered by Wärtsilä

A new passenger ferry being built for Swedish operator Rederi AB Gotland will be fuelled by liquefied natural gas (LNG) and will feature a Wärtsilä integrated solution. The Wärtsilä integrated solution includes a complete LNG powered propulsion- and fuel storage and supply system, as well as comprehensive project services. This will be the first Swedish flagged LNG powered passenger vessel and the first LNG fuelled high speed RoPax ferry in the world. The vessel is being built at the Guangzhou Shipyard International (GSI) yard in China and when delivered, will sail between the Swedish mainland and the island of Gotland. GSI placed the contract with Wärtsilä in November.

By operating on LNG, the new 200 metre long ferry will comply with the International Maritime Organization's (IMO) Tier III regulations regarding emissions of nitrogen oxides (NOx). Furthermore, it will meet the sulphur (SOx) emissions limitations required for operating in the Northern European sulphur emissions controlled areas (SECA), while emissions of particulates will also be reduced to virtually zero. In addition to its compliance with emissions legislation, the ferry will also meet the requirements of the IMO's recently agreed IGF Code regarding the safety of LNG fuelled ships.

"This vessel will have a minimal environmental footprint and we are proud to be working with Wärtsilä to make this possible. Wärtsilä's know-how and experience with gas fuelled vessels is unmatched in the industry," said Håkan Johansson, Managing Director of Rederi AB Gotland. Wärtsilä and GSI have successfully cooperated for many years on projects involving various types of vessels. However, this is the first project between the companies involving an LNG fuelled ship. It is expected that as LNG becomes



increasingly accepted as a marine fuel, and given Wärtsilä's capabilities in LNG solutions, such cooperation will continue into the future.

In addition to the complete LNG powered propulsion and fuel & storage system, the Wärtsilä integrated solution will include services relating to project management, integration engineering, on-site support and overall commissioning responsibility. The selection of Wärtsilä for the supply of a significant portion of the ship's equipment, as well as for the project services, was based on the company's vast experience in gas powered propulsion and its capability to supply everything needed for operating on gas fuel, from the bunkering stations to the propulsion solutions. No other company is able to match this experience.

Wärtsilä's scope of responsibility includes four Wärtsilä 50DF dual-fuel engines, two gearboxes, two controllable pitch propellers (CPPs) with remote control system, two Energopac rudders, two tunnel thrusters, four Wärtsilä 20DF dual-fuel auxiliary generating sets, two Wärtsilä LNGPac fuel gas handling systems, gas valve units, a compact silencer system (CSS), an IMO approved Wärtsilä Aquarius UV ballast water management system, an Oily Water Separator together with a Bilge Water Guard to monitor and prevent oily water being discharged to the sea, project management services, integration engineering services, commissioning services and on-site supervision during installation. Delivery of the Wärtsilä equipment will begin at the end of 2015 and the ship is scheduled to be in operation in 2017.

The ship will carry approximately 1650 passengers, will have 1750 trailer lane metres and can accommodate a corresponding number of passenger cars, campers and busses. It has been designed to meet the DNV-GL classification society's high comfort ratings for climate, noise and vibrations.

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Atlas Copco expands vacuum solutions

Atlas Copco has recently introduced a new portfolio of vacuum products which can support the specific vacuum needs of customers across a range of markets, and many common vacuum applications.

Beside the new range of 2-stage oil-sealed rotary vane vacuum pumps, Atlas Copco also introduced a new range of vacuum booster pumps, piston pumps, liquid ring pumps and steam ejectors. This new portfolio can support industries including mining, cement, paper, refineries and food, as well as industries as diverse as aerospace, automotive, refrigeration, glass, bottling, canning and woodworking.

In early 2015 an innovative, intelligent vacuum pump will be introduced - the GHS VSD+ - representing a real leap forward in the vacuum industry. The GHS VSD+ Series is a new range of highly efficient, intelligent vacuum pumps with Variable Speed Drive (VSD) from Atlas Copco. Based on the well-known and durable plug-and-play design principles of Atlas Copco compressors, these vacuum pumps have been designed by vacuum engineers to deliver peak performance at operating pressures commonly found in industrial applications. Atlas Copco currently offers a range of vacuum solutions:

- The GVD 0.7-28 series of small 2-stage oil-sealed rotary vane pumps deliver excellent ultimate vacuum pressure, high pumping efficiency and superior vapour handling capabilities with quiet operation.



- The GVD 40-275 series of 2-stage oil sealed rotary vane vacuum pumps are renowned for their high ultimate vacuum, rapid pumping speeds, quiet operation and ability to handle water vapour.
- The ZRS 250-4200 mechanical booster pumps, based on the simple rotary lobe principle, remain the favourite pump for applications where high pumping speeds are required for pressures in the region of 0.01 to 50 mbar.
- With over 10,000 units sold, the Atlas Copco GLS 250-500 series of rotary piston pumps set the standard for performance and reliability as the industry's

most efficient, space-saving design. Atlas Copco's Compressor Technique business area provides industrial compressors, vacuum solutions, gas and process compressors and expanders, air and gas treatment equipment and air management systems. The business area has a global service network and innovates for sustainable productivity in the manufacturing, oil and gas, and process industries. Principal product development and manufacturing units are located in Belgium, Germany, the United States. China and India.

아트라스콥코, 진공 솔루션 제품군 확대

아트라스콥코(Atlas Copco)는 최근 광범위한 시장에 서 고객사의 특수한 진공 관련 요구 및 일반 진공 애플리케이션 다수를 지원하는 새로운 진공 제품 포트폴리오를 발표했다.

아트라스콥코는 2단 오일밀봉 회전식 베인 진공펌 프 신제품군 외에도 최신 진공 부스터 펌프, 피스톤 펌프, 유체 링 펌프, 증기 이젝터 제품군을 소개했 다. 이 제품군은 광산, 시멘트, 제지, 제련 및 식품 업 계는 물론 항공, 자동차, 냉장, 유리, 병입, 통조림 제 조, 목공 등 광범위한 산업계에 적용이 가능하다. 아트라스콥코는 올해 초에 진공 산업의 일대 도약 을 대변하는 혁신적인 지능형 진공 펌프인 GHS VSD+가 전격 출시할 예정이다. GHS VSD+ 시리즈 는 고도의 효율성을 자랑하는 지능형 진공펌프 제 품군으로 아트라스콥코의 VSD(Variable Speed Dive: 가변속 구동) 기술이 적용됐다. 이 시리즈는 업계에서 정평을 얻고 있는 아트라스콥코 압축기의 견고한 플러그-앤-플레이 설계 원리를 기반으로 산업용 애플리케이션에서 흔히 나타나는 작동 압력 에서 최고의 성능을 발휘할 수 있도록 설계됐다. 아트라스콥코는 다양한 진공 솔루션을 제공하고

- 있다. – GVD 0.7-28 시리즈는 소형 2단 오일 밀봉 회전 식 베인 펌프로 우수한 절대 진공 압력과 높은 배 기 효율, 탁월한 증기 처리성능을 제공하면서도
- 기 효율, 탁월한 증기 처리성능을 제공하면서도 조용한 작동을 자랑한다.
- GVD 40-275 시리즈는 2단 오일 밀봉 회전식 베 인 진공 펌프로 고도의 절대 진공과 신속한 펌핑 속도, 조용한 작동 및 수증기 처리 성능으로 정평 을 얻고 있다.
- ZRS 250-4200 메카니컬 부스터 펌프는 1단 회전

식 로브 원리에 기초한 제품으로 0.01~50mbar의 압력을 위해 빠른 펌핑 속도를 요하는 애플리케이 션에서 가장 선호되는 제품이다.

- 1만 여대의 판매량을 기록한 아트라스콥코의 GLS 250-500 회전식 피스톤 펌프 시리즈는 업 계에서 가장 효율적인 공간 절약형 설계로 성능 과 안정성에 대한 기준을 제시하고 있다.

아트라스콥코의 압축기 사업부문은 산업용 압축기, 진공 솔루션, 가스/공정 압축기 및 팽창기, 에어/가 스 처리장비, 에어관리 시스템을 제공한다. 압축기 사업부문은 글로벌 서비스 네트워크를 갖추고 있으 며 제조, 석유/가스 및 공정 산업의 지속 가능한 생 산성 향상을 위한 혁신을 추구하고 있다. 주요 제품 개발 및 생산 시설은 벨기에, 독일, 미국, 중국, 인도 에 위치하고 있다.

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SSME exceeds its new order target for 2014

Sungdong Shipbuilding & Marine Engineering (SSME) announced that it signed the Letter of Intent (LOI) with a major European shipping company to build 4 units of 158,000ton tankers (including 2 optional vessels), signifying that SSME is well on pace to exceed its annual order target.

SSME set annual new order target of 43 vessels worth KRW 1.9 trillion in the beginning of 2014 amid the signs of recovery in commercial vessel market. If this tanker order is firmed up, SSME will record the new order intake of 44 vessels worth KRW 2.6 trillion. SSME's annual order target will be exceeded by 102% in vessel quantity and by 136% in order value, which reflects the selective ordertaking approach of the shipbuilder signing the contracts at prices higher than market value.

An official from SSME said, "Our strong performance is driven by our relentless R&D

efforts to constantly improve fuel efficiency which tops the agenda of ship owners. As excellent fuel efficiency can offset the



성동조선해양, 2014년 수주 목표 초과 달성 성동조선해양은 최근 유럽의 한 대형선사와 15만8 천톤급 탱커 4척(옵션 2척 포함)에 대한 건조의향서 를 체결함으로써 수주 목표 초과 달성에 청신호가 켜졌다고 밝혔다.

성동조선해양은 상선 시장이 회복세를 보이는 것을

감안해 지난 2014년 초 43척, 1조9000억원 규모의 수주 계약을 체결하는 것을 목표로 설정했다. 이번 탱커 계약이 완료되면, 총 44척, 2조6000억원에 달 하는 수주실적을 기록하게 된다. 선별 수주를 통해 시장 선가보다 높은 금액으로 계약을 체결해 당초 목표 대비 척수는 102%, 수주 규모는 136%로 초과

달성했다.

성동조선해양 관계자는 "선주들이 가장 큰 관심을 가지고 있는 연비 향상을 지속적으로 연구개발한 것 이 주효했다"며, "선가가 높아도 연비가 우수하면 운 용 몇 년 안에 그 금액을 상쇄할 수 있기 때문에 심 리적 부담이 줄어 발주를 하게 된 것"이라고 말했다.

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STX delivered the high-speed PKG missile patrol ship, 'Lee Byeong-Cheol Ham', to the Navy

STX Offshore & Shipbuilding (STXOS) delivered the 450-ton high-speed Patrol Killer Guided (PKG) missile patrol ship, 'Lee Byeong-Cheol Ham', to the Navy on November 28. This ship, which began to be built at Jinhae shipyard from June 2012, was officially delivered to the Navy after commissioning. It will be combat ready in early 2015 after the 2-year sea trials.

Equipped with the state-of-art weapon system such as ship-to-ship guided missiles and 76 mm naval guns, etc., Lee Byeong-Cheol

STX조선해양, 유도탄고속함 '이병철함' 해 군에 성공적 인도

STX조선해양은 지난 11월 28일 450톤급 유도탄고 속함 '이병철함'을 해군에 인도했다. 이 함은 2012년 6월 진해 조선소에서 건조가 시작되어, 해군이 인수 Ham will replace the aging high-speed patrol vessels of the Navy and carry out the port and coastal defense/patrol mission. In addition, Lee Byeong-Cheol Ham can sail at a maximum speed of 40 knots (74 km/h),



accommodate about 40 crew, and features stealth design and advanced bulletproof

capabilities.

한 후 시운전 평가를 거쳐 이날 정식으로 해군에 인 도되었다. 향후 2개월간의 전력화 과정을 거쳐 2015년 전반기에 실전 배치될 예정이다. 이병철함은 해군의 노후된 고속정을 대체하는 함정 으로 연안 및 항만 방어, 초계작전의 임무를 수행하 고, 함대함유도탄 및 76MM 함포 등 최신 무기체계 를 탑재하고 있다. 또한 최대 속력 40노트(74km/h), 승조원 40여 명, 스텔스 건조공법과 주요 구역에 대 한 방탄기능이 강화되었다.

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Korea Trade Insurance Corporation provides ship financing for offshore wind farm installation vessel to be built by SHI

Korea Trade Insurance Corporation announced on December 14 that it would provide USD 125 million in ship financing for the export of 1 offshore wind farm installation vessel worth USD 250 million which was ordered to Samsung Heavy Industries (SHI).

This offshore wind farm installation vessel, to be built by SHI, will be delivered to the U.K.-based Seajacks by September 2015. Offshore wind farm installation vessel, the special purpose vessel built to install wind turbine, represents the blue ocean to be unlocked. Domestic shipyards are expected to see strong new growth in new orders from this sector. Korea Trade Insurance Corporation will provide USD 125 million which represents 50% of the vessel's price tag of USD 250 million, thus supporting the conclusion of this ship purchase contract and financing.

The recent move to expand offshore wind power, led by European countries such as U.K., Germany, etc., is expected to create new opportunities for domestic shipyards to garner new contracts and overcome the sluggish demand of international major oil companies for offshore plants amid the fall in oil prices.

According to the European Wind Energy

한국무역보험공사, 삼성중공업의 해양 풍 력발전기 설치선에 대한 선박금융 제공

한국무역보험공사는 삼성중공업이 수주한 2.5억 달 러 규모의 해상풍력발전기 설치선 1척의 수출 거래 에 대해 1.25억 달러의 선박금융을 제공한다고 지 난 12월 14일 밝혔다. 이 선박수출계약은 삼성중공 업이 영국 씨잭(Seajacks)에 해상풍력발전기 설치선 1척을 수출하는 거래로 해당 선박은 2015년 9월에 인도될 예정이다.

해상풍력발전기 설치선은 풍력발전용 터빈 설치를 위해 건조되는 특수 선박으로서, 향후 국내 조선사 의 수주 확대가 기대되는 블루오션으로 주목받고 있다. 한국무역보험공사는 발주사인 씨잭의 선박구



'PACIFIC ORCA', the world's largest Windfarm Installation Vessel

Association, the installed capacity (cumulative) of offshore wind farms in Europe has increased more than ten-fold to 6,562 MW in late 2013 from 532 MW in 2003. This is expected to bring a steady rise in new orders for special purpose vessels used to install offshore wind turbines. An official from Korea Trade Insurance Corporation said, "The selection & concentration approach has been increasingly necessary for high value-added vessels

매에 필요한 2.5억 달러 중 50%에 해당하는 1.25억 달러의 선박금융을 제공함으로써, 이번 선박구매계 약의 체결과 금융조달을 지원했다.

최근 유가 하락에 따른 심해유전 개발의 위축으로 글로벌 오일메이저 기업들의 신규 해양플랜트 발주 가 저조한 가운데, 영국과 독일 등 유럽을 중심으로 한 해상풍력발전 확대 정책은 국내 조선사에게 새 로운 수주 기회를 제공할 것으로 보인다.

유럽풍력발전협회(European Wind Energy Association)에 따르면, 2003년 532MW에 불과했던 유럽지역 해양 풍력발전설비(누적 기준)는 2013년 말 6,562MW를 기록해 최근 10년간 10배 이상 증 가하는 등 지속적인 성장을 거듭해왔다. 따라서 해 due to the cutthroat competition resulting from prolonged sluggishness in global ship market. We will be fully ready to provide ship financing with trade insurance to help buttress domestic shipyards' growth in new order for high value-added special purpose vessels. For the blue-chip ship financing projects, we will encourage involvement of domestic private-sector financial institutes to expand the ship financing base."

양 풍력발전기 설치를 위한 관련 특수선의 신규 발 주도 꾸준히 증가할 것으로 예상되고 있다.

한국무역보험공사 관계자는 "글로벌 선박 시장의 장 기 불황에 따른 치열한 수주 경쟁으로, 선박금융 지 원도 고부가가치 선박을 중심으로 한 '선택과 집중' 이 어느 때보다 필요한 시점'이라며, "앞으로도 우리 조선사들의 고부가가치 특수선 수주가 활성화 될 수 있도록 무역보험을 통한 선박금융 지원에 만전 을 기하고, 우량 선박금융 프로젝트에 대해서는 국 내 민간금융기관의 참여를 유도하는 등 선박금융의 저변 확대에도 최선을 다하겠다"고 밝혔다.

NEWS

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Emerson acquires Paine Electronics business

Emerson announced it has acquired the Paine Electronics business from Paine Electronics, LLC, which will become part of Emerson Process Management. Paine Electronics, a leading manufacturer of pressure transducers, is recognized worldwide for its pressure and temperature instrumentation used in some of the most challenging environments.

With this acquisition, Emerson Process Management extends its leadership in providing measurement technologies for the oil and gas industry with expanded upstream capabilities in subsea and downhole drilling operations. Paine's products will join the Rosemount® portfolio of measurement

에머슨, Paine Electronics 사업 부문 인수

에머슨 그룹이 Paine Electronics로부터 사업 부문을 인수했다고 발표했다. 인수된 사업 부문은 에머슨 프로세스 매니지먼트 산하로 편입될 예정이다. 압력 변환기의 선도적 제조 업체인 Paine Electronics는 가장 까다로운 환경에서도 사용이 기능한 압력 및 온도 계기 분야에서 세계적으로 인정받고 있다. 이번 인수를 통해 에머슨 프로세스 매니지먼트는 해저 및 유정 작업에 대한 업스트림 역량을 확장함 technologies. Terms of the acquisition were not disclosed.

"Paine's products are a natural complement to our already-strong measurement technologies for the oil and gas industry," said Tom Moser, group vice president of

Emerson Process Management's Measurement and Analytical technologies. "We are excited about the synergy between our two companies and the opportunities for global business growth."

으로써, 오일 및 가스 산업에 대한 측정 기술을 제 공하는 선도 업체로서의 입지를 한층 확대할 수 있 게 되었다. Paine Electronics 제품군은 Rosemoun® 측정 기술 포트폴리오에 추가될 계획이며, 인수 조 건은 공개되지 않았다.

에머슨 프로세스 매니지먼트의 측정 및 분석 기술 부문 그룹 부사장인 탐 모저(Tom Moser)는 "Paine Bectronics의 제품은 오일 및 가스 산업에 대해 기 존에도 이미 강력했던 당사의 측정 기술을 더욱 보



Since 1951, Paine has manufactured pressure and temperature sensors designed for long-term stability, accuracy and reliability in physically harsh environments.

강할 전망이다. 우리는 이번 인수를 통해 두 기업 간에 발생하게 될 시너지 효과와 글로벌 비즈니스 성장 기회에 대해 많은 기대를 예상하고 있다"고 말 했다.

1951년 설립된 Paine Electronics는 물리적으로 열 악한 환경에서 장기적으로 안정성, 정확성, 신뢰성 을 전달하도록 설계된 압력 및 온도 센서 제조업체 이다.

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Rockwell Automation and AT&T to work together to make Connected Enterprise

Rockwell Automation and AT&T are collaborating to improve remote asset utilization and connected machine management. The companies plan to deliver cellular solutions that help enable Rockwell Automation customers to securely collect, manage and take action on data from industrial equipment located in plants and remote sites around the globe.

By bringing together the AT&T Global SIM and M2X Data Service platform with Rockwell Automation cloud-enabled service offerings, customers benefit from a more secure, flexible and scalable way to connect automation assets and industrial machinery to remote experts.

"We're creating solutions to help change how industrial companies operate around the world," said Mike Troiano, vice president, industrial IoT solutions, AT&T. "Rockwell Automation brings industrial expertise and market presence, while AT&T brings industry-leading IoT platforms and communications. Together, we aim to connect people with machines to make business processes simpler and more efficient."

The companies are also working to develop reference architecture and validated designs for cellular IoT deployments within industrial sites. These tools will guide customers in the design and use of cellular connected assets in ways that complement the existing in-plant network infrastructure.

"Our combined solutions will help industry to realize The Connected Enterprise by securely connecting a large number of smart assets both plant-wide and distributed in the field," said Sujeet Chand, senior vice president, chief technology officer, Rockwell Automation. "This will result in rapid value creation for our customers."
로크웰 오토메이션, AT&T와의 파트너십 통 해 커넥티드 엔터프라이즈 실현

로크웰 오토메이션과 AT&T이 원격 자산 활용과 서 로 연결되어 있는 산업용 기계들의 관리를 개선하 기 위해 손을 잡았다. 양사는 제조 고객들이 산업용 기기에서 데이터를 더 안전하게 수집하고, 관리할 수 있도록 적극 협력한다. 산업용 기계 및 기기는 플랜트 내부 및 글로벌 전체의 원격 제조 사이트에 서 제조를 위해 사용되는 기업의 자동화 자산을 의 미한다.

로크웰 오토메이션의 클라우드 기반으로 제공되는 서비스와 AT & T의 글로벌 SM과 M2X 데이터 서비 스 플랫폼이 결합됨으로써, 고객은 자동화 자산과 산업용 기기들을 원격으로 보다 유연하고 안전하게 관리할 수 있게 되었다.

AT&T 산업 IJ 솔루션 부사장인 마이크 트로이아노 (Mike TRoiano)는 "우리는 제조 기업들이 전 세계 플 랜트를 운영하는 방식에 변화를 줄 수 있는 솔루션 을 개발하고 있다"며, "로크웰 오토메이션은 제조 산 업에 대한 전문 지식과 전문성, 시장 지배력를 제공 하고, AT&T는 업계 선두의 IJT 플랫폼과 통신을 제 공하고 있다. 이 두 기업이 협업하여 사람과 기기를 연결함으로써, 비즈니스 프로세스를 간소화하고 효 율성을 높이는 것이 우리의 목표"라고 말했다.

로크웰 오토메이션은 산업 현장 내에서 셀룰러 bT 구축을위해 어떻게 네트워크를 디자인해야 되는 지 알려주는 참조 아키텍처(Reference architecture) 및 검증된 네트워크 설계 방법을 개발하기 위해 노력 하고 있다. 이러한 도구들은 기존 공장 내 네트워크 인프라를 보완하는 방법으로서 셀룰러 즉, 모바일로 연결된 스마트 자산을 설계하고 사용하는 지침이 되어 줄 것이다.

로크웰 오토메이션 수석 부사장 겸 CTO인 수지트 찬드(Sujeet Chand)는 "로크웰과 AT&T 간의 결합된 솔루션은 곧 커넥티드 엔터프라이즈(Connected Enterprise) 기술로써 IT 기반의 기업 상위 정보시스 템과 자동화 기술 기반의 제조현장 운영기술(OT)을 융합하는 것이다. 이는 경영 혁신을 가져오고자 하 는 로크웰의 기술 비전을 현실화시키는 방식"이라 며, "고객들은 신속한 가치 창출이 가능할 것"이라고 말했다.

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DNV GL and KOGAS held a joint conference

DNV GL Korea and Korea Gas Corporation (KOGAS) held a joint conference at the office of DNV GL Korea in Busan on December 11. This event represents the first step in the implementation of the MOU which both companies signed in June 2014 to promote technical cooperation in LNG sector and aims to spur cooperation and information exchange in the field of LNG value chain technology.

The conference featured presentations by experts of both companies on technology strategy, &D Innovation, LNG transport (FLNG), intelligent piping network technology, etc. Korea Gas Corporation anticipates synergic effects and improvement of technical capabilities by tapping into the risk management know-how and expertise of DNV GL, a world's leading classification society, in shipbuilding, offshore, and gas

DNV GL, 한국가스공사와 합동 컨퍼런스 개최

DNV GL 한국지사와 한국가스공사는 지난 12월 11 일 부산 DNV GL 한국지사 사무실에서 합동 컨퍼런 스(Joint Conference)를 개최했다. 이번 행사는 지난 2014년 6월 양사가 체결한 LNG 분야에 대한 기술 협력 MOU의 후속이행을 위한 첫 행보로서 LNG 밸



sectors.

Both companies will continue to hold this biannual conference touching on various issues for technical cooperation on the drill-

류 체인 기술분야의 상호협력과 정보교류를 목적으 로 치러졌다.

이날 컨퍼런스에서는 기술전략 및 R&D Innovation, LNG 수송(FLNG), 지능형 배관망 기술 등에 대한 양 사 전문가들의 발표로 진행됐다.

한국가스공사는 세계적인 선급기관인 DNV GL의

ing, production, liquefaction, transportation, storage, reliquefaction, and supply of natural gas.

조선, 해양 및 가스분야의 위험관리 노하우 및 지식 을 통해 기술역량 향상과 시너지 효과를 기대하고 있다. 양사는 앞으로도 연 2회 정기 컨퍼런스를 개 최할 예정이며, 천연가스 시추, 생산, 액화, 운송, 저 장, 재기화, 공급 등 전반에 걸쳐 기술협력을 활발하 게 논의할 계획이다.

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2015' Shipbuilding market prospects I

- Global shipbuilding market waiting for tailwinds - Shift in focus towards LNG-related vessels and offshore plants

The state



There has been a mounting anxiety over the prospect of recovery in global shipbuilding market. The 'Outlook of Economy & Industry in 2015' published by KEXIM Overseas Economic Research Institute recently portrayed gloomy prospects, predicting that global newbuilding orders would decrease by approximately 12% to 9.5 million CGT this year.

Particularly, overall market conditions will be unfavorable for shipyards on the lookout for newbuilding orders, accompanied by the falling oil prices, diminishing investment in ecoship and prolonged downturn in offshore plant sector which was brought on by the shale gas boom.

Meanwhile, global shipbuilding market is expected to find respite from the last year's triple woes of global economic downturn, shrinking newbuilding and offshore plant orders, and worsening profitability. The shipbuilding industry speculates that order placement will rebound slowly this year. Specifically, the shipbuilding industry predicted the resumption of order placement for gas-related vessels such as LNG carrier, VLEC, LPG carrier, FSRU, FLNG, etc., and offshore plants, along with the rise in new orders for ultralarge containership which were sluggish last year.

However, the factors of potential economic instability have yet to be eliminated completely. As the world economic growth is likely to slow down, the upward shift in demand for newbuilding vessels is unlikely in the midst of expansion of cargo traffic, except for the demand for ordinary exchange necessary to meet new environmental standards. In that way, this year is expected to see optimism crisscrossed with pessimistic view, and vice versa, towards the market.

> As the world's focus is now on whether the shipbuilding industry will make a turnaround, global new orders decreased by 31.0% year-on-year to 35.87 million CGT (as of November) in 2014, the lowest level ever recorded after the outbreak of global financial crisis. New orders and shipbuilding volume plummeted worldwide in 2014, and particularly, new orders fell by a large margin. Only the market for gas-related vessels such as LPG carrier, LNG carrier, etc., saw an upswing in new orders amid the shale gas boom in the United States, while new orders for most types of vessels, including bulk carrier, oil tanker, containership, etc., diminished by more than a half.

> According to Clarkson, new orders at shipyards worldwide stood at 1,208,741 CGT (46 vessels) as of November last year, sliding 81.3% from the same period of 2013 (6,456,297 CGT with 297 vessels). This is the lowest level ever recorded over the last 5 years since September 2009

> > Korship 37

right after the outbreak of global financial crisis when new orders reached 765,748 CGT (53 vessels).

Global order backlog fell to approximately 113 million CGT as of late November, shrinking to the lowest level ever recorded over the last 1 year. This represents a decline for 6 consecutive months after June 2014 when the global order backlog stood at 120 million CGT. With the offshore energy development projects remaining stagnant due to the fall in oil prices, order drought is expected to persist as the international major oil companies are curtailing investment in the wake of the decline in oil prices.





Market outlook for 2015 - anticipation mixed with concern

The global shipbuilding market is unlikely to break out of deep recession easily in the same way as last year. The shipbuilding orders in 2015 are predicted to increase by 15% year-on-year to approximately 130 million DWT. Particularly, global newbuilding orders are likely to continue a downward trend this year, unless overall order-taking environment improves amid persistent downturn in offshore plant sector and sluggish investment in eco-ship in aftermath of the decline in oil prices. The general-purpose vessel sectors, including the tanker, bulk carrier, etc., will be hit hard, resulting in the reduction of investment in eco-ship.

Meanwhile, tanker market is expected to see a mounting anticipation of increased demand amid the rising charterage for VLCC as a result of OPEC's export volume growth. New orders for oil tankers are not expected to be diminished significantly. In addition, the containership market is expected to see a drastic increase in new orders this year, spurred by strong demand for eco-ship, considering that the fuel con-



Figure 2. Trend of global newbuilding order backlog (Source: Clarkson)

sumption still remains high despite the decline in oil prices. New orders for LPG carriers and LNG carrier are expected to slid or maintain at a level similar to last year's due to largescale order placement for LPG carriers in 2014 and steady order placement for LNG carrier which has been sustained since 2011. However, the newbuilding orders are also likely to increase sharply, driven by shale gas export from the United States, depending on the market conditions.

The dark clouds hanging over the offshore plant market is not expected to be easily cleared up with the outlook for continuous fall in oil prices. Meanwhile, new order placement is expected to resume for offshore facilities such as FLNG/ FPSO for offshore projects that have been delayed thus far. Particularly, this sector is likely to see full-scale investment for deepwater development in water depths of over 3000 m. In the meantime, the Clarkson's index for new building prices remained in the range between 130 and 140 points last year and hit 139 points as of November.

The newbuilding prices in the first half of this year are expected to increase, led by gas-related vessels and large containerships. As the U.S. economy shows signs of recovery, the containership sector has seen a rise in capacity, driven by the growing capacity on the North America-Europe route and Asia-North America route which account for over 20% of global cargo traffic. The related industry predicts that the container cargo traffic will increase by 6.4% this year, compared to the previous year.

Dark clouds over bulk carrier market amid Chinese economic slowdown

The bulk carrier market did not show any turnaround last

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year, contrary to expectations. Particularly, both new orders and shipbuilding volume fell sharply as a result of robust growth in new orders in 2013. The shipbuilding volume of bulk carriers decreased 23.8% year-on-year to 46.06 million dwt while new orders slid 34.5% year-on-year to 56.39 million dwt, as of November 2014. This represents approximately 7.5% of global capacity, suggesting that the capacity glut remains unresolved in light of current market conditions.

The bulk carrier market is influenced heavily by the Chinese market conditions. Specifically, the bulk carrier market is expected to see the demand growing by 4% which falls below expectations due to slow world economic recovery and weak demand in Chinese market last year. The capacity is estimated at about 5%.

This year, the bulk carrier market is also expected to be plagued by capacity glut resulting from the increase in supply. The industry speculates that new order intake will be maintained at a level similar to that of the previous year, bolstered by newbuilding order placement for eco-ship, etc., that can better cope with stringent enforcement of environmental regulations.

The shipping industry predicts that the bulk carrier market will see the capacity growing by 7.5% in 2015 as a result of the orders placed in 2013 and cargo traffic volume remaining at about 4%, a level similar to last year's which indicates a slight deterioration of market conditions. Particularly, the shipping industry predicts that the capacity glut causing a huge order backlog will continue into 2017 and that annual capacity growth will exceed 5%, suggesting that market deteriora-

tion is likely to continue barring a drastic improvement in world economy. Meanwhile, the Baltic Dry Index (BDI), which is a measure of global economic activity, hit 1,120 points on average last year, a decrease by about 1.2% from the same period of 2013.

New orders for bulk carriers are expected to reach 55 million DWT in 2015, an increase by 3.5% from the previous year. The shipping industry predicts that the oversupply will continue as the bulk carrier deliveries will exceed the growth of bulk cargo traffic by 2016.

The shipping industry indicates that the oversupply will be drastically mitigated from 2015 and the demand will start exceeding the supply from 2017. In this regard, the industry pundits predict that new orders are likely to remain at a level similar to last year's as the ship owners take the delivery schedule into consideration.



Figure 3. Trend of global order intake and shipbuilding volume of bulk carrier (Source: Clarkson)





New orders for tankers to rise 25%

Global new orders for tankers decreased by 9.4% year-onyear to 24.43 million dwt and the volumes of vessels built decreased by 26.7% to 15.27 million dwt, as of November last year. Among them, new orders for product carriers which have continued the upward trend since 2012 - stood at 6.06 million dwt, an increase by 10.2%.

The oil tanker market is expected to make a turnaround this year as the capacity growth is likely to keep pace with the cargo demand that has increased more than expected due to the decline in oil prices in the second half of 2014. The growth in exports and oil consumption is expected to gather pace based on the prediction that the major oil-producing countries will ramp up oil production and the oil prices will remain in the range of USD 70. As a result, the related industry predicts that the maritime cargo traffic will increase by up to 2%.

Meanwhile, the product carrier market has been stricken by excessive cargo traffic volumes. Particularly, the capacity growth is expected to reach about 7% this year, driven by massive new orders placed in 2013, despite the cargo traffic growth. As the capacity growth exceeds the cargo traffic growth, the product carrier market is unlikely to make a turnaround this year. Such market conditions are likely to continue into 2016, but the demand and supply situation is expected to be only slightly worsened and unlikely to lead to drastic decline in freight rates.

The tanker charterage is showing an upward trend amid the increase in exports due to recent fall in oil prices and overpro-

duction of oil. According to shipping industry, the 1-year time chartered rate for 310K VLCC has reached USD 32,125 per day as of November, which represents an increase by 16.8% from 2013. Moreover, the charterage for 74K LR class product carrier hit USD 17,813, a 16.7% increase from the previous year.

Such hike in tanker charterage is considered to result from the increased exports of petroleum products refined from unconventional oil in the United States, but the industry pundits caution against premature optimism. Currently, the tanker market is seeing a hike in charterage for some types of ship models amid the decline in oil prices. The industry indicates that the upward pressure on charterage reflects temporary demand arising from overproduction of oil.

The order backlog of tankers remained at an average of 29.5% of capacity since 2003, which is expected to be high enough to anticipate recovery of growth in new orders for tankers in 2015. Thus, new orders for tankers are expected to reach 31.88 million DWT in 2015, an increase by about 25% from the previous year.



Figure 4. Trend of tanker charterage (Source: Clarkson)



Figure 5. Trend of global order intake and shipbuilding volume of tankers (Source: Clarkson)

Particularly, large vessels, such as Suezmax and VLCC, are expected to dominate shipbuilding orders as the demand for medium-sized Panamax class vessels will disappear upon completion of Panama Canal expansion works in the fourth quarter of this year. In 2015, a hike in freight rates and ship prices are cautiously expected as global shipping companies are reducing the supply and proceeding with merger. Another positive factor is the rising exports spurred by the development of shale gas in North America.

Modest growth driven by strong demand for ultra-large vessels

Global new orders for containership decreased 54.9% yearon-year to 871,000 TEU and the volumes of vessels built edged up by 3.1% year-on-year to 1.353 million TEU, as of November 2014. The sharp decline in new orders for containership is primarily attributed to the drastic increase in new orders for ultra-large containership since 2013. According to shipping industry, ultra-large vessels with a capacity of over 10,000 TEU account for 4.5% of all vessels but have the capacity equal to 16.8%. In particular, ultra-large containerships with a capacity of over 10,000 TEU comprise 55% of whole capacity among the containerships that have been ordered thus far. In this regard, shipping companies are expected to compete fiercely over freight rates, and as a result, the market is expected to witness an increase in new orders for ultra-large containerships with a capacity of over 13,000 TEU over the long-term.

Maersk recently announced that it was moving to place an order worth approximately USD 1 billion for 6 ultra-large containerships with a capacity of over 18,000 TEU. The shipbuilding industry has expected Maersk to award contract for ultra-large containerships. Last year, Maersk announced that it would place newbuilding orders with an investment of USD 15 billion which would spread over the next 5 years. Newbuilding order worth USD 15 billion is equal to the value of 150 containerships with a capacity of 10,000 TEU, and the order placement this time heralds the upcoming newbuilding contracts.

This year, global new orders for containerships are expected to increase by 10% to 955,000 TEU, which remains at a level similar to last year's, while the cargo traffic and capacity growth are expected to reach about 6% in consideration of the growth recorded in the previous year. Meanwhile, it remains to be seen whether new orders for large vessels will result from fierce competition between Big4 Alliance, such as 2M, Ocean Three, CKYHE, G6 which are poised for full operation this year, and other shipping companies. The ship-



ping industry predicts that the market will see an inflection point between demand and supply in 2015. New orders from global shipping companies have soared since 2011 when Maersk placed an order for 20 Triple-E (18,000 TEU) vessels. As most of vessels ordered at that time are scheduled for delivery by this year, the strain on shipping market is likely to be mitigated from this year unless the global economy slows down further.



Figure 6. Trend of global order intake and shipbuilding volume of containership (Source: Clarkson)

Ushering in the era of FLNG

Offshore plants have filled the gap in shipbuilding orders since the outbreak of global financial crisis. Offshore plants, such as FPSO, drillship, etc., are priced at hundreds of millions of dollars per unit, representing a high value-added sector, and have been recognized as new engine of future growth in the wake of full-fledged exploitation of offshore energy.

Profitability has recently become an issue that cannot be ignored. Global major shipyards are more likely to face cutthroat competition to dominate the market, given that each contract to build offshore production platform is valued at as high as billions of dollars. New orders for offshore plants have recently plummeted due to lack of investors' confidence amid the decline in oil prices. However, it is only temporary. The enthusiasm for offshore development projects, such as deepwater, shale gas, offshore wind power projects, etc., has yet to cool down.

The related industries blame the excessive order placement during 2011 to 2013 for current fall in new order placement. The rationale is that economic feasibility of offshore plants is not a far cry from that of unconventional energy development, such as shale gas, in terms of development cost, and that the investment has been made continuously in subsea equipment. Although the order placement may be delayed due to the fall in oil prices over the short-term, more offshore facilities will be ordered than have been thus far.

FLNG will open a floodgate of new orders. That is because they are mulling over FLNG, not the fixed platform, for the projects such as Gendalo-Gehem, Jangkrik, Block B, which have been put on hold due to the delay in investment amid the decline in oil prices. FLNG can reduce production cost by about 30% compared to existing LNG facilities and has the advantage of high mobility to overcome geopolitical constraints in production and provides higher operational efficiency than the fixed facilities. The decision on investment in those projects is expected to be finalized within this year. Once the order placement for FLNG is on track, the offshore market is likely to overcome the flat growth and make a slight turnaround in 2015.

Prospect for LNG carriers

As the United States is expected to embark upon fullfledged export of shale gas from 2017, a surge in new orders for LNG carriers is anticipated from this year. About 55 LNG carriers are expected to be ordered this year which represents an increase by 5% from the previous year. According to shipping industry, growth in new orders for LNG carriers will be fuelled by the strong demand associated with large-scale projects such as Yamal Project, and the expected demand for shale gas export projects to be awarded in the period ahead, despite the downward trend



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of maritime freight rates for LNG carriers. If the global LNG projects which have been planned are pushed forward as scheduled, 120 MTPA (mil ton per annual) liquefaction facilities will be built over the next 5 years until 2019. From this period, gas production will start from those projects such as Yamal Project in Russia, Prelude and Ichthys projects in Australia.

This signifies growth of both cargo traffic and demand for LNG carriers. The shipbuilding industry expects that about 200 newbuilt LNG carrier will be needed by 2017. When the United States moves ahead with full-scale shale gas development, the demand for LNG carriers is likely to increase further. In this regard, the vessels for LNG projects launched last year are expected to dominate new orders. More than 30 vessels will be ordered for the long-term transport of LNG that will be produced in Yamal, Gail of India, Kogas of Korea, Mitsui of Japan, Algeria, United States, etc., after 2017.

This year, new orders for LNG carrier are expected to reach 8.48 million to 10.75 million CBM which is equal to 55 to 60 units of 155K LNG carriers.

LNG-powered vessel has emerged as a viable solution

LNG-powered vessels which are currently operational account for less than 1% with 15-20 units. The market still needs validating and therefore is unlikely to be expanded drastically in short period of time. However, the LNG-powered vessel market which has great potentials for growth is expected to expand rapidly amid rigorous enforcement of







environmental regulations.

According to the related industry, the number of LNGpowered vessels will be about 1,000 by 2020. Base on that, an average of 200 LNG-powered vessels are expected to be ordered yearly over the next 5 years. Particularly, the vessels to be built from the next year will be subject to even more rigorous regulations on the emissions of Nitrogen oxides (NOx) in Emission Control Area (ECA) for the United States and Canada as the Tier-III will take effect. LNG-powered vessel has emerged as the solution to cope with that.

Currently, shipping companies or shipyards are outfitting the vessels with SCR or EGR to cope with Tier-III, which is only temporary solution. From this year, vessels sailing in the coastal waters of the United States and Canada are more likely to be LNG-powered vessels which provide economic advantage.

Meanwhile, Tier-III is expected to join the United States in adopting the Tier-III. Then, the new order placement for LNG-powered vessel will gather further momentum.

LNG-powered vessel sector still has many challenges ahead. The infrastructure for LNG bunkering is prerequisite for the full-fledged LNG-powered vessel market. North American or some European countries are currently operating the LNG bunkering and LNG-powered vessels mainly in their coastal waters. However, their operations are limited to some regions. To navigate through the vast ocean, largescale bunkering facilities are indispensable.

Reference

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HHIC-Phil joined the ranks of the world's top 10 shipyards

Hanjin Heavy Industries & Construction (HHIC)-Phil has successfully delivered 68 vessels and 7 facilities such as onshore/offshore plants, achieving the milestone of USD 5 billion in cumulative sales in 5 years after its operation began.

HHIC-Phil, the overseas local corporation of Hanjin Heavy Industries & Construction (HHIC) which was completed in Subic Bay, Philippines in 2009, is the largest shipyard in Philippine, covering an area of 300 ha. Achieving the milestone of USD 5 billion in cumulative sales in 5 years after completion of construction, HHIC-Phil has become the largest shipyard in Philippines.

HHIC-Phil is equipped with the stateof-art facilities such as goliath crane, automation facilities, etc., including 10 guay walls with a total length of 4 km and ultra-large dock measuring 550 m in length and 135 m in width. Particularly, HHIC-Phil has an annual shipbuilding capacity of 600,000 tons. So far, HHIC-Phil has delivered 68 vessels such as containerships, tankers, bulkers, etc., and 7 facilities such as onshore plants and offshore platforms. Moreover, HHIC-Phil joined the ranks of world's top 10 shipyards in terms of order backlog based on the data published by Clarkson in April 2014.

Through HHIC-Phil, HHIC has overcome the limited availability of facilities at Yeongdo shipyard, thus eliminating the constraints in its construction of high value-added large vessels. As a result, HHIC successfully built up its competitiveness over the mid and long-term and laid groundwork for evolving into a global shipyard. As the nation's first shipyard, HHIC has proved its leadership, building various vessels including the drillship, Asia's first membrane type LNG

carrier, cable-laying vessel, ice-breaking vessel, etc., since its establishment in 1937.

Particularly, HHIC opened the SDC (Skill Development Center) in Philippines and has made intensive effort to develop local talent pool and technical workforce for welding, painting, etc. Last year, HHIC-Phil won orders in a row for very large crude carriers with a capacity of 300,000 tons and ultralarge containerships with a capacity of over 10,000 TEU, securing the order backlog of 39 vessels worth approximately USD 2.6 billion.

According to SBMA (Subic Bay Metropolitan Authority), the number of vessels delivered by HHIC-Phil rose from 5 units in the first half of 2013 to 11 units in the same period this year, showing that HHIC-Phil has become the largest exporter within the SBMA zone.



In particular, HHIC-Phil commenced construction of 38,000 m³ LPG carrier and 11,000 TEU ultra-large containership last year, making full-fledged inroads into the market for ultra-large vessels and high value-added vessels.

Ahn Jin-gyu, President of HHIC-Phil, said, "We will steadily expand our shipbuilding capabilities with a shift in focus towards high-profit ship models based on strong competitiveness and qualitative growth, rather than quantitative growth such as the scale of shipyard." He added, "We will take another leap forward to become a global shipyard by pursuing a two-track strategy that aims to develop HHIC-Phil into globally competitive core business unit in shipbuilding industry and make Yeongdo shipyard focus on the construction of commercial vessels and high-tech special purpose vessels."

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A clean energy solution with igus on board

Automated docking of a floating power plant in the Hamburg harbour reduces emissions

The "Hummel" LNG HYBRID barge was baptised in a ceremony in Hamburg's Hafencity. Cruise ships can now be supplied with power whilst in port, thanks to the use of this floating LNG power plant. It uses environmentally-friendly lig-

plant. It uses environmentally-friendly liquefied natural gas – LNG. This saves fuel and reduces cruise ships' emissions. The coupling process takes place at the dock using a complete solution from the switching cabinet to

the connectors. Normally, the ships' own on-board generators continue to run in order to supply the cruise ships with electricity during their time in port. Becker Marine Systems designed and built the "Hummel" HYBRID LNG barge for the Port of Hamburg in order to reduce pollution in the future. Hummel is a floating LNG power plant which supplies cruise liners with electrical power. The leading energy supply experts at igus were brought into the project in order to deliver the energy from the barge to the docks, where they are then connected to cruise ships. igus is used to providing customised solutions, but this was a new case as all the electronics and steel structures were designed and supplied by igus.



The "Hummel" LNG HYBRID barge supplies a cruise ship with power



The complete coupling system was developed and installed by igus.

Automatic connection

As soon as the barge arrives at its berth, a gangway moves out, connecting staff on board with the shore. Energy chains from igus are underneath this gangway carrying four thick 6-10kV cables with connectors. These are connected to large power supply



igus handled all the work from the switching cabinet to the connector.

boxes as soon as the gangway is docked and the chains are connected. The system connecting the barge must also compensate for the constant motion due to waves and tidal fluctuations. The barge will come into regular use for the 2015 cruise season.

ABB and Hitachi to form strategic power grid partnership

New Joint Venture to build on Hitachi's strong local market presence and ABB's High Voltage Direct Current (HVDC) technology leadership to address Japan's new energy focus

ABB and Hitachi announced on Dec 16 an agreement to form a joint venture for high voltage direct current (HVDC) system solutions in Japan. The new entity, to be based in Tokyo, will be responsible for the design, engineering, supply and after-sales services related to the DC system of HVDC projects bringing ABB's latest technologies to the Japanese market where Hitachi will be the prime contractor.

Hitachi and ABB will take equity interests of 51 % and 49 % respectively. This is the first step of a strategic partnership between the two companies to contribute to the evolution of Japan's power network. Hitachi and ABB will explore further strengthening of the relationship and address opportunities to widen the scope for future collaboration.

The joint venture is expected to commence operations in the coming months, subject to the necessary approvals and statutory procedures.

"Since the first development in the 1970s, Hitachi has participated in every HVDC project in Japan and has continued to underpin the stabilization of the electricity grid. I am confident that the establishment of a new company combining the strengths of Hitachi and ABB will provide a frame-



ABB HVDC test lab in Ludvika, Sweden

work for the timely provision of the new technologies required by the Japanese HVDC market. By enhancing and expanding the HVDC business through its partnership with ABB, which has a strong performance record in the global market, Hitachi will continue to contribute to the stabilization of Japan's electric power grid." said Hiroaki Nakanishi, Chairman & CEO of Hitachi, Ltd.

"ABB pioneered HVDC 60 years ago and has continually pushed the boundaries of this technology," said Ulrich Spiesshofer, CEO of ABB. "Our presence across half the world's installed base and our capability to develop and manufacture all major components of the HVDC value chain inhouse have put us in a leading position in the industry. We are proud to enter into this partnership with Hitachi, with a solid reputation and extensive, 100 year experience in the Japanese market. Together we can build on our complementary strengths to play our part in the evolution of Japan's power infrastructure."

HVDC is a technology used for transmitting electricity between two grid systems. The supply side power is converted from alternating current (AC) to direct current (DC) before being transmitted, and is then convert-

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ed back to AC in the receiving system for use. The system is ideal for longdistance transmission due to the technology's ability to minimize electricity losses, and to its lower space requirements and construction costs. It is also well-suited for interconnections between two different frequencies.

The global HVDC market has seen many projects using line commutated converter technology (LCC) HVDC systems since the 1970s, while the development of voltage source converter (VSC) systems has advanced as a new technology since around 2000. In recent years there has been a particular focus on using HVDC to connect renewable energy sources. This has seen an increase in VSC-HVDC transmission systems, which facilitate grid-stabilization.

The technology is ideal for long-distance underground and underwater power links and interconnections, and is increasingly being deployed across a range of applications. These include the integration of renewable energies from land-based and offshore wind farms, the mainland power supply to islands and offshore oil and gas platforms, city center in-feeds where space is a major constraint, and cross-border interconnections that often require subsea links. Its ability to comply with grid codes ensures robust network connections regardless of application.

In Japan, nine HVDC projects were carried out up to 2006, all of them using the LCC type. Now, with the increasing introduction of renewable energy and innovation in electric power systems, demand for VSC-HVDC systems is expected to increase for applications such as



ABB HVDC valve hall

wide-area power transmission grids and connection of offshore wind farms.

Hitachi has participated in every HVDC project in Japan so far. In the Japanese market, which demands a high level of reliability, Hitachi has contributed through technology development and project management to the creation of HVDC systems that maintain high operation rates ranking amongst the best in the world.

ABB pioneered HVDC technology, putting into operation the world's first commercial link in Sweden in 1954, and was the first to introduce VSC technology (HVDC Light) in the 1990s. The company also holds many other world records in this technology. Over the years ABB has been awarded around 100 HVDC projects representing a total installed capacity of more than 120,000 MW, accounting for about half of the global installed base. ABB's HVDC Light solution leads the way in VSC technology; the company has delivered 14 of the 15 VSC links that have been commissioned worldwide. The new joint venture will combine Hitachi's sales network, project management expertise, quality assurance processes and delivery performance record, with ABB's stateof-the-art HVDC technologies, and contribute to innovation in electric power systems in Japan. 戱

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한진중공업-수빅조선소, 글로벌 10위 조선소로 발돋움

한진중공업-수빅조선소(HHIC-Phil)가 완공 5년만에 선박 68척과 해양/육상 플랜트 등 7기를 성공적으로 인도하며, 누적 매출액 기준으로 50억 달러를 달성했다.

지난 2009년 완공된 한진중공업의 해외 현 지법인인 수빅조선소는 총 면적 300 ha로 필리핀 최대 규모의 조선소다. 수빅조선소 가 완공 이후 5년 만에 누적 매출액 50억 불을 달성하면서 필리핀 내 최대 조선소로 서의 위상을 높였다.

수빅조선소는 길이 550m, 넓이 135m의 초 대형 도크와 총 길이 4km에 이르는 10개의 안벽을 비롯해 골리앗 크레인과 자동화 시 설 등 최첨단 설비를 갖추고 있으며, 연간 60만톤의 건조능력을 보유하고 있다. 현재 까지 컨테이너선, 탱커선, 벌커선 등 선박 68척과 육상 플랜트, 해상 플랫폼 등 7기를 인도하는 성과를 거뒀다. 한편 수빅조선소 는 지난 2014년 4월 클락슨이 발표한 수주 잔량 기준 전세계 조선소 순위에서 10위권 에 첫 진입하는 기염을 토하기도 했다.

한진중공업은 수빅조선소를 통해 기존 영 도 조선소의 설비 제한으로 인해 고부가가 치 대형 선박 건조의 한계를 극복할 수 있 게 됐고 중장기 경쟁력 강화에 성공하면서 글로벌 조선소로 도약할 수 있는 발판을 마 련할 수 있게 됐다.

한진중공업은 지난 1937년 설립된 국내 최 초의 조선소로서 석유 시추선을 비롯, 아시 아 최초로 멤브레인형 LNG선, 케이블선, 쇄 빙선 등을 건조해 국내 조선소의 종가로 선 구자적인 역할을 톡톡히 해왔다.

한진중공업은 필리핀 현지에 트레이닝센터 (SDC; Skill Development Center)를 세워 용



접, 도장 등 각 분야별 기능 인력에서부터 기술인력에 이르기까지 현지 우수인력을 집중 양성해왔다. 수빅조선소는 지난해 30 만톤급 초대형 원유운반선과 1만 TEJ급 이 상의 초대형 컨테이너선 등을 잇따라 수주 하면서 현재까지 총 39척, 약 26억 달러 규 모의 조업 물량을 확보한 상황이다.

수빅경제자유구역청(SBMA, Subic Bay Metropolitan Authority)에 따르면, 수빅조선소 의 선박 인도량은 2013년 상반기 5척에서 지난해 같은 기간 동안 11척으로 증가해 SBMA 내 최대 수출기업으로서 자리매김했 다. 특히 지난 해에는 3만 8000㎡급 LPG 선과 11,000 TEU급 초대형 컨테이너선 착 공에 돌입함으로써 본격적인 초대형선 및 고부가가치선 시장에 출사표를 던졌다. 로베르토 가르시아(Roberto V, Garcia) SBMA 청장은 "수빅조선소는 입주 이후 단순한 설 비나 자본 투자를 넘어 관련산업 동반성장 과 국가경제 기여, 인재 양성을 통한 고용 창 출과 지역시회 공헌에 이르기까지 필리핀 경 제에서 가장 바람직한 해외기업 유치 시례로 손꼽히고 있다"며 "향후 양국간 경제협력과 투자 활성화를 위해 SBMA 투자기업에 대한 지원을 아끼지 않을 계획"이라고 전했다.

수빅조선소 안진규 사장은 "지금까지는 조 선소 규모와 설비 등 양적 측면이 부각되었 지만 앞으로 지속적인 경쟁력 확보를 통해 고수익 선종으로의 질적 성장을 함께 이뤄 초대형선부터 고부가가치선, 해양플랜트에 이르기까지 건조능력을 점차 확대해 나갈 것"이라며, "향후 수빅조선소를 글로벌 경쟁 력을 갖춘 조선부문 핵심사업장으로 육성 하고, 영도조선소는 상선 및 고기술 특수목 적선에 집중하는 투트랙 전략을 통해 세계 적 조선사로 재도약하겠다"고 밝혔다. 🖏

이구스의 친환경 에너지 솔루션

LNG선으로 유해가스 배출 없앤 FLPP(Floating LNG Power Plant)의 자동화 도킹 시스템에 적용된 이구스 시스템

함부르크 하펜시티에서 LNG하이브리드 바지선 "Humme('함멜)"의 진수식 이 진행됐다. 이 선박은 친환경 LNG를 연료로 사용하는 이 선박은 비 용 절감뿐만 아니라 유 해가스 배출도 줄일 수 있다. 이 험멜의 완성으 로 이제 항구에 정박해 있는 크루즈선에 자동으 로 전원을 연결할 수 있

게 됐다. 스위칭 캐비넷부터 커넥터까지 일 체형 솔루션을 사용한 이구스의 커플링 솔 루션이 공급되었기 때문이다.

일반적으로 선박 지체에 내장된 발전기는 항구에 정박되어 있는 동안 전기를 공급하 기 위해 계속 가동상태에 있게 된다. 독일의 베커마린시스템즈(Becker Marine Systems) 는 환경 오염을 막기 위해 LNG 하이브리드 바지선을 제작했는데, 이 바지선에 에너지 전달 솔루션을 공급하고 있는 곳이 바로 이 구스다. 험멜에서 선창까지 필요한 모든 전 기 및 스틸 구조물들을 설계부터 설치까지 이구스가 함께 참여해 완성시켰다.

자동 연결 시스템

바지선이 배에 닿으면 둘 사이의 연결을 도 와주는 갱웨이가 밖으로 열린다. 이 작업을 도와주는 것이 바로 갱웨이 밑으로 설치된 4개의 두꺼운 6-10kV 케이블 및 에너지 체 인이다. 갱웨이가 설치되고 체인 연결이 완



크루즈 선박에 전원을 공급하고 있는 LNG 하이브리드 바지선 "Hummel"



igus가 개발부터 설치까지 참여한 일체형 커플링 시스템

료되면 바지선의 대형 전원 공급 박스까지 자동으로 연결된다. 배와 바지선을 잇는 이 시스템에서 무엇보다 중요한 것은 높은 파 도나 조석 변동에 상관없이 안전하게 에너 지를 공급할 수 있도록 하는 것이다. 이번에 진수식을 마친 험멜은 오는 2015년 크루즈



스위칭 캐비넷부터 커넥터까지 모든 전기 요소 및 스틸 구성물들의 공급을 책임진 이구스

시즌에 본격적으로 운영될 계획이다. 🖏

Turbo boost

Only simulation software that has been developed in-house can hope to tackle the immense complexities of engine turbochargers.

- ACTUS is ABB's new simulation software for large turbocharged combustion engines

The performance of turbocharged combustion engines depends heavily on the performance of the turbocharging system itself. The interplay between the engine and the turbocharging system is complex and simulation is an essential tool for understanding this interaction and how best to match the engine components. Today, most engine manufacturers perform simulations to optimize their engine systems' designs. The vast majority of manufacturers rely on commercial simulation tools, which are sometimes supplemented by in-house developments for specific tasks.

While today's commercially available tools are usually of very high quality and offer an extremely wide range of functionality, ABB continues to rely on in-house simulation software for its engine simulation needs. The use of in-house software allows ABB to fully customize the simulation to suit the specific needs the company has as a manufacturer of turbochargers for large-bore combustion engines. These needs range from selection of optimal turbocharger specifications in sales to research applications for test benches, turbocharger product development and the development of turbocharging concepts.

ABB

The simulation of turbocharged engine systems has a long tradition in ABB. The first digital computations were performed in the 1960s with the introduction of the first digital computers [1,2]. These computational tools were continuous-

ly improved and extended. In the early 1980s, the existing calculation methods were combined into a single simulation platform called SiSy (Simulation System) that has been continuously extended since then [3].

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After more than 20 years of development of SiSy, it became increasingly difficult to further extend the software due to its monolithic software design, so the decision was made to replace the software with a new simulation tool based on a modern, modular software design. The new simulation tool was named ACTUS (advanced computation of turbocharging systems). The software consists of two parts: a modern user interface with a graphical topology editor for setting up the simulations and a simulation kernel for performing the calculations.

Graphical user interface

In the graphical user interface, the engine is built by combining components from a library of distinct elements such as pipes, valves, compressors, cylinders, shafts, etc. and defining their possible interaction through fluid, mechanical, heat, or signal connections. (Figure 1) Once the topology is defined, the parameters of each component are specified in the parameter editor. A special simulation case editor allows multiple consecutive simulations to be set up – to simulate multiple engine load points in one simulation run, for example. The user interface also gives convenient access to a broad database of detailed performance data for all ABB turbochargers available since the 1970s.



Figure 1. ACTUS user interface graphical editor showing a model of a simple six-cylinder, single-stage turbocharged engine with a turbine bypass valve.

Simulation kernel

The second part of ACTUS, the simulation kernel, solves the model equations for the system and computes the results. The primary focus of the simulation is to predict the most relevant aspects of the whole engine system rather than focusing on specific, detailed aspects. While nowadays it would be possible to simulate the gas exchange of an engine cylinder with

three-dimensional computational fluid dynamics, such a level of detail would not be suitable for a system level computation: The resulting computational time would be prohibitive for use in optimization and, even more importantly, such a calculation would require detailed knowledge of all geometries of the engine, which is typically not available to ABB.

ACTUS consists of two parts: A modern user interface with a graphical topology editor for setting up the simulations and a simulation kernel for performing the calculations.

Therefore, the models used in ACTUS are simplified models derived from physical first principles. The system simulation of a turbocharged engine system requires a large number of such simplified models from a range of different disciplines. This includes mechanical models for the crankshaft, and turbocharger shafts and bearings; thermal models for heat transfer; chemical models for emissions; and thermodynamic models for gas properties as well as for compression, expansion, fluid flow and storage.

For complex processes, such as the cylinder combustion, the physical first-principle models are commonly complemented by empirical model extensions. These have been



Figure 2. Pressure before turbine inlet #1 over one engine cycle for a steady engine operation point (at full load)





Figure 3. Benefit of convergence acceleration: Instead of requiring 150 calculation cycles in transient mode, the solution is found after 26.

derived from the literature or from research collaborations, or have been developed internally within ABB.

ACTUS convergence acceleration

As most large-bore engine systems run under a constant load for long periods, the constant-load operating points are those of greatest interest for design optimization. Due to the inherently unsteady nature of the combustion engine process, a constant engine load point is not a steady state but rather a situation that exhibits periodicity, as can be seen, for example, from the pressure trajectory near a turbine inlet over one engine cycle. (Figure 2)

The solution is periodic when all dynamic states within the system match the initial state after the cycle completion. The most common approach used to determine such a periodic solution is to run a transient simulation long enough for all initial disturbances to decay. Due to the high rotational inertias of the turbocharger and crankshafts, typically more than 100 engine cycles are needed to obtain the cyclic solution. (Figure 3)

In order to speed up such simulations, ACTUS employs an optimization method, called convergence acceleration that significantly reduces the number of cycles needed to obtain the cyclic solution. This allows steady-state operating conditions for typical engines to be calculated on a standard PC in a matter of seconds.

ACTUS Match

This convergence acceleration is coupled with a unique feature called ACTUS Match. ACTUS Match allows the calculation of the set of simulation input values that will result in a certain desired set of simulation output values. This is useful as system design applications often need to determine a system configuration that yields a desired result. For example, a common task in turbocharger matching is to determine the turbine size such that the engine will operate with an air-to-fuel ratio defined by the engine manufacturer and a given load. From a simulation standpoint, this is a nontrivial task as the resulting air-to-fuel ratio is typically not an input to the simulation, but rather a result depending on the charge air pressure, which in turn depends on the effective turbine area (size).

The sales department use ACTUS to select optimal turbocharger specifications for a particular engine – a task most Customers rely on ABB to do.

Here, ACTUS Match allows the required turbine to be determined while, at the same time, taking into account the amount of fuel required to accommodate the desired engine load. ACTUS Match performs this task directly and with only slightly more overhead than a single standard simulation. Most simulation tools require the use of an external optimization process for such applications, which results in significantly increased run times and complexity for the user. This high computational performance allows ACTUS to be used in a very efficient manner for design studies and optimizations.

Sales application

ACTUS was introduced in 2012 and is now widely used within ABB. The software has more than 30 users in sales and research departments and at ABB locations worldwide.

A typical use within the sales department is for the selection of an optimal turbocharger specification for a particular engine (in fact, most customers rely upon ABB for this). Starting with key engine data and, if available, measurements from previous similar engines, a simulation model of the engine is constructed. The model is then used to determine the most suitable turbocharger.

For complex engine systems, such as a two-stage turbo-

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Figure 4. Typical operating lines for a two-stage turbocharged engine compressor for a power plant application

charged engine with a turbocharger bypass as a control element, this becomes a complex task. Typically, the engine manufacturer will first define the desired operating conditions for the engine. ABB's task is then to select a compressor and turbine configuration such that the turbocharging efficiency and, thus, the engine efficiency, is maximized. At the same time, the design has to satisfy a series of other constraints such as a given control reserve for the bypass, a minimal distance from the compressor surge line, maximum admissible rotational speeds of the turbocharger and maximum allowable turbine inlet temperatures.

Here, the ACTUS Match feature significantly reduces the throughput time required for the specifications from hours to minutes. (Figure 4)

ACTUS is also used within product development to predict design parameters for the next generation of turbochargers.

Research applications

In the turbocharging engineering division, ACTUS is used to investigate new turbocharging concepts and their impact on the combustion engine. A number of these studies were presented at the 27th CIMAC World Congress in 2013 [4,5,6]. One current trend in turbocharging is toward two-stage turbocharging. This allows significantly higher pressure ratios to be used. While the benefits of two stage turbocharging are well understood for four-stroke combustion engines and several engine manufacturers already offer engines with twostage turbocharging, the potential for large two-stroke engines is currently not fully understood. In order to gain such understanding, simulation studies were performed showing the potential for total fuel savings at different load conditions [4]. (Figure 5)

In the reference case (top curve), the engine is turbocharged by a single-stage turbocharger and a brake mean effective pressure of 21 bar, as is common today. The study shows that by using two-stage turbocharging and either increasing the brake mean effective pressure or employing a power turbine or waste heat recovery system, the overall fuel consumption of the system can be reduced significantly. It should be noted that these results are a prediction based purely on simulation models that have been utilized for the purpose of exploring the potential of future turbocharging options, well before any experimental results would be available.

In addition to the applications described above, ACTUS is also used within product development to predict design parameters for the next generation of turbochargers. ACTUS also features a mode in which turbocharger performance

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Figure 5. System fuel consumption comparison for different two-stroke engine turbocharging topologies

can be evaluated based on measurement data and compared with expected values. Recently, ACTUS was extended so that it can be used to determine the specifications for new two stage turbocharger test benches at ABB sites. Due to the complexity of two-stage operations, the specification methods previously used were no longer suitable.

In the turbocharging Engineering division, ACTUS is used to investigate new turbocharging concepts and their impact on the combustion engine.

Turbocharging the future

The detailed understanding of the turbocharging process and its continuous improvement have always been strengths of ABB. Part of that understanding has been derived from the long-standing tradition of system level simulations of large-bore combustion engines. ABB's new ACTUS simulation tool builds upon that tradition and provides a modern and sound basis for future simulation needs.

As an in-house simulation tool, ACTUS allows very efficient system-level simulations and is highly customized to ABB's specific needs as a turbocharger developer and manufacturer. This allows ABB to continue to support customers in determining the optimal turbocharging solution for their engines and to shape new turbocharging concepts and solutions that enable ABB's customers to further improve engine performance and to comply with future emission legislation.

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Common Rail Fuel Injection: Key technology for clean and economical combustion

With common rail fuel injection, the combustion process can be optimized to achieve low pollutant levels combined with lower fuel consumption. Fuel is injected into the combustion chamber from a common rail under high pressure. The electronic control system ensures that the start of injection, the quantity and time are independent of the engine speed. In 1996, with the Series 4000 engine, MTU was the first manufacturer of large diesel engines to introduce common rail fuel injection as a standard feature.

MTU Friedrichshafen GmbH

Pioneer of the common rail fuel injection system

The emissions regulations for diesel engines in applications such as ships, trains and heavy duty off-road vehicles and gen sets worldwide are becoming more stringent and make extensive modifications to the power units necessary. At the same time, customers are constantly calling for more economical engines. Exhaust after treatment systems such as SCR catalytic converters (selective catalytic reduction, short: SCR) or diesel particulate filters are one way of lowering emissions, but also have a greater space requirement and potentially increase the engine's maintenance needs. For these reasons, MTU primarily pursues a policy of reducing emissions by internal engine enhancements. Fuel combustion inside the engine is improved so that, if at all possible, emissions are not produced in the first place. If necessary, MTU introduces a second phase of emission control whereby remaining harmful emissions are removed by exhaust after treatment systems.

As part of the internal engine enhancements, one of the major means of

control for obtaining clean fuel combustion, besides exhaust gas recirculation, is the fuel injection system. It is designed to inject the fuel at high pressure at precisely the right moment, while also accurately metering the quantity of fuel injected in order to create the conditions required for low emission combustion inside the cylinder.

With precise control of fuel volume delivery at high pressure, fuel consumption can also be dramatically reduced. This is the reason why MTU implemented a technology change from conventional mechanical injection systems to the flexible, electronically controlled common rail system at a very early stage - at the time mainly

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Figure 1. Common rail system for Series 4000 The performance and flexibility of the CR system create the prerequisites for clean and efficient combustion.

with a view to producing more economical engines. In 1996, MTU equipped the Series 4000, the first large diesel engine, with a common rail system as a standard feature.

A common fuel pipeline - the so-called rail that gives the system its name - supplies all the engine's fuel injectors with fuel. When fuel is to be injected into a cylinder, the system opens the nozzle of the relevant injector and the fuel flows from the rail into the combustion chamber, is atomized by the high pressure in the process, and mixes with the air.

The common rail system components have to be extremely precisely and flexibly controlled. For this purpose, MTU uses its ECU (Engine Control Unit, see Figure 1), a proprietary engine management system that was developed in-house. Due to the increasingly stringent emissions standards for engines of all power classes and all types of application, MTU in future will be fitting all newly developed engines with common rail fuel injection.

Lower emissions due to combination with other key technologies

With combustion optimization by internal engine design features there is a three-way interaction between nitrogen-oxide formation, the production of soot particulates and fuel consumption: the more intensive the combustion and thus the energy conversion, the lower the particulate emissions and consumption and the higher the nitrogen oxide emissions.

Conversely, retarded combustion leads to lower nitrogen oxide formation, but also to higher fuel consumption and particulate emission levels. The job of the engine developers is to find a compromise between these extremes for every point on the engine performance map. When doing so, they must harmonize the effect of the fuel injection system with that of other internal engine measures such as exhaust gas recirculation, which primarily reduces nitrogen oxide emissions, and external exhaust after treatment systems.

As a pioneer in this field, MTU can draw from many years of experience with fuel injection systems produced by Tognum's subsidiary company L'Orange and other suppliers. In the course of this period, MTU has acquired comprehensive expertise in the integration of the common rail fuel injection system into the engine. This has enabled the company to fully utilize the potential of the fuel injection system in combination with other key technologies for refining the combustion process. The two key parameters in fuel injection that affect fuel consumption and emissions are injection rate and injection pressure.

Injection rate: pre-, main and post injection

The injection rate determines when and how much fuel is injected into the cylinder. In order to reduce emissions and fuel consumption, the present evolution stage of the injection system for MTU



Figure 2. Fuel flow and injection sequence for multiphase injection

MTU divides the fuel injection sequence into as many as three separate phases. The main injection phase delivers the fuel, a pre-injection phase reduces the load on the crankshaft drive gear, and a post-injection phase reduces particulate emissions. This enables both fuel consumption and emissions to be reduced.





engines divides the fuel injection sequence into as many as three separate phases (see Figure 2).

The timing of the start of injection, the duration and amplitude are user defined in accordance with engine performance map. The main injection phase supplies the fuel for generating the engine's power output. A preinjection phase initiates advance combustion to provide controlled com-



Figure 3. Change in injection pressures since 1996 for Series 4000 engines Since 1996, MTU has steadily increased the injection pressures to further reduce consumption and particulate emissions. Since 2000, MTU has used advanced versions of the common rail system on the Series 4000, amongst others, in which each fuel injector has its own fuel reservoir. The advantage is that even with large injection quantities, the fuel rail remains free of pressure fluctuations and the injection sequences of the individual cylinders do not interfere with each other. bustion of the fuel in the main injection phase. This reduces nitrogen oxide emissions, because the abrupt combustion prevents high peak temperatures.

A post injection phase shortly after the main injection phase reduces particulate emissions. It improves the mixing of fuel and air during a late phase of combustion to increase temperatures in the combustion chamber, which promote soot oxidation. Depending on the engine's operating point, the main injection phase can be supplemented as required by including pre-and/or post injection phases.

Injection pressure: peak pressures of up to 2,200 bar

Injection pressure has a significant influence on particulate emission levels. The higher the injection pressure, the better the fuel atomizes during injection and mixes with the oxygen in the cylinder. This results in a virtually complete combustion of the fuel with high energy conversion, during which only minimal amounts of particulates are formed.

For this reason, MTU has continually raised the maximum injection pressure of its common rail systems from 1,400 bar in the case of the Series 4000 engine in 1996 to the present 2,200 bar for the Series 1600, 2000 and 4000 engines (see Figure 3). In the case of the Series 8000 engine, it is 1,800 bar. For future engine generations, MTU is even planning injection pressures of up to 2,500 bar.

Over the same period, MTU has further improved the system's durability and ease of maintenance. A filter concept designed to meet the requirements has further improved the injection system's ability to cope with particle contamination in the fuel. In future, injector servicing intervals will be extended with the aid of electronic diagnostics.

Solo system: injectors with their own fuel reservoir

Because of its performance capabilities, the common rail injection system has established

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Figure 4. Injector with integrated fuel reservoir

The use of injectors with an integrated fuel reservoir prevents pressure fluctuations in the common rail system and, therefore, a momentary undersupply or oversupply of fuel to the injectors.

itself as standard equipment on car diesel engines in the course of the last few years. The version of the system as described is also well suited for use in small capacity industrial engines.

In the case of engines with larger cylinder capacities, however, the conventional common rail system is now revealing its limitations, since these require a relatively large quantity of fuel to be injected into the cylinder for each ignition stroke. This produces pressure pulsations in the common rail system's fuel reservoir that can interfere with the subsequent injection sequences. Since 2000, MTU has used an advanced version of the common rail system for the Series 4000 and 8000 engine, and since 2004 for the Series 2000 as well, in which the fuel injectors have an integrated fuel reservoir (see Figure 4).

This permits the fuel lines between the injectors and the common rail to have a relatively small cross section. During an injection sequence, all that happens is that the pressure in the injector's own fuel reservoir drops slightly. This prevents pressure fluctuations in the common rail system and, therefore, a momentary undersupply or oversupply of fuel to the injectors.

Tailored solutions for flexible use of fuel

With the higher technical performance levels of the injection systems, the demands placed on the fuel in terms of purity and quality also rise. Thus the fuel must comply with pre-defined values for viscosity and lubricity, as components of the high-pressure pumps and injectors are lubricated by the fuel. It must also be free of any contamination that would lead to abrasive damage at the high pressures employed.

To ensure that the engine operates correctly, therefore, only diesel fuel that is approved for the application in question and meets the applicable standard may be used. At the customer's request, MTU carries out analyses for specific application-related approval of other fuels in close cooperation with the Tognum subsidiary L'Orange or alternative suppliers. With some applications, for example, a lack of lubricating properties on the part of the fuel can be compensated for by special coatings on the injection system. In addition, MTU assists customers when designing the onsite tank and fuel system. This is of great interest for mining vehicles, for instance, that are subjected to high levels of dust exposure.

Summary

MTU continually develops its engines to ensure they will meet the tough future emissions standards, while at the same time consuming as little fuel as possible. To this end, MTU optimizes fuel combustion in the cylinder by means of its electronically controlled common rail fuel injection system in combination with other technologies such as exhaust gas recirculation.

By achieving clean and efficient combustion, the expense of exhaust after treatment systems can be minimized and, in some cases, eliminated altogether. MTU has used common rail systems successfully since as long ago as 1996 and has continually advanced the technology in collaboration with the Tognum subsidiary L'Orange and other suppliers. Due to its extensive expertise in common rail injection systems, MTU is able to optimally exploit the potential of the technology in order to make engines extremely economical and clean.

About Company

MTU is the brand name under which the Tognum Group markets engines and propulsion systems for ships, for heavy land, rail and defense vehicles and for the oil and gas industry. They are based on diesel engines with up to 9,100 kW and gas turbines up to 45,000 kW power output. The company also develops and produces bespoke electronic monitoring and control systems for the engines and propulsion systems.



Emerson tackles costly downtime losses in industrial process facilities, launches reliability management consulting service

Enterprise-wide reliability strategies can save global companies more than \$50 billion a year in costs, increase capacity by more than 5 percent

Emerson Process Management

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Guest Article

Taking on what may be industry's greatest cause of excessive operational cost and unrealized profit, Emerson Process Management is changing the game for industrial producers like oil and gas, chemical, refining, and power. For these 24/7 operations, which routinely suffer 5 to 7 percent unplanned downtime losses due to poor maintenance practices, the company's new global reliability management consulting practice is guiding leaders on how to better manage maintenance costs, improve reliability, and increase profitability.

With more than 25 years of leadership in developing reliability-enhancing technologies and services, Emerson is elevating the reliability cost challenge to the boardrooms of its customers with an economic-based management consulting practice aimed at saving companies millions in wasted expense and lost revenue.

"C-suite executives are seeing the need to better manage physical assets for improved profitability," says Steve Sonnenberg, president of Emerson Process Management, a global business of Emerson (NYSE: EMR). "With the right strategy, the typical \$1 billion plant can save \$12 million or more

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annually in maintenance costs – not including the corresponding operational and production benefits from reduced downtime. Extend that across a corporation's network of facilities and soon reliability becomes the number one strategic lever for a safer, more profitable enterprise.

By reducing scheduled and unscheduled downtime, companies can reduce their maintenance spend by 50 percent or more, according to Solomon Associates, a leading benchmarking company in the process industries that tracks companies' performance based on reliability and maintenance metrics. Optimized reliability practices – such as increased condition monitoring and analysis-based maintenance activities – drive down costs and also improve sales, quality, health and safety, and environmental compliance. These are all key factors affecting operational risk and shareholder value.

Corbion, a global food and biochemical company with plants in many countries, implemented standardized best practices of reliability over several years and reduced its global maintenance expense by one third while simultaneously dramatically increasing availability. These actions enabled the company to capture millions of euros in increased profits and sustained increases in capacity and production.

To expand its portfolio of reliability-focused services, Emerson recently acquired Management Resources Group, Inc. (MRG), a leading management consulting firm with 28 years of experience improving reliability in industrial manufacturing. This strategic investment complements Emerson's existing lifecycle services offering as well as the company's leadership in "pervasive sensing" which provides manufacturers more operational insight through greater sensor-based coverage of their plants and assets. Through its consultants, Emerson can advise global customers on enterprise-wide reliability management programs that connect the millions of data points collected in a plant, providing actionable information to trigger maintenance activities before equipment fails.



Reliability consulting fills the gaps in legacy data with standardized content libraries.



Companies can request a Discovery Visit for on-site evaluation and recommendations of reliability services.

"If a company is not a top-quartile performer, it is losing millions in revenue and spending millions of dollars on unnecessary maintenance costs," says Robert DiStefano, MRG's founder and former CEO. "Every dollar not spent on maintenance goes directly to the bottom line. Our approach helps companies dramatically reduce downtime and enhance safety and compliance, increasing the stature and reputation of a company and ultimately providing better value for shareholders.

A recent Solomon RAM study found companies reach the top-performing quartile when they have less than 3 percent unplanned downtime and maintenance costs less than 2 percent of plant replacement value (PRV). For example, a \$1 billion top-performing plant spends \$12 to \$20 million per year on maintenance expense. By contrast, poor performers spend two to four times more per year.

에머슨 프로세스 매니지먼트가 업계의 과도한 운영 비용 및 이익 손실에 대한 최대 원인을 집중 공략함 으로써, 오일 및 가스, 화학, 정유, 전력과 같은 산업 생산의 판도를 바꾸기 시작했다. 연중 항시 가동이 필 수인 업계에서는 미비한 유지 보수 관행으로 인해 갑 작스러운 가동 정지 시간이 5~7%까지 달하는 고충 을 겪고 있다. 에머슨이 새롭게 시작하는 글로벌 신뢰 성 경영 컨설팅 서비스는 운영진을 대상으로 유지 보 수 비용 관리 향상, 신뢰성 강화, 수익성 증진을 달성할 수 있도록 돕는 것을 목표 로 한다.

신뢰성 강화 기술 및 서비스 개발 분야를 25년 이상 선도해 온 에머슨은 기업들

이 경비 낭비 및 수익 손실과 관련된 수 백만 달러를 절감할 수 있도록 겨냥한 경

에머슨 프로세스 매니지먼트의 사장 Steve Sonnenberg는 다음과 같이 설명했다.

"직책이 C로 시작되는 각 분야의 최고 책임자들은 수익성 향상을 위한 물리적 자

산 관리의 강화 필요성을 통감하고 있다. 대략 10억 달러 규모의 시설일 경우 올

제 기반 경영 컨설팅 관행을 통해 고객의 신뢰성 비용 과제를 해결하고 있다.

에머슨 프로세스 매니지먼트

증진할 수 있다.

글로벌 기업들은 전사적인 신뢰성 관리 방안을 통해. 연간 500억 달러 이상 절감하고, 5% 이상 생산 능력을

에머슨 산업 시설의 다운타임을 줄이는 신뢰성 관리 컨설팅 서비스 시작

에머슨의 신뢰성 관리 컨설팅 서비스는 자산 관리에 대한 사전 대책적인 접근법으로써 기업의 재정적 이익을 이해할 수 있도록 돕는다.

Guest Article (국문)

KorShip 62

바른 전략을 바탕으로 한 다운타임 감소를 통해 부가 적인 운영 및 생산 이익을 배제하고도, 유지 보수 비 용에서만 연간 120억 달러 이상의 절감이 가능하다. 산업체들의 시설망 전반에 있어 신뢰성은 전사적으로 안전성 및 수익성을 증진할 수 있는 최고 전략으로 부상하는 중이다."

신뢰성 및 유지 보수 통계를 기반으로 한 기업 성과 추적을 전문으로 하는 공정 업계의 선도적 벤치마킹 업체인 Solomon Associates에 따르면, 기업들은 계획 된 가동 정지 시간 및 불시의 가동 정지 시간을 감소 시킴으로써 유지 보수 지출을 50% 이상 절감할 수 있다고 한다. 공정 조건 모니터링 및 분석 기반 유지 보수 활동과 같은 최적화 된 신뢰성 관행은 비용 절감 은 물론, 매출, 품질, 보건, 안전성, 환경 규제 준수까지 향상시킬 수 있는데, 이들은 모두 운영 위험성 및 주 주 가치에 영향을 미치는 주요 요소에 해당된다.

여러 국가에서 시설을 운영 중인 다국적 식품 및 생 화학 기업인 Corbion의 경우, 지난 몇 년 동안 표준화 된 최적 신뢰성 관행을 구현해 전세계적으로 유지 보 수 비용을 1/3까지 줄임과 동시에 효용성을 극적으로 증가시켰다. 이러한 적극적 대처를 기반으로, 당사는 수익성 향상 및 생산 능력의 지속적 증가를 통해 수 백만 유로를 거둬들일 수 있었다.

에머슨은 신뢰성 중심 서비스의 포트폴리오를 확대하 기 위해 산업 제조 부문의 신뢰성 향상에 28년 이상의 경험을 쌓아온 경영 컨설팅 기업인 MRG(Management Resources Group, Inc.)를 인수했다. 이 전략적 투자는 에머슨의 라이프 싸이클 서비스를 보완할 뿐만 아니 라, 제조 업체들이 시설 및 자산 전반으로 센서 기반 의 운영 통찰력을 강화를 위한 솔루션인 '퍼베이시브 센싱(pervasive sensing)'을 주도하고 있는 에머슨의의 리더십 역시 보강할 것으로 기대를 모으고 있다. 더불 어, 에머슨은 소속 컨설턴트들을 통해 전세계 고객들 에게 시설에서 수집된 수 백만 데이터 지점을 연결하 는 전사적 신뢰성 관리 프로그램에 대해 조언하여, 장 비에 고장이 발생하기 전에 유지 보수 작업을 실행할 수 있도록 능동적으로 정보를 제공한다.

MRG의 창립자이자 전임 CEO인 Robert DiStefano는 다음과 같이 밝혔다. "기업 성과가 최상위 1/4에 속하



신뢰성 컨설팅은 표준화 된 컨텐츠 라이브러리로 기존 레거시 데이터와의 차이를 좁힌다.



기업들은 현장 평가 및 신뢰성 서비스 권장 사항을 위한 방문 탐사(Discovery visit)를 요청할 수 있다.

지 않는 업체의 경우, 수 백만 달러의 수익을 쉽게 손실하며, 불필요한 유지 보수 비용에 수 백만 달러를 지출한다. 유지 보수 비용은 수익성과 직결된다. 에머슨의 접근법은 가동 정지 시간을 대폭 줄이고 안전성 및 규제 준수를 강화함으로써 기 업의 위상과 명성을 증진하고, 궁극적으로 주주들에게 보다 높은 가치를 환원하 는 것이라 할 수 있다."

최근 발표된 Solomon RAM 연구에서는 최상위 1/4에 속하는 기업들은 불시 가 동 정지 시간이 3% 이하이고, 유지 보수 비용이 PRV(시설물 교체 가치)의 2% 이 하라고 보고했다. 일례로, 10억 달러 규모의 최고 성능 시설은 유지 보수 비용에 연간 1,200만~2,000만 달러를 지출하지만, 성능 관리가 저조한 기업들의 경우 상기와 비교해 2~4배에 달하는 비용을 유지 보수에 소요하고 있다. 🖏

Product Review



HydroComp PropCad® 2014 Released

HydroComp, Inc.

HydroComp PropCad® is the industry-standard software for geometric modeling of marine propellers for design and manufacture. This tool provides automatic preparation of 2D design drawings, 3D offsets, thickness classification reports, and CAD/CAM data. Manufacturers, researchers and designers rely on PropCad for their modeling needs. The tool is widely used in over 40 countries for quickly generating propellers and design variants from small outboard production lines to large merchant ship propellers. The latest 2014 release of PropCad features a new table-driven interface, updated classification society rules, expanded 3D CAD exports, new smoothing tools, and more!

Updated interface and enhanced user experience

For the past three years, HydroComp has been developing enhancements to the PropCad software in order to update and expand PropCad's propeller design capabilities. A substantial effort has focused on data entry and visualization. As a result, PropCad has moved to a table-driven interface that allows users to quickly enter and modify data in their designs. The content of the interface has been consolidated so that principle dimensions, radial distributions, and 2D section offsets are now all visible on the main screen. A new summary table displays the derived characteristics of the design, including weight, mass moment of inertia, total skew, and mean pitch. The display mode enables graphing of any radial distribution, such as chord, skew, or pitch angle. Oneclick graphing allows quick visualization of blade outlines, thickness profiles, and 2D section offsets.

New capabilities and expanded parametric control

PropCad 2014 features an improved, fully-parametric Builder that allows users to define radial distributions of parameters from HydroComp's library propellers, from user-generated distribution files, or by entering the data directly into the sections spreadsheet. In 2014, the Builder includes presets for

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Figure 1. Main screen of PropCad 2014

standard propeller designs. The Builder includes new options, including radial control of leading and trailing edge thickness, chordwise position of maximum thickness for Gawn-type sections, a CAD-friendly tip correction, and additional control of cup (with the ability to set the cup sweep angle, enable face-only cupping, and allowing cup around the tip). These added settings give PropCad users an unprecedented level of control in their designs.

PropCad's table-driven entry supports cell formulas for onthe-fly calculations while improved data tools allow users to quickly visualize and smooth user-entered data. The 3D window includes hardware-accelerated anti-aliasing, smoothed 3D renders, new visualization modes, and even video recording! Users can also now add root fillets between the blade and hub, detect required hub length, and automatically set the blade position relative to the hub.

Updates, updates, updates...

In addition to new features, PropCad 2014 includes updates to existing Classification Societies and 3D CAD exports. CCS, NK, and Swedish/Finish rules for propeller thickness have been added to PropCad 2014. Additionally, ice class designations are available for ABS Steel, BV/RINA, LR Ship and LR Naval, and Swedish/Finnish rules. The Classification Thickness reports have been overhauled to include all intermediate calculations and data in addition to the required calculations for submittal and approval.

All 3D CAD exports have been updated for compatibility with the latest versions of the major CAD tools. A new export dialog allows the user to select the exported surfaces (face/ back, root, tip, LE, TE, and root fillet) and also to increase the density of the model without altering their design. Lastly, a new IGES export has been included for universal CAD compatibility!

Visit www.hydrocompinc.com to learn how to increase your productivity with PropCad 2014.

About HydroComp

Celebrating its 30th year of operation in 2014, HydroComp provides software and services for resistance and propulsion prediction, propeller sizing and design, and forensic performance analysis. HydroComp is proud to have served over 700 industry, research, academic, and government clients from more than 60 countries.

SSME won orders for 2 shuttle tankers

Sungdong Shipbuilding & Marine Engineering (SSME) announced on December 3 that it won an order worth USD 200 million from a large shipping company of Greece for 2 units of 157,000-ton shuttle tankers (including 1 optional vessels).

These shuttle tankers are outfitted with special equipment that maintains a fixed position of the vessel at the sea and carry crude oil to land-based storage facility from offshore oil field.

SSME also built 2 units of 157,000-ton shuttle tankers in 2013. RIO 2016, built first among them, was named as 'Ship of Year 2013' by Naval Architect, an internationally renowned U.K. magazine specializing in shipbuilding and offshore sectors.

SSME has won orders for 40 vessels (including 5 optional vessels) worth KRW 2.3 trillion so far this year, cementing its leadership in commercial vessel sector.

성동조선해양 셔틀탱커 2척 수주

성동조선해양이 그리스의 한 대형 선사로부터 157,000톤급 셔틀탱커 2척(옵션 1척 포함)을 총 2억 달러에 수주했다고 지난 12월 3일 밝혔다.

성동조선해양이 이번에 수주한 셔틀탱커는 해상에서 선박의 위치를 고정할 수 있 는 특수장비가 탑재된 탱커로 해상 유전에서 채굴한 석유를 바로 선적하여 육상의



저장시설까지 왕복하는 역할을 하는 선박이다. 성동조선해양은 2013년에도 157,000톤급 셔틀탱커 2척을 건 조한 바 있으며, 이들 선박 중 처음 건조된 리오(RO) 2016은 영국의 권위 있는 조선해양전문지 네이벌아키텍트(Naval Archited)가 선정하는 2013 올해의 선박으로 선정된 바 있다. 성동조선해양은 현재 40척(옵션 5척 포함) 한화로 2조 3,000 억원 규모의 수주 계약을 달성하며 상선 시장에서 그 진가 를 과시하고 있다.

Technip awarded an important subsea contract by Statoil

Technip has signed a lumpsum contract with Statoil ASA for the Gullfaks Rimfaksdalen (GRD) Marine Operations Pipelay and Subsea Installation project. This project is an option to the Snøhvit CO₂ Solution project awarded in 2013.

The GRD project scope consists of a subsea tie-back to a new Wye piece on an existing pipeline close to the Gullfaks A platform. The GRD template will be located 190 kilometers Northwest of Bergen, Norway.

The GRD project scope consists of a subsea tie-back to a new Wye piece on an existing pipeline close to the Gullfaks A platform. The GRD template will be located 190 km Northwest of Bergen, Norway. This contract covers:

- Fabrication and installation of two sections of pipe-in-pipe, total length ~9.5 km, with a 13% chrome stainless steel production flowline,
- Installation and tie-ins of three spools and an 8.5-kilometer umbilical,
 Installation of a ~280-ton template and a 110-ton manifold.

Technip's operating center in Oslo, Norway, will execute the project.



Vessels from the Group fleet will install the template in 2015. The flowline will be welded at Technip's spoolbase in Orkanger, Norway, while the installation will be performed by the Apache II, in the first half of 2016. The installation of the associated manifold, spools, umbilical and other subsea equipment will be performed by other vessels from Technip's fleet. First gas is planned for the second half of 2016. Odd Strømsnes, Managing Director of Technip in Norway, stated: "We are very proud of this award, which builds on our unique track record in pipe-in-pipe."

DSME clinched an order from the Malaysian Navy for 6 corvettes

Daewoo Shipbuilding & Marine Engineering (DSME) announced on November 21 that it won an order from the Malaysian Navy for 6 corvettes. Corvette is a kind of surface combatant capable of anti-ship attack and defense, carrying out the coast guard mission in preparation for enemy's surprise attack. The corvette to be built by DSME this time will measure 85m in length and 12.9 m in width with a weight of 1,800 tons.

The 3 vessels out of the 6 units will be built at Okpo shipyard on Geoje island and delivered from January 2018 on a staggered basis. The remaining 3 units will be delivered in the form of block for final assembly in Malaysia. After delivery to Malaysian Navy, these vessels will be combat ready for coastal defense.

Malaysia, which has the most powerful navy in Southeast Asia, is strengthening and modernizing its naval force to be better prepared for possible maritime dispute in the Strait of Malacca, an important passage connecting the Far East Asia and Europe. DSME has maintained close relationship with the Malaysian Navy which placed orders at the shipbuilder for 2 training vessels in 2010.

Goh Jae-ho, President of DSME, said, "We will continue to satisfy basic requirements of clients in terms of delivery, price, performance and others, and furthermore, and meet the recently burgeoning demand of major warship clients for overseas shipyard development. By fully leveraging our experience in developing and operating the shipyards worldwide, we will increase our order intake for warship."

DSME, which wrote a new chapter in the history of Korean defense industry in 2011 by winning an order from the Indonesian Ministry of Defense for 3 submarines, has successfully won orders for warship from the Navies around the world including the U.K., Norway, Thailand, Bangladesh, etc.

대우조선해양, 말레이시아 해군이 발주한 군함 6척 수주

대우조선해양은 말레이시아 해군이 발주한 초계함(Corvetle) 6척을 수주했다고 지 난 11월 21일 밝혔다. 초계함은 대함 공격 및 방어가 가능한 수상 전투함의 일종으 로, 적의 기습공격에 대비해 연안을 경비하는 임무를 수행한다. 대우조선해양이 이



Shin Joon-seop(second from the right), Managing Director of DSME, and Sharul Lajelan(third from the right), President of NMEL, are shaking hands after signing a contract to build 6 corvettes in Malaysia on November 21.

번에 수주한 함정은 길이 85m, 폭 12.9m, 1,800톤 규모다. 이번에 수주한 6척 중 3척은 거제 옥포 조선소에서 건조되 어 2018년 1월부터 순차적으로 인도될 예정이며, 나머지 3척 은 블록 형태로 납품돼 말레이시아 현지에서 최종 조립될 예정이다. 말레이시아 해군은 인도된 선박을 연안 방어를 위 해 실전 배치할 계획이다.

동남아시아에서 가장 높은 수준의 해군력을 보유한 말레이 시아는 극동아시아와 유럽을 잇는 중요 통로인 말리카 해협 의 해상 분쟁에 대비해 해군력 강화 및 현대화를 지속 진행 중이다. 대우조선해양은 지난 2010년 훈련함 2척을 수주하 는 등. 말레이시아 해군과의 돈독한 관계를 맺고 있다.

대우조선해양 고재호 사장은 "납기, 가격, 성능 등 발주처의 기 본적인 요구 조건을 충족하는 것은 물론, 최근 주요 함정 발주 처로부터 요청이 쇄도하고 있는 '해외 조선소 개발 요구'에도 부응하겠다'며, "세계 전역의 조선소를 개발 · 운영해 본 경험을 적극 활용해 함정 수주의 밑거름으로 삼겠다"고 강조했다.

2011년 인도네시아 국방부로부터 잠수함 3척을 수주하며 대 한민국 방위산업의 새 역사를 쓴 대우조선해양은 영국, 노르 웨이, 태국, 방글라데시 등 세계 각지의 해군으로부터 군함 을 수주하는데 성공했다.

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SSME secured orders for 2 eco-friendly tankers



158,000-ton oil tanker being built by SSME

Sungdong Shipbuilding & Marine Engineering (SSME) announced on December 23 that it received an order worth approximately KRW 150 billion from Norway-based Nordic American Tankers for 2 units of 158,000-ton oil tankers.

These vessels are eco-friendly vessels adopting the energy-saving design developed independently by SSME and feature the optimized ship model and G-type (Green Ultra long stroke) engine that increased fuel efficiency. Particularly, these vessels are eco-ships that reduce fuel consumption by over 10% and minimize greenhouse gas emissions, compared to existing ship models.

An official from SSME said, "This contract is a meaningful contract

paving the way for long-term partnership with Nordic American Tankers which has strong trust in domestic shipyards to an extent that over 90% of its fleets were built in Korea."

SSME has won orders for 42 vessels worth USD 2.26 billion, including 18 bulk carriers, 2 shuttle tankers, 22 tankers, etc., as of late December 2014, exceeding its annual new order target of USD 1.9 billion.

성동조선해양, 친환경 탱커 2척 수주

성동조선해양이 노르웨이 노르딕 아메리칸 탱커스(Nordic American Tankers)로부터 158,000톤급 원유운반선 2척(한화 약 1,500억원)을 수주했다고 지난 12월 23일 밝혔다.

이번에 수주한 선박은 성동조선해양이 독자 설계한 에너지 절감형 디자인이 적용된 친환경 선박으로 선형의 최적화 설 계와 연료효율을 높인 G타입(Green Ultra long stroke) 엔진이 적용됐다. 기존 선형대비 약 10% 이상의 연비 절감 효과와 온실가스 배출을 최소화 한 에코십(Eco-ship)이다.

성동조선해양 관계자는 "노르딕 아메리칸 탱커스가 소유한 선박의 90% 이상이 국내 조선소에서 건조된 선박인 만큼 한국 조선소에 대한 신뢰가 강하다"라며, "장기적인 파트너 십을 만들어 갈 수 있는 의미 있는 계약"이라고 말했다.

성동조선해양은 2014년 12월 말 기준으로 벌크선 18척, 셔틀 탱커 2척, 탱커 22척 등 총 42척 22억6,000만 달러에 달하는 수주 계약을 체결하며, 2014년 초 수주목표인 19억 달러를 상회하는 실적을 달성했다.

Hyundai Engineering Selects Intergraph Smart[™] 3D to Deliver South American Oil Refinery

Hyundai Engineering (HEC) has reported significant time and cost savings as a result of using Intergraph Smart[™] 3D in the delivery of a US \$ 300 million South American oil refinery project.

Smart 3D reduced the cost and work hours involved in the production of the project's engineering drawings by 51 percent, as compared to 2D manual methodology, delivering a multimillion U.S. dollar saving for the company.

HEC adopted Smart 3D several years ago and has noted a significant improvement in the quality of engineering outputs. The solution enables drawings to be produced automatically, with no manual production required – therefore reducing the technical errors commonly seen with 2D solutions.

"Smart 3D has been instrumental in reducing project

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risk and delivering significant time and cost savings," said Myung-su Han, HEC engineering IT team leader. "Furthermore, the high quality of engineering deliverables helped us to avoid reworks and other delays, in turn reducing the overall project schedule."

Gerhard Sallinger, Intergraph Process, Power & Marine president, said, "The South American oil refinery project is further proof that Intergraph's 3D design solutions offer a clear and quantifiable benefit over 2D solutions. Smart 3D is a logical step forward for Intergraph customers who are currently enjoying the benefits of our earlier 3D design package PDS[®], and would like to drive productivity even further." Smart 3D is the world's first and only next-generation 3D design solution specifically tailored for plant, offshore, shipbuilding, and the metals and mining industries, employing a breakthrough engineering approach that leverages real-time concurrent design, rules, relationships and automation. It is the most advanced and productive 3D design solution that effectively enables optimised design, increasing safety, quality and productivity, while shortening project schedules.

STXOS clinched orders for 13 high value-added vessels including LNG bunkering vessel



STX Offshore & Shipbuilding (STXOS) announced that it recently signed a contract with Royal Dutch Shell and Greece-based shipping company Pleiades to build 1 unit of 6,500 m³ class LNG bunkering vessel and 6 units of 73,500 DWT medium-sized oil tankers.

LNG bunkering vessel facilitates ship-to-ship transfer of gas fuel, such as LNG, into LNG-powered vessels on the sea. There has been a heightened interest in LNG bunkering vessel, the next-generation ship model, amid the surge in demand for eco-friendly and high-efficiency LNG-powered vessels that can better cope with rigorous regulations of IMO (International Maritime Organization) to curb greenhouse emissions from ship.

STXOS has proceeded with R&D related to LNG bunkering vessel since 2011 and received the AIP (Approval in Principle) from major

classification society for the first time worldwide, gaining recognition for excellent in LNG bunkering vessel technology.

This LNG bunkering vessel to be built by STXOS this time applies the Re-liquefaction Plant that reduces the boil-off (evaporation) rate (BOR) of LNG to increase efficiency. In addition, this LNG bunkering vessel will be outfitted with LNG Transfer Arm ensuring safe fuel supply regardless of the size of the port or LNG-powered vessel.

An official from STXOS said, "Having won this order, STXOS has made successful entry into the market for LNG bunkering vessel, the next-generation technology-intensive high value-added vessel. By building the LNG bunkering vessel for Royal Dutch Shell, we are better positioned in this competitive market."

STXOS has added many LR1 and MR-class tankers to its orderbook this year and is currently negotiating with other ship owners on LR1 tanker contracts, raising the expectation for new orders in a row.

STX조선해양, LNG 벙커링선 등 고부가치 선박 13척 수주

STX조선해양은 최근 오일메이저인 로열 더치 셸(Royal Dutch Shell)과 그리스 선사인 플레이아데스(Pleiades)로부터 각각 6,500㎡급 LNG 벙커링선 1척과 73,500 DWT급 중형

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유조선 6척에 대한 수주계약을 체결했다고 밝혔다. LNG 벙커링선은 LNG 등 가스연료를 해상에서 LNG 추진선에 직접 주입하는 선박 이다. 국제해사기구(MO)의 선박 온실가스 규제로 친환경·고효율 선박인 LNG 추 진선 발주가 늘면서 이를 지원하기 위한 차세대 신선종 LNG 벙커링선이 새롭게 주목받고 있다.

STX조선해양은 지난 2011년부터 LNG 벙커링선에 대한 연구개발을 진행해왔고, 지 난해 세계 최초로 메이저선급의 기본설계승인(AP)을 받음으로써 LNG 벙커링선에 대한 기술력을 인정받았다. 이번에 건조하는 LNG 벙커링선은 재액화설비 (Re-liquefaction Plant)를 적용해 LNG의 자연기화율(BOG)을 낮춰 효율성을 높인 것 이 특징이다. 또한 항구 규모나 LNG 추진선 크기에 관계없이 안전하게 연료공급 이 가능하도록 LNG 이송시스템(LNG Transfer Arm)이 탑재 된다.

STX조선해양 관계자는 "이번 수주로 STX조선해양이 차세대 기술집약 부가가치선인 LNG벙커링선 시장에 성공적으로 진입했다"며, "쉘의 첫 LNG 벙커링선을 STX조선해양이 건조 하게 되어, 향후 시장 경쟁에서 우위를 점할 수 있게 되었다" 고 말했다.

이번 수주에 앞서 LRI과 MR급 탱커를 올해 대거 수주한 바 있는 STX조선해양은 현재 다른 선사들과도 LRI 탱커 건조 협의가 진행 중에 있어 연이은 수주 소식이 기대되고 있다.

STXOS signed a contract to build 4 units of LR1 tankers



STX Offshore & Shipbuilding (STXOS) announced that it inked a contract with the Singapore-based shipping company BW Pacific Limited to build 4 units of 74,000 DWT LR1 tankers on December 11. These vessels will be delivered on a staggered basis from the second half of 2016. The ship price and number of optional vessels remain undisclosed at the request of ship owner.

Specifically, these vessels will adopt eco-friendly and high-efficiency ship model that reduces fuel consumption and minimize the emissions of exhaust gases.

STXOS recently won orders for LR1 tankers in a row, solidifying its leadership position that it has established in the medium-sized tanker market since it entered into a voluntary agreement last year. Particularly, STXOS has garnered approximately 17% of 367 LR1 tankers last year that have been ordered since 2000, taking the top spot worldwide in this sector. An official from STXOS said, "We have filled our orderbook primarily with MR and LR1 tankers since we revamped our business structure with a focus on medium-sized vessels in the wake of the voluntary agreement last year. Particularly, we have achieved outstanding results in the field of LR1 tanker which has proved our unrivalled technological prowess." He added, "We will see drastic improvement of productivity as a result of our ship model specialization program that has made progress as planned."

STX조선해양, LR1 탱커 4척 수주

STX조선해양은 지난 12월 11일 싱가폴 선사인 BW 퍼시픽 (BW Pacific Limited)으로부터 74,000 DWT급 LR1 탱커 4척에 대한 계약을 체결했다고 밝혔다. 이들 선박은 2016년 하반기 기부터 순차적으로 인도할 예정이며, 선주 요청에 따라 선가 와 옵션 척수는 밝히지 않았다.

이번에 STX조선해양이 수주한 선박들은 연료소모량을 줄이 고, 배기가스 배출량을 최소화 할 수 있는 친환경 고효율 선 형으로 설계될 예정이다.

지난 해 자율협약 체결 이후 중형탱커 전문 건조사로서 입 지를 다지고 있는 STX조선해양은 최근 잇따라 LR1 탱커 수 주에 성공. 지난 2000년 이후 발주된 LR1 탱커 367척 중 약 17%의 점유율로 이 분야에서 세계 1위 자리를 지키고 있다.

STX조선해양 관계자는 "지난해 자율협약 체결 이후 중형선 중심으로 사업구조를 개편한 이후 올해 수주 잔량의 대부분 을 MR과 LR1 탱커로 채웠고, 특히 독보적 기술력을 가진 LR1 분야에서 괄목할 성과를 거뒀다"면서 "선종의 전문화가 계획대로 진행되면서 생산성도 크게 향상될 것으로 기대된 다"고 말했다.

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DSME won orders for 6 LNG carriers from U.K.-based BP

Daewoo Shipbuilding & Marine Engineering (DSME) secured an order worth approximately USD 1.3 billion from a European ship owner for 6 LNG carriers

According to the foreign press, these LNG carriers ordered by the U.K.-based BP are 174,000 m³ class that will be deployed for BP's Freeport LNG project in the United States. Currently, BP plans to import 4.4 million tons of LNG per annum for 20 years through this project. These vessels will be outfitted with ME-GI (MAN Electronic Gas-Injection) engine developed by MAN Diesel and natural gas Partial Re-liquefaction System (PRS) developed by DSME. They are scheduled for delivery on a staggered basis from 2018.

The latest contract brings the value of vessels ordered to DSME to USD 12.7 billion which is close to its annual new order target of USD 14.5 billion. An official from DSME said, "We cautiously expect that we will meet our annual new order target by the end of this year, considering that a number of vessels are expected to be added to our orderbook, including the LNG carrier ordered from Korea Gas Corporation and the vessels transporting the LNG for Russia's Yamal project.

대우조선, 영국 BP로부터 LNG선 6척 수주

대우조선해양은 유럽지역 선주로부터 LNG선 6척을 약 13억 달러에 수주했다. 외신에 따르면 대우조선해양이 수주한 LNG선은 영국 BP에서 발주한 것으로 BP 의 미국 프리포트 LNG(Freeport LNG) 프로젝트에 사용될 17만4000㎡급 선박으로



밝혀졌다. 현재 BP는 이 프로젝트를 통해 연간 440만톤의 LNG를 20년 동안 수입할 계획이다.

이들 선박은 만디젤(MAN Diesel)이 개발한 ME-GI(MAN Electronic Gas-Injection Engine) 엔진과 대우조선이 개발한 천연가스 재액화 장치(PRS)가 적용된다. 오는 2018년부터 순차적으로 인도될 예정이다.

한편, 이번 수주로 대우조선해양은 올해 127억 달러의 수주 실적을 달성할 것으로 예상되고 있어, 연초 세운 목표인 145 억 달러에 근접하게 됐다. 대우조선해양 관계자는 "연말까지 야말 프로젝트와 한국가스공사 발주 LNG선 등 다수의 발주 예상 선박이 있어 수주목표를 달성할 수 있을 것으로 조심 스럽게 기대한다"고 말했다.

Nexans' DEH systems selected by Statoil for the Kristin and Maria fields

On 1, December 2014, Statoil, on behalf of Wintershall, has signed a contract with Nexans for the supply of Direct Electrical Heating (DEH) technology. The DEH riser will connect the Kristin and Maria fields in the Norwegian Sea with the Kristin platform, ensuring the constant flow through pipelines.

The delivery, worth approximately \in 13 million, will replace an existing DEH riser cable from the Kristin platform. The new riser cable will connect the Kristin platform with a subsea connection box, and will contain four cores to enable the operation of one DEH line to the Kristin field and one to the Maria field.

DEH is a flow assurance method used on many pipelines. The meth-



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od is based on controlling the temperature on the pipeline by passing electric current (AC) through the steel wall of the pipeline, thus preventing hydrate and wax formation. In addition, Nexans has been awarded a subcontract by FMC Technologies for a dynamic control umbilical system for the same project.

Floating platforms like Kristin feature a riser system containing flexible production lines, water injection lines, gas injection/lift lines, umbilicals controlling the subsea templates and electrical cables for heating the pipelines.

Dirk Steinbrink, Senior Vice President High Voltage & Underwater Cable Group at Nexans, said, "The award of both of these contracts highlights Nexans' expertise in subsea cables and Direct Electrical Heating systems."

Krister Granlie, Executive Vice President Hybrid Underwater Cables, added "Nexans is pleased to be working with Statoil and Wintershall on this project. We are looking forward to continuing our long standing relationship with Statoil."

Production of the DEH riser will start during autumn 2015, with delivery taking place during second quarter of 2016.

넥상스, 스타토일의 크리스틴 및 마리아 유전에 DEH 시스템 공급

지난 12월 1일 스타토일은 윈터쉘을 대신해 넥상스와 DEH 시스템 계약을 체결했 다. DEH 시스템은 노르웨이 해에 위치한 크리스틴과 마리아 유전을 크리스틴 플 랫폼과 연결하며, 파이프라인 속 정유의 일정한 흐름을 보장한다. 이번에 계약 체결한 금액은 약 1,300만 유로로 크리스틴 플랫 폼의 기존 DEH 파이프 라인을 대체하게 된다. 이번에 공급하 는 라이저 케이블은 크리스틴 플랫폼을 해저 커넥션 박스(접 속함)와 연결되며, DEH 라인은 크리스틴 유전과 마리아 유전 각각 작동할 수 있도록 4개의 코어를 내장하고 있다.

DFH는 많은 파이프라인에서 사용되는 정유 흐름 보장 방법 이다. 이 방법은 파이프라인의 강철 벽을 통해 교류 전류를 통과시켜 파이프라인의 온도를 조정하는 것을 기반으로 하 며, 이 덕분에 수화현상과 왁스형성을 방지할 수 있다. 뿐만 아니라 넥상스는 FMC 테크놀로지로부터 같은 프로젝트에 쓰일 동적 제어 엄빌리칼 시스템도 수주했다.

크리스틴과 같은 플로팅 플랫폼은 라이저 시스템을 특징으 로, 유연한 생산라인과 물 주입 라인, 가스 주입/리프트 라 인, 엄빌리칼 제어 해저 형판, 그리고 파이프라인 히팅에 쓰 이는 전선이 포함된다.

넥상스 그룹 초고압 & 해저 케이블 사업부문 총괄 부사장 더크 스테인브링크(Dirk Steinbrink)는 "이 두 건의 계약 수주 는 해저케이블과 DEH 시스템분야에 대한 넥상스의 전문성 을 인정하는 것"이라고 말했다.

넥상스 하이브리드 해저 케이블부문 부사장 크리스터 그란리 (Krister Granile)는 "넥상스는 이 프로젝트에서 스타토일 및 원 터쉘과 함께 일하게 되어 기쁘다. 우리는 스타토일과의 오래 된 파트너십을 계속해서 이어나갈 것을 기대한다"고 말했다. DEH 시스템은 2015년 경부터 생산을 시작해 2016년 2분기 에 납품될 예정이다.

Rolls-Royce secures major deck machinery contract for six vessels

Rolls-Royce is to deliver an extensive package of advanced deck machinery to six new high-end anchor handling tug supply vessels (AHTS) to be built by Kleven in Norway for the Danish ship owner Maersk Supply Service. The contract with Kleven is worth in excess of £ 54 m to Rolls-Royce, and includes an option for an additional four vessels. This represents the largest single contract for deck machinery that Rolls-Royce has won. The 95 m long vessels are designed by Salt Ship Design, and will be built at Kleven's two shipyards in Norway.

Each vessel is of Salt200 design and will be equipped with a triple drum main anchor handling winch with a pull capacity of 500 tonnes; two secondary winches; cargo securing winches and other auxiliary winches; and a dry bulk cargo system. The delivery from Rolls-Royce



also includes rudders and steering gear for all six

72 Korship

vessels. An additional option for an Anchor Recovery Frame, used for assisting launch and recovery of anchors, is also specified.

"We look forward to working closely with Rolls-Royce on this large and important project for Maersk. This large order shows the capabilities of the maritime cluster in Norway, and close cooperation within the cluster is an asset to our customers", said Ståle Rasmussen, CEO of Kleven.

Rolls-Royce offers the broadest range of deck machinery products in the marine market, and is able to offer customers a full system from one supplier, including services.

"The more complex vessels become, and the greater the focus on

safety and efficiency, the more differentiated are the kinds of deck machinery our customers need. We are very proud to be chosen by Kleven and Maersk for this significant order", said John Knudsen, President Commercial Marine, Rolls-Royce.

The first six vessels are to be delivered from the Kleven yards between Q4 2016 and Q3 2017. If options for an additional four vessels are declared, the last vessel in the series will be delivered in Q1 2018.

TOTAL E&P NORGE AS selects AVEVA NET for information management

AVEVA announced that it has been selected to supply an asset visualisation and information management solution to TOTAL E&P NORGE AS (Total) on 10 December 2014. Built on the AVEVA NET software, the solution has been configured specifically for Total's innovative Martin Linge fixed-platform asset on the Norwegian continental shelf (NCS).

The new solution was rapidly delivered and is already in the implementation and testing phase. When fully deployed, Total will use AVEVA NET's advanced access and contextualisation functionality to deliver a wide range of design, engineering and operational information throughout the life cycle of the Martin Linge asset.

Through a challenging tender process, Total was convinced that AVEVA could provide the data access and visualisation capability needed for this project. Timely access to all types of information will enhance Total's ability to make better decisions more quickly and also reduce risk. Total were particularly impressed with how open the AVEVA solution can be, allowing Total to work with their existing data in different tools, such as Documentum, OpenText, AVEVA's own design and engineering software and other third party applications.

"AVEVA's solutions are all developed with a focus on maintaining integrity across the life cycle of the Digital Asset," said Helmut Schuller, Executive Vice President, Global Sales, AVEVA. "The creation and maintenance of an accurate Digital Asset enables our customers to master change on complex projects and throughout the life of their facilities. This is particularly important for The Martin Linge development and we feel that this decision by Total is a very strong endorsement of the industry-leading solutions and services that we can offer to



Helmut Schuller, Executive Vice President, Global Sales, AVEVA

the oil & gas sector."

The Martin Linge field is estimated to hold oil & gas reserves of about 190 million barrels of oil equivalent. The project will set a precedent for sustainability by supplying the field's power needs from the Norwegian mainland grid via a 162 km subsea cable. This innovation will reduce CO₂ emissions by two million metric tons per annum. Production is due to start in the fourth quarter of 2016.

AVEVA has a strong presence in Norway, having a sales and support office in Oslo and a Centre of Excellence for Operations Integrity Management Solutions in Stavanger, which serves an increasing number of National and International Oil Companies.

KorShip 73

DongBang and OHT select ABB's OCTOPUS advisory solution



Amarcon, an ABB Group company recently announced that the company will deliver OCTOPUS-Onboard advisory solutions to a total of three vessels owned by Norwegian oil service company OHT AS and Korean heavy cargo transporter DongBang. The information and control system will support the vessels route planning, optimization of speed and insight in critical motions.

The repeat order with encompasses OCTOPUS motion monitoring and forecasting for vessel M/V Albatross. Amarcon has previously delivered advisory suites to OHT's heavy lift cargo vessels Eagle, Falcon, Osprey and Hawk.

"We have deployed the OCTOPUS technology across our fleet to improve the safety and efficiency of critical heavy lift transportation operations. All the other vessels of OHT use the OCTOPUS technology in order to execute critical heavy lift transportation projects in a safe and efficient way. For us it was therefore a logical step to also equip the newest edition in our fleet, the M/V Albatross, with this system", said Bertil Rognes, Project Engineer at OHT.

Under the contract with DongBang, Amarcon will deliver OCTOPUSonboard systems and motion monitor systems (TMS-3) to two heavy freight cargo vessels, the DongBang Giant No 2 and Giant No 3. The motion monitor system is based on three accelerometers that continuously provide the crew with information for decision-making support.

Both OHT and DongBang will have access to OCTOPUS-Online, which is an online reporting service. By using this tool, the vessel owner can download and display all measured motions and accelerations that are collected from the vessel.

동방그룹과 OHT, ABB OCTOPUS 솔루션 채택

ABB 그룹의 자회사인 Amarcon은 노르웨이 석유 서비스 회사 Offshore Heavy Transport AS(이하 OHT)와 한국 중량물 운반선사 동방그룹이 소유한 총 3척의



선박에 OCTOPUS 시스템을 제공하게 되었다고 발표했다. OCTOPUS 시스템은 파형에 따른 선박의 운동성(RAO)을 분석하여 안전한 항로 계획 및 선속을 지원한다.

OHT는 앨바트로스(Albatross)호에 OCTOPUS 모션 모니터 링을 연동해 안정적인 침로와 선속을 지원하는 예측 시스 템을 탑재하게 된다. Amarcon은 이전부터 OHT의 중량 화 물운반용 선박인 이글, 팰콘호, 오스프리호, 호크호 등에 대해서도 동일한 시스템을 공급해왔다.

"중요한 중량물 수송시 안전하고 효율적인 운항을 위해 전 선단에 OCTOPUS 시스템을 적용 중이다. 우리 선단에 투 입된 신규 선박 앨바르토스호에도 OCTOPUS 시스템을 설 치하게 되었다"고 OHT 프로젝트 엔지니어 버틸 로그네 (Bertil Rognes)는 말했다.

한국에 본사를 둔 동방그룹 역시 자사 선박인 동방 자이언 트 2호(DongBang Giant No 2)와 자이언트 3호(Giant No 3) 에 OCTOPUS 시스템 적용을 결정했다. 이로써 선박 운항 자는 안전한 항로와 선속 결정하기 위한 정보를 모션 센서 (TMS-3)를 기반으로 제공받을 수 있게 됐다.

시스템 적용을 통해 OHT와 동방그룹 양사는 모두 OCTOPUS 온라인 서비스를 제공 받는다. 온라인 서비스는 선박에 장착된 모션 센서가 인지한 선박의 운동성 및 각종 자료(Acceleration, Moment)를 인터넷 상에서 확인할 수 있다.



Domestic shipyards reclaimed top spot in October, surpassing Chinese rivals by a wide margin. However, domestic shipyards remained in second place based on cumulative value of orders this year.

According to the data published by Clarkson, new orders at domestic shipyards stood at USD 2.3710 billion with 23 vessels (906,604 CGT) last month. Meanwhile, Chinese shipyards won new orders worth a combined USD 671 million with 21 vessels (267,305 CGT) in the same period, thus being relegated to second place in terms of order value, order quantity, and CGT.

Domestic shipyards won orders worth a combined USD 24.985 billion so far this year, spurred by strong performance of three domestic shipbuilding giants that won orders for high value-added vessels in a row and Sungdong Shipbuilding &



Marine Engineering (SSME) that secured orders for oil tankers and tankers last month. This figure represents a 33.8% decrease compared to the same period of previous year (UD 37.769 billion). In the meantime, Chinese shipyards won orders worth a combined USD 26.53 billion so far this year.

Here, we take a close look at the performance of major domestic shipyards, the world's leading players with strong growth



Photo: Hyundai Heavy Industries Co., Ltd.

Offshore plant orders awarded to domestic shipyards in 2011-2014

_	Data	Type	Number of vessel	Amount	Ship owner	Delivery	Shipyard
	lul	Drillship	2 vessels	USD 1.1225 billion	Maersk, Denmark	July 2014	Samsung Heavy Industries
	Aug	LNG-FSRU	1 vessel	USD 280 million	Excelerate Energy, U.S.A	First quarter of 2014	Daewoo Shipbuilding & Marine Engineering
		Semi-submersible Rig	2 units	USD 1.1 billion	Songa Offshore, Norway	Second hallf of 2014	Daewoo Shipbuilding & Marine Engineering
	Sep	Well Intervention Vessel	2 vessels	USD 420 million	Eide Marine Services AS, Norway	2013	STX Finland
		Drillship	1 vessel	KRW 600 billion	Noble Drilling, U.S.A	Second half of 2014	Hyundai Heavy Industries
		Fixed Offshore Platform	1	USD 1.4 billion	Chevron, U.S.A	Second half of 2014	Daewoo Shipbuilding & Marine Engineering
2011		Drillship	1 unit	USD 550 million	Offshore drilling company, Americas		Daewoo Shipbuilding & Marine Engineering
	Oct	Platform Supply Vessel	1 unit	,	Troms Offshore Supply AS, Norway	First half of 2013	STX OSV
		Offshore Plant Module	2 units	,	1	From 2013 to 2014	STX OSV
		Platform Supply Vessel	4 units	KRW 2 trillion	Island Offshore, Norway	Consecutively from the 3rd quarter	of 2013 to the 1st quarter of 2014
	Nov	Pipe Laying Support Vessel	2 units	USD 500 million	Odebrecht, Brazil	August of 2014	Daewoo Shipbuilding & Marine Engineering
	Dec	Offshore facilities (Gas platform and various facilities)		USD 900 million	Major multinational oil companies	2nd half of 2014	Hyundai Heavy Industries
	<u>c</u>	CPF (Central Processing Facility)	I	KRW 2.6 trillion	INPEX, Australia	4th quarter of 2015	Samsung Heavy Industries
	Jail	Semi-submersible rig	1 unit	USD 620 million	Odfjell, Norway	by mid 2014	Daewoo Shipbuilding & Marine Engineering
	Feb	LNG-FSRU	I	1	Hoegh, Norway		Hyundai Heavy Industries
	140×	Offshore Platform	1 unit	USD 560 million	DONG E&P A/S, Danish	April 2015	Daewoo Shipbuilding & Marine Engineering
	Mar	FPSO	1 unit	USD 2.0 billion	INPEX, Australia	April 2016	Daewoo Shipbuilding & Marine Engineering
	Apr	Drillship	1 vessel	USD 645 million	Ensco plc	Third quarter 2014	Samsung Heavy Industries
		Semi-submersible Drilling Rig	2 units	USD 1.1 billion	Songa Offshore, Norway	Mid 2015	Daewoo Shipbuilding & Marine Engineering
	May	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
	<u>!</u>	Semi-submersible drilling rig	1 unit	USD 700 million	Fred Olsen Energy, Norway	March 2015	Hyundai Heavy Industries
2012	linc	LNG-FPSO	1 unit	ı	Petroliam Nasional Berhad, Malaysia	June 2015	Daewoo Shipbuilding & Marine Engineering
	3	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	ı	Excelerate, U.S.A	Between early 2015~2017	Daewoo Shipbuilding & Marine Engineering
	u U U	Drillship	1 vessel	USD 620 million	Rowan, U.S.A	First half of 2015	Hyundai Heavy Industries
	0400	Drillship	1 vessel	USD 623 million	-		Samsung Heavy Industries
		Drillship	4 vessels	USD 2.06 billion	Transocean, U.S.A	One-by-one from mid 2015	Daewoo Shipbuilding & Marine Engineering
	Oct	Drillship	1 vessel	USD 560 million	Atwood Oceanics, U.S.A		Daewoo Shipbuilding & Marine Engineering
		LNG-FSRU	1 vessel	USD 270 million	Hoegh LNG, Norway	First half of 2015	Hyundai Heavy Industries
	Nov	Drillship	1 vessel	USD 700 million	-	2nd half of 2015	STX Offshore & Shipbuilding
	Dec	offshore platform (Top side)	1 unit	USD 1.77 billion	Statoil, Norway	The end of 2016	Daewoo Shipbuilding & Marine Engineering
2013	0	Gas Production Platform (topside)	1 unit	USD 1.1 billion	Statoil, Norway	Mar 2016	Hyundai Heavy Industries
2	0	LNG-FSRU	1 vessel		BW Maritime, Singapore	2015	Samsung Heavy Industries

	Mor	Floating Production Unit (FPU)	1 unit	USD 1.3 billion	Total, France	First half of 2016	Hyundai Heavy Industries
	Ma	Tension Leg Platform (TLP)	1 unit	USD 700 million	Total, France	First half of 2015	Hyundai Heavy Industries
	Apr	FPSO	1 unit	USD 1.9 billion	Chevron, U.S.A		Hyundai Heavy Industries
	May	Semi-Submersible Drilling Rig	1 unit	USD 750 million	Diamond Offshore, U.S.A	Nov of 2015	Hyundai Heavy Industries
		Ultra-deepwater Drillship	1 unit	USD 515 million	Ensco, United Kingdom	Third quarter of 2015	Samsung Heavy Industries
	Jun	FPSO	1 unit	USD 3.0 billion	Nigeria	Second half of 2017	Samsung Heavy Industries
		Jack-up Rig	2 units	USD 1.3 billion	Statoil, Norway		Samsung Heavy Industries
		Ultra-deepwater Drillship	2 units	USD 600 million	Seadrill, Norway	Second half of 2015	Samsung Heavy Industries
	Jul	Semi-Submersible Rig	1 vessel	USD 718 million	Stena, Sweden	First half of 2016	Samsung Heavy Industries
202		Ultra-deepwater Drillship	1 unit	USD 570 million	Atwood Oceanics, U.S.A	The end of 2015	Daewoo Shipbuilding & Marine Engineering
		Drillship	1 unit	USD 550 million	1	Dec of 2015	Samsung Heavy Industries
	Sep	Ultra-deepwater Drillship	1 unit	USD 600 million	Ocean Rig, Greece	Dec of 2015	Samsung Heavy Industries
		Jack-up Rig	1 unit	USD 530 million	Maersk Drilling, Denmark	The middle of 2016	Daewoo Shipbuilding & Marine Engineering
L		Drillship	2 vessels	USD 1.24 billion	- 1	Second half of 2015	Daewoo Shipbuilding & Marine Engineering
	Oct	Drillship	1 vessel	USD 520 million	Transocean, U.S.A	The middle of 2016	Daewoo Shipbuilding & Marine Engineering
		LNG-FSRU	1 unit	1	Gas Sayago (Joint venture)	Sep of 2016	Daewoo Shipbuilding & Marine Engineering
L	Č	LNG-FSRU	1 unit	1	BW Maritime, Singapore	Early 2016	Samsung Heavy Industries
	Dec.	LNG-FSRU	1 unit	1	Mitsui OSK Line, Japan	The middle of 2016	Daewoo Shipbuilding & Marine Engineering
	Feb	LNG-FPSO	1 unit	USD 1.45 billion	Petroliam Nasional Berhad, Malaysia	2018	Samsung Heavy Industries
	Apr	Drillship	2 vessels	USD 1.29 billion	Oceania	First half of 2017	Samsung Heavy Industries
	li de c	Central Processing Platform	2 units	USD 700 million	Hess E&P Malaysia, Malaysia	The end of 2016	Hyundai Heavy Industries
2014	Aino	Fixed offshore platform	4 units	USD 1.94 billion	ADMA-OPCO, UAE	The end of 2019	Hyundai Heavy Industries
		Fixed Offshore Platform & Subma- rine Cable	4 units	USD 1.9 billion	ADMA-OPCO	Second half of 2019	Hyundai Heavy Industries
	Nov	Offshore Platform	1 unit		Royal Dutch Shell	I	Comorina Loon Vadi atrico
		FPU	1 unit		I	I	oansung neavy muusmes
* 11-40		-	-				

Note : Based on the press release and public announcements of each shipyards, internal estimation of Monthly KORSHIP (estimation until Dec 15, 2014)





Valves, the blood vessels of ship

- Fierce competition among small and medium-sized valve-related equipment manufacturers

The marine equipment sector requires high reliability and technology, including the stability, durability, etc., which are necessary to withstand adverse marine conditions (salt water, high temperature and high humidity, vibration, shock, etc), unlike general industrial fields.

Korea, the world's shipbuilding powerhouse, has achieved a local content rate of 75% in marine equipment, which is relatively low compared to the nation's local automotive content rate of about 90%. Particularly, the offshore plant, a high value-added sector, has a local content rate of only 25%.

Among marine equipments, valves have various varieties, depending on the purpose or application, such as gate valve, globe valve, check valve, ball valve, butterfly valve, pressure reducing regulators, safety valve, etc.

A FPSO consists of about 4,500 valves of 2,000 types which are worth about KRW 50 billion. In Korea, there are more than 100 small and medium-sized valve-related equipment manufacturers. The competition is fierce in this market.





Top entry ball valve by Ace valve (Source: www.acevalve.co.kr)



Swing check valve by Ace valve (Source: www.acevalve.co.kr)



Cryogenic safety relief & control valve by mt.h control valves (Source: www. mth.co.kr)



Main Starting Valve by mt.h control valves (Source: www.mth.co.kr)

Major Performance Gallery





Safety Valve with Low Lift Type by JOKWANG I.L.I (Source: www.jokwang.co.kr)





Double Block & Bleed valves by DK-Lok (Source: www.dklok.com)



High Pressure Ball Valves 2-way by hy-lok (Source: www.hy-lok.com)



High Pressure Needle Valves by hy-lok (Source: www.hy-lok.com)



Major Performance Gallery



Butterfly Valves by AVK valves (Source: www.avkvalves.com)



Check Valves by AVK valves (Source: www.avkvalves.com)



Cryogenic globe valves by Buyoung CST (Source: www.bycst.com)

Butterfly Valve by DR VALV (Source: www. daeryunn.com)



DongJin Energy System (Source: www.dongjini.co.kr)



V-Notch Ball Valve by DR VALV (Source: www.daeryunn.com)





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Butterfly Valve by Hifly Valve

The Type-600 ratio relay volume booster

Control Air Inc. / YTEC Co., Ltd.

Control Air is a leading American manufacturer of precision pneumatic and electro pneumatic control products essential to automated industrial equipment, process control systems and instrumentation.

The Type-600 ratio relay volume booster is designed to use a pneumatic signal to produce an output pressure which has high flow capacity and can be amplified. This unit is most useful for systems requiring the conversion of a low flow control signal to the higher flow requirements of an operating system. Using an independent supply pressure for greater volume, the Type-600 relays up to 50 SCFM flow capacity to a final control element such as a



valve actuator. The standard signal to output ratio is 1:1, however, the Type-600 is also available with an amplified signal to output ratio of 1:2, 1:3 and 1:6.

Features;

- High Flow Capacity: Allows flows up to 50 SCFM
- Amplified Output: Available in a signal to output pressure ratio of 1:1, 1:2, 1:3 and 1:6
- Stable Output: Venturi aspirator maintains output pressure under varying flow conditions
- Balanced Supply Valve: Rolling diaphragm design makes unit insensitive to supply pressure variation
- Optional Negative Bias: 4 psi negative bias option allows "zero" of I/P's

Applications;

The Type-600 is used extensively for increased flow capacity, pressure application, or remote pressure control applications. This includes web tensioning, roll loading, control valve actuators, I/P volume boosting, cylinder actuation, clutch and brake control, and gas flow control.

-TEL: +82-31-777-8200 -http://www.ytec.net

84 KorShiP

roduct

New antifouling product GLOBIC 8000

Hempel



Hempel announced the launch of two new antifouling products for dry-dockings and new buildings which deliver fuel savings of up to 3% and provide added flexibility to shipowners and yards.

GLOBIC 8000 is a brand new hydrolysing self-polishing antifouling product that fits neatly between the existing GLOBIC 6000 and GLOBIC 9000 antifouling systems. It builds on proven GLOBIC technology to deliver premium performance at a reasonable price. It incorporates Hempel's nano acrylate technology which delivers a fine polishing control mechanism to bring the integral biocides to the surface at a stable rate ensuring a clean hull. GLOBIC 8000 can be used on all vessels at all speeds but its nano acrylate technology binder makes it particularly effective for slow-steaming operations because of its instant activation of polishing and biocide leaching.

Andreas Glud, Hempel's Group Product Manager said, "These two new products offer a wider choice for owners and yards and deliver exceptional value-for-money. They comprise 58% volume solids and can be specified up to 90 months dry docking interval. This, together with a 3% fuel saving, means that these antifouling systems offer an unparalleled return on investment"

He added "Our GLOBIC technology has been widely accepted and well-tested by the market and our 6000 and 9000 products are in demand for all vessel types. GLOBIC 8000 provides an added dimension to this technology and offers a great alternative for those seeking a top-tier antifouling at an industry leading price".

Completing the suite of new products is BASIC which is Hempel's most economic antifouling suitable for up to a 36 month drydocking interval. It comes with 60% volume solids and a sufficient biocide package to deliver an optimal price/performance match.

> -TEL: +82-51-679-9300 -http://www.hempel.com

Category 6A cable for automation applications

Nexans



Nexans is introducing its Category 6A cable, designed for automation applications. The new cable is able to carry 10 GBit/s while offering the exceptional durability and flexibility essential for drag chain installations.

Nexans introduces durable, flexible CAT 6A Ethernet cable for industrial automation applications. The cable, part of the Motionline[®] range, will meet the need for increased data volume in industrial settings. The CAT 6A cable can bend to a radius 10 times its diameter while withstanding at least three million cycles, a new benchmark for CAT 6A Industrial Ethernet.

Nexans' CAT 6 cable carries signal frequencies of up to 500 MHz while reducing crosstalk and system noise. Its outer PUR jacket is halogen free, protecting people and equipment in the event of a fire. It is also abrasion and oil resistant.

The Industrial Ethernet cable can be used for Industry 4.0, machine-to-machine intercommunication and Internet of Things applications. The high data rates, ability to withstand strenuous repetitive movement and small bending radius make the cable suitable for applications requiring a high volume of data transfer in drag chain applications.

The cable has been tested at the dedicated Nexans' Motion Application Centre in Nuremberg, Germany. It meets all relevant international standards.

-TEL: +82-2-2140-2400 -http://www.nexans.co.kr

New Product

SUBLIFT boat hoists

Swede Ship Marine AB



In 2014 Swede Ship Marine acquired the SUBLIFT boat hoist operation. A new company has been formed called Swede Ship Sublift AB. The first deliveries of boat hoists from the yard at Djupvik on the island of Tjörn, Sweden to customers in Sweden and Norway took place in the autumn 2014.

SUBLIFT's origin is the in Sweden well known "Slamkryparen", the so called "Mudskipper". It is a design with a unique submersible function bringing boats up from the water on a slipway to a storage location on land and back. It is a compact motorized hydraulically controlled all in one solution that replaces cranes and tractors giving a low total investment cost. In particular SUBLIFT offers safe handling of boats without high lifting and unsafe transits from for instance crane to wagon or from wagon to cradle that can lead to incidents or in the worst case accident.

The boat hoist is easily adapted to different hull widths. The U-shaped frame straddles cradles alternatively blocks and supports that can be put in place before lowering the vessel. Both sail- and powerboats are managed without conversion between boat lifts. SUBLIFT is relatively easy to operate via the wireless controller, even by the non-professional on e.g. a boat club. The compact design maneuvers very well especially in confined spaces. When vessels are parked in a fish bone pattern they can be parked and picked up individually.

SUBLIFT provides services and training how to run and manage the boat hoist at dry docking and launching as well as efficient parking of boats. The company can also assist in the design of ramps and investigation of seafloor conditions for slipways. More than 170 boat hoists have been delivered to the nonprofit yacht clubs, commercial marinas as well as governments around the world. Four boat hoists with lifting capacity 12, 25, 40 and 75 ton is marketed.

> -TEL: +46-304-6795-00 -http://www.swedeship.se

BMEA (Busan Marine Equipment Association) Member List

ANSWER CO., LTD.

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

BANDO MARINE.

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

BERM YOUNG VALVE.

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

B-I INDUSTRIAL CO., LTD.

Head Office : Gangseo-gu, Busan Homepage Add : www.b-i.co.kr Main Products : Fire & gas detection system, smoke, heat & fiame detector. TEL : +82-51-441-5670

BMT CO., LTD.

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

BO KYOUNG IND., CO.

Head Office : Gangseo-gu Busan Homepage Add. : Main Products : O-ring, Sealing, Gasket TEL : +82-51-831-4615

BOKYUNGTL CO., LTD.

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

BO MYUNG METAL CO., LTD.

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

BOYANG HARDWARE CO., LTD.

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

BUSAN INDUSTRY CO.

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

BUSUNG PLANT CO., LTD.

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

CEPHAS PIPELINES CO., LTD. Head Office : Gangseo-gu Busan Homepage Add. :

Main Products : Butterfly Valve TEL : +82-51-263-3661

CHK CO., LTD. Head Office : Gangseo-gu Busan Homepage Add. : www.chkj.co.kr Main Products : Telephone Booth, Work Shop, Cable Box, Spare Box TEL : +82-51-831-9500

CHWANG HYEOP INSTRUMENTS.

Head Office : Gangseo-gu Busan Homepage Add. : www.chkj.co.kr Main Products : Telephone Booth, Work Shop, Cable Box, Spare Box TEL : +82-51-831-3607

CHANG WON ENVIRONMENT IND CO., LTD.

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

CMR KOREA CO., LTD.

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

DAECHANG METAL CO., LTD. Head Office : Saha-gu Busan

Homepage Add. : Main Products : Main Bearing support, Chain Wheel, Gear Wheel TEL : +82-51-264-0831

DAE-DONG ENTEC CO., LTD.

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

DAE HAN HEAT ELECTRIC MACHINERY IND.,CO. Head Office : Kijang-kun Busan

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

DAEHEUNG IND. CO., LTD.

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

AQ TECK CO., LTD.

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

DAEHWA TECHNICAL CO., LTD.

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

DAEJUNG SPECIAL STEEL CO., LTD. Head Office : Gangseo-gu Busan

Homepage Add. : Main Products : Winch, Shaft, Gear Cluch TEL : +82-51-831-1133

DAEKYUNG CO., LTD.

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

DAERIM MACHINERY CO., LTD.

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

DAESAN ENGINEERING CO., LTD.

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

DAE SEONG MARINE TEC CO., LTD.

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

DAESUNG IND CO.

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

DAE WON HEAVY INDUSTRIES CO., LTD.

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

DAEWON METAL IND. CO., LTD.

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

DAEYANG ELECTRIC CO., LTD.

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

DAEYANG INSTRUMENT CO., LTD.

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

DAEYANG SP CO., LTD.

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

DA HEUNG ENG. CO., LTD.

Head Office : Sasang-gu Busan Homepage Add. : Main Products : Marine valves TEL : +82-51-311-1882

DAOM METAL.

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

DEAIL MACHINERY.

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

DECKWIN CO., LTD.

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

DH-M CO., LTD.

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

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DHP ENGINEERING CO., LTD.

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

DINES CO., LTD.

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

DK INDUSTRIAL CO., LTD.

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

DK TECH CORPORATION CO., LTD.

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

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

DOLIM PRECISION.

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

DONG-A VALVE IND.

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

DONGBANG SHIP MACHINERY CO., LTD.

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

DONGHAE INTEC CO., LTD.

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

DONG HUN ENTERPRISE CO.

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

DONGHWA ENTEC CO., LTD.

Head Office : Gangseo-gu Busan Homepage Add. : www.dh.co.kr Main Products : E/R Heater & Cooler, Copt, Condenser, Plate Heat Exchanger TEL : +82-51-970-1000

DONGHWA M&E CO., LTD.

Head Office : Gangseo-gu, Busan Homepage Add. : www.donghwame.com Main Products : Heat Exchanger TEL : +82-51-971-3455

DONGHWA PNEUTEC CO., LTD.

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

DONGIL SHIPYARD CO., LTD. Head Office : Saha-gu Busan

Homepage Add. :www.dongilshipyard.co.kr

Main Products : Rescue Boat Davit & Winch, Assembly, Line Hauler TEL : +82-51-200-1211

DONGKYUNG INDUSTRY CO., LTD.

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

DONG NAM ENGINEERING CO., LTD.

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

DONGNAM PRECISION IND. CO., LTD.

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

DONG SUNG HIGHTECH.

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

DONGYANG G.T.S.

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

DONGYANG HYDTEC CO., LTD.

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

DONGYANG METAL CO., LTD.

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

DONGYOUNG ELECTRIC CO., LTD.

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

DSB ENGINEERING CO., LTD.

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

DSE BEARING CO., LTD.

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

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

DUYOUNG INDUSTRIAL MACHINES CO., LTD.

Head Office : Gangseo-gu Busan Homepage Add.

Main Products : Plate-Baffle TEL : +82-51-831-2477 EM SYSTEC CO., LTD.

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

FRIEND CO., LTD.

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

GEO MAEK SHOT&PAINT CO.,LTD.

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

GEORIM ENGINEERING CO., LTD.

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

GISUNG ENGINEERING CO., LTD.

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

G. M. TEC CO., LTD.

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

G.S HIGH-TECHER CO., LTD. Head Office : Gangseo-gu Busan

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

G&S PRECISION IND CO., LTD.

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

HAE DONG METAL CO., LTD.

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

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

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

HAE SUNG INDUSTRIAL.

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

HAEWON INDUSTRIES CO.

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

HAEWON IND. CO., LTD.

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

HAEYANG FAMILY CO., LTD.

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

HAEYANG METAL CO., LTD.

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

HAEYANG PROPELLER CO., LTD.

Head Office : Gangseo-gu Busan Homepage Add. : Main Products : Marine Propeller TEL : +82-51-831-4599

HANCHANG TRANS CO., LTD.

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

HANJULEVEL.

Head Office : Sasang-gu Busan Homepage Add. : www.hanjulevel.co.kr Main Products : Level instrument Etc, Vapour 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 : +82-5339-766

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

Head Office : Gangseo-gu Bus 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

Head Omce : Sana-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

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 Homenage 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 Homenage 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.

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Until : Send to head office by 15nd every month.

Kor ShiP

94



Registration No. :	Youngdungpo Ra 00220		
Published on	JAN. 5. 2015		
Publisher	Yoseob Choi		
Editor-in-Chief	Chunghoon Lee		
Senior Editor	Chanyoung Choi		
Designer	MiHwa Choi		
Marketing Manager Sungsu Park Kijong Seo Jongki Hong			
Printed by	Hyung–Je Art Printing		
Printed (CTP) by	Hyung–Je Art Printing		
Published by	PROCON		
Address: Rm 708 ACE Techno Tower #55–7, Mullae–dong 3 ga, Youngdungpo–ku, Seoul, Korea			
Tel : +82–2–2168–8898			
Fax : +82–2–2168–8895			

International : +82-10-5604-7311 (Chanyoung Choi)

www. korship .co.kr	www. procon .co.ki
E-mail : korshipeditor	@gmail.com
Price per Copy : ₩10,0	00
Annual Subscription Fee	₩100,000

Banl	k of receipt
Kiup Bank	083-038571-04-013
Kook Min Bank	757-21-0285-181
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Woo Ri Bank	182-07-168838
* Deposit person : PROCON (Choi Yo Seob)	

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