

GLOBAL SALES MARKETING & TECHNICAL SUPPORT/ SERVICE

Better service tomorrow


J.O. ENGINEERING CO., LTD.
KS Q ISO 14001 / KS Q ISO 9001


HYUNDAI
GLOBAL SERVICE
HYUNDAI HEAVY INDUSTRIES GROUP


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Message from managing director

We build a Better Service Tomorrow

We would like to extend our thanks to all our business partners for friendly cooperation rendered to us. Since its foundation in 1998, We, J.O.Engineering Co.,Ltd. have successfully expanded as a leading company in the field of parts sales of ship's main engines, aux engines, and other related service for marine equipment and machinery.

As an authorized agent certified by Hyundai Global Service co.,Ltd. we have consistently concentrated on reliable service to our clients over the world in the spirit of realizing the life-time service for the vessels and involved in a diversified line of business to meet the changing market.

We firmly believe in making every efforts to satisfy our client's various needs in a new millennium and will remain as ideal business partner with reliability and competitiveness.

Jung-Woon, Lee
Managing Director
J.O. Engineering Co.,Ltd.




History of Company

- 1998.** Established J.O.Engineering
Technical cooperation with Hyundai Shipyard of HHI
- 1999.** Assigned as a formal parts agent for genuine parts of
M/E & A/E with Hyundai Engine & Machinery Div. of HHI
- 2000.** Awarded export prize by Korean Government
- 2006.** Certified ISO 9001 (Quality Management system) &
ISO 14001 (Environmental Management system)
- 2008.** Awarded export prize by Korean Government. (10 Mil USD)
- 2010.** Starting a cooperative business in Greece Seascope / Agent
- 2012.** Starting a cooperative business in Dubai J.O(M.E) / Agent
- 2013.** Starting a cooperative business in India One Stop Marine / Agent
- 2016.** Open branch office in Singapore J.O.engineering(SG)
- 2017.** HGS(Hyundai Global Service Authorization)
- 2018.** Became Member Korea Chamber of Commerce

01

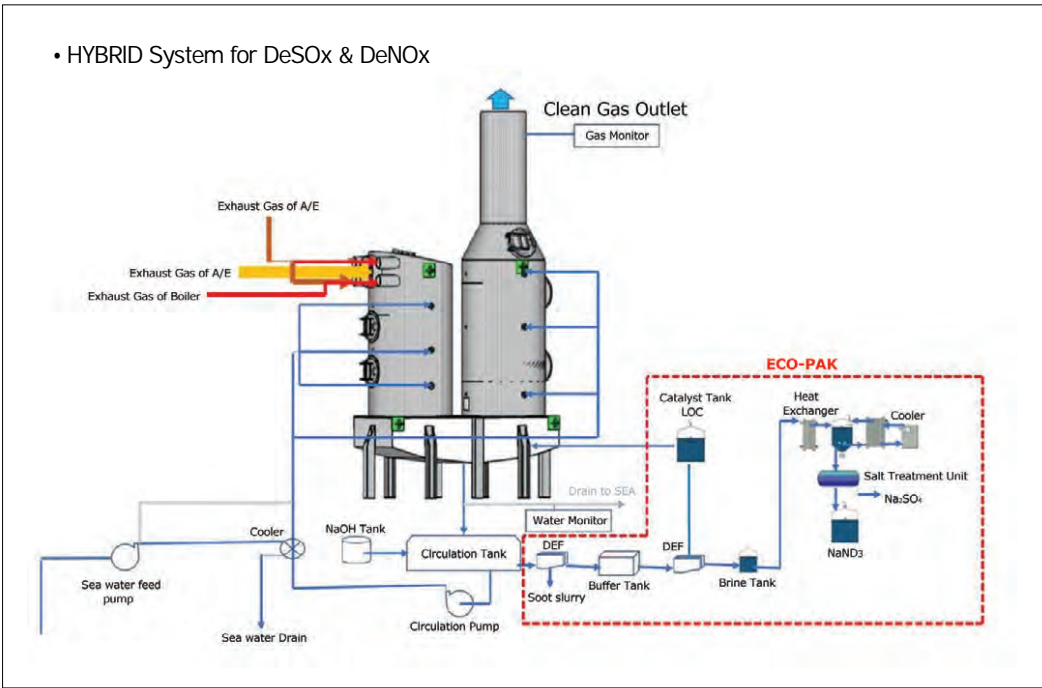
Technical
Support Services

- 1.1 SOx Scrubber Retrofit
- 1.2 BWTS Retrofit
- 1.3 Alpha Lubricator Overhaul & Retrofit
- 1.4 M/E Pneumatic Control System Overhaul
- 1.5 4-Stroke Engine Overhaul(Himsen, MDT)
- 1.6 2-Stroke Engine Overhaul(MDT, Win-GD)
- 1.7 COP/T & WBP Maintenance
- 1.8 Side Thruster Maintenance
- 1.9 Turbocharger Overhaul / Cut off for
Low Load Operation and Fuel Saving
- 1.10 Trouble Shooting & Repairs
- 1.11 Repairing & Reconditioning
- 1.12 Electrical & Electronics / Automation(ACONIS)
- 1.13 Marine machinery maintenance
- 1.14 LSA & FFA maintenance

SOx Scrubber Retrofit

We are providing optimal solutions in an effort to minimize environment impacts caused by stricter regulations, which have been adopted or will be ratified, including IMO MARPOL Annex VI on Sox emissions and IMO Global Ballast Water Convention. HGS provides safe and reliable installations of efficient, environmental technologies for existing vessels.

● Schematic diagram of the simultanceous abatement system of SOx and NOx

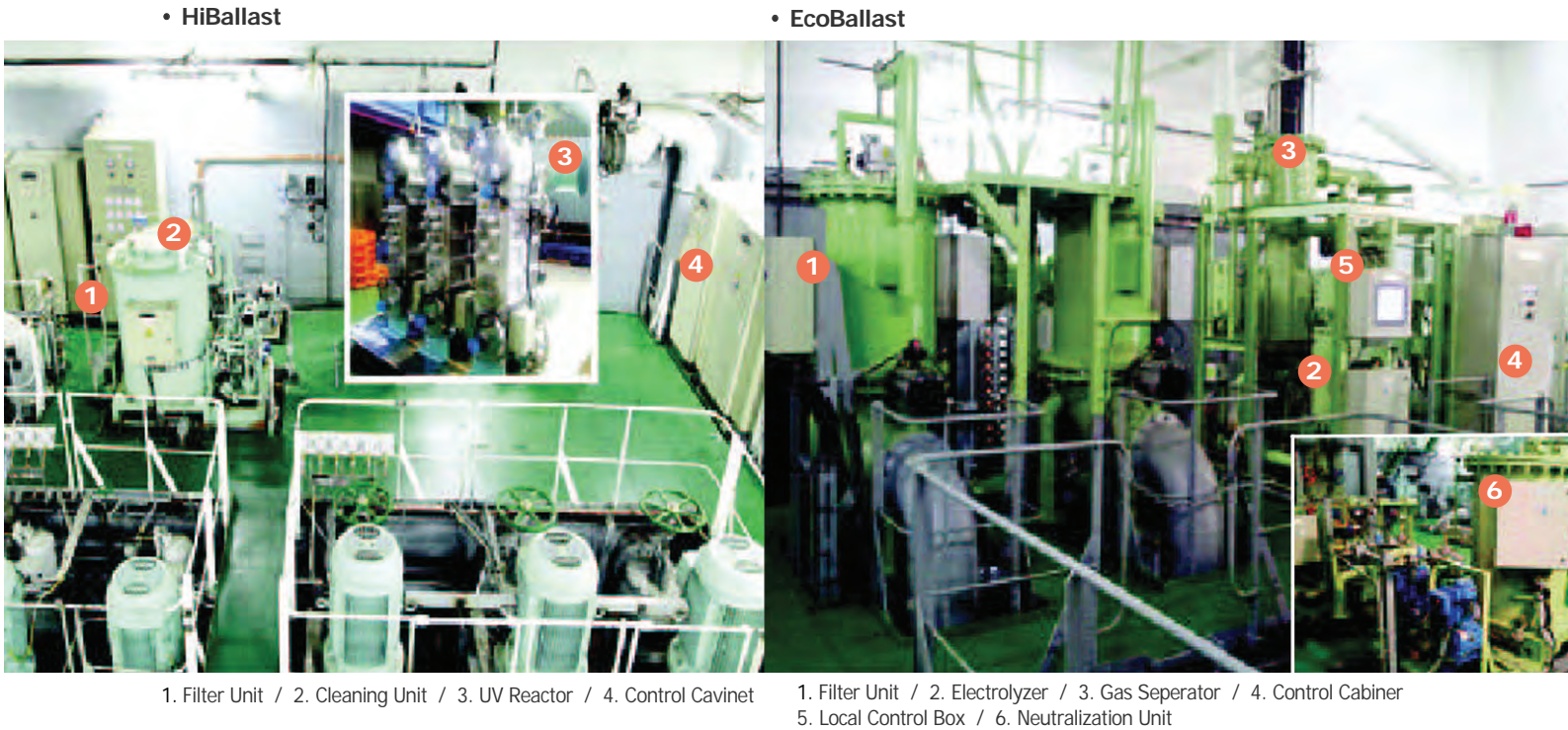


● Technical comparison of EGCS for NOx & SOx

Description	SCR in Scrubber	Others
Function to abata SOx & NOx	• 2 in 1, simultaneously	• 1 in 1 by a Scrubber and a SCR, Respectively
Name of Equipmet	• Combined De-SOX & De-NOx "SCRin Scrubber"	• Scrubber for De-SOX • SCR for De-NOx

Description	SCR in Scrubber	Others
Name of Equipmet per a ship	• Only One(1)	1 x Scrubber and Multiple SCR acc. to the ship's Specifications
Technoiogy	• Simultaneous Abatement by NaOH & Liquip Catalyst (Eco Friendly)	• NaOH for De-SOx • Urea Dosing & Solid Catalyst for De-NOx
No. of Manufacturers	• Jung Won only one	• Many
International Emission Regulation	• Satisfied (Single operation for De-SOx as well) • SCR Ready Vessel is possible without big amount additional.	• Satisfied
CAPEX & OPEX	• Less Cost than others	• 100 (SCR + Scrubber) Refer what follows
Footprint (2 nd Gen-catalyst)	• 80% ~ 65%	• 100%
Maintenance & Installations	• Simple • Low Cost • No down time of M/E (Only need to replenish Catalyst : Below 10% per year	• Complex • High Cost • Dowe time required (Catalyst to be replaced by every 1~3 years at least and need to take 2 days for replacement or maintebance due to harst vibration for the SCR on-Engines.)
Operation specification • Operating Temp. • Content of Sulfur	• Regardless of Exh. Gas Temp • 3.5% More or less, No influence	• Above 320 deg. Celcius to be required for SCR • Sulfur content exceed 3.5% is adversely affected to SCR
Imfluence of Engine Performance • SFOC • Exh. Gas Back • Operating Temp. • Pressure	• No effect on the performance • Nothing to do with the Approval of engine makers • No matter apply Tier 1 & 2	• Absolute effect • Need Approval and / or Certification from engine makers

Description	SCR in Scrubber	Others
By product from the Effluent	<div>• De-SOx - H₂SO₄ / Discharged to sea - Na₂SO₄ / Stored Onboard</div> <div>• De-NOx - HNO₃ to be transformed to NaNO₃ & can be Recycled as Fertilizer</div> <div>Drawbacks : Storage space Onboard</div> <div>Note : To solve the drawback, need more study 1) Development of Sodium tech. 2) Pickup system for fertilizer factory</div>	<div>N/A : Emission to the air and sea (At closed loop, depends on ECAs)</div> <div>Side effect : NH₃ Slip & Ammonia Oxidation - Add. NH₃ Required. - Abatement eff. of NOx to be lowered due to the Oxidized Ammonia absorbed into the surface of the lifespan of the catalyst - Deactivation of the catalyst - Corrosive pollution of the Surround</div>
Classification & Certificates	DNV-GL AIP Upon Request (MED as well)	Applied.
Recommend	To install SCR Ready Scrubber with easy cost, Compared to the installation of typical SOx scrubbers alone.	



BWTS Retrofit

Among various technologies to treat ballast water in accordance with tougher international regulations, "Ultraviolet(UV) systems" and "electrolysis systems" are most preferably accepted and adopted by the current BWTS retrofit market. HGS offers both BWTS options, HiBallast and EcoBallast, which are well fitted for clients' retrofit needs and requirements.

Approval for Simultaneous DeSOx & DeNOx EGCS Technology

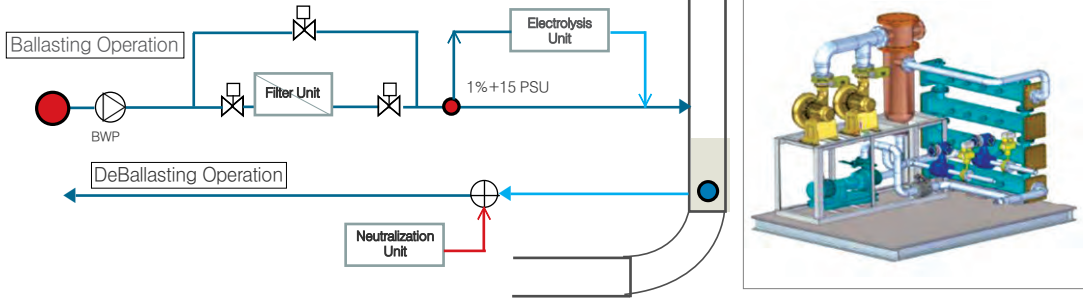
DNV-GL AIP



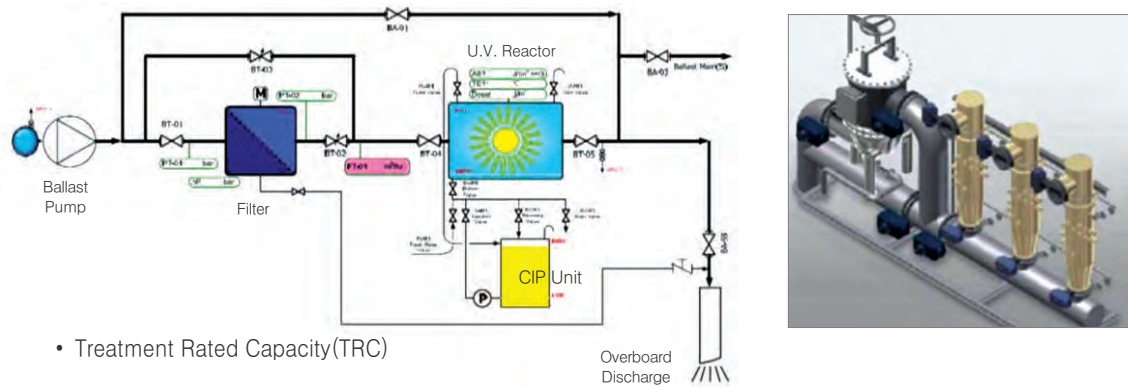
Aip Content

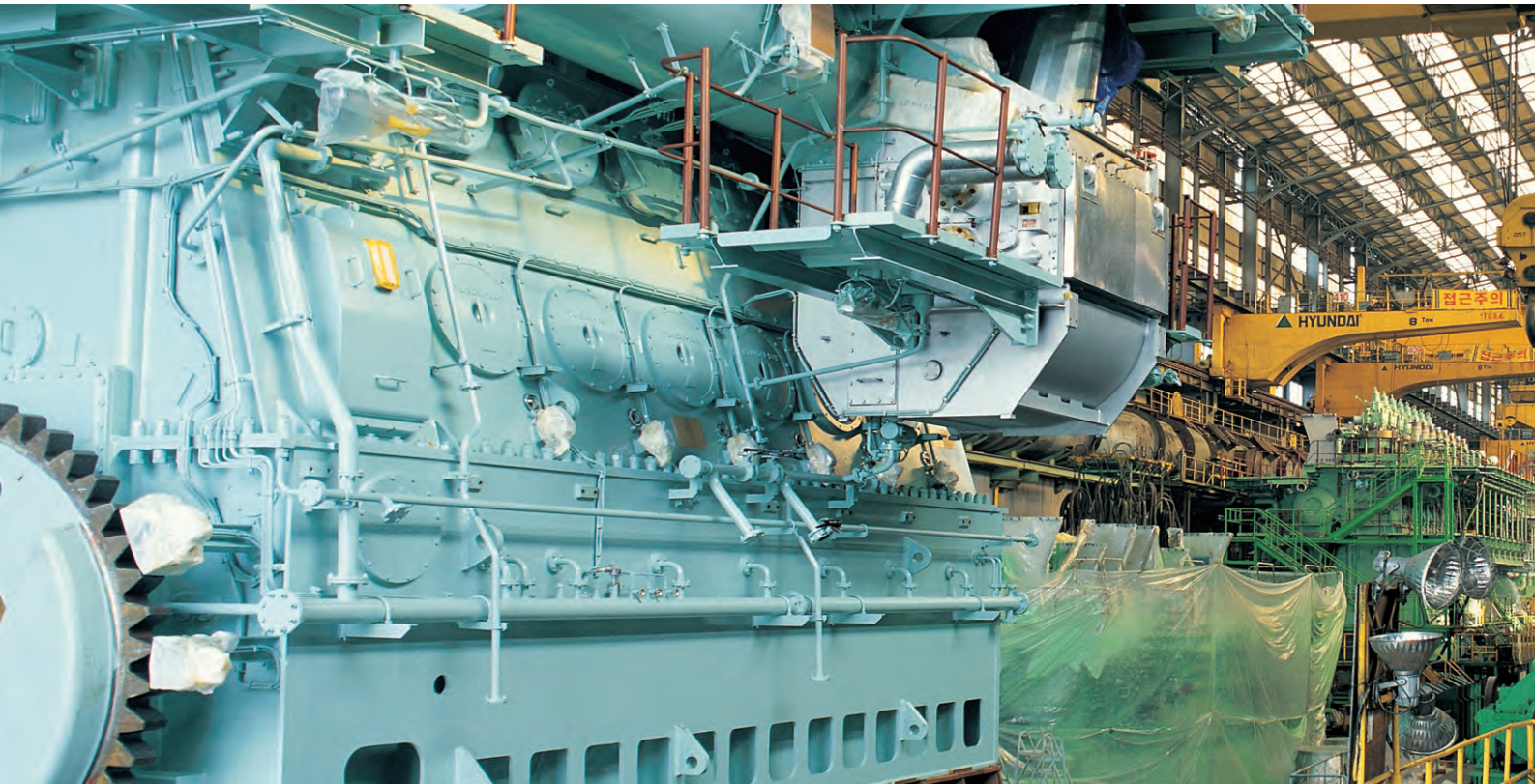
1. Ship type : 14,000TEU Container
2. Rule : MEPC 259(68), NTC
3. Aip Scope
 - Performance Test
 - Pilot Test for SiNSAS
 - IMO Rule Documents
 - EGC Record Book
 - ETM-B
 - OMM
 - SECP
 - Operation Manual
 - HAZID
 - HAZID Report
 - Monitoring System Manual
 - SOx, NOx, CO2 analyzer
 - Turbidity sensor, pH meter, PAH monitor

• HiBallast System Flow Diagram



• EcoBallast TM System Flow Diagram





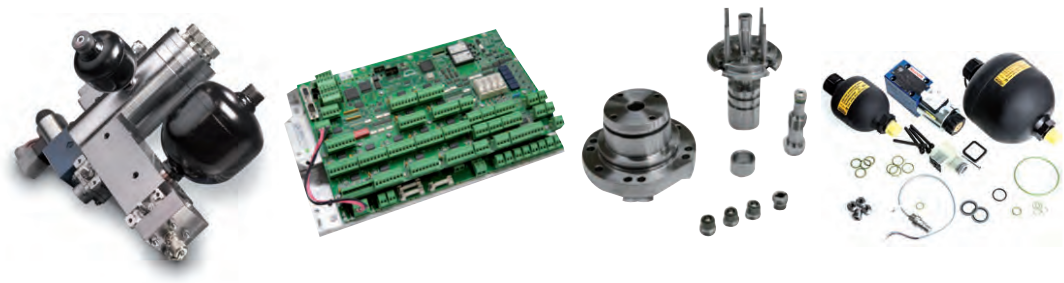
Alpha Lubricator Overhaul & Retrofit

Working Scope

- Inspection of control unit
- Timing check of angle encoder & pick up sensors
- Replacement of pick-up sensors
- Inspection of feedback sensors
- Simulation test by pre-lubrication
- Routine maintenance for running hours(5 years, 7 years)

Benefits of upgrading system

- Cylinder lubrication oil saving of 20-50% at low load
- More accurate feed rate control at all engine loads
- Minimising over-lubrication at low load, Reducing deposits, hence improving the cylinder condition
- Implementation of latest design features
- Upgraded interface by latest software version



M/E Pneumatic Control System Overhaul

Working Scope

- Ensure safety voyages
- Periodic maintenance
- Copmonents
 - Repair Kits for VIT Actuator
 - Repair Kits for reversing air cylinder
 - Repair Kits for pneumatic control system
 - Working period : 3 Days in D/D

Recommended maintenance intervals

Interval	Within 1 year	2 years	3 years	6~8 years
• Drain	• Once a day			
• Filters	• 1month after delivery • 1year after delivery		• Overhaul	• Overhaul • Renew rubber part • Renew filter elements
• Low-Pressure • Pneumatic • Devices (less than 10kgf/cm2)			• Overhaul	• Overhaul • Renew rubber part • Renew filter elements
• Low-Pressure • Pneumatic • Devices (less than 30kgf/cm2 or less)		• Overhaul	• Overhaul • Renew rubber part • Renew filter elements	

Components

- Reversing Air Cylinder
- Pos No.50,103,85,87,89,91
- Actuair
- Pos No. 128X6
- Pos No.84,86,88
- Pos No. 117
- Pos No. 101
- Pos No. 45.59



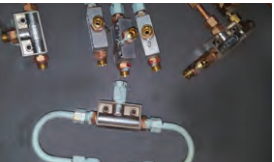
Reversing Air Cylinder



Actuair



Pos No.84,86,88



Pos No.50,103,85,87,89,91



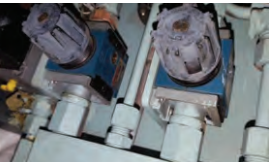
Pos No. 128X6



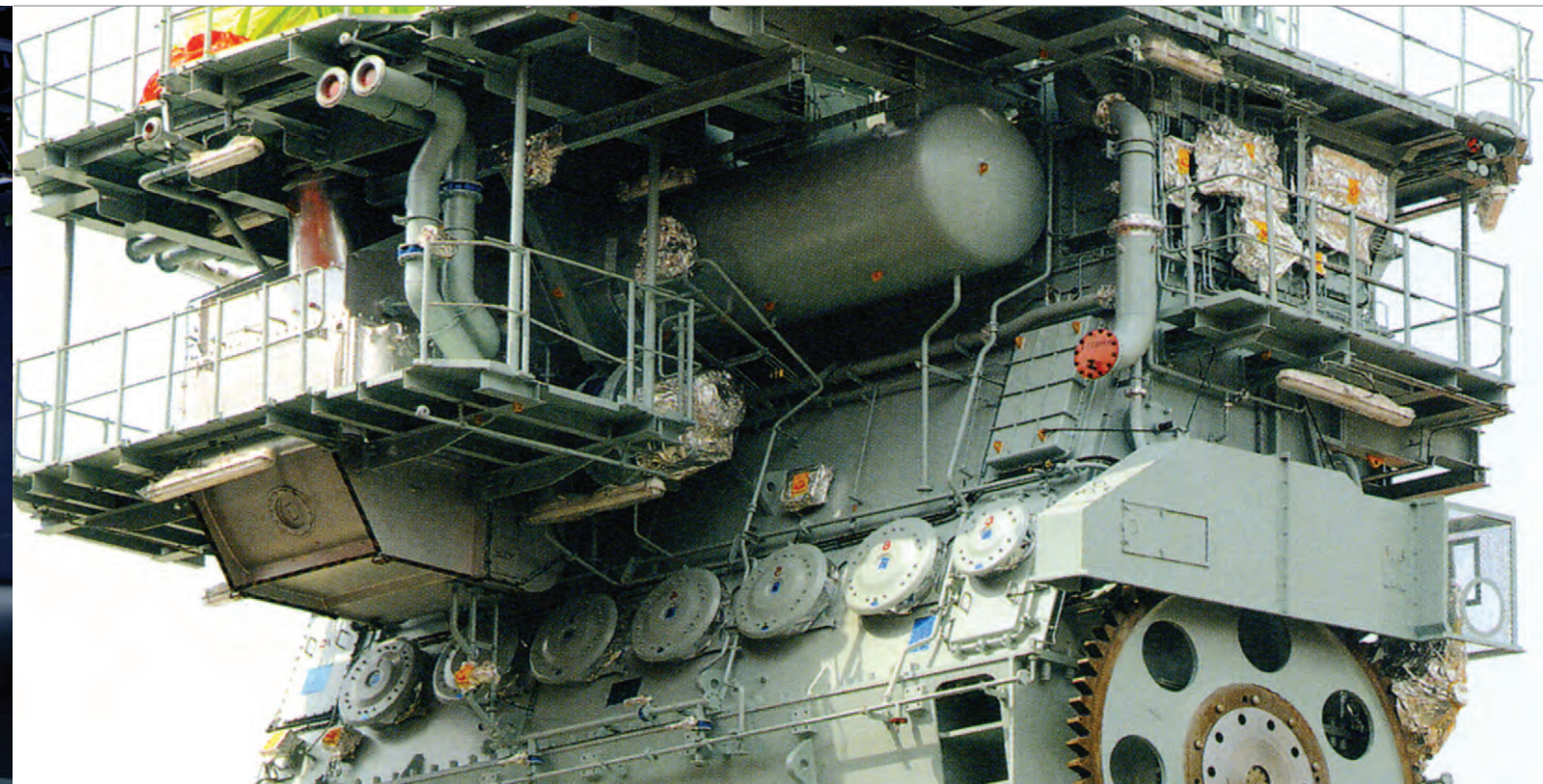
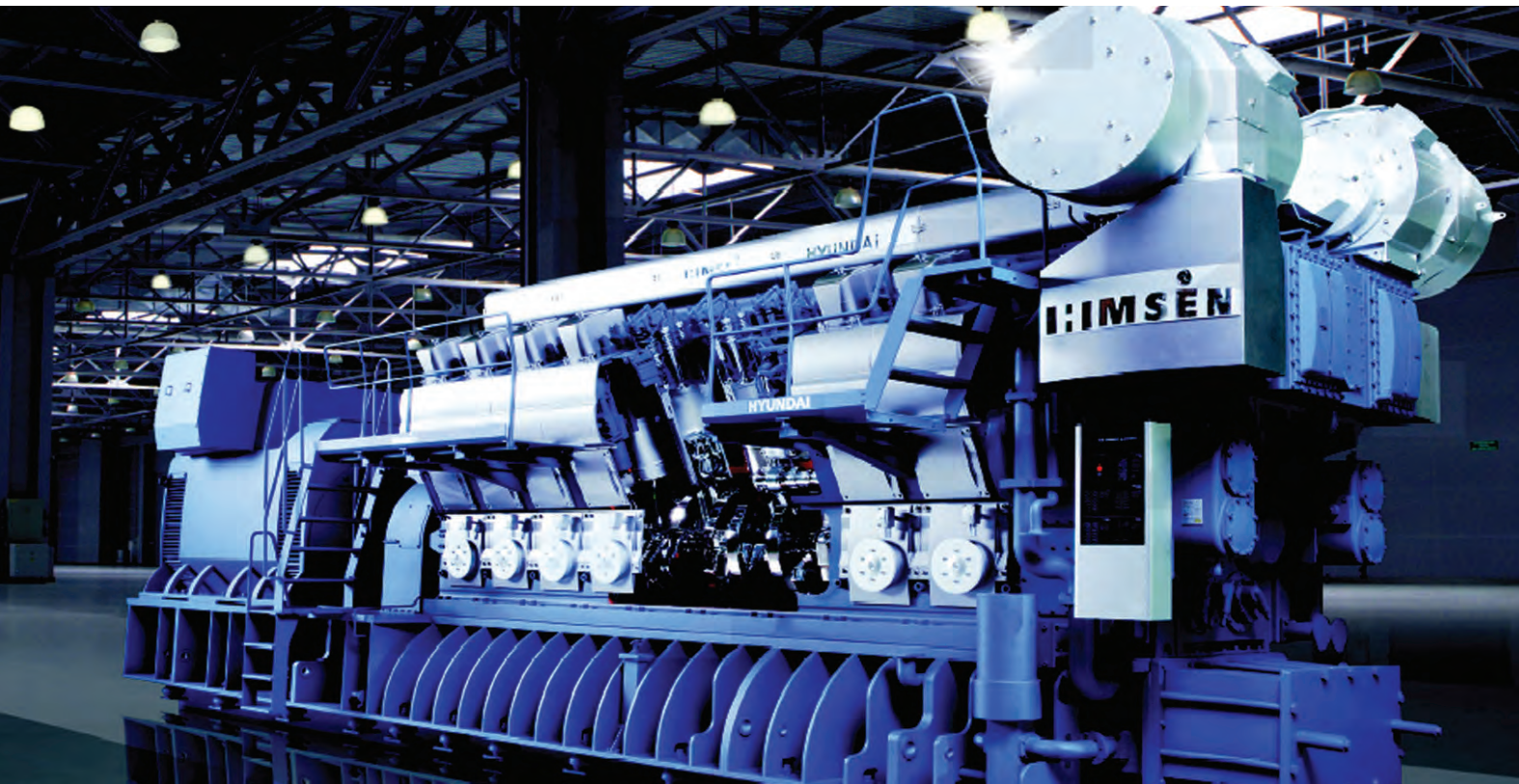
Pos No. 117



Pos No. 101



Pos No. 45.59



4-Stroke Engine Overhaul(Himsen, MDT)

Himsen 16,000 HRS routine maintenance (24000 & 32000 HRS applicable)

● Benefits

- Correct engine maintenance work for 16,000hrs will be guided by Service engineer of Hyundai-GS during maintenance work.
- Correct engine operation working procedure will be guided by Service engineer of Hyundai-GS during maintenance work in order to protect big damage of engine.
- Service engineer of Hyundai-GS is available during her sailing/dry dock.

● Working Scope

- Cylinder head
(Excluded cylinder head reconditioning)
- Piston & Piston rings
- Connecting rod and big-end bearing
- Cylinder liner
- Cooling water jacket
- Timing gear and pump driving gears
- Camshaft bearing
- Fuel injection pump & Fuel injection valve
- L.O. Pump & C.W. pump



2-Stroke Engine Overhaul(MDT, Win-GD)

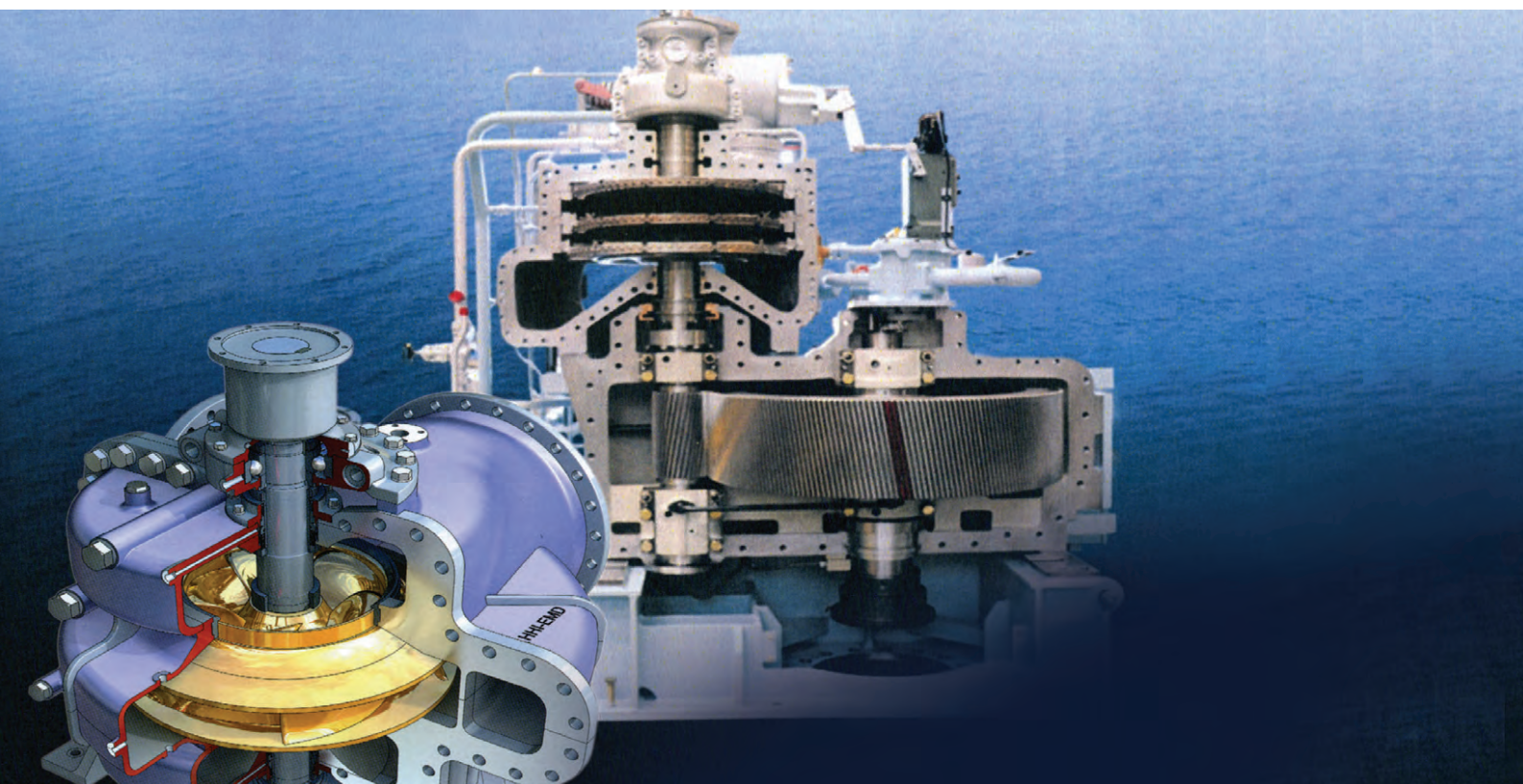
● Benefits

- Overhaul service is including overhaul kit and dispatching S/V at the vessel's dry docking
- Correct engine maintenance work for 2,000 / 4,000 / 6,000 / 8,000 / 16,000 hrs will be guided by guided service engineer of Hyundai-GS during maintenance work.
- Correct engine operation working procedure will be guided by service engineer of Hyundai-GS during maintenance work in order to protect big damage of engine.
- Service engineer of Hyundai-GS is available during her sailing/dry dock.
- High quality maintenance service guaranteed by Hyundai-GS
- Easy of engine operation
- Safety voyage

● Working Scope

- ME Type Engine Maintenance
- Pneumatic Control Maintenance
- Alpha Lubricator Maintenance
(5 years, 10 years)
- Maintenance Work / Overhaul inspection
according to Engine Running Hour





Side Thruster Maintenance

● **Benefits**

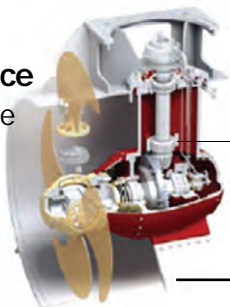
- Overhaul service is including overhaul kit and dispatching S/E at the vessel's dry docking
- Improved pitch control performance by replacement of O.D Box (NF type) with feedback device
- Replacement of EAL-Sealing applicable to the ' VGP2013 rule'
- Installation of the HEX-programming for the safety operation
- Inspection of hydraulic system & calibration for the operating convenience

● **Service area**

- Korea, China, Singapore, Middle East & Europe

● **Contents of maintenance**

- Performance of maintenance
- Overhaul evaluation
- Overhaul maintenance
- Calibration



Component	Description	Remark
Thruster Unit	Blade Seal	
	Lip Seal	Seal Mark Scope
	Radial Shaft Seal	
	Oil Distribution Unit	Old Type->
HUP	Feed-back Part	New Type
	Solenoid Part	
	Throttle Valve	
	Reliet Valve	
	Line Filter Element	

COP/T & WBP Maintenance

● **Benefits**

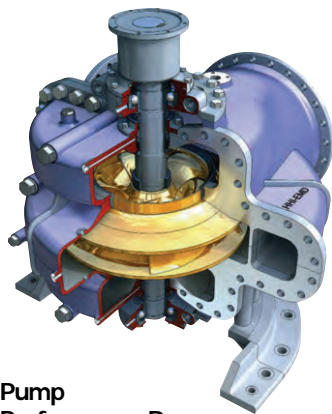
- Total maintenance service : Spare parts + Maintenance + Calibration
- Rapid technical service from specialized Hyundai service engineer
- Leakage check and replacement of sealing device for excellent sealing performance
- Check the alignment of the turbine(gear) shaft and the shaft of the driven machine
- All kinds of safety function & running condition after overhaul for the safety operation

● **Service area**

- Korea, China, Singapore, Middle East & Europe

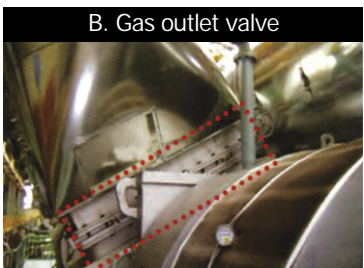
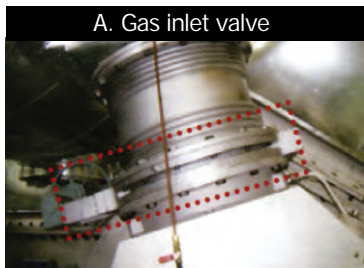
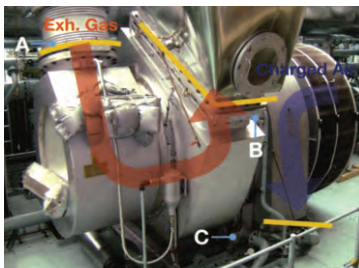
● **Regular maintenance plan**

Equipment	Part name	Remark
Cargo oil pump	Rotating part	Every 5 years
	Wearing part	Every 5 years
	Casing	Every 5 years
	Gear coupling	Every 5 years
Steam turbine	Easy stop & Governor valve	Every 3 years
	Bearing	Every 3 years
	Rotating part	Balancing test
	Sealing part	Every 3 years
	Oil deflector	Every 3 years
	COSP	Every 5 years
Stripping & Vacuum pump	AVSS	Every 5 years

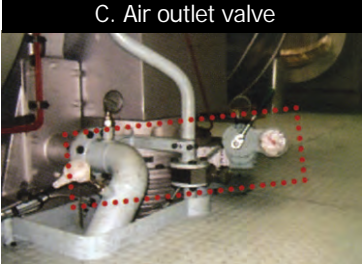


Pump Performance Range
Cargo Oil Pump : 1,800 - 6,050 m³/h
water Ballast Pump : 1,200 - 5,00m³/h

Turbocharger Overhaul / Cut Off for Low Load Operation and Fuel Saving



Application	New / Retrofit 2 (or more) T/C installed engine
Description	At low load operation, • 1 T/C cut-off • Increase of scavenge air pressure
Benefit	SFOC reduction : 2~3 g/kWh at low load



Trouble Shooting & Repairs

Machinery, Electrical & Automation

To solve the existing problems on machinery, our experienced and qualified engineer describe symptoms of malfunction and determining and remedying to restore the machinery to its working state.

● Benefits

- High quality R&M service guaranteed by HYUNDAI-GLOBAL SERVICE
- Engine history & management available
- Updated technical information will be provided by HYUNDAI-GLOBAL SERVICE

● Main engine repair and maintenance service

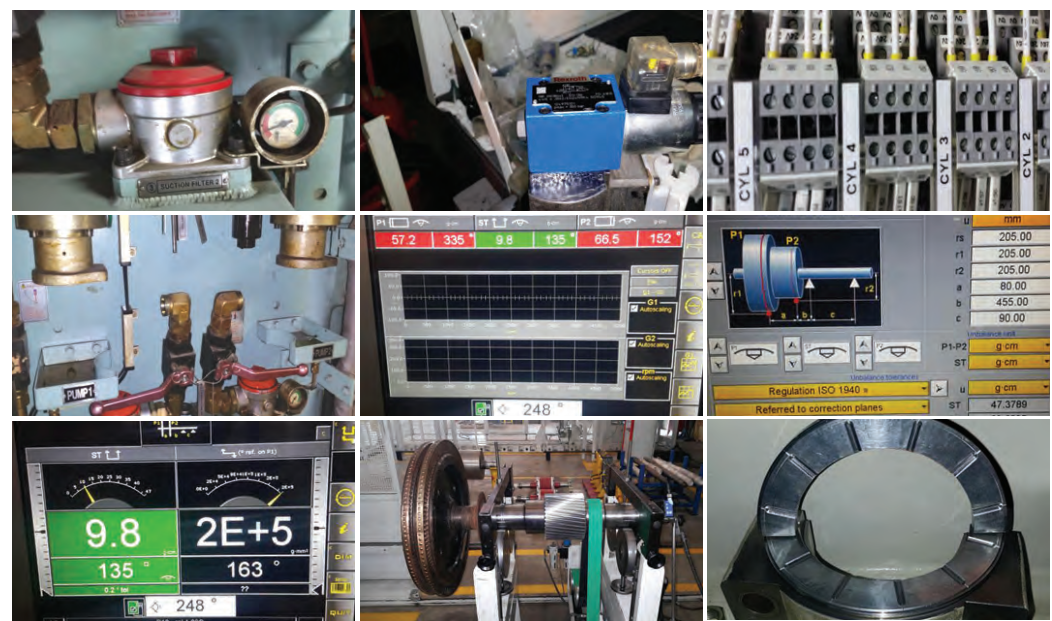
- Fuel Pump overhaul
- Bearing overhauls (main, crankpin, crosshead)
- Engine performance check (Cam timing & Efficiency check)
- Lubrication system check including ALFA Lubricator
- Turbocharger overhaul
- Laser measurement of cylinder liner (Without dismantling Cylinder Head)

● Auxiliary engine repair and maintenance service

- Cylinder Head & Overhaul
- Piston, Connecting Rod, Cylinder liner overhaul
- Camshaft and Camshaft drive inspection
- Inlet & Exhaust Valve overhaul
- Crankshaft deflection check & main bearing inspection
- Turbocharger & Compressed air system overhaul

● Local control panel and bridge maneuvering system

- Trouble shooting overhaul of ACONIS, KONGSBERG, NABTASCO, LYNDSO & OTHERS SYSTEM



Repairing & Reconditioning

J.O.Eng has strengthened the technical and Engineering services in the field of repairing and reconditioning for essential machinery such as cylinder liner, cylinder heads, piston crowns, exhaust valve spindles, plunger barrels nozzles turbo charger and governor. We are also specialized for repairing of high quality stainless steel welding work in cargo tanks of chemical tankers.

● Service area

- Korea, China, Singapore, Dubai & Europe

Electrical & Electronics / Automation (ACONIS)

J.O.Engineering.Co.,Ltd provides preventive and break down maintenance of rotating electrical machinery and associated equipment I.E Generators, Motors. We offer regular check up/breakdown maintenance of power management systems, protection equipment, feeder, power distribution / switch gear and propose customized solution including replacement of potentially defective devices. J.O.E offers regular checkup and maintenance of defective integrated control and monitoring system. Above services are performed by well qualified and authorized service engineers with exceptional experience in respective fields



● Service area

- Korea, China, Singapore, Dubai & Europe

Marine machinery maintenance

J.O.Engineering.Co.,Ltd provides fast & reliable supply of genuine spare parts for all Korean manufactured marine to our customers throughout the lifespan of the ships. Repair service of above machinery by authorized / qualified service engineers at competitive cost is also available

● Service area

- Korea, China, Singapore, Dubai & Europe

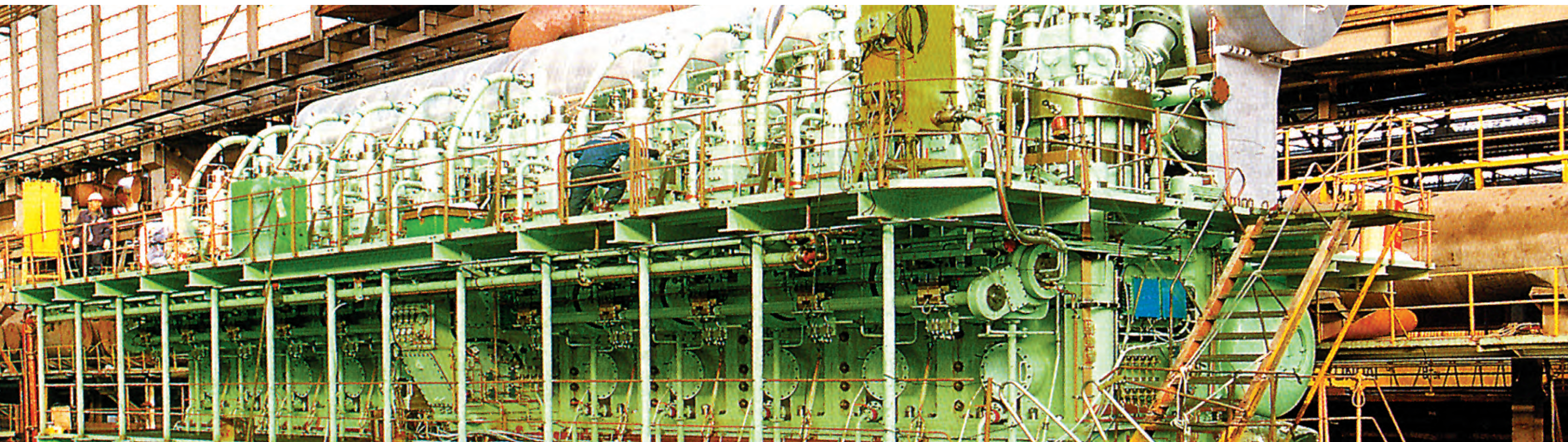
LSA & FFA maintenance



02

Spare Part Service

- 2.1 2-Stroke Diesel Engine
- 2.2 4-Stroke Diesel Engine
- 2.3 General Marine Equipment & Machinery



2-Stroke Diesel Engine

As a formal parts sales agent certified by Hyundal Engine & Machinery division, J.O.Engineering can supply genuine parts of 2-Stork diesel engine

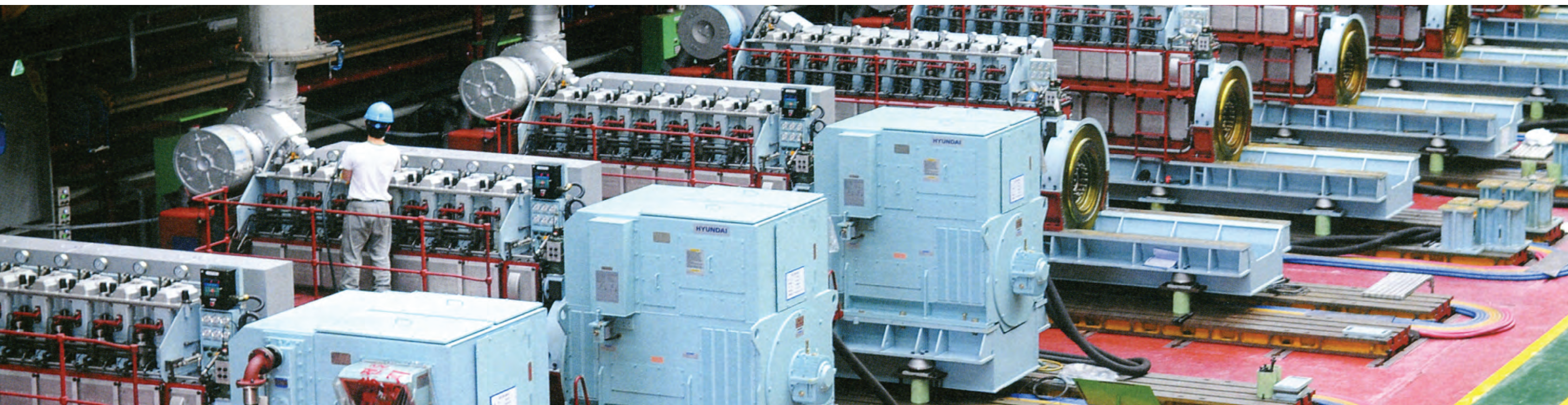
2-Stroke Engines

Hyundal-MAN B&W		Hyundal-Wartsila		
MC/MC-C/MC-s Type	ME/ME-C/ME-B/ME-Gi Type	RTA Type	RT-Flex Type	X Type
98MC/MC-C	98ME/ME-C	RTA48R-B	RT-Flex48T-DVE	X35
	95ME-C	RTA50	RT-Flex50-D	X40
90MC/MC-C/MC-s	90ME-C/ME-Gi	RTA52U	RT-Flex50-B	X62
80MC/MC-C	80ME-C/ME-Gi	RTA58T-B	RT-Flex58T-DVE	X72
70MC/MC-C	70ME-C/ME-Gi	RTA62U-B	RT-Flex60C-B	X82
60MC/MC-C	60ME-C/ME-Gi	RTA68-B	RT-Flex68-D	X92
50MC/MC-C	50ME-ME-B/ME-Gi	RTA72U-B	RT-Flex82-C	
46MC-C	46ME-B	RTA82T	RT-Flex82-T	
42MC		RTA84C	RT-Flex82T-B	
35MC	35MC-C/ME-B	RTA84T-D	RT-Flex84T-D	
		RTA96C	RT-Flex96C-B	

Components

- Bed Plates
- Connecting Rods
- Cylinder Heads
- Cylinder Liners
- Piston Rods
- Cylinder Frames
- Frame Box
- CKD/PKD Base Engine Components
- Cross Head Pins





4-Stroke Diesel Engine

HHi-END has developed its own specially designed HIMSSEN engine incorporating its valuable experience and technical know-how acquired in manufacturing diesel engines for over two decades.

4-Stroke Engine

D/Gen Engine (Midium Speed)		
ENGINE	FOR USE	TYPE
HYUNDAI HIMSSEN	MARINE & OFFSHORE	H17/21V H 17/28 (E) H 17/28 (E) H21C H 21/32 H22CDF H 25/33 H25/33V H27DF H 32/40 (V) H35DF
	MARINE PROPULSION	H 21/32 P H 25/33 P H 32/40 P
	STATIONARY	H 17/28 (G) H 17/28 H 21/32 (V) H 25/33 (V) H 32/40 (V.GV)
HYUNDAI HOLEBY MAN B&W	MARINE	L 32 / 40 L 27 / 38 L 16 / 24 L.E.V 23 / 32 H.A.K L.E.V 23 / 30 H.A.K

Components

- Cylinder Blocks
- Cylinder Covers
- Piston Crowns
- Cylinder Liners
- Re-Engine Services
- Cylinder Heads
- Connecting Rods Frames
- Pistons





General Marine Equipment & Machinery

J.O.ENG Supplies genuine parts of various marine equipment & machinery which has been produced and supplied by manufactures in korea as well as foreign countries. J.O.Eng has been authorized for access to any available technical data of the vessels in HHI's possession under mutual business cooperation

● Engine Room Machinery

- M/E & D/E engine
- Various pump & motors
- Various valve & remote control system
- Purifiers
- Air compressor
- Oily water seperator
- Filters
- Heat exchanger & cooler
- F.W.Generator
- Boilers
- MGPS
- Sewage Treatment
- Calorifier, Sterilizer
- Mineralizer

● Hull Machinery & Out fittings

- ICC & Anode
- Steering Gear & Winches
- Bow / Stern thruster
- Various crane & davit
- Life saving appliance
- Hatch cover fittings
- Accom. Lader/Pilot ladder
- Air con plant/Ref plant
- Elevator
- Air horn & whistle
- Vent fan & Motor

● Electric Equipment

- Various elect motors
- E/R monitoring system
- Lighting Fixture
- Fire Detection System
- Radar, Gyro compass
- Echo Sounder / Doppler speed Log
- Electionics / Automaction

● Cargo Oil Handling System

- C.O.Pump / W.B.Pump & Turbine
- Level Gauge
- Valves & Remote control system
- Fire Extinguishing system
- Detection system
- Inert Gas system



03

Power Plant
Service



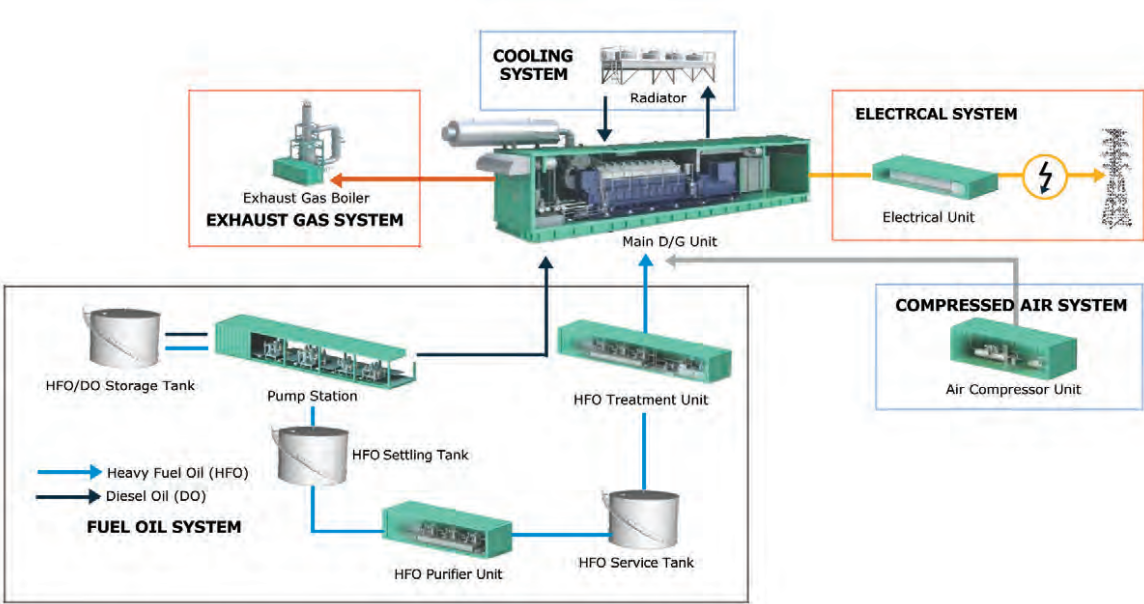


Power Plant Services

HGS is the specialized total service provider of Electrical power such as warranty, O&M, spare parts, engineering, Fuel conversion, training and ludrcants oil supply service. For power plant application, we have supplied 192 power plants, 1959 units, total 5,286MW managed by HGS.

Our global resources combined with over 45 years of experience, enable us to provide total services for all types of diesel, gas and duel fuel engine plants.

Through continuously evolving new technology and expertise, HGS offers you optimized service to get the stable power production and effective operation of your plant.



Spare Parts Management

- Reliable supply of all the spare parts throughout the entire life cycle
- Ready to supply right parts on sharp and fast-tracted global supply chain for urgent parts
- Supplying the parts through specialized parts inventory management system

Long-term Operation and Maintenance

- Daily / Weekly / Monthly operation report by qualified engineers and technicians
- Scheduled and unscheduled accurate maintenance
- Managing risk and decision at the right time

Performance Diagnosis

- Diagnosis and life evaluation of power equipment
- Precise diagnosis of engine core parts
- Noise and vibration diagnosis technologies

Total Lifecycle Cost Management

- Fuel efficiency optimization over the life of the equipment
- Real-time price and availability informed purchasing decisions with highly customized inventory controls
- Reporting and proactive spares inventory management reducing cost and time

Technical Support

- 24/7 hours technical support
- Provide the expert technology service
- O&M / Retrofit / Spare Parts / Performance improvements technical support

Retrofit and Upgrades

- Modernization and life-time extension of a power plant
- Comprehensive and flexible retrofit solution
- Better acceleration performance of the power plant
- Up-to-date human-machine interface with IT solution



Technical Support System

JO Engineering since its foundation in 1998 has evolved into robust technical support company apart from Hyundai Global Service authorized spare part agent. Equipped with experienced marine engineers , engine specialists/subcontractors, we are one stop solution to all your technical support needs and have provided satisfactory services to shipping companies world over JOE invites customer inquiries for ship's technical problems/maintenance/Retrofits and any other marine related services. We assure you of best services in the field



Quality Assurance

A Leader in the High Technology
With more growth aiming toward the future always considers the quality and enviornment in advance.

Certificates



- 1

2

3

4
- 1) KS Q ISO 9001 Quality Management system

2) KS Q ISO 14001 Environmental Management system

3) Hyundai Global Service Certificate

4) Export Prize from Korean Government

Office & Warehouse



- 1

2

3
1. 1st Office(Main)

2. 2nd Office

3. Warehouse

Branch office & Agent Global Network

 **J.O.ENGINEERING CO.,LTD.**
Branch Office and Agents

 **HYUNDAI**
GLOBAL SERVICE
Hyundai global service network agent & Support

