

Hanwha Power Systems

Profile 2025

Contents

Mission

We drive a sustainable future through innovative energy equipment, smart technology and solutions.

Slogan

Your optimized lifecycle partner for energy equipment and solutions.

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Introduction to Hanwha Power Systems

2

Equipment Solutions

- 01 Compressors
- 02 Gas Turbines

3

Ship Solutions

- 01 Technology
- 02 Services



Introduction to Hanwha

Hanwha, always by your side on the path to a sustainable future for people and the planet.

Hanwha continues to grow by preemptively responding to rapidly changing business environments with a balanced business portfolio that includes aerospace & defense, energy, ocean & materials, finance, machinery and retail & services. Our affiliates are becoming global leaders in their arenas by strengthening core competitiveness and securing future growth engines based on sound financial structures.

Hanwha's Core Values

Hanwha's Spirit of 'Trust and Loyalty' lies at the foundation of our growth. Our core values of challenge, dedication, and integrity form the basis for the mindset and actions of all employees, strengthening our solidarity as Hanwha people.

Business Enterprise in South Korea Total asset basis, as of end of 2024 Top 7	Total Sales As of 2024 64.1B USD	Years of History Founded in 1952 73
Global Networks As of end of 2024 821	Ranking on Fortune Global 500® in 2024 372	One of the TIME100 Most Influential Companies in 2024 

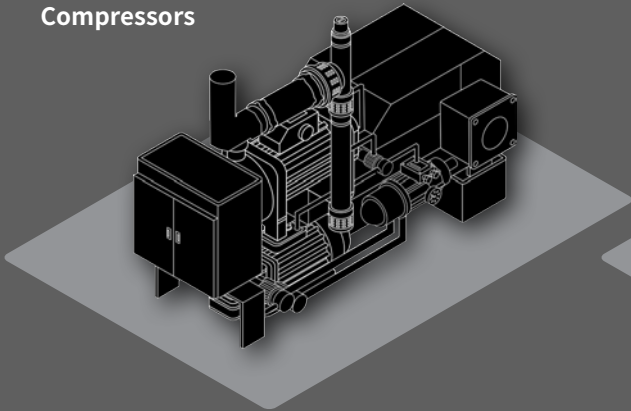
Core Values



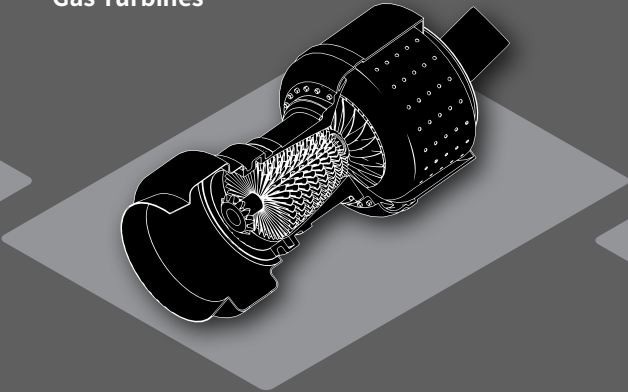
Hanwha Power Systems

Hanwha Power Systems has been a trusted provider of advanced energy equipment since 1997, building on its proven reliability and efficiency in gas turbine technology. With more than 9,000 units delivered worldwide, the company has established a strong global presence. In 2023, the company expanded into its marine solutions business as part of its commitment to create synergies with Hanwha Group's ship-building and marine businesses. Hanwha Power Systems develops and integrates energy efficiency improvement technologies and low-emission propulsion systems to support stable and sustainable navigation in ship maintenance, retrofit, and new buildings. Hanwha Power Systems will continue to be the best and optimal partner for energy equipment and marine navigation solutions.

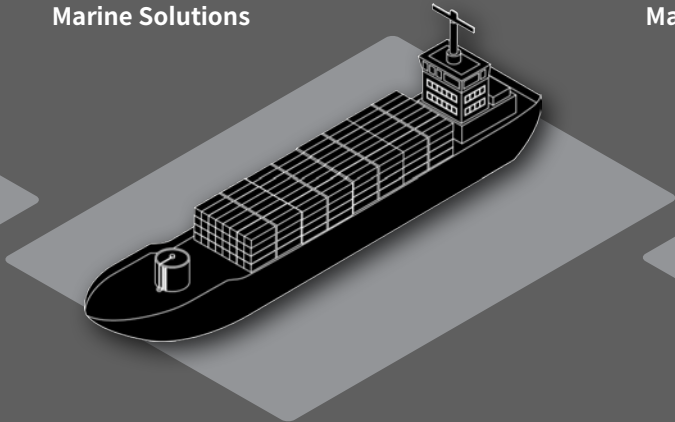
Business Area
Compressors



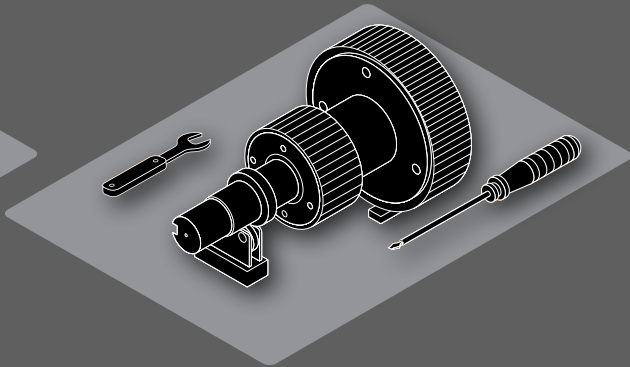
Gas Turbines



Marine Solutions



Maintenance



HISTORY

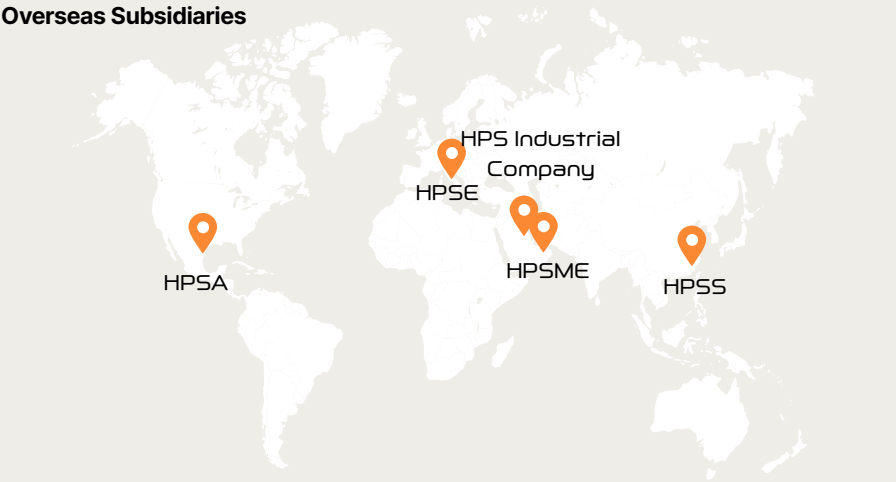
1977 Established Company, Aircraft Gas Turbine Engine Maintenance	1996 Developed Industrial Gas Turbine	2013 Launched the World's Largest Capacity Air Cooled Compressor	2016 Registered as Saudi Aramco approved Vendor	2022 Engaged in combined cycle power generation project
1979 Commenced Aircraft Gas Turbine Engine Repair and Overhaul Business	1997 Commenced Industrial Air Compressor Business	2014 Entered the Vessel Compressor Market	2018 Launched Turbo Expander Generator(TEG), an eco-friendly, high-efficiency energy solution	Entered the Ethylene Compressor and CO₂ Compressor Market
	2011 Entered Gas Compressor Market		2021 Awarded and achieved sCO₂ power generation system DOE(Department of Energy) national project	2023 Successfully demonstrated complete hydrogen combustion for the first time in the world, Commenced marine solution business

Global Network



Global Network

Overseas Subsidiaries



Company Name	Hanwha Power Systems Americas	Hanwha Power Systems Shanghai	Hanwha Power Systems Service Middle East	Hanwha Power Systems Industrial Company	Hanwha Power Systems Europe
Location	Houston	Shanghai	Abu Dhabi	Khobar	Milan
Major Businesses	Compressor and equipment sales + service center operation •Out-facility repair and balancing of core parts •Overhaul of parts				



Americas

Hanwha Power Systems Americas
580 Westlake Park Blvd, Suite 500, Houston
TX 77079, USA



Europe

Hanwha Power Systems Europe
Via de Vizzi 93/95, Cinisello Balsamo
20092, Milan, Italy



Middle East

Hanwha Power Systems Industrial Company
Unit 4, 12TH Floor, Al fardan Tower, Khobar
31952, KSA



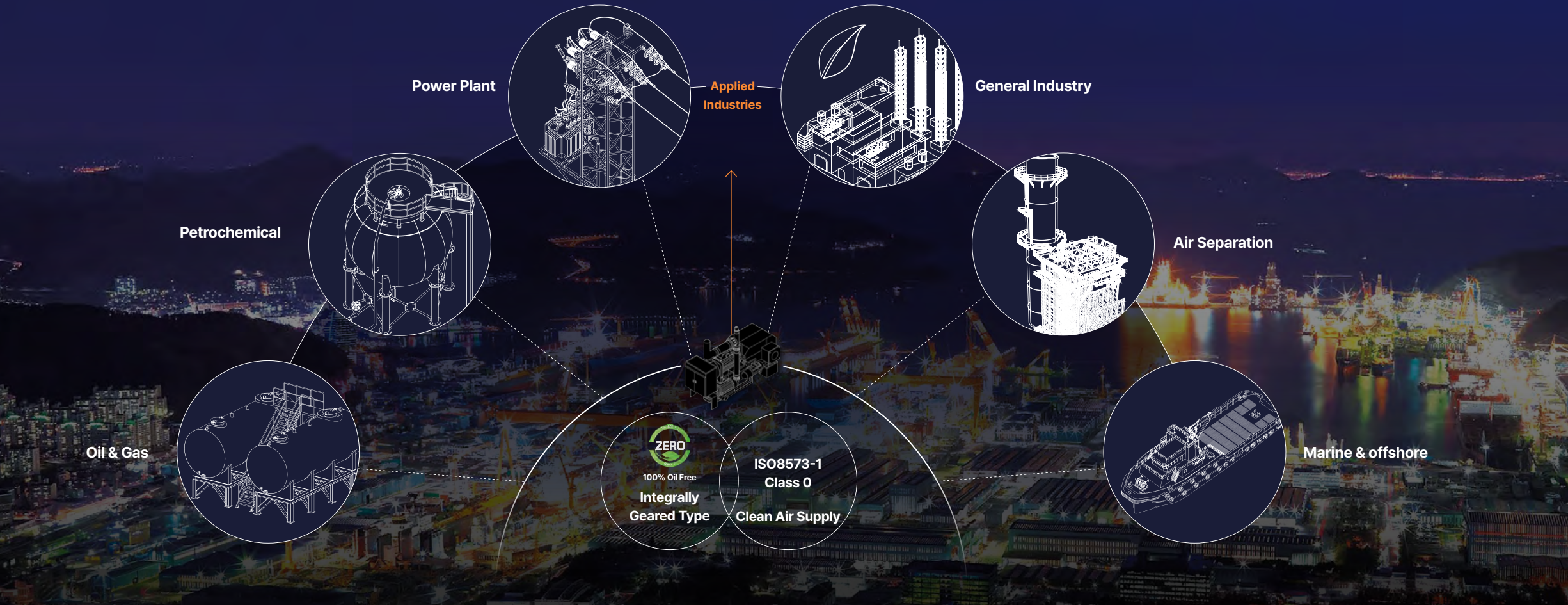
Asia-Pacific

Hanwha Power Systems Shanghai
200233 20/F, New Caohejing International Business Center A, No391,
Guiping Road, Shanghai, China



Middle East

Hanwha Power Systems Service Middle East
PO BOX 33586, Plot #35-WR43, ICAD 3 Musaffah South, Abu Dhabi, UAE



COMPRESSORS

Integrally Geared Type

Hanwha Power Systems' integrally geared turbo compressors deliver exceptional performance and efficiency through our proprietary technology. They provide 100% oil-free, clean and dry air to maintain optimal production conditions while complying with strict environmental regulations. This is why we are trusted across a wide range of industries for the stability and reliability of our tailor-made, best-in-class solutions.

ISO8573-1 Class 0-certified Clean Air Supply

Our products are certified to ISO8573-1 Class 0, the highest quality highest standard for compressed air purity. They are trusted in demanding applications across steel, chemicals, and food, as well as in advanced sectors such as semiconductors and batteries, where uncompromising reliability is essential.

Compressors

Building on air compressors used in various industrial manufacturing processes, we have developed a rich lineup of high-value products. Our lineup covers gas compressors for oil & gas, air separation, and power plants. Also Boil-Off Gas(BOG) compressors for LNG terminals and plants, cryogenic compressors, companders, and marine compressors.

Line-up

Air/ N₂ Compressor

SMx Pro



- Air / N₂
- 700~35,000Nm³/hr
- Instrument Air or Plant Air
- API 672

Engineered(SE-A/N)



- Air / N₂
- ~200,000Nm³/hr
- Air Separation or Petrochemical
- API672 or API617

Gas Compressor

Gas



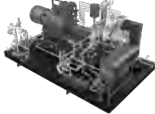
- Various gas
- ~169,000 m³/hr
- Oil & gas process (up to 6 stage)
- API 617

CO₂



- L-CO₂
- CO₂ Sequestration
- Up to 8 stage
- API617

VRU



- Lethal(Sour Gas)Service
- Vapor Recovery Unit
- API617

Fuel Gas



- CH₄(Natural gas)
- Gas Turbine for Power plant
- API 617

Gas Compressor

Ethylene



- Demethanizer process
- Cryogenic Gas
- API617

HP



- CH₄(Natural gas)
- LNG Terminal
- API617

BOG



- LNG BOG(Boil Off Gas)
- LNG Terminal
- API 617

Steam



- Steam(superheated)
- Mechanical Vapor
- Re-Compression
- API617

Expander

Cryogenic



- LNG Liquefaction or Hot process gas
- API617 CH₄

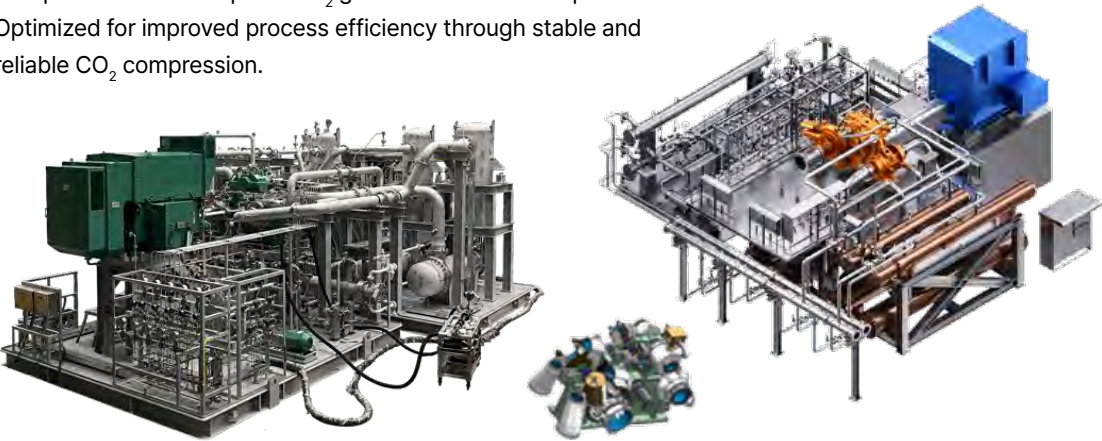
Handling GAS	
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CH ₄	Methane
C ₂ H ₄	Ethylene
C ₃ H ₆	Propylene
C ₃ H ₈	Propane
N ₂	Nitrogen
NH ₃	Ammonia
+ more	

Representative Products and References

CCS

CO₂ Compressor

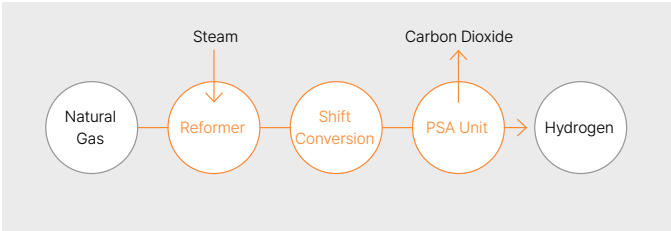
- Compresses and transports CO₂ generated in the SMR process.
- Optimized for improved process efficiency through stable and reliable CO₂ compression.



Major Reference

Location	Korea
Application	Dry ice production
Model Name	SE-65(Capacity : 300TPD)
Applied Process	CO ₂ compression/ transportation
Features	CO ₂ Treatment in SMR Process

SMR Process Diagram



Major Reference

Location	Korea
Application	Dry ice production
Model Name	SE-65(Capacity : 450TPD)
Applied Process	CO ₂ compression/ transportation
Features	CO ₂ Treatment in SMR Process



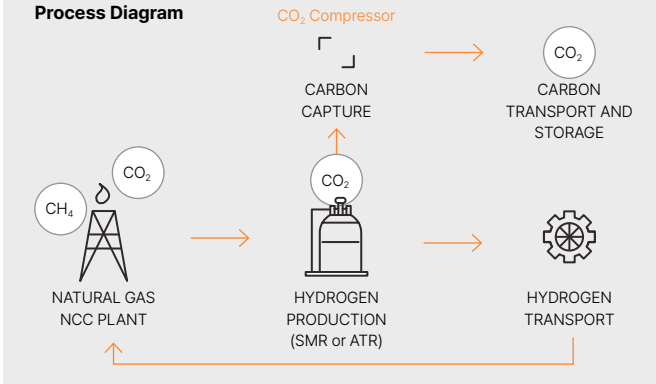
Major Reference

Location	Korea
Application	CO ₂ compression and transportation
Model Name	SE-65
Applied Process	CO ₂ compression/ transportation
Features	CO ₂ capture in the SMR process of NCCs



- Captures and transports CO₂ generated in the blue hydrogen production process.
- Used in the main processes in Naphtha Cracking Centers(NCCs).

Process Diagram



Representative Products and References

Marine & Offshore

BOG(Boil Off Gas) Compressor

- Boil-off gas(BOG) forms due to the temperature difference with the surrounding environment because LNG is stored at a cryogenic temperature of -162°C. Hanwha's BOG compressor is critical equipment which compresses and re-liquefies the generated boil-off gas.
- Proven reliability based on its track record of supplying BOG compressors to numerous LNG terminals across Korea.
- Reduces installation space by up to 60% compared to traditional reciprocating compressors, while offering high-efficiency operation.

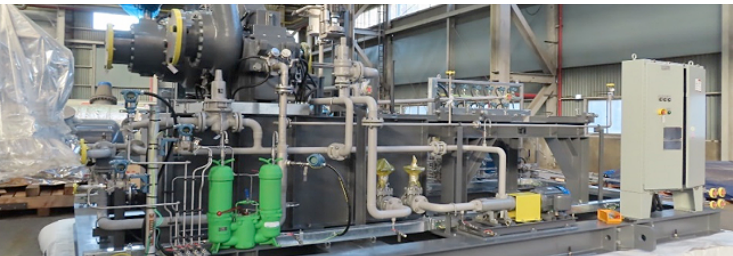


Major Reference

Location	Korea
Application	Boil Off Gas compression/reliquefaction
Model Name	SE-45
Applied Process	Reliquefies boil-off gas and stores in LNG tanks
Features	Optimized installation space, high-efficiency product response High reliability(stable operation experience)

Natural Gas Liquefaction Compressor

- A nitrogen refrigerant liquefaction compressor LNG supply and utilization in off-grid remote areas.
- Compact footprint and easy installation for enhanced customer convenience.
- Supporting new developments with optimized investment efficiency, easy maintenance, and a wide range of tailored designs.

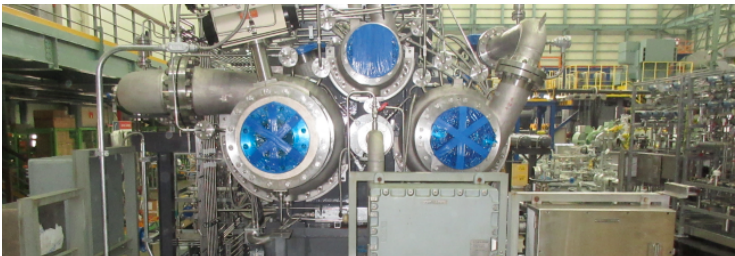


Major Reference

Location	US
Application	Small Scale LNG
Model Name	SE-45
Applied Process	Natural gas liquefaction
Features	Provides a variety of solutions for liquefaction processes Efficient installation space and single-lift installation

C3 & MR Compressor

- Used in the liquefaction process of conventional LNG plants with high liquefaction efficiency.
- Used in liquefaction processes utilizing C3 & MR(propane and mixed refrigerants).
- Successfully tested and validated, allowing for flexible product development tailored to customer-specific requirements.



Major Reference

Location	Korea
Application	C3 & MR Refrigerant compressors
Model Name	SE-65 & SE-65
Applied Process	C3/MR process
Features	Pilot substantive test complete Process solutions for LNG terminals

Representative Products and References

Petrochemical

Vapor Recovery Compressor

- Applied in vapor recovery units for capturing and reusing flare gas.
- Aligns with global environmental policies(contributing to reducing flare gas emissions and lowering production costs).
- Optimal solution for offshore platforms which are requiring proven reliability.



Major Reference	
Location	UAE
Application	Gas treatment plant(Offshore)
Project Progress	In commercial operation(2018~)
Model Name	SE-45
Applied Process	Vapor recovery process



Major Reference	
Location	UAE
Application	Gas treatment plant(Offshore)
Project Progress	In commercial operation(2018~)
Model Name	SE-45
Applied Process	Vapor recovery process

Regeneration Gas Compressor

- Utilized in sweet gas dehydration processes in gas treatment plants.
- Featuring optimized designs to handle diverse gas compositions in large-capacity, high-pressure applications.

* SWEET Gas: Natural gas free from corrosive components such as hydrogen sulfide or mercaptans



Major Reference	
Location	Saudi Arabia
Application	Gas treatment plant
Model Name	SE-45
Applied Process	Dehydration(moisture removal process)
Features	Offers highly reliable compressor solutions for chemical and gas processes

Representative Products and References

Power Plant & General Industry

Fuel Gas Compressor

- A key component in gas power plants. Extensive experience in ensuring stability under diverse operating conditions .
- Optimized for gas power plants worldwide for many years.
- Strong track record of supplying multiple gas turbine OEMs, with tailored fuel gas supply solutions for each turbine model.



Major Reference

Location	Americas
Application	Gas power generation
Model Name	SE-45
Applied Process	Fuel gas compressor
Features	Proven track record with multiple gas turbine manufacturers

Plant Air for General Industries

- Tailor-made solutions solution tailored to the operating conditions and environments of various industries and customers.
- Customized, high-performance, high-reliability turbo compressors providing 100% oil-free, clean, dry air.
- The standard for industrial air compressors based on high stability and operational reliability.



Major Reference

Application	Steel
Model Name	SMX Series
Applied Process	Plant Air(Industrial Air)

Combo Compressor

- A combo compressor integrates two or more compression processes into a single compressor.
- Its advanced design enables two processes in one, significantly reducing installation footprint.
- Enabling flexible product development to deliver tailored compression systems for diverse customer requirements.



Major Reference

Location	Europe
Application	Air Separation
Model Name	SE-90
Applied Process	Dual services(Feed & Recycle)
Features	Product development tailored to customer needs / Incorporation of two separate processes into a single product / Energy savings through high-efficiency implementation

Representative Products and References

Power Plant & General Industry

Main Air Compressor

- MAC(Main Air Compressor) is a core component in Air Separation Units(ASU), compressing incoming air to a typical pressure of 6 barA(87 PsiA) and delivering it to subsequent processes.
- A high-efficiency, low-power product that ensures cost-effective and reliable plant operation.
- With a proven track record of over 1,000 units delivered and operating worldwide.

Design Capability

Flow rate	m ³ /hr	~180,000
	CFM	~105,950
HP	HP	~ 33,500

Discharge pressure	BarA	1.2 ~ 200
	PsiA	17 ~ 2,900



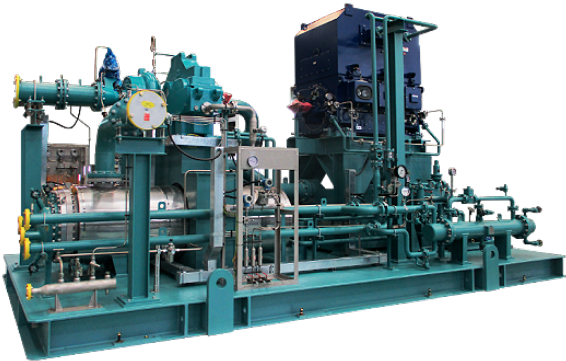
Boosting Compressor

- A Boosting Air Compressor(BAC) boosts pressure, typically above 25 BarA for processes requiring high-pressure compressed air.
- Possible to provide ultra-high pressure compressed air to meet various compressed air requirements.
- Over 100 compressors delivered and operated worldwide.

Major Reference

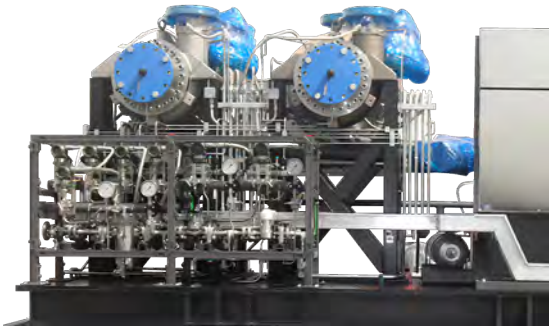
Application	Air separation
Model Name	SE-45
Applied Process	Air boosting process

Features	A high-efficiency solution helping customers save their electricity costs.
	Diverse design and operation experience.
	Providing customers with high reliability.



Cryogenic Expander

- Applied in a special process that liquefies natural gas(NG) using nitrogen as a refrigerant.
- Configured as a warm/cold expander, achieving optimal efficiency.
- Primarily used in small and medium-sized plants, and able to develop various product lineups tailored to customer-specific requirements



Major Reference

Location	South America, Asia
Application	For natural gas reliquefaction
Model Name	SE-45
Applied Process	Natural gas liquefaction
Features	Cryogenic expanders
	Combined configuration(warm/cold expanders)

Contact within 1 hour
On-site arrival within 1 day
Service provision and
Happy Call within 2 days

Rush 112

**Minimum equipment
downtime**

Policy

Customer-focused

We offer fast and smart care services that combine Hanwha's high-quality genuine parts and exceptional technical expertise, allowing you to concentrate on stable maintenance and equipment operation.

**Maximum equipment
operation time**

**Periodic Maintenance
(Program S1-S4)
Preventive Maintenance
Planned Maintenance**

Smart Care

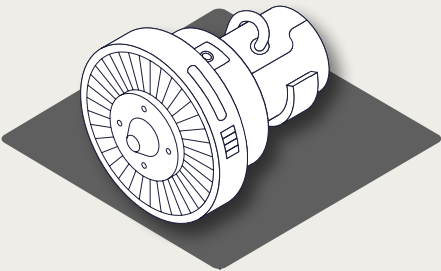
AFTER MARKET SOLUTIONS

Compressor Room Services

Stable plant operations depend on maintaining equipment in the best possible condition. Regular maintenance optimizes performance, prevents unexpected accidents, and extends equipment lifespan. Periodic inspections ensure components are functioning properly, enabling timely replacement and repairs. Addressing even minor issues consistently reduces the risk of equipment failure, ensures the safety of technicians, and prevent fatal accidents.

AM Solutions

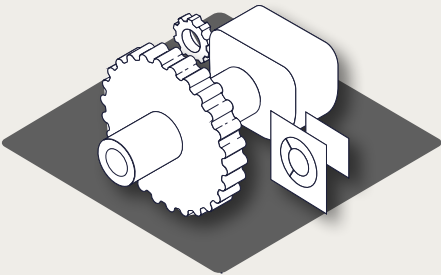
Operational Service



Parts

Parts Supply

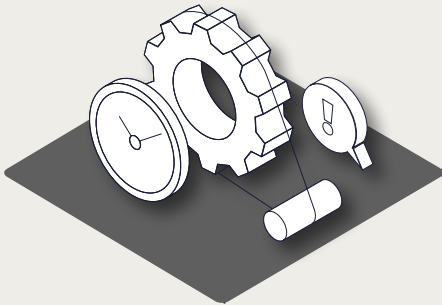
Parts replacement and delivery due to consumption or malfunction



Maintenance

Inspection/ Maintenance

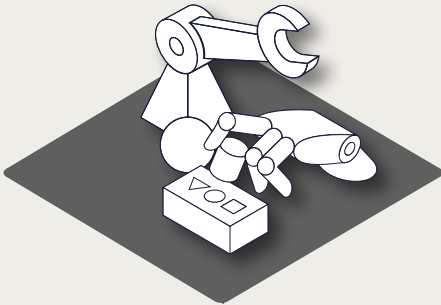
Providing appropriate solutions upon identifying product performance issues



Long-Term Service Agreement

Integrated equipment lifecycle management

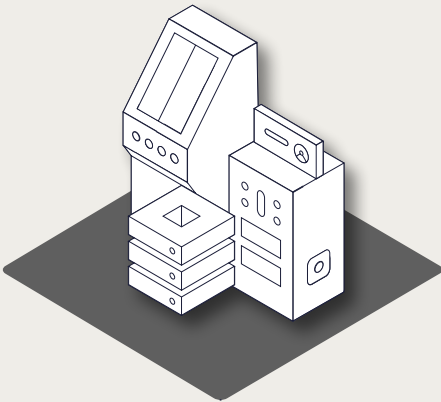
Proactive risk prevention and appropriate measures to ensure stable operation



Monitoring

Preemptive response service through real-time management

Preventive maintenance and enhanced operational efficiency through monitoring



Total Compressor Room Solutions

Facility efficiency improvement services

Comprehensive management of customer-owned compressor equipment, including operating equipment

Operational Goals



Establishment of Management System

Designated managers for fast and accurate system operation



Risk Management

Comprehensive management through regular inspections and diagnostics



Cost Savings

Increased equipment efficiency and extended lifespan

Services

Parts & Maintenance

Global	Genuine	Fast
		
We provide optimal service and parts through our global network of subsidiaries/offices, service centers, and warehouses.	We provide genuine parts that guarantee optimal compressor performance, maximum service life, high quality, and the best reliability.	We achieve customer satisfaction through quick and prompt handling of requests and after-sales follow-ups.

Genuine parts to guarantee optimal performance and equipment lifespan.

With over 40 years of expertise in aircraft engine design and manufacturing, we provide stable and reliable genuine parts.

Rotor Assembly	Gear Set	Bearing Set	Seal Set	Oil Pump & Hanwha Genuine Oil
				
Pinion Assembly, Impeller	Bull Gear	Pinion Bearing, Main Driver Bearing	Air/Gas Seal (Carbon, Dry), Oil Seal, Bull Gear Seal	Main Oil Pump, Auxiliary Oil Pump

LTSA(Long Term Service Agreement)

Periodic Maintenance (\$1~\$4)

S1	S2	S3	S4
Recommending replacement cycles based on the inspection and diagnosis of compression equipment or device operating parameters, and analysis of inlet/outlet pressures, and system pressure.	Inspecting the oil cooling system status, checking the condition of the main rotor and bearings, preemptively identifying potential issues, and examining the status of the drive unit.	Checking for damage to the air-end components caused by the usage environment, removing impact factors in advance, and inspecting the progress, pressure, and temperature sensors.	Minimizing aerodynamic losses through core decomposition tests and key component replacements, rotor balancing, and more.
4,000hrs 0.5y	8,000hrs 1.0y	24,000hrs 3.0y	40,000hrs 5.0y
S1 Preventive Services/ Monitoring	S2~4 Planned Maintenance		

Benefit

Estimate costs based on periodic inspections and diagnostics.
Established unit price during the contract period.

Systematic management of compressors and auxiliary equipment.
Real-time management through Hanwha's proprietary Remote Monitoring System (RMS).

Accident management based on accumulated data.
Planned and preventative services based on the customer's shutdown schedule.

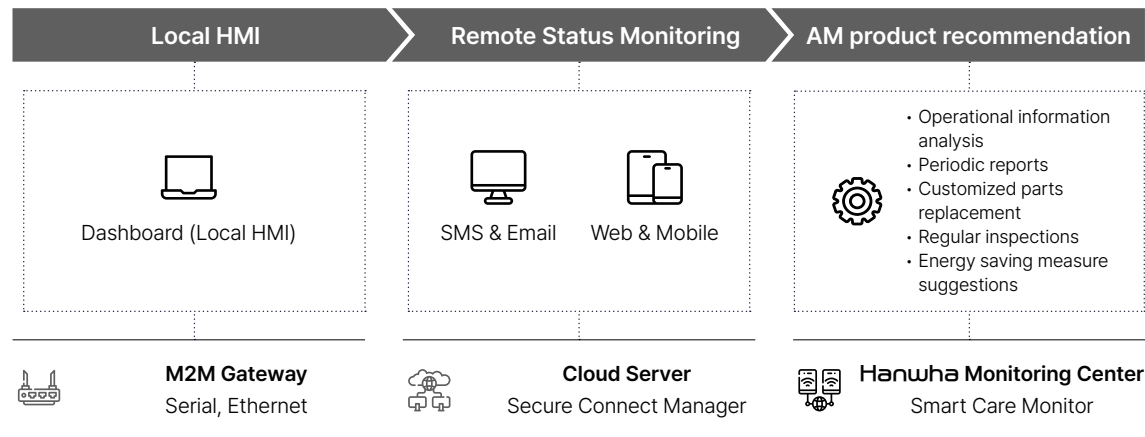
Providing the latest compressor technology information and networking opportunities.
Project plan management.

- Efficient equipment operation and lower operating expenses(OPEX)
- Extending equipment lifespan and maintaining performance
- Minimizing various risk factors and risks
- Customer-centric technical service support

Services

Monitoring

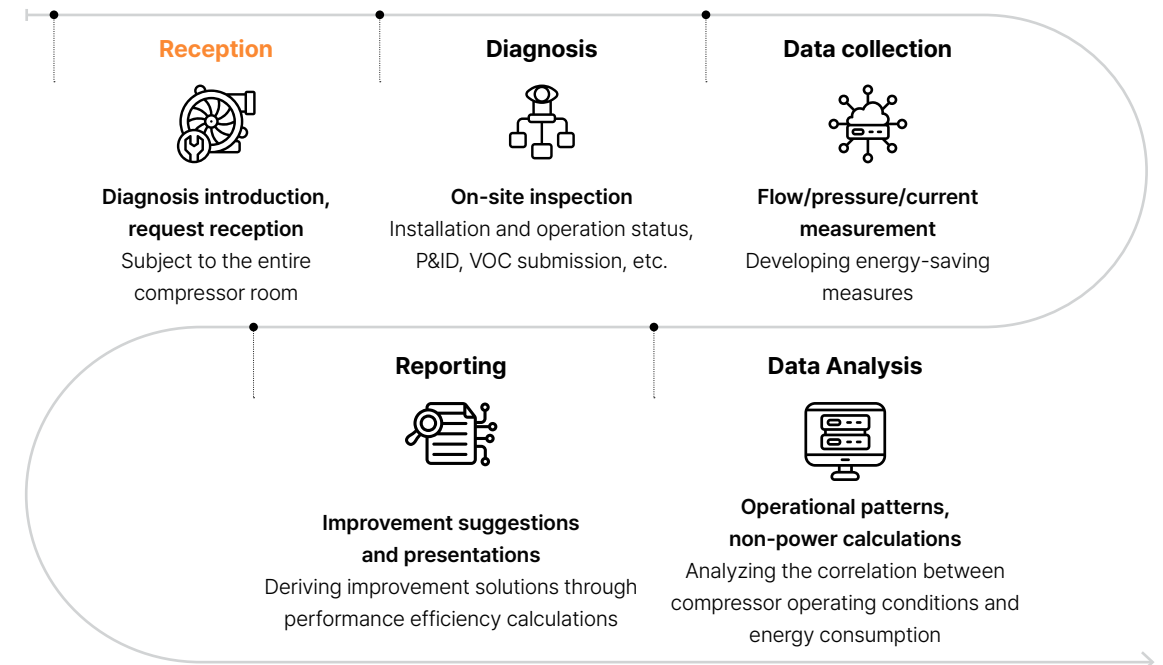
We extend compressor lifespan, maximize availability, and minimize downtime through remote monitoring.



Total Compressor Room Solutions

We assess the overall operation of the customer's compressor room air system and recommend the most efficient equipment operation strategies. By measuring and analyzing actual operational data, including flow rates and power consumption, we recommend energy-saving and cost-effective compressor operation measures. Diagnostics typically take up to two weeks.

Process

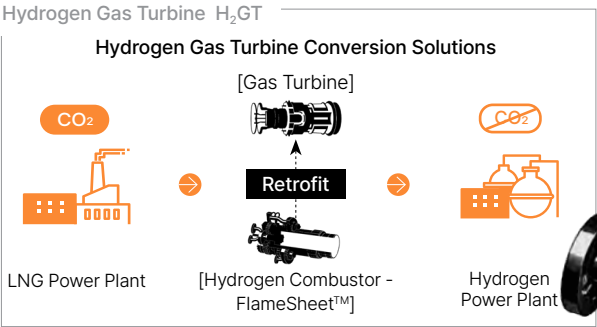


GAS TURBINE

HYDROGEN SOLUTION

Hanwha Power Systems offers a hydrogen turbine solution that retrofits gas turbines combustors fueled by LNG, enabling full hydrogen combustion or co-firing with natural gas. This solution reduces CO₂ emissions while utilizing existing gas turbines.

H₂ Turbine Power Generation Solutions



Key Benefits

Advantages of utilizing existing assets

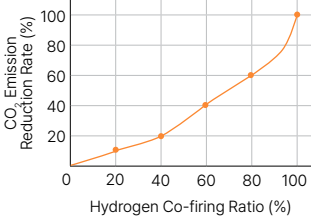
Minimal equipment investment, such as replacing combustors

- ▶ Transition to low-cost, eco-friendly hydrogen power generators

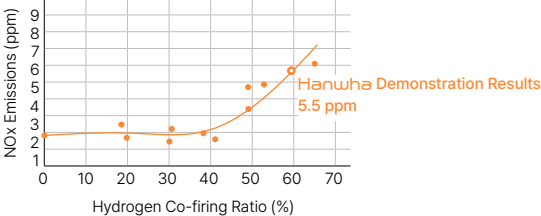
Leveraging existing power grids and infrastructure

- ▶ Reducing socioeconomic burden associated with energy transition

CO₂ Reduction Rate by Hydrogen Co-firing Ratio

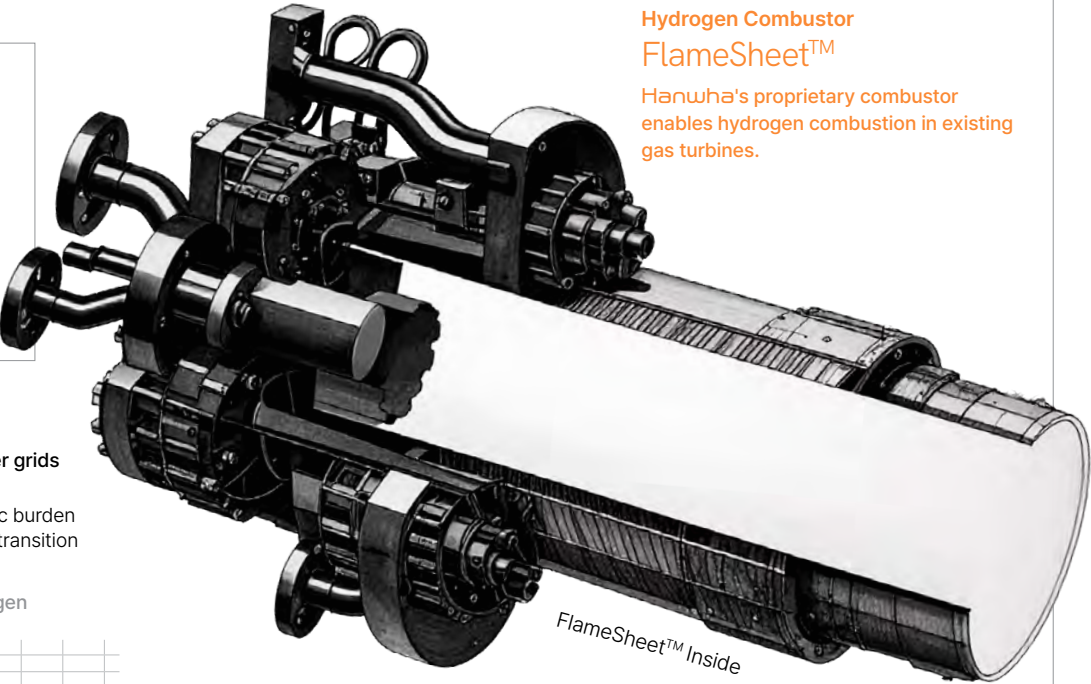


NO_x Emissions by Hydrogen Co-firing Ratio



Hydrogen Combustor FlameSheet™

Hanwha's proprietary combustor enables hydrogen combustion in existing gas turbines.



Hanwha Power Systems' hydrogen turbine technology has already been proven in numerous international sites and has successfully increased the co-firing ratio in a short period through domestic demonstration projects.

Turbine Retrofit Demonstration Cases

30%
Hydrogen co-firing
operational site
(Netherlands, 2018-)



40%
Hydrogen co-firing
operational site
(US, 2023-)



100%
Successful hydrogen
combustion
demonstration site
(Daesan, 2023-)



GAS TURBINE

INDUSTRIAL SOLUTION

We offer comprehensive services(Long Term Service Agreement) for power generation gas turbines, including parts manufacturing, repairs, planned maintenance, routine maintenance, and rotor maintenance, leveraging more than 30 years of our expertise in aircraft gas turbine manufacturing and maintenance technologies.



1

Part supply

Development and manufacturing of upgrades that circumvent patents and improve the vulnerabilities of OEM products.



2

Part repair

General repairs, residual service life prediction, and replacement of vulnerable parts



3

Plan/Regular Maintenance

Systematic maintenance services by dispatching expert supervisors



4

Rotor Life Extension

Lifespan extension through rotor balancing and maintenance of steam and gas turbines



5

Long Term Service Agreement

Reduced customer lifecycle costs through comprehensive and flexible long-term service agreements.

MARITIME SOLUTIONS

FOR OCEAN, FOR EARTH

Hanwha Power Systems provides technologies and solutions to address various environmental regulations and support the advancement of eco-friendly marine industries.

①
Eco-friendly
retrofits

②
Fuel
transition

③
Carbon-
reducing
solutions

④
Cargo loading
optimization

Marine Solutions Business

Hanwha Power Systems provides tailored, competitive solutions to address the environmental challenges of the marine industry, driving the success of every project.



① Optimized Solutions
Providing analysis and customized solutions for vessels.

② Market Insight
Market analysis and technical solution development.

③ Sustainable Support
Warranty services and vessel lifecycle support.

 Fast and reliable warranty services	 Optimal solutions complying with environmental regulations and economical operational guidance, while reducing Total Cost of Ownership(TCO)*	 Maximized convenience by supplying necessary parts and top-tier technical services	 Implementation of smart ship solutions based on diverse IT technologies
*Total Cost of Ownership			
Turnkey Execution			
Design and engineering expertise	Procurement capabilities	Quality and risk management	Comprehensive project management



Core Technologies

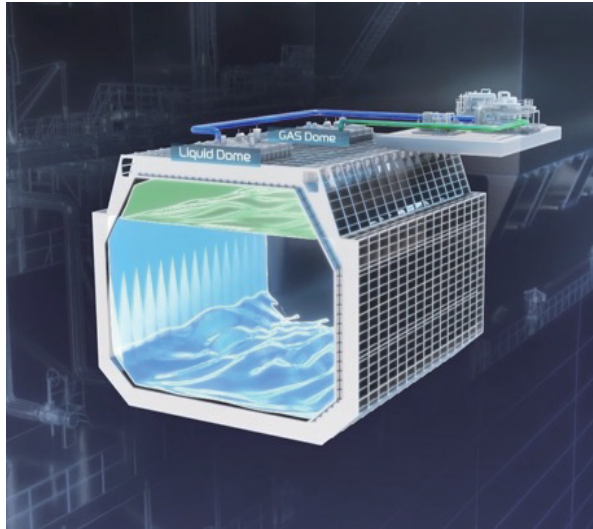
Hanwha Power Systems proactively responds to the rapidly growing green solutions market driven by tightening environmental regulations, offering innovative and competitive solutions that enhance vessel performance. Our goal is to provide customers with cost-effective, optimized solutions that contribute to achieving environmental sustainability.

① Energy-Saving		② Conversion		③ General Retrofit	
BOG Re-liquefaction Air Lubrication System Rotor Sail Propeller Optimization Bulbous Bow Wind Saver Cap		LNG/MeOH/NH₃ Dual Fuel LNGC to FSRU	Ammonia Gas Turbine	OCCS	Cargo Capacity Improvement
We reduce fuel consumption during vessel operations, contributing to both economic efficiency and environmental protection. To improve energy efficiency, we utilize various methods such as replacing aging facilities and equipment and improving hull design.		We can minimize environmental pollution and secure fuel flexibility according to stricter vessel emissions regulations. We are constantly driving innovation to shift toward low-carbon fuels.		We improve the structure of existing vessels to enhance overall performance and maximize fuel recycling to increase vessel efficiency. Our goals include improving fuel efficiency, reducing carbon emissions, and cutting costs.	

① Energy-Saving

BOG Re-liquefaction

Re-liquefaction systems offer a more efficient and cost-effective way to manage boil-off gas (BOG) generated from existing LNG carriers. This solution saves costs while supporting environmental compliance. Hanwha's proprietary NRS® (Nitrogen Refrigerant System), specially designed for LNG carriers, reliquefies BOG using the cooling efficiency generated through N₂ compression and expansion via N₂ Reverse Brayton cycle.

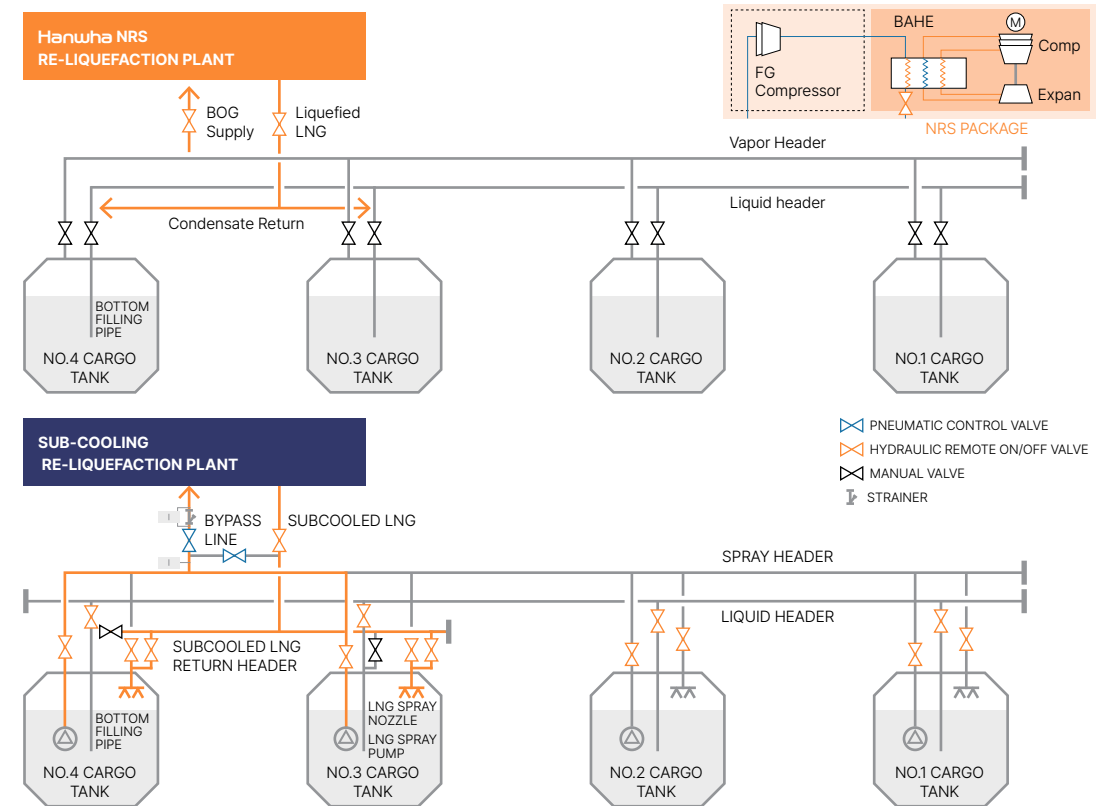


Retrofit Concept(Scope of Work) :

- 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(2.1/2.8 TPH),
Sub-cooler(1.5/2.1 TPH)



① Energy-Saving

Air Lubrication System(ALS)

Air Lubrication System(ALS) is a technology that reduces friction between the hull and the water by creating a layer of microbubbles beneath the hull. Reduced friction significantly improves operational and fuel efficiencies.

Principle of ALS

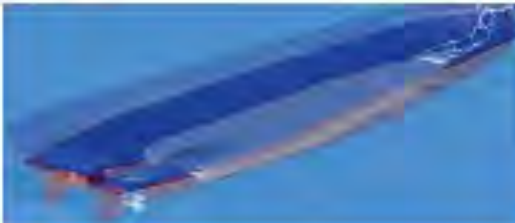
Air is effectively delivered from the air compressor to the air outlet, and the discharged air effectively creates a layer of air beneath the hull and the free-flowing liquid.



Air Outlet Hole



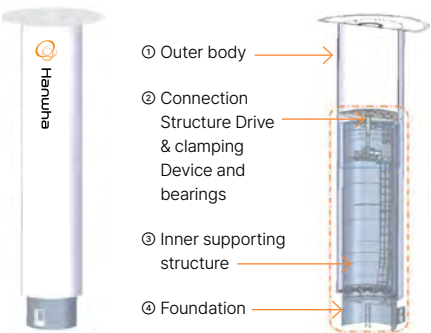
Air Layer



Rotor Sail

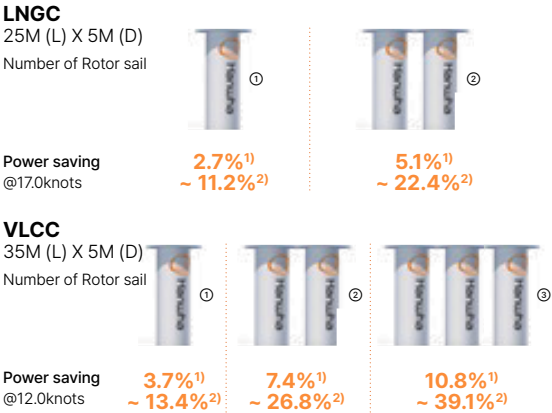
The rotor sail system is a device using the Magnus effect(a phenomenon that generates thrust) to create pressure differences between the front and rear of the rotor. This technology is recognized as one of the leading eco-friendly solutions that satisfies GHG regulations. Hanwha is spearheading the field by establishing the world's first Rotor Sail System demonstration center.

Design Review



* Regular Inspection Period for Hanwha Rotor Sail : Every 2.5 years
* Consumable item (Timing belt) : Every 2.5 years

Power & Fuel saving and EEDI



* Calculation according to MEPC 76 Guidance based on global wind probability
* Calculation under the most favorable wind condition

① Energy-Saving

Propeller Optimization/Bulbous Bow

Hanwha Power Systems offers a range of energy-saving device solutions that help reduce fuel costs, comply with regulations, and improve efficiency.



ESD

Propeller Optimization

- ① Reduced fuel consumption through improved efficiency
- ② Reduced carbon emissions by optimizing fuel consumption
- ③ Reduced vibration and noise

Net Power Saving : 3~5%

Bulbous Bow Retrofit

- ① Reduced hull resistance
- ② Increased propulsion efficiency
- ③ Decreased carbon emissions and fuel consumption

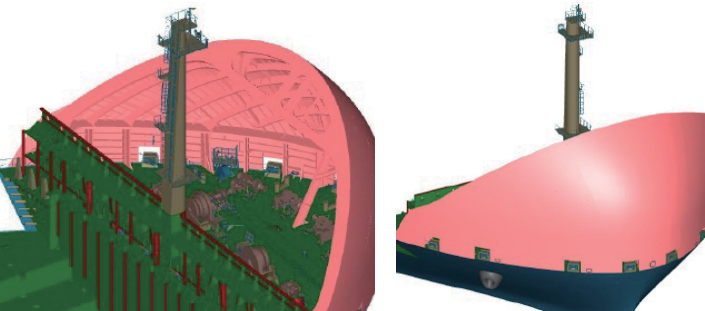
Net Power Saving : 4~5%

Wind Saver Cap

- Evaluates wind direction cover design using a numerical wind tunnel.
- Effectively reduces wind resistance of container stacks.
- Measures wind speed and direction under full load conditions, considering wind speed and direction.

Expected Efficiency (increased efficiency) : 1.5~2%

3D View for Wind Saver Cap



② Conversion

LNG Dual Fuel Conversion

Dual Fuel Conversion of vessels involves retrofitting the propulsion system, including the main engine and fuel system, to enable it to run on alternative fuels. This process ensures regulatory compliance by improving fuel flexibility, reducing emissions, and lowering operational costs. Dual-fuel conversion is the most efficient and reliable solution for meeting both IMO and regional decarbonization regulations.



- Retrofit Concept(Scope of Work) :**
- ① Main Engine Retrofit
 - ② Fuel Gas Supply System with Bunker Station
 - ③ Alternative Fuel(LNG, Methanol, Ammonia) Tank

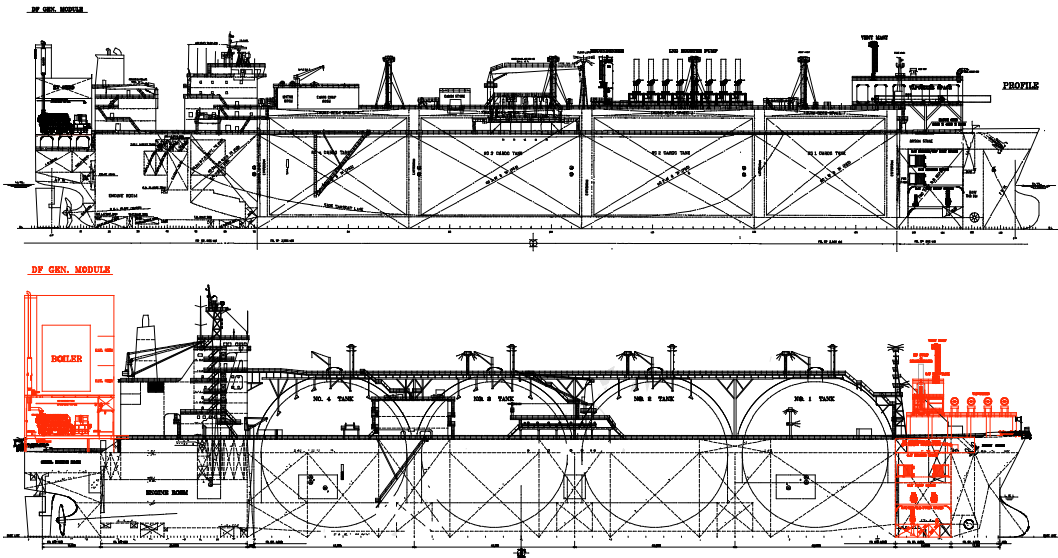
Technical Benefit :
Compliance with GHG regulations, Fuel Flexibility

Reference(incl. new building & Retrofit) : Total 7 vessels



LNGC to FSRU Conversion

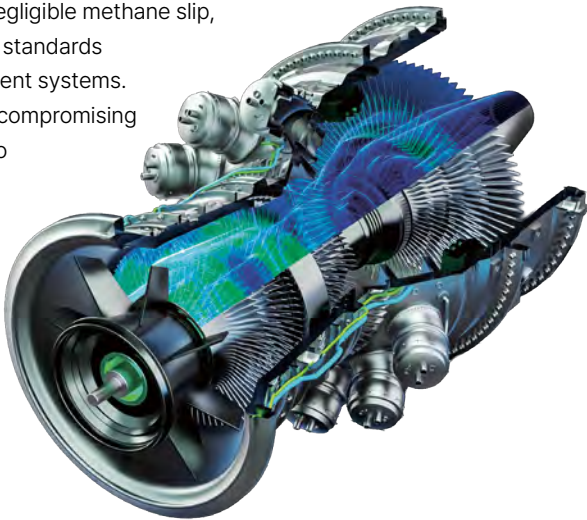
The FSRU conversion market is growing, driven by rising LNG demand, cost and time efficiencies, and the need for flexible energy solutions amid geopolitical uncertainties. The advantages of FSRU retrofits include reduced capital expenditures(CAPEX), shorter lead times compared to new builds, and the ability to utilize older vessels. This not only reduces environmental impact but also allows operators to adapt efficiently to changing market conditions, maximizing return on investment(ROI).



② Conversion

Ammonia Gas Turbine

Leveraging Hanwha Group's proven strengths in sustainable solutions and broadening our scope, we are fully committed to developing next-generation ammonia gas turbines in partnership with energy technology leader Baker Hughes. These turbines are designed for use on 174K LNG carriers as well as container ships of various sizes. They are capable of running on 100% ammonia — with zero pilot oil— enabling truly carbon-free operations. In addition, they offer outstanding fuel flexibility, operating on 100% ammonia, 100% natural gas (NG), or any ammonia-NG blend. This versatility ensures cost-effective performance in line with future fuel prices and emissions regulations. Emissions are kept to an absolute minimum, with negligible methane slip, ammonia slip, and NO emissions, while still meeting Tier III NOx standards for large low-speed engines - without the need for after-treatment systems. Their compact design allows for ammonia fuel storage without compromising cargo capacity, and they include dedicated safety enclosures to address the unique handling requirements of ammonia fuel.



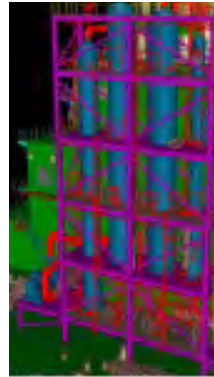
Applicable to All Commercial Vessels	Full Carbon-Free Operation	Negligible CH ₄ , NH ₃ slip and N ₂ O emissions	Increased Fuel Flexibility and Affordable Costs
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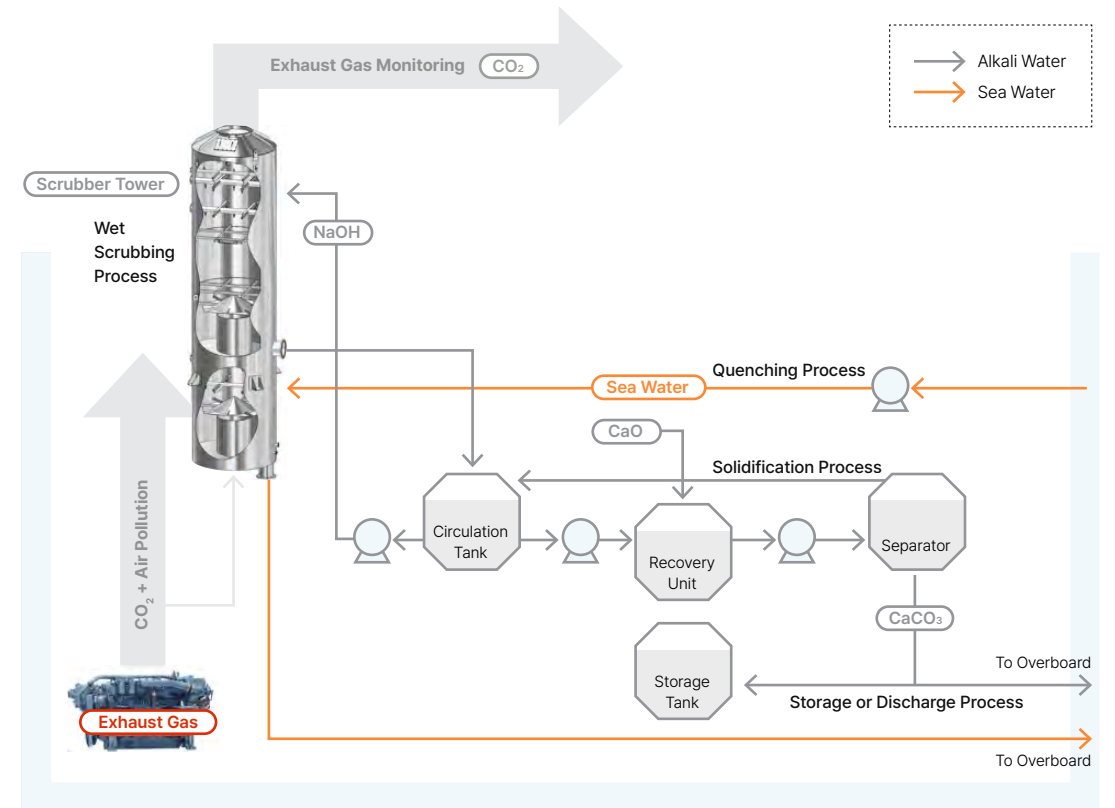
③ General Retrofit

OCCS(Onboard Carbon Capture & Storage)

Onboard Carbon Capture & Storage(OCCS) is a technology that captures carbon dioxide emitted during vessel operations and stores it onboard or transports it to land for storage. This is a key technology that reduces carbon emissions from vessels and contributes to achieving the maritime industry's carbon neutrality goals.



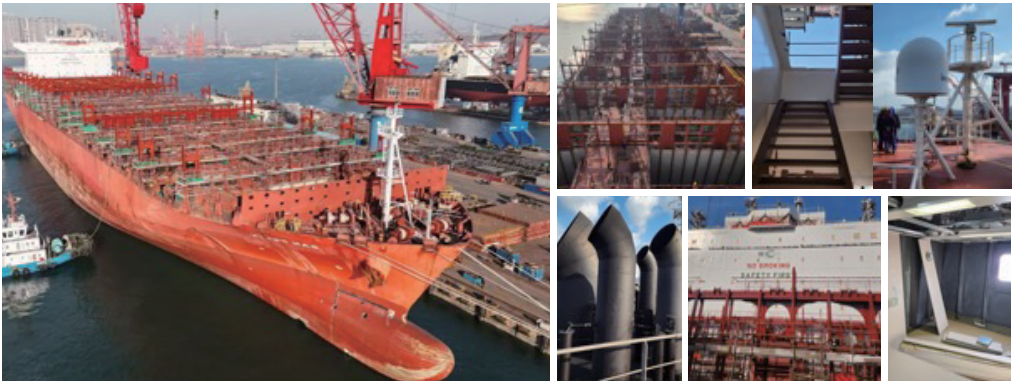
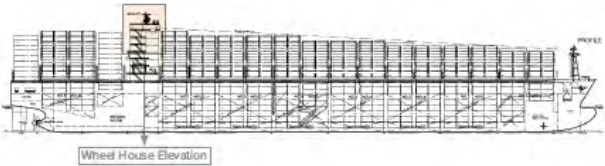
- CO₂ absorption using NaOH solution
- Continuous carbon absorption and energy regeneration
- Physical separation of CaCO₃ using a filter



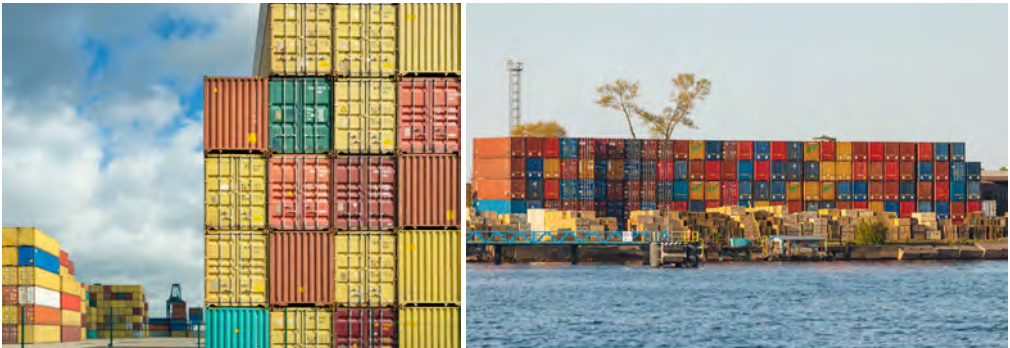
③ General Retrofit

Cargo Capacity Improvement

Hanwha Power Systems offers solutions that maximize shipping companies' profits from container ships. We maximize transport capacity by increasing the cargo capacity and number of units. This can be achieved with relatively low costs and a short construction period compared to other retrofit projects.



Accommodation (Deck House) Elevation



Higher Lashing (Additional Tier) With Mickey Mouse

MARITIME SERVICES

Hanwha Power Systems aims to become a global comprehensive solutions provider responsible for the lifespan of vessels. Leveraging our expertise in world-class after-sales services for ships, we deliver rapid solutions and enhance vessel performance through eco-friendly solutions in response to increasingly stringent environmental regulations. In addition to eco-friendly vessel retrofits, Hanwha Power Systems is committed to taking responsibility for breaking and recycling.

One-Stop Service

Hanwha Power Systems provides post-warranty services for various types of vessels(LNGCs, tankers, containerships, LPGCs, etc.) and specializes in proactively addressing customer demands.

Hanwha Power Systems provides flexible and rapid solutions that prioritize safe and efficient operation of vessels. Our goal is to offer a comprehensive care service that minimizes customer inconvenience by delivering high quality technical support.

