

Marine Solutions



Creating Sustainable Solutions
For Ocean, For Earth

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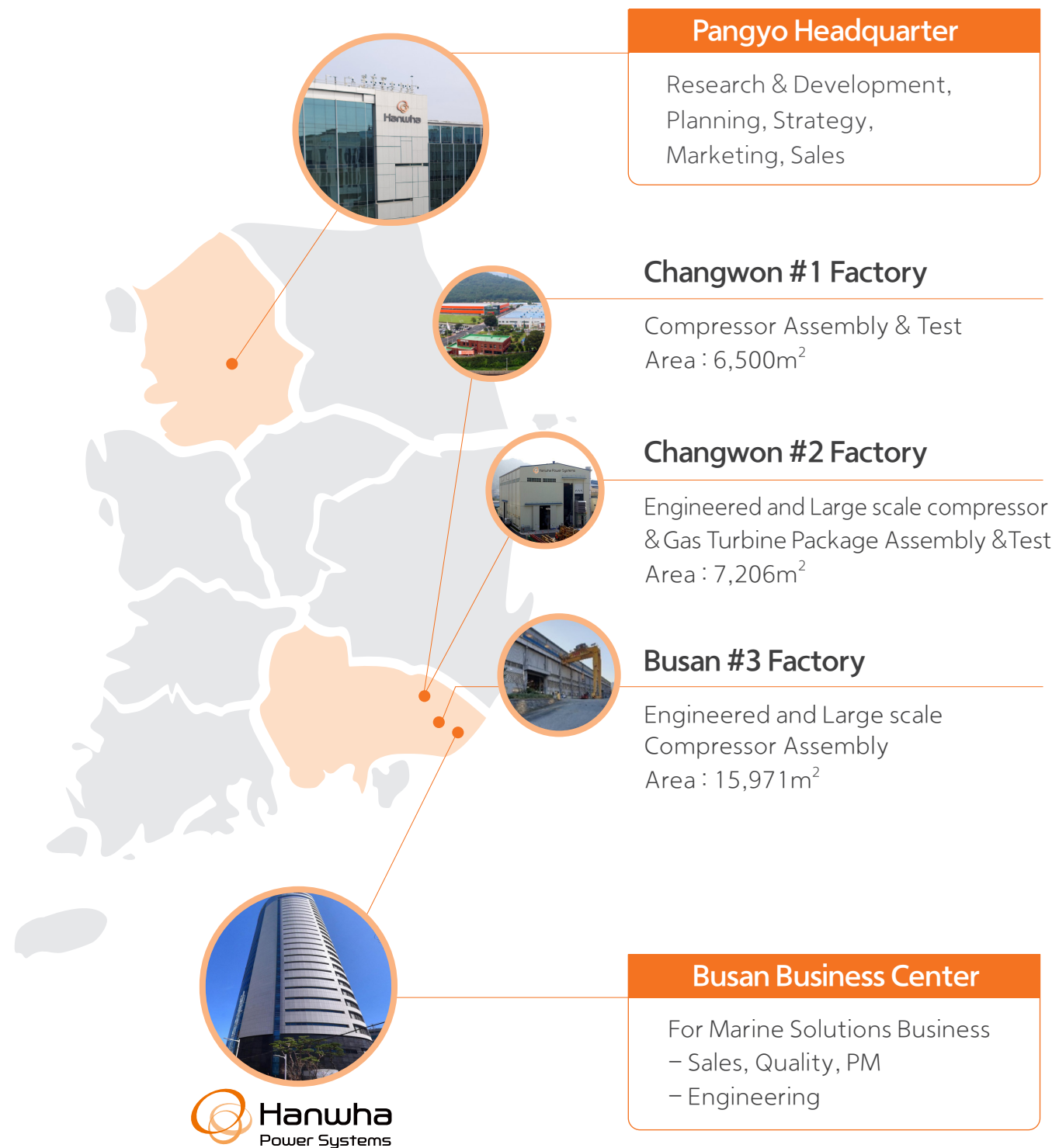
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Locations in Korea

Operating three plants for manufacturing and assembly & **One Business center** for Marine Solutions Business as a strategic base



Marine Solutions for Ship's lifetime

Hanwha Power Systems are aiming to become a global comprehensive solution provider responsible for Ship's lifetime

Based on the world's highest quality ship after service expertise, we provide prompt solutions and trouble shooting and improve the operational performance of ships with Green Solutions against stricter environmental regulations

Our Goal is to take responsibility for the eco-friendly demolition or recycling of vessels

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The Edge of Excellence, Why Choose Hanwha Power Systems

Marine Solutions Division at **Hanwha Power Systems**, we deliver tailored, competitive solutions for the maritime industry against environmental challenges with our expertise, driving every project to success.



Turnkey Solution Provider with Single Contact Point



Design and Engineering Expertise

With a highly skilled and experienced engineers, we provide customized engineering tailored to your specific vessels, adhering to the latest industry standards and technologies.



Procurement Capabilities

We leverage our global supply chain network to source high-quality materials and equipment, ensuring cost-effectiveness and reliability.



Quality and Risk Management

We implement rigorous Quality protocols to maintain the highest quality standards. Our proactive risk management strategies identify and mitigate potential risks, ensuring safety and compliance.



Comprehensive Project Management

Our project management excellence, combined with our strong partnership and continuous collaboration with global shipyards and makers ensures that every phase of your project is meticulously planned and executed.

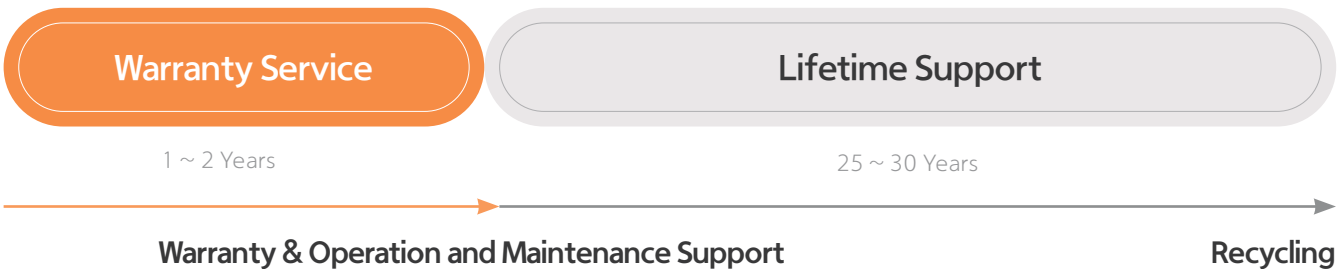
Warranty Service

Hanwha Power Systems offers post-warranty services for various types of vessels (LNGC, TANKER, CONTAINER SHIP, LPGC, etc.) and specializes in actively responding to our customer's demands.

Hanwha Power Systems provides our customers with flexible and prompt solutions that prioritize the safe and efficient operation of vessels. Our goal is to create a total care service that minimizes the customer's inconvenience by providing high level technical services.



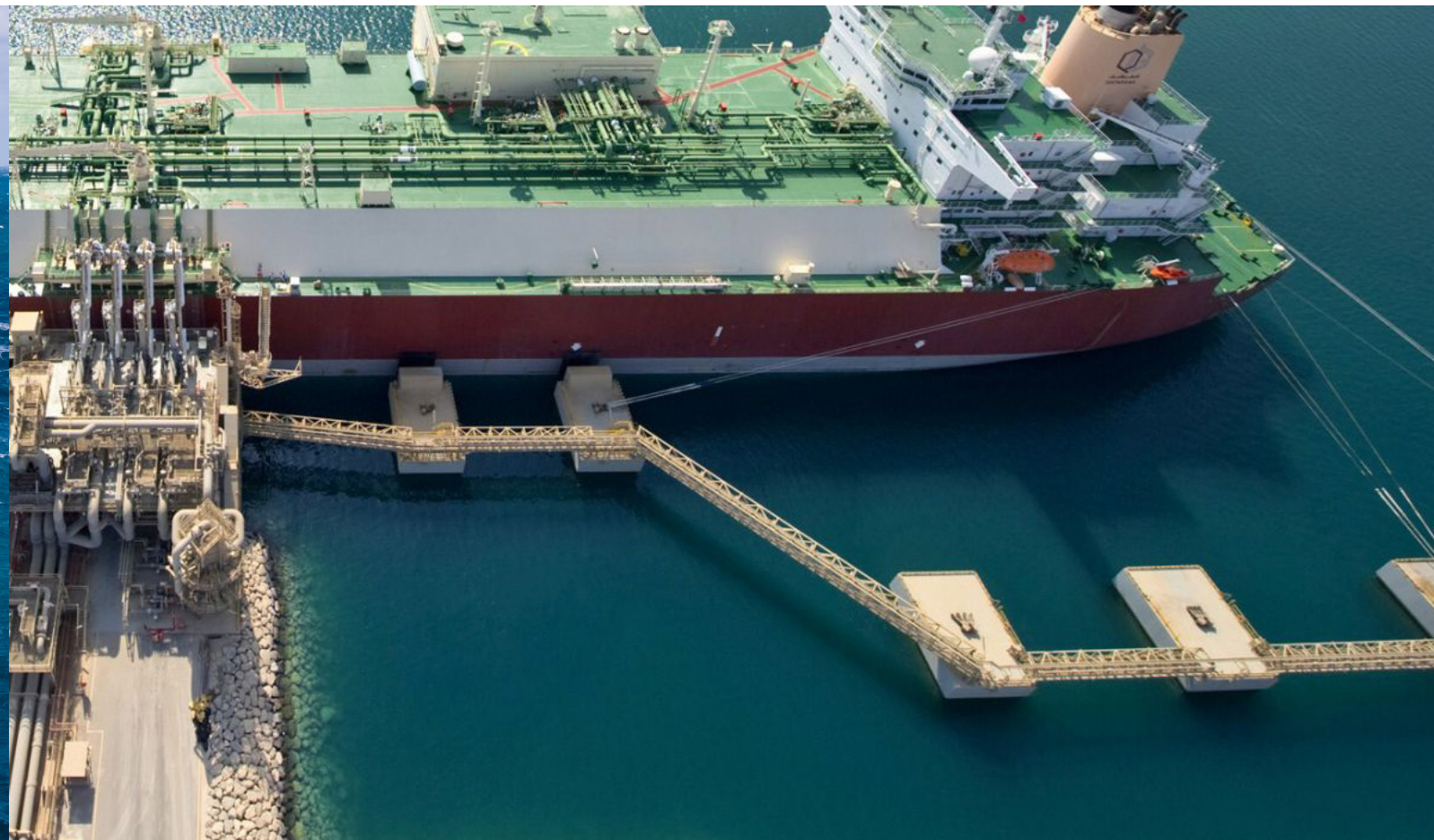
Hanwha Power Systems provides **proactive warranty services with cutting-edge expertise** and accumulated data-driven insights. We dedicated to **ensuring safe and economical vessel operations** by providing unwavering support and exceptional service **anytime, anywhere, throughout the vessel's entire lifecycle**.



Eco-friendly Retrofit

Hanwha Power Systems is pleased to introduce our company as an innovative and competitive solution provider that improves the operational performance of vessels while proactively responding to the market demand for Green Solutions which are rapidly increasing due to stricter environmental regulations.

Hanwha Power Systems aims to provide our customers with economical and optimized solutions that enable our customers to contribute to Environmental Sustainability.



Green Retrofit

- Air Lubrication System
- Dual Fuel Conversion (LNG, MeOH)
- Rotor Sail
- ESD (B/Bow, Propeller Re-design)
- Ammonia Gas Turbine



LNGC Conversion

- BOG Re-liquefaction
- LNGC to FSRU Conversion



Carbon Free Solution

- Total Solutions for Fuel Transition

LNGC to FSRU Conversion

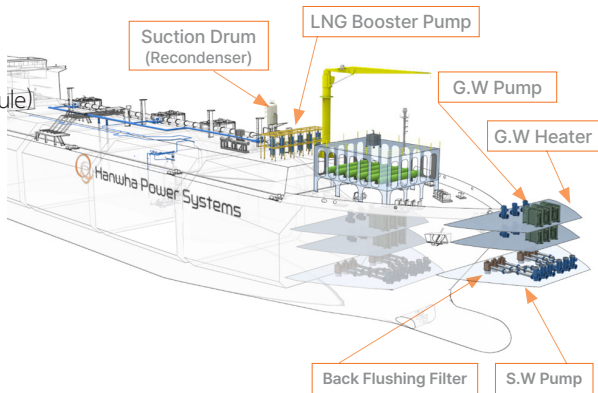
Benefit

Lower CAPEX, Shorter lead times and Repurpose aging vessel

Information

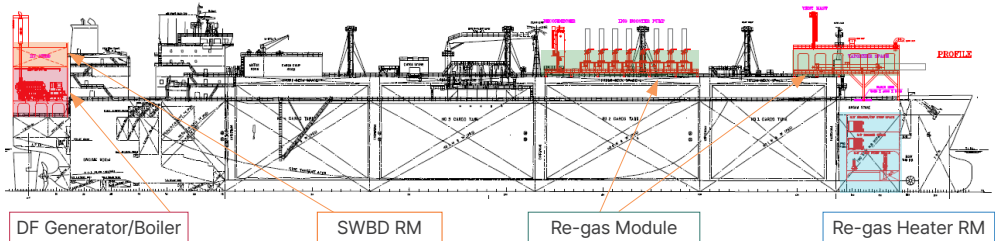
• Retrofit Concept (Scope of Work)

- ① Re-gasification Module
- ② Additional Dual Fuel Generators (Module)
- ③ GW Heat Exchanger and Re-gas SW/GW Pump
- ④ IAS, CHS Integration and HV/LV Switchboard

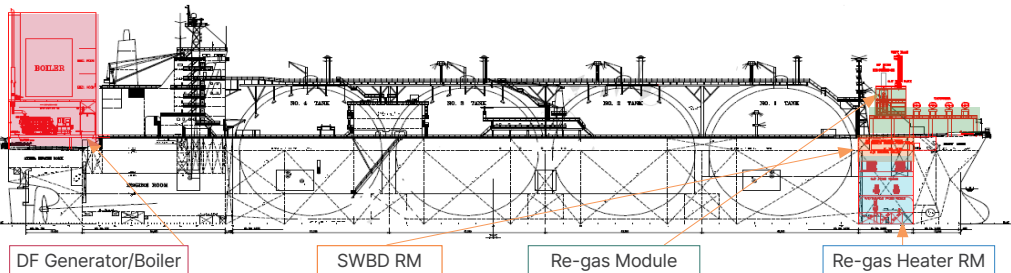


• FSRU General Arrangement

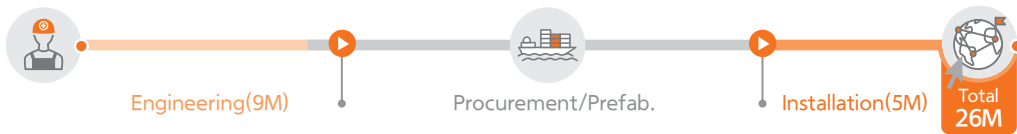
• Membrane Type



• MOSS Type



Project Schedule Overview



The FSRU conversion market is growing and driven by increasing LNG demand, cost and time efficiency and the need for flexible energy solutions with geopolitical uncertainties. The advantages of conversions include lower CAPEX, shorter lead times than new building and the ability to repurpose aging vessels. This not only reduces environmental impact but also allows operators to adapt to changing market conditions efficiently, maximizing the return on investment.

Dual Fuel Conversion

Benefit

Compliance GHG regulation, Fuel Flexibility

Information

• Retrofit Concept (Scope of Work)

- ① Main Engine Retrofit
- ② Fuel Gas Supply System with Bunker Station
- ③ Alternative Fuel(LNG, Methanol, Ammonia) Tank

• Conversion Work Scope

Retrofit Works

- ① Add LNG Fuel Tank, Vent Mast
- ② Add FGSS Room
- ③ Modify M/E & Engine Room
- ④ Add LNG Bunkering Station

LNG Fuel Tank

- ① Type : B or C

Bunker Station

- ① One(1) Liquid Line
- ② One(1) Vapor Return Line

Engine Room, Casing, Funnel

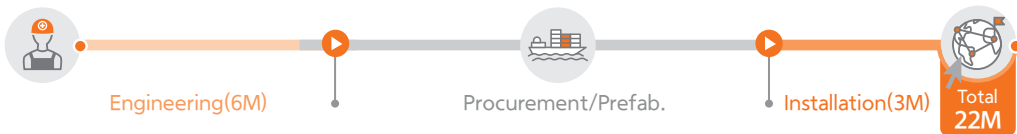
- ① MAN-ES ME-GI Engine
- ② DF Boiler
- ③ N₂ Generation System
- ④ Water Spray Pump
- ⑤ CO₂ Room

FGS Room

- ① LNG HP(High Pressure) Pump
- ② LNG HP Vaporizer
- ③ BOG Compressor
- ④ Forcing Vaporizer / Heater
- ⑤ Glycol Water System



Project Schedule Overview



DF conversion on vessels involves retrofitting the ship's propulsion system including main engines and fuel systems to enable it to use an alternative fuel, aiming to improve fuel flexibility, reduce emissions and lower OPEX ensuring compliance with regulations. Converting to Dual Fuel is the most efficient and reliable solution for addressing both the demand from charterers for green transportation and the de-carbonization legislation at IMO & regional.

Ammonia Gas Turbine Propulsion Conversion

Benefit



Carbon free fuel

Negligible ammonia slip (less than 10ppm)

Information

• Retrofit Concept (Scope of Work)

Eco-friendly

- ① Zero CO₂ Emission with NH₃ 100% (No Pilot Oil Needed)
- ② Negligible NH₃/CH₄ Slip and N₂O Emission
- ③ No SCR Needed (Tier III Compliance)

Dedicated Enclosure & Small Footprint

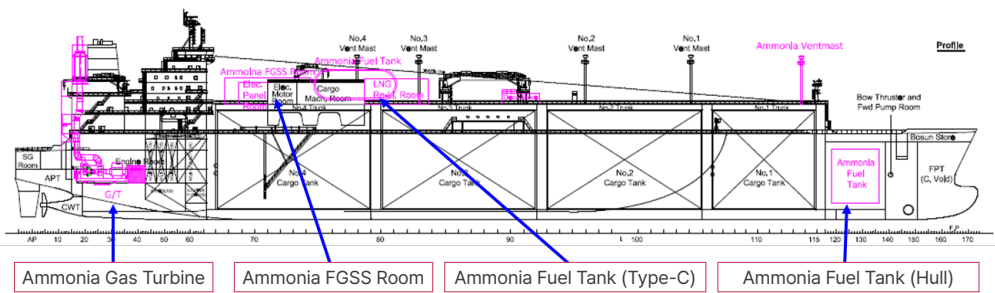
- ① Safe and Secure Engine Room
- ② Ammonia Fuel Tank Installation without Cargo Loss

Fuel Flexibility

- ① NH₃+NG (LNGC)
NH₃ 100% / NG 100% / NH₃+NG
- ② NH₃+FO (VLAC, VLCC, B/C, Container ship, etc.)
NH₃ 100% / FO 100% / NH₃+FO

Easy Maintenance

- ① Module Exchange/Replacement on Board after 35,000 Hours Running



Project Schedule Overview



As maritime regulations tighten, we need an innovative and safe solution for decarbonization in shipping industry. Hanwha has released a blueprint for shipping decarbonization and developed 100% carbon-free propulsion system called "GT(Gas Turbine) for GT(Green Transition)". Ammonia emerges as a carbon-free alternative to traditional fuels. Hanwha has a pioneering ammonia combustion system for gas turbines and will make a cleaner and greener maritime future. Discover the future of marine propulsion solution with ammonia gas turbines.

BOG Re-liquefaction

Benefit



Reduce for Cargo Loss and Compliance GHG Regulation

Information

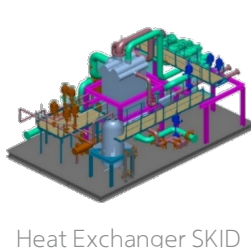
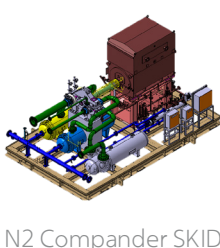
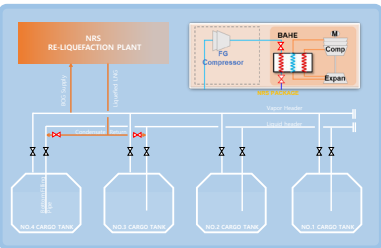
• Retrofit Concept (Scope of Work)

- ① Re-liquefaction System(Hanwha NRS[®] / Sub-cooler)
- ② Cooling Sea/Fresh Water Pump/Cooler in Engine Room
- ③ Electrical Modification

• Re-liq. Capacity : Hanwha NRS[®](2.8 TPH), Sub-cooler(1.5/2.1 TPH)

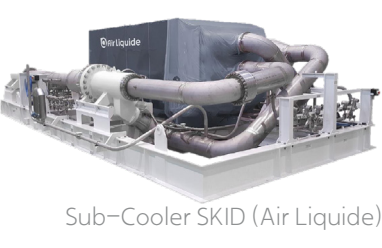
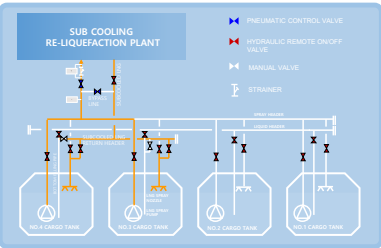
• NRS[®] Re-Liquefaction,

- ① NBOG Direct Re-Liquefaction
- ② Re-liquefaction : 2.8 ton/h
- ③ Regulate the pressure of Cargo tank by Re-liquefied BOG
- ④ Reduction of cargo loss and carbon emissions

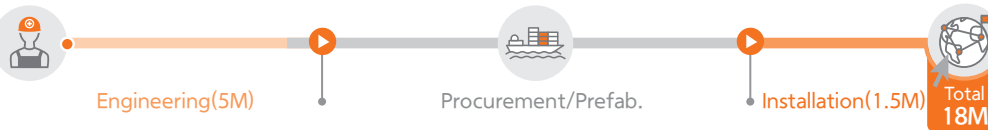


• Sub-Cooler Re-Liquefaction,

- ① LNG Cold Power Recovery (In-Direct)
- ② Re-liquefaction : 1.5 ton/h, 2.1 ton/h
- ③ Regulate the pressure and temperature of Cargo tank by spraying of sub-cooled LNG.
- ④ Reduction of cargo loss and carbon emissions



Project Schedule Overview



The re-liquefaction system offers a more efficient and economical way to manage boil-off gas (BOG) generated from existing LNG carriers. This solution not only provides cost benefits but also helps comply with environmental regulations. Hanwha develops own NRS[®] (Nitrogen Refrigerant System) for targeting LNGC. BOG is re-liquefied by using cooling duty produced by compressing and expanding the N2 refrigerant through N2 Reverse Brayton Cycle.

Air Lubircation System

Benefit



Net Power Saving of Approx. 5~9%

Information

• Retrofit Concept (Scope of Work)

- ① One(1) Air Compressor (Turbo Type, less OPEX than Screw Type)
- ② Air Injection units with including pipelines, flow control valves
- ③ FW, LO Coolers for air and compressor
- ④ Control & monitoring system

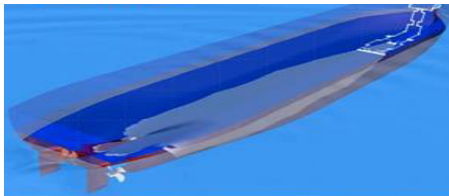
• ALS Flow Distribution Principle

Based on full scale CFD simulation, Air delivered well from the air compressor to the air outlet hole and the released air creates air layer effectively between the hull bottom and free stream liquid flow.

Air Outlet Hole

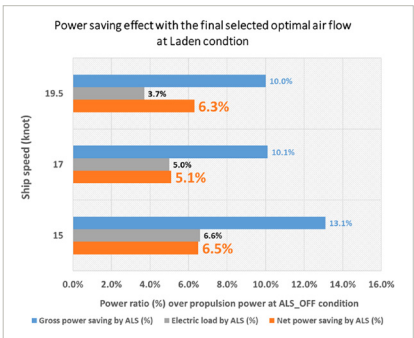
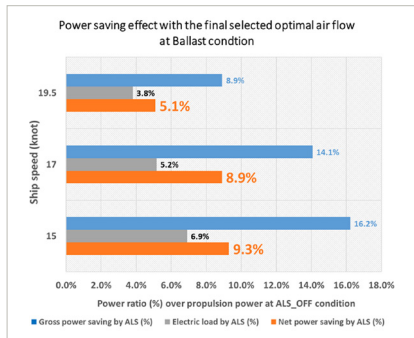


Air Layer

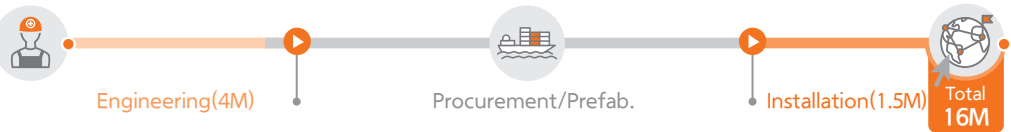


• ALS Performance Monitoring during Sea Trial

- ① Test result from performance evaluation test
- ② A net power saving of 5.7% to 9.3% was recorded as indicated below



Project Schedule Overview



Air Lubrication System is a technology designed to reduce friction resistance between a vessel and the water by creating a carpet of microbubbles on the full flat bottom of a vessel's hull. By decreasing this frictional resistance, vessel owners and operators can significantly improve operational efficiency.

Hanwha Power Systems' air compressor system generates an air layer under the vessels with low power consumption. Through optimized and customized engineering, it forms the most efficient air layer shape on specific vessel type enhancing fuel efficiency.

Rotor Sail System

Benefit



Increase abt. 3 ~ 4% fuel efficiency per Rotor

Information

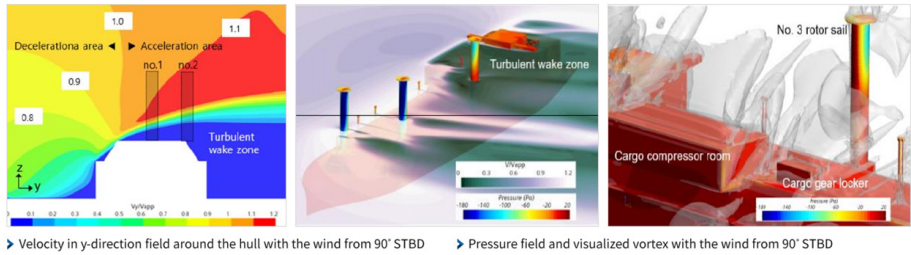
• Retrofit Concept (Scope of Work)

- ① Number of Rotor Sail with foundation
- ② Wind Sensor
- ③ Electrical & control system

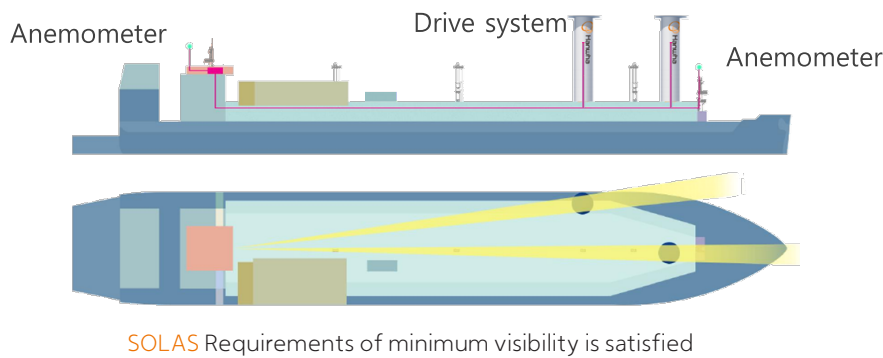
Magnus effect is an observable phenomenon that is commonly associated with a spinning object moving through the air. The path of the spinning object is deflected, which can be explained by the difference in pressure of the fluid on opposite sides of the spinning object.

The effect depends on the speed of rotation.

• CFD Analysis & Wind Tunnel test



• System Configuration & Navigation Bridge Visibility LNGC



The rotor sail system is a device that make use of the Magnus effect, which is an observable phenomenon make thrust that results in a difference in pressure on the after and forward of the rotor.

This technology is recognized as one of the leading eco-friendly solutions to meet the GHG regulation. Hanwha is taking the lead in this technology by establishing the world's first demonstration center to accelerate its development.

Containership Cargo Capacity Improvement

Benefit

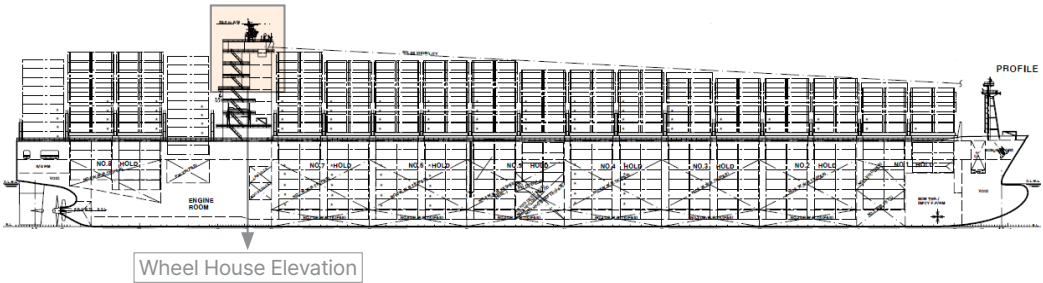


Cargo Capacity and CII rating Improvement

Information

• Retrofit Concept (Scope of Work)

- ① Higher Lashing (Additional Tier)
- ② Added Mickey Mouse
- ③ Lashing concept change (From internal to external lashing)
- ④ Accommodation (Deck house) Elevation



Project Schedule Overview



Engineering(5M)



Procurement/Prefab.



Installation(1.5M)



Total 9M

Hanwha Power Systems has a solution that can maximize the shipping company's profits for containerships. The shipping capacity can be maximized by increasing the stack weight and tier of the cargo ship through the additional tier of the lashing bridge or Mickey mouse for the container ship. This can be achieved through relatively low cost and short-term construction compared to other retrofit projects.

Energy Saving Devices

Benefit



Net Power Saving

Information

- ① Propeller Optimization Expected efficiency : 3~5%
- ② Bulbous Bow Retrofit Expected efficiency : 4~5%
- ③ Propeller Cap-Fin Installation Expected efficiency 1~1.5%

• Propeller Optimization

Through propeller optimization, HPS provides the best service to customers as follows.

- ① Reduction in fuel consumption due to increased propulsion efficiency
- ② Reduction of carbon emissions due to optimization of fuel consumption
- ③ Ship vibration and noise reduction



• Bulbous Bow Retrofit

Through bow retrofitting optimized to the operating profile, HPS provides the best service to customers as follows.

- ① Hull resistance reduction.
- ② Propulsion efficiency increase
- ③ Reduction of carbon emissions & fuel consumption



• Propeller Cap-Fin Installation

Through the Cap-Fin installation, HPS provides the best service to customers as follows.

- ① Reduction of fuel consumption and improve of thrust
- ② Reduction of tip vortex cavitation



Hanwha Power Systems offers a wide range of Energy Saving Device Solutions that help lower fuel costs, meet regulations, and improve efficiency. Enhance your fleet's performance and competitiveness with our advanced technology.

Global Network



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