ISO 9001 Certificate No. A 0858
ISO 14001 Certificate No. B 0110
OHSAS 18001 Certificate No. C 0082
AS9100 Certificate No. FM568558
WORLD CLASS 300

40th ANNIVERSARY 1980-2020

DongHwa Entec

HEAT EXCHANGER FOR SHIPBUILDING BUSINESS



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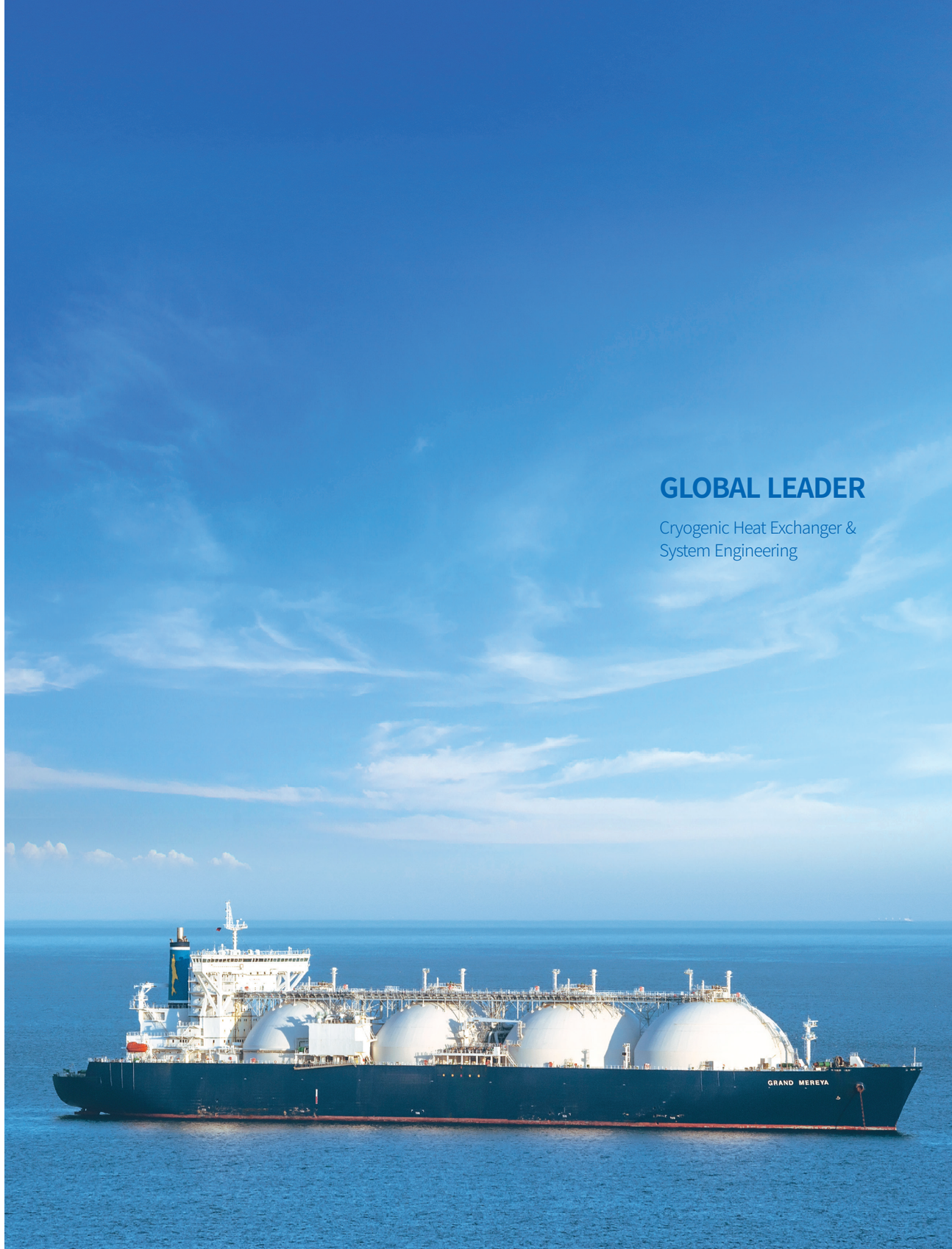
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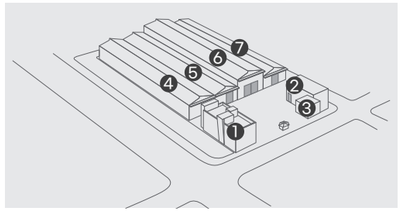
DONGHWA ENTEC FOR MARINE

녹산공장
Noksan Factory

주소 부산시 강서구 녹산산단 261로 7
준공 2001년 7월
공장규모 대지면적: 15,574m²(4,710평)/건축 연면적: 13,845m²(4,188평)

Adress: 7, Noksansandan 261-ro, Gangseo-gu, Busan, Korea
Completion: Jul. 2001
Factory Scale: Plant Size: 15,574m²(4,710평) / Building Size: 13,845m²(4,188평)





① 사무동 Office Work ② 복지동 Welfare Center
③ 전기계장실(현장) ④ 1Bay(A/B) ⑤ 2Bay(C/D)
⑥ 3Bay(E/F) ⑦ 4Bay(G/H)





(주)동화엔텍은 35년간의 생산 노하우를 바탕으로 고객사양에 만족하는 최적화된 설계와 비용절감을 고려한 생산라인, 탄력적인 납기대응, C/S, A/S 체계를 완벽하게 갖추고 고객만족을 실현하기 위해 끊임없이 노력하고 있습니다. 현재는 환경규제 등에 따른 LNG 수요증가로 부상되는 LNGC 및 LNG 연료선, OFFSHORE 관련 선박기기의 개발, 설계, 생산, 납품에 전력하고 있으며, 고객 NEEDS에 맞는 SIZE COMPACT화와 PACKAGE화 연구개발에 박차를 가하고 있습니다.

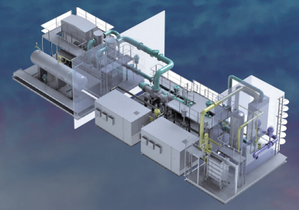
DongHwa Entec is making ceaseless effort to realize customer satisfaction with production line, flexible payment, customer service, and follow-up service considering optimized design and cost reduction to satisfy customer specification based on know-how for 35 years. Currently, we are focusing on development, design, production, and delivery of ship equipments related to offshore, emerging LNGC and LNG Fuel line due to increased demand for LNG by environment regulation, and developing ceaseless research on size compact and package based on Customer's Needs.



Production Range

㈜동화엔텍은 명실상부한 조선·해양 열교환기 기자재 선두업체로써 선도기술과 지속적인 개발을 바탕으로 고객 Needs의 만족을 최우선 과제로 생각하고 있습니다.

DongHwa Entec is a leading company for shipbuilding and marine heat exchanger equipment, and the company places the highest priority on meeting customer needs and customer satisfaction



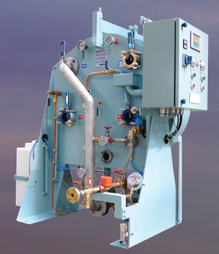
DH-Reli
(BOG Reliquefaction System)



DH-FGSS
(Fuel Gas Supply System)



DEAERATOR



FRESH WATER GENERATOR (FWG)



LNG VAPORIZER



ENERGY SAVING SYSTEM (ESS)



FUEL SWITCH



MGO COOLING UNIT



AIR/GAS COMPRESSOR



AIR COOLER for MAIN ENGINE



SHELL & TUBE HEAT EXCHANGER

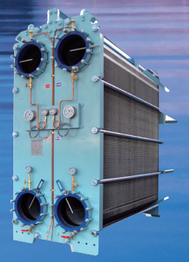


PLATE TYPE HEAT EXCHANGER

LNG SYSTEM & CRYOGENIC HEAT EXCHANGER

DH-FGSS (Fuel Gas Supply System)

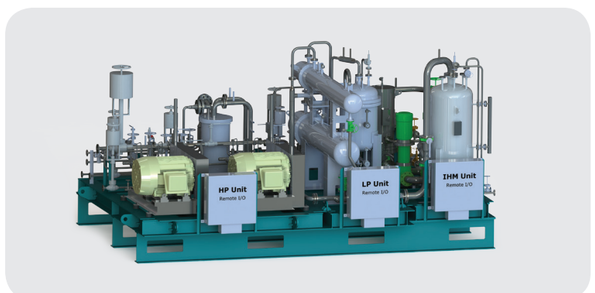
Fuel Gas Supply System (DH-FGSS)은 가스추진선박의 연료공급시스템으로 Tank 내의 LNG, BOG를 엔진연료공급 조건으로 만들어 주는 시스템입니다. LNG Fuel Tank, LNG Pumping System, BOG Compressing System, LNG Heating System, BOG Heating(Cooling) System, Heating Medium Circulation System, Bunkering System, Venting System 등으로 구성되고, 대형선박과 소형선박, 고압엔진과 저압엔진 등 프로젝트의 특성에 맞춘 최적의 시스템엔지니어링으로 제품을 구현합니다.

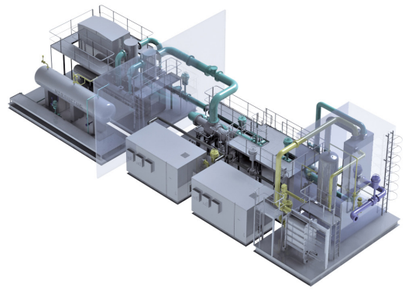
The fuel gas supply system (DH-FGSS) is a gas-propelled ship's fuel supply system. It is a system that makes LNG and BOG within the ship's tank into a proper engine fuel supply. The fuel gas supply system consists of an LNG fuel tank, an LNG pumping system, a BOG compressing system, an LNG heating system, a BOG heating (cooling) system, a heating medium circulation system, a bunkering system, and a venting system. We supply the system through system engineering that is optimized for project characteristics including small and large ships, high pressure and low-pressure engines.

DH-FGSS PACKAGE

- **HP unit for main propulsion engines**
  - High pressure pump
  - High pressure vaporizer
- **LP unit for generator engines**
  - Fuel gas vaporizer
  - Separator
  - Fuel gas heater
- **Glycol water heating unit**
  - Glycol Water Tank
  - Glycol Water Pump
  - Glycol Water Heater







DH-Reli (BOG Reliquefaction System)

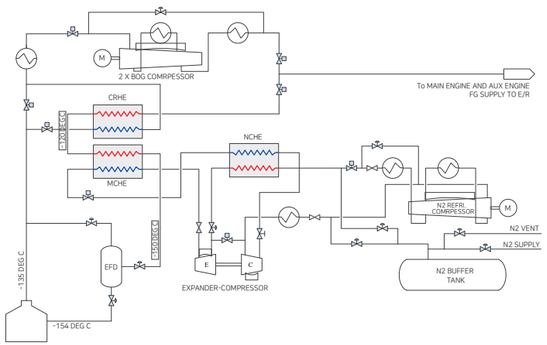
BOG(Boil Off Gas) 재액화 시스템(DH-Reli)은 초저온 유체를 보관하는 탱크에서 발생하는 BOG를 재액화하는 시스템으로, 특히 LNG 운반선과 같이 대형의 Cargo Tank에서 발생하는 BOG 회수를 위한 최적의 시스템입니다. 시스템설계기술을 바탕으로 Compact Heat Exchanger(PFHE, PCHE)를 사용하고, 계열사 동화뉴텍을 통한 최적의 Compressor를 조합하여, 최고의 성능을 보장합니다. 기계장비 뿐만 아니라 최적 운전을 위한 Control & Monitoring System, Safety System 등을 함께 공급하고 있습니다.

The BOG (boil off gas) reliquefaction system (DH-Reli) is a system that reliquefies the BOG generated in a tank storing fluids at ultralow temperatures. The system is an optimum system to collect the BOG generated in large cargo tanks of LNG carriers. Based on the system design technology, we use a compact heat exchanger (PFHE, PCHE), and combine optimum compressors through our affiliated company Donghwa Pneutec, and guarantee the best performance. We also supply control and monitoring systems and safety systems for optimum operation in addition to machine equipment.

- **Pilot plant – Development of 2ton/day BOG re-liquefaction**
  - Equipment of LNG propulsion vessel using high density heat exchanger
- **Development of BOG treatment system of LNG fuel tank for gas propulsion ship**
  - Design of Reverse Brayton-Cycle using N2
  - Risk avoidance design and risk response design
  - Implementation of integrated system including control and measurement
  - Authentication/verification through performance evaluation
- **Optimization of BOG processing system process for LNG**
  - Re-liquefaction equipment process optimization
  - Thermal performance review and economic evaluation through performance evaluation
- **Compact size with high density heat exchanger**
  - Development of proprietary model of PCHE shape
  - Development of PCHE commercialization process
- **Automatic Control System**
  - PLC based controller(Low cost)
  - Fail safe redundant system design Dual CPU, UPS
  - Automatic control with manual control override
  - Designed with safety function

  Safety factors: Icing, tube fracture, gas leakage





LNG SYSTEM & CRYOGENIC HEAT EXCHANGER



Printed Circuit Heat Exchanger

PCHE(Printed Circuit Heat Exchanger)는 고온고압의 진공 환경 조건에서 모재와 모재 사이의 표면에서 발생하는 계면 확산 현상을 이용하여 모재와 모재를 접합하는 제품입니다. 열교환 형태는 Plate Type과 유사하나, Plate-Plate 간의 구조적 결합이 모재의 기계적 특성을 유지하는 장점으로 고온 및 초저온, 고압 환경에서 사용 가능한 특성이 있습니다. Compact한 특징의 열교환기로 선박에서는 주로 LNG 운반선의 BOG 재액화장비(초저온), 고압 기화기, Compressor Cooler 등으로 사용하고 있습니다. 육상용으로 수소연료전지의 폐열회수, 개질, SCO_2 발전, 수소충전소 등에 사용하고 있습니다. 특히 ㈜동화엔텍은 수소충전소의 H_2 Pre Cooler(700bar)를 최고품질로 공급하고 있습니다.

The PCHE (printed circuit heat exchanger) is a product that bonds basic materials using an interfacial diffusion phenomenon caused from the surface between basic materials at high temperatures and a pressure and vacuum environment. Although the heat exchange type is similar to the plate type, the structure of the plates maintains the mechanical properties of the basic material means it can be used at a high temperature, an ultralow temperature, and in a high-pressure environment. As a compact heat exchanger, it is used as to reliquify an LNG carrier's BOG (cryogenic), high pressure vaporizer, and compressor cooler. For onshore use, the equipment is used for waste heat recovery, reforming hydrogen fuel cells, SCO_2 power generation, and hydrogen charging stations. We are supplying a high quality H_2 pre cooler (700bar) for hydrogen stations.

• Special Characteristic

Thermal Design
- Optimized thermal Design High Heat Duty, Low Pressure Drop
- Micro Channel Design with Process
- Multi Stream Service
- Avoidance Design with Icing phenomenon

Production Technology
- Diffusion Bonding Technology Stainless steel : 3XX, 4XX
- Welding Technology Core-Core Welding Core-Header Welding
- Inspection Methods He Leak, Pressure Test... NDE(PT, UT, MT...)

DongHwa Entec PCHE

Code & Standards
- ASME Division I & II
- Class Society
- KGS(Korea Gas Safety Code)

Structural Design
- Pressure & Thermal Analysis
- Vibration, Pitching & Rolling
- Fatigue analysis

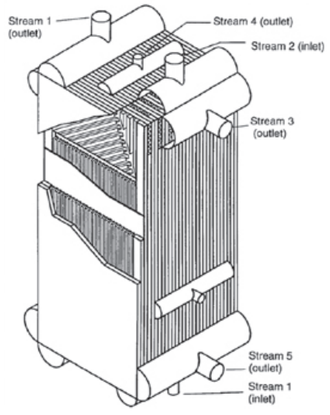
Maintenance and Repair Solution
- Performance Monitoring Methods
- Cleaning Methods
- Repair Procedure



Plate Fin Heat Exchanger

Plate와 Fin을 고온상태의 진공브레이징 공정을 이용하여 제작한 Compact한 특징의 열교환기로 초저온 공정, Oil & Gas 산업의 핵심기기입니다. 주로 Aluminum, Stainless Steel, Inconel 등으로 제작하고, 높은 온도 접근성, 체적대비 높은 집적도를 바탕으로 Multi Stream의 공정에 사용되는 특수형태의 열교환기입니다. 성능예측기술, 구조 및 신뢰성 해석 기술과 함께 최적화된 제작공정을 통해 신뢰성 높은 제품을 공급하고 있습니다.

PFHE (plate fin heat exchanger) is a core piece of equipment in the cryogenic process and the oil and gas industry, and it is manufactured with aluminum, stainless steel, and inconel. It is a special type of heat exchanger used for the multi stream process based on high temperature accessibility, and the high concentration compared to volume. We are supplying highly reliable products through the optimized manufacturing process alongside the performance predicting technology, structure, and reliability analysis technology.



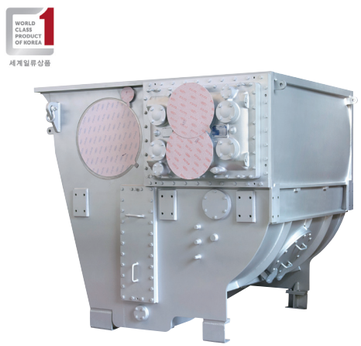
• General overview

plate-fin heat exchanger consists of corrugated fins, separated parting sheets, nozzles and manifolds. Its principal use has been in oil & gas process, cryogenics and aerospace where high performance with low mass and volume is important. Plate-fin heat exchanger can treat multi-streams in only one unit.

• Features are as below

- Compactness - space and weight savings
- Variable temperature service & close temperature approachment
- Multiple process streams into a single unit

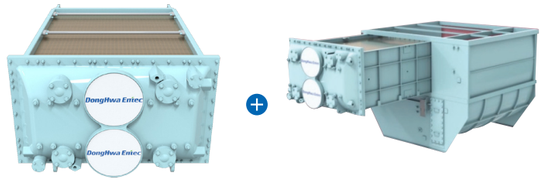
WORLD CLASS PRODUCT

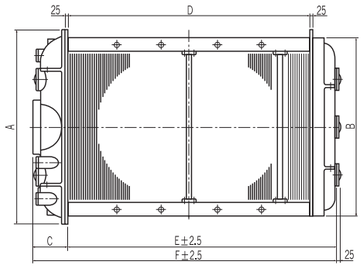


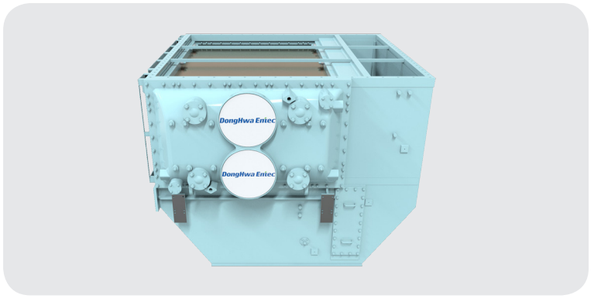
Air Cooler

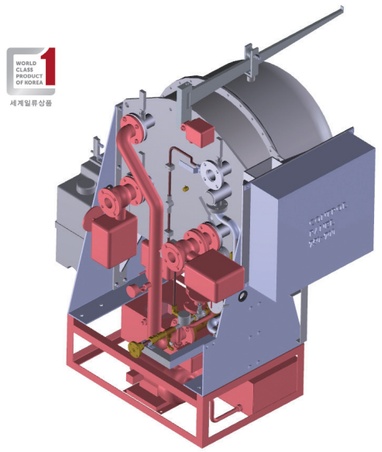
1980년 설립이래 ㈜동화엔텍은 40년 이상 저속 및 고속엔진에 사용되는 Air Cooler를 국내외 엔진제조사에 공급하고 있으며, 세계일류상품에도 선정되고 있습니다. Turbo Charger를 통해 공급되는 압축공기를 냉각시켜 더 많은 압축공기를 엔진에 공급함으로써 엔진의 연소효율을 향상시킬 수 있습니다. 선박 엔진용 Air Cooler 기술을 바탕으로 선박배기가스 중 NO_x 저감시설인 EGR에도 Cooler로 사용되고 있습니다.

Since its establishment in 1980, Donghwa Entec has been supplying air coolers used for low and high speed engines, and our air cooler was selected as a world class product. The engine's combustion efficiency can be improved by supplying more compressed air by cooling the compressed air supplied through a turbo charger. Based on our air cooler technology for ship engines, the air cooler is also used for EGR equipment, a NO_x (a discharged gas from a ship) reduction equipment.







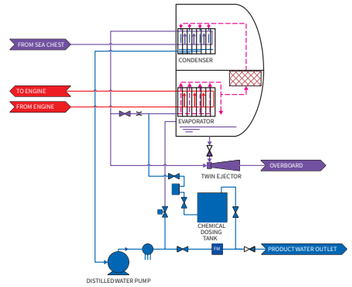


Fresh Water Generator

FWG(Fresh Water Generator)는 선박에서 필요한 담수를 저압증발 방식으로 해수를 만드는 장치로 세계일류상품으로 선정되어 있습니다. 해수의 증발열원으로는 엔진 냉각 후 폐열원인 Jacket Water나 Steam을 이용하며, Water Ejector를 이용해 Chamber 내부를 진공으로 유지합니다. 해수 증발과 응축과정에 사용되는 열교환기 Type에 따라 Plate 조수기, S&T 조수기로 구분되고, 선박에서 필요한 담수량에 따라 모델이 구분됩니다. 20Ton, 25Ton, 30Ton, 35Ton, 40Ton/d 모델이 있으며, 필요시 개별 설계도 가능합니다. 담수의 염분 농도를 측정하여 필요 성능치를 제어하는 시스템이 구비되어 있고, Self Cleaning 시스템, 부속의 교체 등을 알려주는 Alarm System 등을 구비한 Smart 조수기를 통해 한차원 높은 조수기 운영시스템을 제공하고 있습니다.

The FWG (fresh water generator) is a device that makes the required fresh water on a ship from seawater using low pressured evaporation, and it was designated as a world class product. The seawater evaporation heat source includes jacket water (waste heat source after engine cooling), or steam. By using the water ejector, the inside of the chamber is maintained in a vacuum state. Depending on the heater changer type used for seawater evaporation and condensing process, the FWG is divided into the plate type and the S&T type, and the model is classified according to the amount of fresh water required on a ship. There are 20t, 25t, 30t, 35t, and 40t/d models, and an individual design is possible, if necessary. We provide a higher level FWG operating system through a necessary performance value controlling system that measures fresh water's salt concentration, and self-cleaning system, and an alarm system notices when parts need replacing.

• Flow diagram



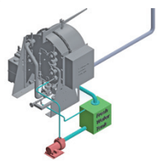
Benefits
- Save Times(M/H)
- Save cost

Feature
- Self Cleaning - 7hr/1hr
- Self Flushing - 90minitus
- Self Diagnosis - 10ppm
- Self Evaluation - ton/year

Two concept of Smart FWG v1.0

The difference between the two types depends on the cleaning water supply method.

Model S1 :
Standalone Smart FWG
- Supplied self cleaning system



Model W1 :
Water - Filling Smart FWG
- Supplied fresh water tank

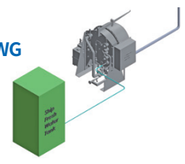




Plate Type



Tubular Type



Double Effect Type

WORLD CLASS PRODUCT

LNG Vaporizer

LNG 해상인수기지(FSRU : Floating, Storage, Regasification Unit)에서 LNG를 하역할 때 사용하는 초저온 열교환기로 고압의 LNG를 기화시키는 역할을 담당합니다. LNG를 기화시키는 열원은 Sea Water, Glycol Water, 기타 저온환경에서 사용 가능한 유체를 이용하고, 이 유체의 특성에 맞는 최적 설계를 구현합니다. 고압 초저온의 열적특성 해석 능력과 구조설계 기술이 핵심이며, 세계일류상품으로 선정된 세계최고의 제품입니다. 시스템 특성에 따라 HP Vaporizer 후단에 Trim Heater를 설치하여, 압력강하에 따른 온도 보상 용도로 사용하기도 하며, 하역 조건 변화에 대응하기도 합니다. ㈜동화엔텍의 LNG Trim Heater, Plate Cooler, Steam Heater, Glycol Heating System과 연계하여 사용할 경우 최상의 시스템 효율과 효과적인 운전성을 가질 수 있습니다.

As an ultralow temperature heat exchanger used to load/unload the LNG from the LNG FSRU, the equipment plays a role in gasifying the high-pressure LNG. The heat source that heats the LNG uses fluid usable in sea water, glycol water, and other low temperature environments, and the optimal design suitable for the fluid characteristics is implemented. The ability to analyze the heat characteristics of high pressure and extreme temperature and structure design technology are the core of the technology, and the equipment has been selected as a world class product. Depending on the system features, a trim heater is installed at the rear end of the Hp vaporizer and it is used for temperature compensation and responds to the changes in the loading/unloading conditions. If the equipment is used in connection with our LNG trim heater, plate cooler, steam heater, and glycol heating system, the best system efficiency and effective operability can be achieved.

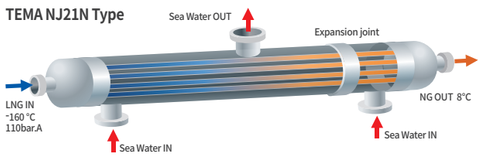


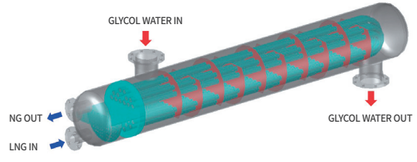
<FSRU Regas System High Pressure LNG Vaporizer>

• General Design Data

ITEM	200 MMSCFD	150 MMSCFD
Heat exchanged (kW)	36,656	28,031
Design pressure (bar.G)	Shell 7.0 / Tube 135.0	Shell 7.0 / Tube 135.0
Design code	ASME, Class	ASME, Class
Tubes	OD : 19.05mm Length : 13.50m	OD : 19.05mm Length : 13.00m
Shell ID	1450mm	1350 mm

TEMA NJ21N Type





Advantage

1. Capacity : Max. 250 mmscfd
2. Design pressure : 135 bar.G
3. Counter flow → High effciency
4. Easy overhaul → Removable bundle

Supply items

1. HP vaporizer : Max. 250 mmscfd/set
2. Trim heater
3. Glycol heater
4. Glycol pump
5. Glycol tank

LNG 운반선은 Cargo Tank에서 발생하는 BOG나 BOG가 부족할 경우 LNG를 기화하여 추진 연료로 사용합니다. Low Pressure LNG Vaporizer는 LNG를 기화하여 연료로 사용할 때 필요한 열교환기로, Steam Heating, Glycol Water Heating 등 다양한 열원에서도 사용 가능합니다. LNG Cargo Handing을 위한 필수장비로 공급유량과 온도를 제어하기 위한 시스템을 함께 공급하고 있습니다. LNG 운반선에서는 사용 목적에 따라 Main LNG Vaporizer, Forcing LNG Vaporizer으로 사용되고, 유량, 온도 제어용 Control Valve, In-line Mixer, Mist Separator, Gas Heater 등이 함께 공급되어 최적의 Cargo Handling System으로 구현됩니다.

An LNG carrier uses the BOG generated in a carto tank as propelling fuel or for the gasification of the LNG and uses it if the BOG is insufficient. The low-pressure LNG vaporizer is a heat exchanger necessary when using gasified LNG as fuel, and it can be used with various heat sources including steam heating and glycol water heating.

As essential equipment for LNG cargo handling, we supply a system to control the amount of oil supplied and the temperature together. In an LNG carrier, the equipment is used as the main LNG vaporizer and the forcing LNG vaporizer. The control valve for the amount of oil and the temperature control, the in-line mixer, the mist separator, and the gas heater are supplied together, and so an optimal cargo handling system is implemented.

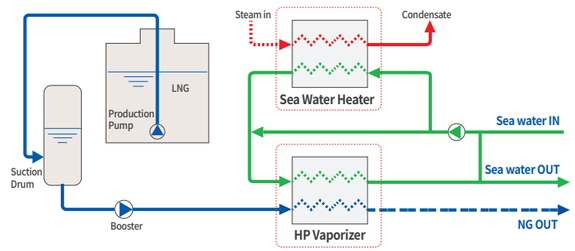


<S&T Type Low Pressure LNG Vaporizer>

• Sea water direct heating

Comblned open / closed loop with sea water and steam heating

- Min, equipment
- Simple control
- Min, Energy consumption
- High pressure vaporizer : Shell and Tube type heat exchanger



WORLD CLASS PRODUCT

Energy Saving System

ESS(Energy Saving System)는 선박의 중앙해수 냉각시스템을 최적화 하기 위한 지능형 제어시스템으로써 세계일류상품으로 선정되어 있으며 운항 중 해상환경 조건을 실시간으로 모니터링하여 해수중앙 냉각스시템의 Pump 구동을 효율적으로 관리하는 시스템입니다.

ESS (energy saving system) is an intelligent control system to optimize the ship's central sea water cooling system (CSCS). The ESS monitors marine environment conditions during the ship's navigation, and it efficiently manages the operation of the CSCS pump.



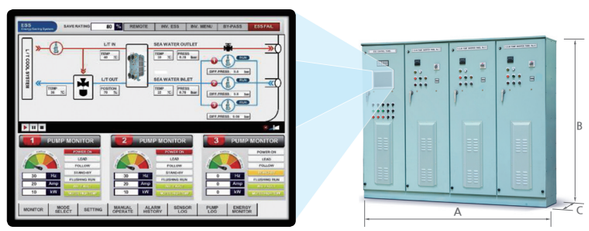
The advantage of ESS

- High energy saving rate up to 40%
- CO2 Reduction according to Save fuel oil(DO, HFO)
- Automatic flushing
  - Anti-fouling
  - Adjust flushing timing
- Stability of system
  - Set the minimum flow-rate
- Continuous operation variable pump speed control
- Reduction in the start current

• Screen of ESS controller

• Reduction
- Greenhouse gas emission
- Fuel oil (DO, HFO) consumption

• Regulati on
- EEDI



HEAT EXCHANGER



ECO care U1

Eco-care U1은 SCR(선택적 촉매 환원장치/Selective Catalytic Reduction)에서 필요로 하는 40% 요소수를 선박이 운항하는 동안 실시간으로 자동 제조/공급할 수 있는 장치입니다. 기존의 요소수 보관 탱크와 요소수 유지를 위한 냉각 장치가 필요 없어, 선박의 공간 및 운용 비용을 절감할 수 있습니다.

The purpose of this eco-care U1 is to make and service as an automatic real time the aqueous urea solution at 40% concentration (AUS 40), which is needed to operate SCR (selective catalytic reduction) converters at onboard during sailing. We eco-care U1 is not need the big urea tank with additional chiller system and we can save cost for AUS40.

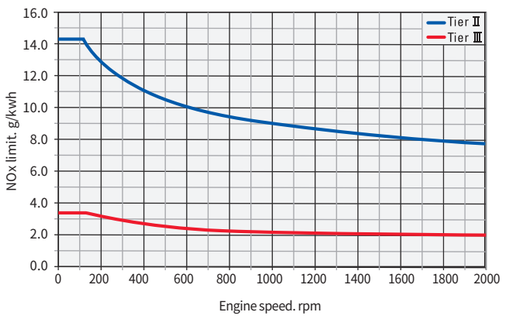
• NOx reduction - Tier III solutions

Benefits
- Save space : No big Tank
- Save Time : No Urea bunkering
- Save Cost



NOx Limits

The international NOx emission limits on marine diesel engines as determined by MARPOL Annex VI are shown below graph as a function of the rated engine speed, rpm.



HEAT EXCHANGER

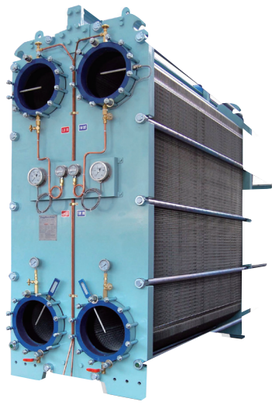
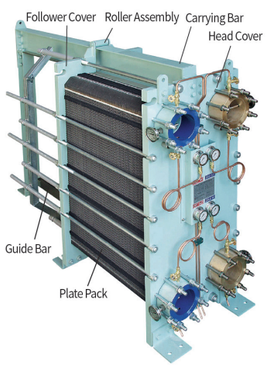


Plate Type Heat Exchanger

Plate Type Heat Exchanger는 S&T Type과 함께 가장 전통적인 형태의 열교환기입니다. 일반적으로 S&T Type에 비해 Compact한 특징이 있고, 유지보수가 용이하다라는 장점이 있습니다. 주로 가스켓을 이용하여 Plate와 Plate 사이를 고정하고, 볼팅을 이용하여 누출을 방지합니다. ㈜동화엔텍의 Plate는 30년 역사를 바탕으로 다양한 용도와 다양한 규격에 대응이 가능합니다. 글로벌 네크워크를 통해 언제든지 필요한 보전서비스를 받을 수 있습니다. ㈜동화엔텍 Plate Cooler는 당사의 ESS 제품, DH-FGSS, HP Vaporizer 등과 연계했을 때 One-Line Service를 제공하고 있습니다.

The plate type heat exchanger is the most common heat exchanger along with the S&T type. It is more compact than the S&T type, and it is easier to maintain/repair. Fixing between plates is done by using the gasket, and leaks are prevented through bolting. Due to our 30 years of experience, Donghwa Entec plates can respond to various uses and sizes. Users can receive the necessary maintenance service anytime through the global network. Our plate cooler can provide one-line service when it is linked to our FFS products, DH-FGSS and HP vaporizer.



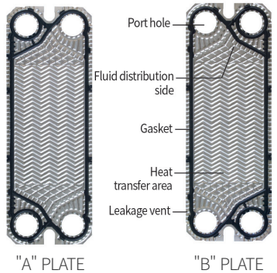
• Type of Heat Plate

HIGH-THETA PLATE

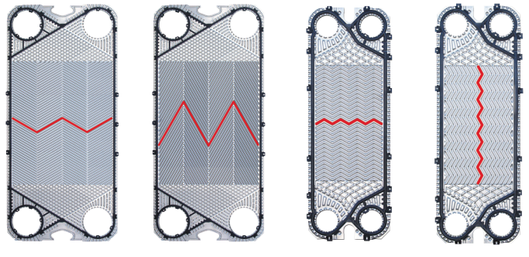
- High turbulent flow
- High heat transfer coefficient
- Perfect temperature approach
- High pressure drop

LOW-THETA PLATE

- Low turbulent flow
- Low heat transfer coefficient
- High temperature approach
- Low pressure drop



"A" PLATE "B" PLATE



High-theta Plate Low-theta Plate High-theta Plate Low-theta Plate

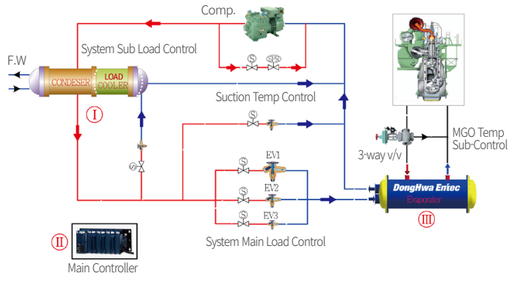
MGO Cooling Unit

MGO Cooling Unit은 냉매를 이용해 선박용 연료유의 이송이 원활하도록 연료유의 온도를 낮춰주는 제품입니다. 환경규제 강화에 따라 일정 지역을 항해 시 선박연료유를 저급유에서 MGO로 변경하여 사용해야 하는데 이때 통상적으로 MGO Cooling Unit이 적용됩니다.

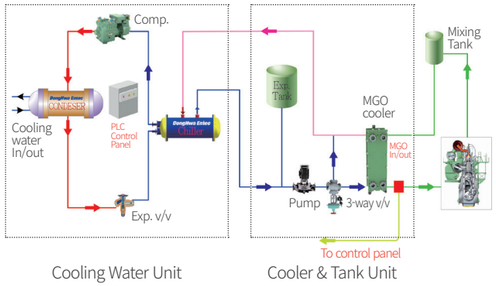
The MGO cooling unit is a product that lowers the temperature of the fuel oil so that ship's fuel oil can be transferred smoothly using a refrigerant. According to the environmental regulation consolidation, ship's fuel oil should be changed from low grade oil to MGO using the MGO cooling unit when sailing in certain areas.



• Direct Syetem



• In-direct Syetem



Cooling Water Unit Cooler & Tank Unit

• The advantage of Donghwa Entec MGO Cooling Unit

Compact Size	All models of MGO C/U were standardized as very compact size to install it within given space where only cooling water and oil connectionis required.
Easy operation	You can very easily operating MGO C/U through hybrid control system by just setting the target temperature.
Easy maintenance	You can easily cleaning MGO C/U through internal Electric Heater on Evaporator when it is polluted by bunker-C due to ship's crew mistake.
Perfect performance	Performance strictly is evaluated through best facilities simulating engine condition in Donghwa R&D Center.
Sufficient delivery record	MGO C/U were delivered through strictly performance test evaluation in attendance of owner's superintendent.

HEAT EXCHANGER

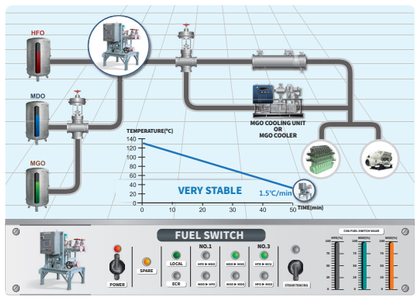


Fuel Switch

Fuel Switch는 Bunker Change 과정을 자동 컨트롤 시스템을 통하여 수행하는 장비입니다. 최근 선박 건조 동향이 지능화된 선박 및 선원의 편의성을 추구하고 있으며, 선박 시스템의 안전성 또한 중요시 되고 있습니다. 이에 (주)동화엔텍의 Fuel Switch는 안전성을 고려하여 고온의 HFO와 상온의 MGO/MDO간의 Bunker Change 과정에서 발생되는 온도변화[2°C/min]를 제어하여 엔진 손상의 위험성을 줄이고, Bunker Change 과정을 선원의 수동 Valve 조작이 아닌 자동 제어를 통하여 선원의 편의성도 추구하고 있습니다. 또한 HMI(ECR & LOCAL)를 통한 원격시스템이 구축되어 있어 어떠한 상황에서도 선원의 요구 조건에 맞게 컨트롤이 가능하며, 실시간 Bunker Change 과정을 모니터링 할 수 있도록 시스템이 구현되어 있는 장비입니다. 특히 MGO Cooling Unit 와 연계하여 Bunker Change 의 모든 과정을 한 번에 수행 가능하도록 한 종합제어가 강점입니다.

The fuel switch performs a bunker change process through the auto control system. A recent shipbuilding trend is pursuing the convenience of intelligent ships and the crew members, and the safety of the ship's systems is also becoming important. Donghwa Entec's fuel switch reduces the risk of engine damage by controlling the temperature change (2°C/min) caused by the bunker change process between HFO at a high temperature and the MGO/MDO at room temperature. It also seeks the convenience of the ship's crews through auto control, instead of the manual control of the valve by the crew members in the bunker change process. As a remote system through HMI (ECR and Local) is established, control is possible in line with depending on the crew's situation, and the system is implemented to monitor bunker change process in real time. In particular, the comprehensive control provides an advantage so that all bunker change processes can be performed at once in connection with the MGO cooling unit.

• Automatic by Fuel Switch



• The advantage of Fuel Switch

Lower Cost & Central Control
Yon respectively can control MGO cooling unit & Fuel Switch and monitor actual operating condition in real-time through MHI at ECR with One control panel of Donghwa total solution for applying low-sulphur MDO/MGO on sailing in CARB and EU-ECA, compared to providing each equipment of other systems.

Compact Design
3-Way valve with simplicity can be designed with easy installation and maintenance, which is able to applied to sea-going vessel as well.

Precise control
During change-over, the temperature increase/decrease rate should be less than 2°C/min. to protect the fuel equipment from the thermal shock resulting in sticking.

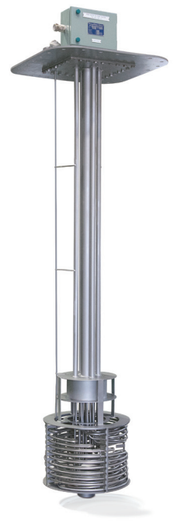
Easy operation & Data Log
You can use and adjust this system due to a simple control logic automatically, switching to manual during error condition as well. All data during operation condition are able to be monitored and recorded as an automatic real-time data logging system which are interlocked to GPS(Global Positioning System).



Deaerator

Deaerator는 급수 속에 녹아 있으면서 배관, 열교환기 등의 내부 부식의 원인 가스(산소, 이산화탄소)를 제거하고 이와 동시에 급수를 가열하는 가열기의 기능을 하며 급수펌프의 (유효흡입양정)가 일정하게 유지되도록 하는 기능을 가진 장치입니다. 육상용 플랜트에는 주로 Spray & Tray Type이 사용되며, 해상용 선박에는 주로 Spray & Scrubber Type이 사용됩니다. ㈜동화엔텍은 자체적으로 Spray, Tray, Scrubber 등 탈기기의 핵심기술을 개발하여 공급하고 있으며, 현재도 성능개선을 위하여 연구, 개발 중입니다.

The deaerator removes internal corrosive pipe gases (oxygen, CO_2) and heat exchangers that melt in the water supply, and also heats the water supply, and it is a device that keeps the water supply pump (net positive suction head) stable. For onshore plants, the spray and tray type is mainly used, and the spray and scrubber type is mainly used for offshore ships. Donghwa Entec has developed the core technology of the deaerators including the spray, tray, and scrubber, and supplies them. We are still performing R&D for performance improvement.



Electric Heater

Electric Heater는 선박 내 Heating이 필요한 유체로는 Fuel Oil, Lubricant Oil, Jacket Water, Sea Water 등이 있으며 유체의 종류에 따라 내부식성 소재를 이용합니다. Electric Heater의 종류로는 Shell Body Type, Tank Mounting Type 있으며, 특히 Tank Mounting Type 중에서도 Tank의 옆면에 적용되는 Side Type, Tank의 윗면에 적용되는 Top Mounting Type이 있습니다. Electric Heater 운영은 유입되는 유체의 온도를 전기를 이용하여 히터의 발열부로 유체를 가열하여 배출시키며 이를 위한 컨트롤 방법으로 MC Type과 TPR Type이 있습니다. MC Type은 On-Off Step Control Type으로 용량을 여러 개로 분할하여 필요한 만큼의 용량만 이용하여 제어를 할 수 있으며, TPR Type은 Electric Current Control Type으로 4~20mA의 전류를 이용해 자동으로 온도를 제어할 수 있습니다.

Equipment that directly heats fluid using electric energy, and it is a heat exchanger used for heating the main equipment's lubricant and fuel oil or to cope with emergency situations. The electric heaters include a shell body type and a tank mounting type. The tank mounting type incudes a side type applied to the side of a tank and top mounting type applied to the top part of a tank.

HEAT EXCHANGER



Glycol Water Heater

극저온의 LNG Cargo로부터 선체를 보호하기 위하여 Cargo와 Cargo사이의 임시 물막이에 설치된 Heating Coil 내부로 90°C로 가열된 Glycol Water (45% Glycol Water + 55% Fresh Water)를 순환시킵니다. 이렇게 Glycol Water를 가열 시키기 위하여 사용하는 장비가 Glycol Water Heater이며 Glycol System을 구성하는 Glycol Water Heater, Pump, Tank등 조립으로 공급이 가능합니다.

Glycol supply & heating system to protect the ship from LNG cargo at cryogenic LNG cargo. Glycol water heated at 90°C is circulated inside the heating coil installed at the temporary water barrier between the cargo to protect the hull from the LNG cargo at ultralow temperatures. The equipment used to heat the glycol water is the glycol water heater, and supply of it is possible by assembling the glycol water heater, pump, and tank consisting of the glycol system.



Oil Heater

Oil Heater는 선박에 사용되는 연료유, 윤활유 등 보일러에 의해 생성되어진 스팀을 이용하여 가열하는 장치입니다. 연료유를 가열하여 점도를 낮추고 엔진에서의 인화점을 높여주는 M/E & G/E F.O. Heater, Heavy Fuel Oil의 점도를 낮추며 정화장치에 가장 좋은 효율을 보이는 온도까지 가열하여 불순물 제거에 도움을 주는 H.F.O. Purifier Heater, 엔진에 사용된 Lube Oil의 불순물을 제거하기 위한 적정온도로 가열해주는 L.O. Purifier Heater는 Oil Heater의 가장 일반적인 제품들입니다.

A device that heats fuel oil and lubricant oil used in ships where steam is generated by the boiler. The following are the general products of oil heaters: The M/E and GE FO heater lowers viscosity and increases the flash point in the engine by heating the fuel oil. The HFO purifier heater lowers the heavy fuel oil's viscosity and helps remove impurities by heating up the temperature and showing the most efficient setting of the purification device, and the LO purifier heater heats up to a proper temperature in order to remove the impurities of lubricant oil used for the engine.



Tank Cleaning Heater

원유 혹은 석유화학제품을 운송하는 유조선은 크게 Product Carrier와 Crude Oil Carrier로 구분 됩니다. 특히 Product Carrier의 경우 각 화물창마다 각기 다른 제품을 운송하기 때문에 화물의 안전수송 및 제품의 오염을 방지하기 위하여 각 화물창은 반드시 청소를 실시하며, Tanker 선의 경우 기름을 하역한 후 다른 종류의 기름을 보관하기 위해 Tank 내 잔존 오일 및 찌꺼기 청소용으로 S.W 혹은 F.W를 70~80°C 이상으로 가열한 후 청소기계가 각 화물창을 청소합니다. 이 때 S.W 혹은 F.W를 가열하는 용도로 사용하는 장비를 Tank Cleaning Heater라고 부릅니다.

A tanker that transports crude oil or petrochemical products that can be classified into product carriers and crude oil carriers. A product carrier transports different products in each cargo hold, and so each cargo hold must be cleaned for the safe transportation of cargo and the prevention of product pollution.

For a tanker, cleaning machines clean each cargo hold after SW or FW reaches temperatures higher than 70~80°C for cleaning the remaining oil and residue in tanks to preserve the different types of oil after unloading the oil.



LPG Cargo Heater

LPG Cargo Heater는 Cargo의 하역 또는 Cargo의 연료이용 등을 위한 열교환기입니다. 주로 해수를 이용하여 LPG를 기화시키며, LPG는 공기보다 비중이 커 누출 시 극도로 위험한 물질로 완벽한 설계/제작 과정을 거쳐 철저한 품질시스템을 구현해야만 하는 제품입니다.

The LPG cargo heater is a heat exchanger for loading/unloading cargo or the fuel used for the cargo. It mainly heats the LPG using sea water. The LPG is an extremely dangerous substance when it gets leaked as its specific gravity is bigger than air's. Therefore, this is a product with a quality system that needs to be thoroughly implemented through a perfect design/manufacturing process.

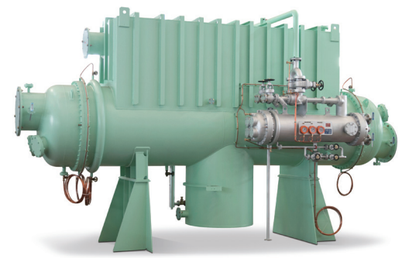
HEAT EXCHANGER



Cargo Drain Cooler

Cargo Drain Cooler는 Steam Heating Service 이후 발생하는 Saturated Steam을 응축하여 보일러 급수 등으로 재사용이 가능하도록 하는 열교환기로, 주로 LNG 운반선의 경우 Steam을 열원으로 LNG를 Heating (LNG Vaporizer, Forcing Vaporizer, Gas Heater, Glycol Heater) 후 Saturated Steam을 Drain Cooler에서 응축하여 회수하고 있습니다. Steam Heating Service에는 순환되는 에너지 효율을 향상시키기 위해 반드시 필요합니다.

Cargo Drain Cooler is Equipment that allows the supply of water to be reused by condensing the saturated water used in the equipment in the LNG ship system.



COPT Vacuum Condenser

COPT Vacuum Condenser는 Tanker 선에 사용되는 특수목적 열교환기로 Cargo Oil Loading시 Steam Turbine을 이용하여 펌프를 구동하고, 이때 터빈의 성능 향상과 Exhaust Steam 회수를 위한 용도로 Vacuum Condenser가 설치됩니다. 부가적으로 Tanker선의 Inert Gas System 적용 시 발생하는 증기회수에도 사용되며 통상적으로 Vacuum Condenser에는 내부의 불응축 가스를 추출해 주는 고효율의 Ejector 또는 Vacuum Pump Unit가 부착되어 있습니다.

The COPT vacuum condenser is a special purpose heat exchanger used for tanker ships. The pump is operated using a steam turbine when the cargo oil is loaded, and in doing so a vacuum condenser is installed to improve the turbine performance and collect exhaust steam.



Condensate Accumulator

Condensate Accumulator는 LPG Cargo의 액화·냉동 사이클 내에서 잔여 응축수를 끌어 모아 저장하는 장비입니다. 냉동 시스템의 Condensate accumulator 기능은 시스템 충전 중에 사용되지 않는 부분을 잡고 유지하는 것입니다.

The condensate accumulator equipment that gathers and stores residual condensed water within the LPG cargo liquefaction and refrigerating cycle. The function of the condensate accumulator of the refrigeration system is to hold and maintain the unused portion during system charge.



LPG Economizer

LPG Economizer는 LPG 운반선의 Cargo Handling 핵심장비로, LPG 재액화시스템을 통해 액화된 LPG를 Sub-Cooling하는 장비입니다. 열교환기와 Separator가 기능적으로 결합된 외형에 다중 열교환기 구조로 공간대비 기능이 많으며, 열교환 설계 기술과 제조/조립 기술이 복합적으로 구현된 제품입니다.

The LPG economizer is a core piece of cargo handling equipment of the LPG carriers, and it is equipment that sub-cools the LPG through the LPG reliquefaction system. It is a multi-heat exchanger that functionally combines the heat exchanger and the separator, and the LPG economizer has many functions in a compact space. It is a product that combines heat exchanging design technology and manufacturing/assembling technology.



Vent Gas Cooler

Vent gas cooler 기술은 LPG Cargo의 양하역과 작동상태 변경 중에 탄화수소 배출을 최소화하면서 LPG Cargo의 저온 액화상태를 효율적으로 이송하는데 역할을 하는 장비입니다.

The vent gas cooler is a piece of equipment that minimizes the hydrocarbon discharge during the loading/unloading of cargo and the operation status change, and it plays a role in the efficient transferring of the low temperature of LPG cargo's liquified state.



Suction / Vent Gas Separator

Separator는 LPG Cargo의 액화·냉동 사이클에서 발생하는 증기와 탱크로 모아지는 LPG증기를 모아서 분리하는 장비입니다.

The vent gas cooler is a piece of equipment that minimizes the hydrocarbon discharge during the loading/unloading of cargo and the operation status change, and it plays a role in the efficient transferring of the low temperature of LPG cargo's liquified state.

MARKET EXPANSION DIRECTION

Cryogenic Heat Exchanger and System Engineering Global Leader

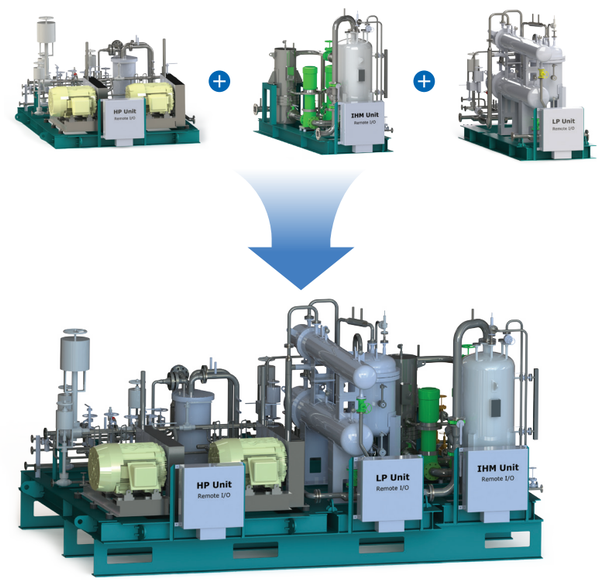
The Present Main Force Product

Small / Unit Mainly



The Future Main Force Product

Module / System Package Nucleus



USE OF GENUINE SPARE PARTS



품질에 대한 장기적인 시각을 가지고 투자하십시오. 이것이 바로 (주)동화엔텍의 순정품을 사용해야하는 이유입니다. 당사의 순정 예비 부품은 해당 제품에 최적화되어 있으며 최상의 성능과 안전성을 보장하는 유일한 방법입니다. 당사는 순정 부품과 순정 예비 부품에 대해 동일한 품질 보증 프로그램을 제공합니다. (주)동화엔텍의 순정 예비 부품 이외의 승인되지 않은 예비 부품은 성능 저하 또는 오작동을 유발할 수 있습니다.

"Invest with a long-term vision on quality." This is why our customers need to use our genuine products. Our genuine spare parts are optimized to the products concerned and are the only way to assure the best performance and safety. We provide the same quality assuring program for both genuine parts and genuine spare parts. Unapproved spare parts can cause a decline in performance decline or malfunction.

재생

- (주)동화엔텍은 자체 브랜드뿐만 아니라 모든 유형의 열교환기에 재생 서비스를 제공합니다.
- 신속하고 정확하며 편리하게 고객이 특정 날짜 내에 모든 유형의 열교환기를 완벽하게 재현 할 수 있습니다.
- 모든 종류의 열교환기를 완벽하게 재생할 수 있는 회사는 동화엔텍뿐입니다.

수리

(주)동화엔텍의 숙련된 서비스 엔지니어들은 제품을 원상태로 복원하기 위해 최선을 다하고 있습니다.

- Air cooler, Plate cooler, and product of F.W.G./Shell & Tube 등의 제품은 수명이 다할 때까지 최상의 상태로 유지됩니다.
- Air Cooler : 번들 화학 세척, 튜브 누출 테스트와 타사 브랜드의 제조 및 설치를 지원합니다.
- Plate Cooler : 정기적인 관리와 수리는 성능 향상뿐만 아니라 수명 연장이 가능합니다. 동화엔텍은 고객의 신뢰를 얻기 위해 최선을 다하고 있습니다.
- F.W.G/Shell & Tube : 육지 및 해상 양쪽에 설치된 제품의 튜브 교체 서비스는 운영 비용을 절감하고 제품의 성능을 향상시키는데 효과적입니다.

A/S 네크워크

A/S 전담팀은 국내외 어디든지 고객 서비스를 제공할 준비가 되어 있습니다. 동남아 지역 고객들을 위해 A/S팀을 파견하여 가장 합리적인 방법으로 우수한 정비 장비를 사용하여 고품질의 서비스를 제공하고 있습니다.

Regeneration

- DongHwa Entec provides a regeneration service for our own brands and all types of heat exchangers.
- Customers can regenerate all types of heat exchangers without a problem within the specific date quickly, precisely, and conveniently.
- The company that can perfectly regenerate all types of heat exchangers is DongHwa Entec.

Repair

Our skilled engineers are doing their best to regenerate the products to their original state.

- Air cooler: We support bundled chemical washing, tube leak testing, and the manufacture and installation of competitors' brands.
- Plate cooler: Long-term management and repair improves the performance and life extension is possible. DongHwa Entec is doing its best to gain our customers' trust.
- FWG/ Shell & Tube: The tube replacement service for products installed onshore/offshore saves on operating expenses and product performance improved.

After sales network

The After Sales Team is ready to provide customer service anywhere at home and abroad. The After Sales Team is sent quickly and offers high quality services using excellent maintenance equipment.

QUALITY CERTIFICATIONS

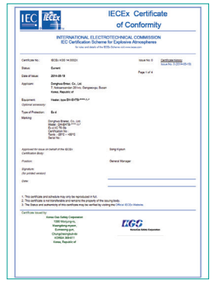

BV


CSEL(ML) A1


LR


MAN


ASME-RPT

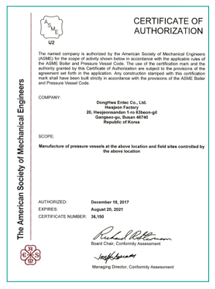

IECEx

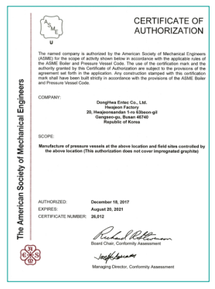

ISO 9001

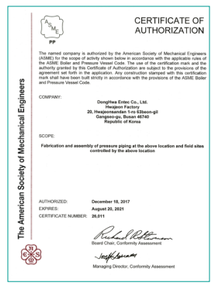

KR


NK


RS


ASME-U

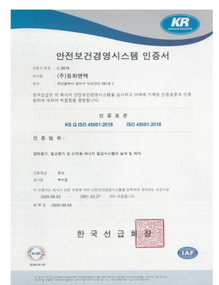

U2


PP


KEPIC


DNV.GL

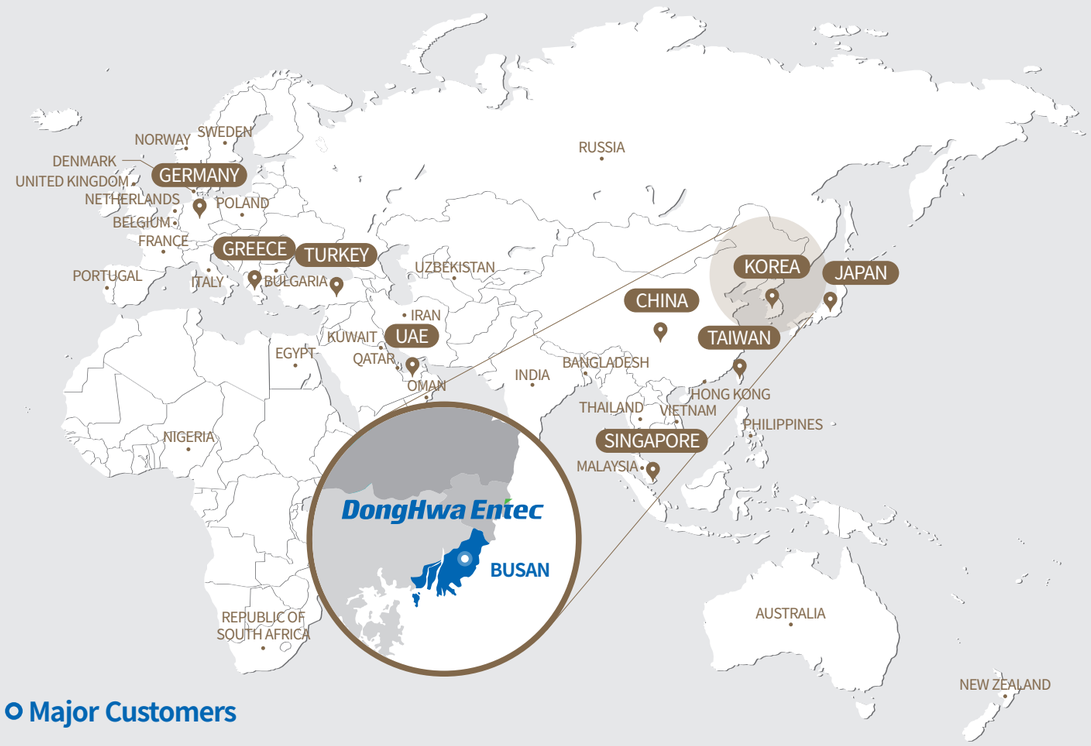
Accreditation details	Scope	No.	Certification body
ISO 9001	Design and manufacture of pressure vessels, heat exchangers and energy saving systems for ships	A 0858	KR
ASME U	Manufacture of pressure vessels (Sect. VIII, Div.1)	26,012	ASME
ASME U	Manufacture of pressure vessels (Sect. VIII, Div.2)	36,150	
ASME PP	Fabrication and assembly of pressure piping	26,011	
ASME PRT	Fabrication of part with design (Sect. VIII, Div.1)	55,652	
KEPIC MN	Construction of class 2,3 vessel and storage tank	MN-543	KEPIC
SELO A1	Manufacture of pressure vessel (A1)	TS2200485-2020	SELO
DNVGL	Manufacture of welded pressure vessel Class I & II	AMT000003B	DNVGL
LR	Fusion welded pressure vessels Class 1	MD00/2674/0003/FW	LR
BV	BV Mode II Scheme for Class I & II pressure vessels	SMS.W.II./1223/E.0	BV
KR	Manufacture of Welded Class I & II pressure vessels	GCH00681-BP001	KR
CCS	Type approval for L.O. Cooler	FS18T00006_01	CCS
	Type approval for AUX. Boiler FO Heater	FS18T00006_02	
	Type approval for Air Charge Cooler	FS18T00032	
RS	Type Approval Certificate for Condenser	17.10465.296	RS
	Type Approval Certificate for Vaporizer	17.10466.296	
	Type Approval Certificate for Heater	17.10467.296	
	Type Approval Certificate for TCH, BOG, Glycol	17.10468.296	
IECEx	IECEx Certificate (Heater)	IECEx_KGS_14.0002X	KGS
	IECEx Certificate (Glycol Water Heater)	IECEx_KGS_15.0004X	
MAN	Approval for Scavenge Air Cooler	2700-2013-386.0	MAN
	Approval for Charge Air Cooler	2700-2014-402.0	
	Approval for EGR Cooler	2700-2018-673.0	

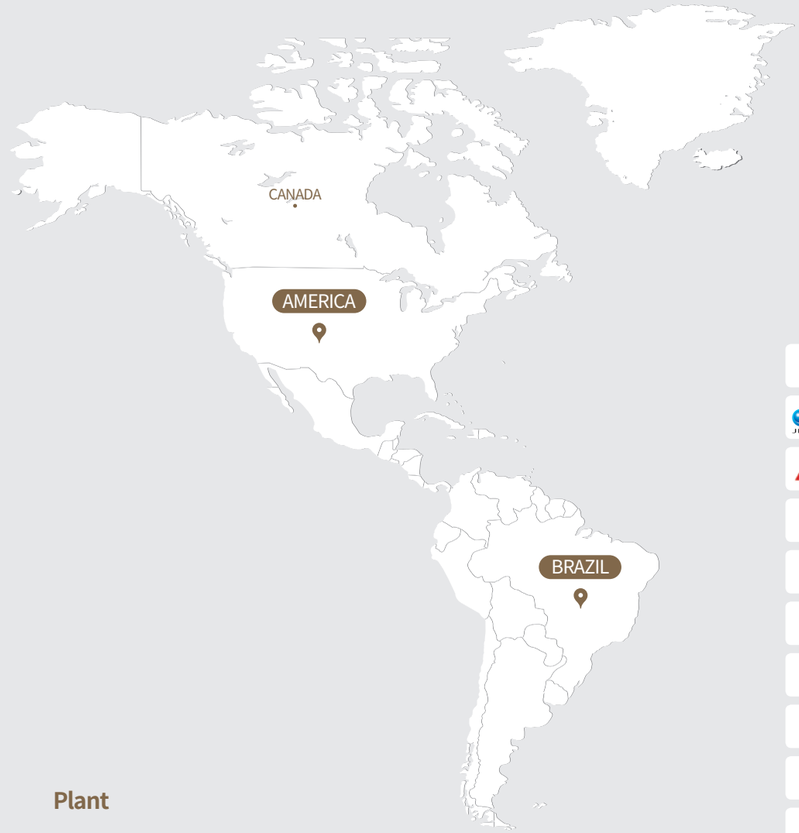

ISO 45001


ISO 14001


OHSAS 18001

SALES A/S NETWORK & MAIN CUSTOMER





Major Customers

Marine

- Hyundai Heavy Industry
- Hyundai Samho Heavy Industry
- Doosan Engine
- Doosan Infracore
- MAN DIESEL & TURBO
- DSME Co., Ltd.
- DSEC
- Hyundai Mipo Dockyard
- HANJIN HEAVY INDUSTRIES & CONSTRUCTION
- Atlas Copco Comptec LLC
- EXCELERATE ENERGY L.P.
- Hanwha Techwin CO., LTD.
- POSCO E&C
- Samsung Heavy Industry
- STX offshore & shipbuilding Co., Ltd.
- Hyundai Engine
- STX engine
- CSBC CORPORATION
- IMABARI SHIPBUILDING CO., LTD.
- KAWASAKI HEAVY INDUSTRY, LTD.
- MITSUI ENGINEERING & SHIPBUILDING CO., LTD.
- IMEX CO., LTD.
- IZUMI STEEL WORKS, LTD.
- MITSUBISHI HEAVY INDUSTRIES, LTD.
- NAMURA SHIPBUILDING CO., LTD.
- SASEBO HEAVY INDUSTRIES CO., LTD.
- HITACHI ZOSEN CORPORATION.
- DAIHATSU DIESEL MFG.CO., LTD.
- JAPAN MARINE UNITED CORPORATION
- SUMITOMO HEAVY INDUSTRIES, LTD.
- IHI CORPORATION
- NIIGATA POWER SYSTEMS CO., LTD.
- OSHIMA SHIPBUILDING CO., LTD.
- YANMAR CO., LTD.
- DAEHAN SHIPBILDING CO., LTD.
- DAESUN SHIPBUILDING & ENGINEEING CO., LTD.
- SUNDONG SHIPBUILDING & MARINE ENGINEERING CO., LTD.
- SPP SHIPBUILDING CO., LTD.
- LIQUID GAS EQUIPMENT PROCESS
- KEPPEL SHIPYARD
- Wärtsilä Oil & Gas Systems AS
- Sembcorp Marine
- Exmar Shipmanagement NV
- Gaslog LNG Services Ltd.
- STX HEAVY INDUTRIES CO., LTD.

Plant

- FUJI ELECTRIC
- GS E&C
- HYUNDAI ENGINEERING
- POSCO E&C
- SAMSUNG ENGINEERING
- LOTTE ENGINEERING
- SK E&C
- SUMITOMO HEAVY INDUSTRIES
- MHPS-TAKASAGO
- MHPS-HITACHI
- MHI-EC
- CB&I
- TOYO ENGINEERING
- KAWASAKI HEAVY INDUSTRY
- DOOSAN HEAVY INDUSTRIES
- MITSUI ENGINEERING & SHIPBUILDING
- SHIN NIPPON MACHINARY
- EBARA PUMP
- ELLIOTT EBARA
- MITSUBISH HEAVY INDUSTRIES COMPRESSOR
- IHI CORPORATION
- HANWHA TECHWIN
- GENERAL ELECTRIC
- MITSUBISH ELECTRIC
- KOBE STEEL
- ATLAS COPCO
- INGERSOLL RAND
- SHINKO AIR
- MAN DIESEL & TURBO
- AIR LIQUIDE
- MISUZU INDUSTRY

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