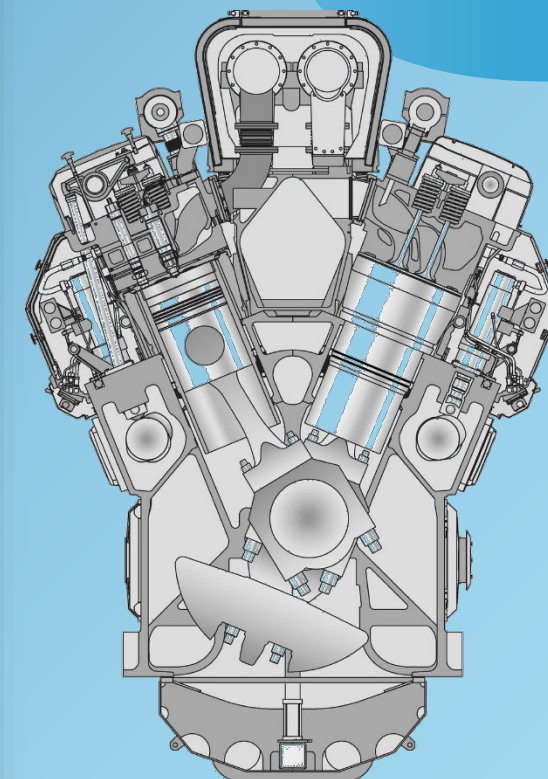




## DF Engine Maintenance for LNG/C



KOREA GLOBAL SERVICE CO., LTD.  
Skyrex 103-320, Samsan-ro 303  
Nam-Gu, Ulsan, Korea. 44713  
Tel : +82 52 710 5006 Fax : +82 52 710 5007  
E-mail : sales@koglos.com

**Specialized Service for LNG Ships**

## 1. Introduction of DF Service

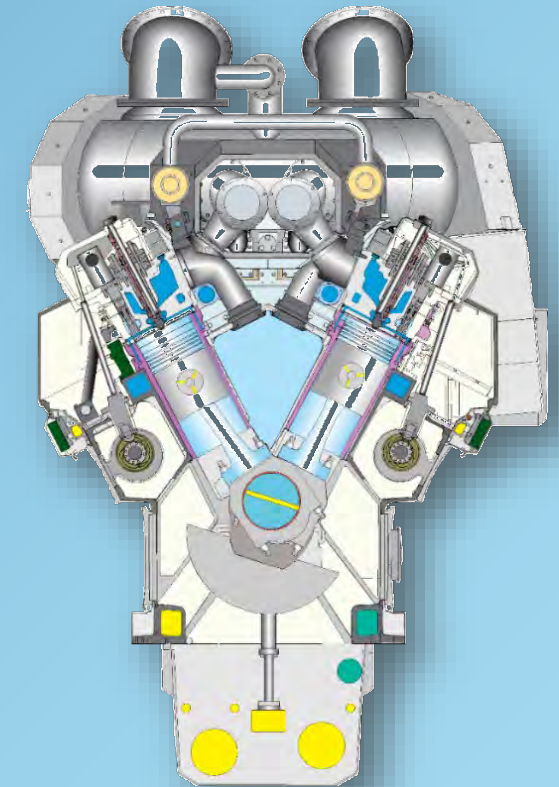
- All engineers are of ex-Hyundai Wartsila or Wartsila Korea trained by engine builder and abundant service work experiences – **All Korean engineers**
- More than 30% cost effective than the original engine builder or maker
- Company registered to Hyundai Global Service(HGS) as the authorized repair agent
- **Available for Wartsila DF, Hyundai Himsen DF**

## 2. Estimation of major overhaul (18,000 R/H sample)

Engine type	Duration	Man-days	Estimation(USD)
12V50DF x 1	6 S/E X 20 Days	120	108,000
8L50DF x 1	6 S/E X 10 Days	60	54,000

**30% lower price than original maker**

- Estimation is based on major overhaul for 50DF engine (refer to KGS work scope)
- If require attached overhaul service(optional), 11~15 days by 6 S/E per engine
- Tariff: USD900 /man-day as lump-sum, **NO EXTRA COST FOR WEEKENDS & HOLIDAYS**
- All the required spares to be supplied by shipowner
- The above estimation is an example only, and the actual cost shall be calculated subject to condition
- Hotel & travel expenses to be added on actual basis
- Same work scope for 18,000 R/H or 24,000 R/H major overhaul
- For 36,000 R/H maintenance, working days will be increased as per work scope



### 3. Major Overhaul Work Scope (18,000 R/H)

**Connecting rods** : Inspect big/small end bearing for one bank, replace if required

**Crankshaft** : Inspect main bearing for one bank, replace if required

**Cylinder heads** : Replace with reconditioned one

**Cylinder liners** : Inspect liners and measure bore and honing, renew anti-polishing ring

**Piston** : Pull & inspect replace complete set of rings as running in program

### 4. Attached Overhaul Work Scope (18,000 R/H) (Optional)

**Booster servomotor for governor** : Overhaul and replace worn parts

**Exhaust manifold** : Renew expansion bellows

**Flexible coupling** : Check flexible coupling

**Fuel injection pump** : Overhaul and replace worn parts

**Governor driving gear** : Inspect and replace the parts

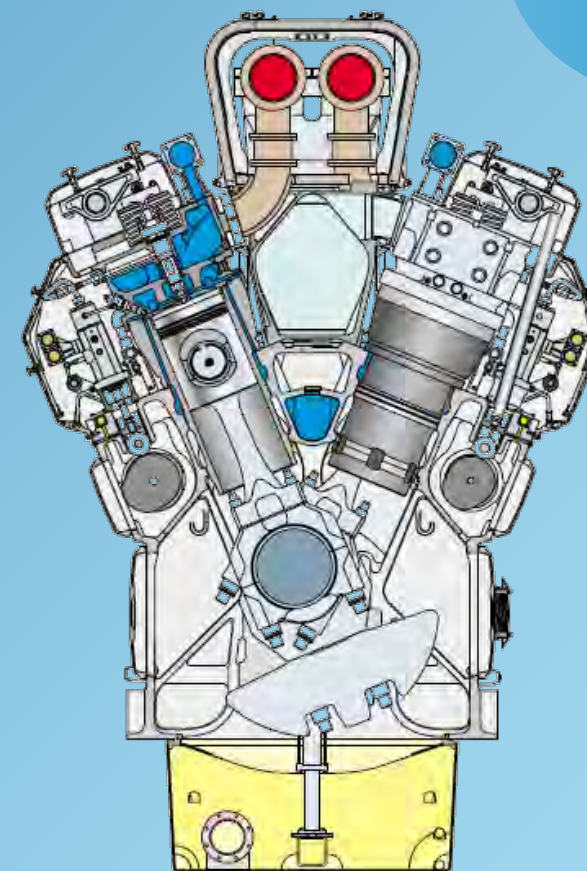
**HT-water pump** : Pump, driving gear, thermostatic valve, inspect and replace parts

**LT-water pump** : Pump, driving gear, thermostatic valve, inspect and replace parts

**Lube oil pump** : Pump, driving gear, thermostatic valve, inspect and renew bearing and shaft seal

**Main starting valve** : General overhaul and renew worn parts

**Pilot fuel pump** : Replace pilot fuel pump



# 5. KGS Standard DF Maintenance Work Scope (18,000 R/H)



**KOREA INTEGRATED MAINTENANCE PROVIDER**  
 • MAIN ENGINE : ME & MC TYPE MAN HYUNDAI, DOOSAN, STX  
 • ELECTRIC SWITCHBOARD : 660V, LOW VOLT, HIMARIS/SMAP  
 • DIG ENGINE : HMMSEN, MAN, HOLEBY, WARTSILA  
 • RC/SBMS : NABTESCO, KONGSBERG, ACONIS AMS/PMs  
 • KOREA MKR : PUSNES DECK MC, HI-AIR A/C, KANGRIM BOILER  
 • GENERAL REPAIRS : HULL, OUTFITTING, VDR, GYRO, GMDSS

**KOREA GLOBAL SERVICE**  
 Hoemae 220, Ssangnok, 242 Samnang-ro,  
 Songdeok-dong, Nam-gu, Ulsan  
 Korea 44713.  
 Tel : +82-52-710-6000  
 Fax : +82-52-710-5007  
 E-mail : sales@kgsos.com

## Wartsila 50 DF Engine Maintenance Work Scope

● Major Overhaul items

No.	System	Maintenance Task
1	Connecting rods	Inspect big end bearing, one/bank Dismantle the big end bearing. Inspect mating surfaces. If defect found, open all big end bearings. Renew bearing shells, if necessary.
2	Connecting rods	Check small end bearing and piston pin, one/bank If defects found, open all and renew if needed.
3	Crankshaft	Inspect main bearings Inspect one main bearing. If in bad condition, check/change all main bearings. Note the type of bearing in use and do the inspection accordingly.
4	Crankshaft	Check thrust bearing clearance Check axial clearance.
5	Cylinder heads	Replace of cylinder head
6	Cylinder liners	Inspect the cylinder liners Measure the bore using form No. 5010V001, replace liner if wear limits are exceeded. Hone the liners. Check the deposits from cooling bores. If the deposits are thicker than 1mm, clean. Renew the anti-polishing ring.
7	Piston	Check the cooling gallery deposit, one piston/bank If the deposition exceeds 0.3 mm, open all piston tops. Inspect the piston skirt, clean lubricating oil nozzles.
8	Pistons, piston rings	Inspect pistons and replace piston rings Pull, inspect and clean. Check the height of the piston ring grooves, use forms No. 4611V009 and 4611V002. Check the retainer rings of the gudgeon pins. Replace complete set of piston rings. Note the running-in programme.



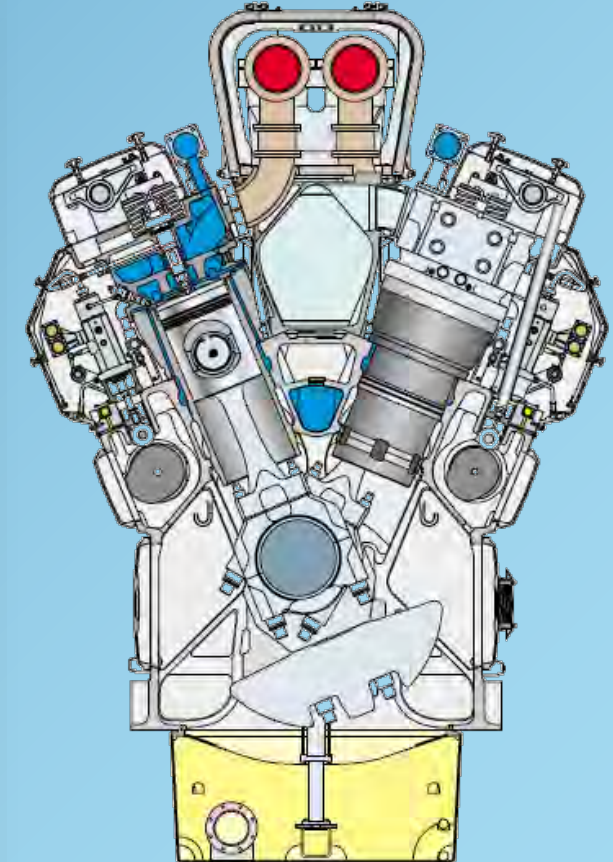
**KOREA INTEGRATED MAINTENANCE PROVIDER**  
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 • ELECTRIC SWITCHBOARD : 660V, LOW VOLT, HIMARIS/SMAP  
 • DIG ENGINE : HMMSEN, MAN, HOLEBY, WARTSILA  
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 Hoemae 220, Ssangnok, 242 Samnang-ro,  
 Songdeok-dong, Nam-gu, Ulsan  
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 Tel : +82-52-710-6000  
 Fax : +82-52-710-5007  
 E-mail : sales@kgsos.com

## Wartsila DF Engine Maintenance Work Scope

● Attached Overhaul items (Optional)

No.	System	Maintenance Task
1	Booster servomotor for governor	General overhaul of the booster servomotor Replace worn parts. See manufacturers instructions.
2	Exhaust manifold	Renew expansion bellows Renew the expansion bellows between exhaust pipe sections, after the cylinder head and before the turbocharger.
3	Flexible coupling (Oil supply from engine)	Check the flexible coupling Dismantle and check flexible coupling acc. to manufacturers recommendations.
4	Fuel injection pump	Overhaul of injection pumps Clean and inspect injection pumps, replace worn parts. Renew fuel injection pump elements. Replace the erosion plugs.
5	Governor driving gear	Inspect governor driving gears Replace parts if necessary.
6	HT-water pump	Inspect HT-water pump Dismantle and check. Renew bearings and shaft sealing.
7	HT-water pump driving gear	Inspect HT-water pump driving gear Replace parts if necessary.
8	HT-water thermostatic valve	Clean and inspect HT-water thermostatic valve Clean and check the thermostatic element, valve cone-casing and sealings.
9	LT-water pump	Inspect LT-water pump Dismantle and check. Renew bearings and shaft sealing.
10	LT-water pump driving gear	Inspect LT-water pump driving gear Replace parts if necessary.
11	LT-water thermostatic valve	Clean and inspect LT-water thermostatic valve Clean and check the thermostatic element, valve cone-casing, indicator pin and sealings.
12	Lube oil pump	Inspect lubricating oil pump Renew bearings and shaft sealing.
13	Lube oil pump driving gear	Inspect lubricating oil pump driving gear Replace parts if necessary.
14	Lube oil thermostatic valve	Clean and inspect lubricating oil thermostatic valve Clean and check the thermostatic element, valve cone-casing and sealings.
15	Main starting valve	General overhaul of main starting valve Renew worn parts.
16	Pilot fuel pump	Replace the pilot fuel pump Replace the pilot fuel pump
17	Turbocharger(s) ABB TPL-chargers	Inspect turbocharger parts Inspect and replace the nozzle ring, turbine diffuser/cover ring if necessary





## 6. 50DF 18,000 R/H Overhaul Work Schedule

○ Engine Type : Wartsila 6L50DF

○ Manpower : 6 Person (1 Engineer + 5 Technicians) x 10 Days per 1 Engine (without Travelling / Waiting time)

No	Work Scope	Working Schedule									
		+1 Day	+2 Day	+3 Day	+4 Day	+5 Day	+6 Day	+7 Day	+8 Day	+9 Day	+10 Day
1	<b>Cylinder Head Complete Replacement</b>										
	1) Dismantlement	■	■								
	2) Replacement with New/Reconditioning Parts								■	■	
2	<b>Piston Overhaul</b>										
	1) Dismantlement		■	■							
	2) Measurement & Cleaning			■	■						
	3) Piston Ring Replacement				■						
	4) Reassembly							■			
3	<b>Cylinder Liner Overhaul with Honing</b>										
	1) Dismantlement				■	■					
	2) Measurement & Cleaning				■	■					
	3) Honing by Ship's Own Tool				■	■					
	4) Reassembly				■	■					
4	<b>Big-End Bearing Replacement</b>										
	1) Dismantlement					■	■				
	2) Measurement & Cleaning					■	■				
	3) Reassembly					■	■				
5	<b>Main Bearing &amp; Thrust Bearing Replacement</b>										
	1) Dismantlement								■	■	
	2) Measurement & Cleaning								■	■	
	3) Reassembly								■	■	
6	<b>Confirm Running Test</b>										■

※ Please arrange meals during our service team on-board and some cabins (Single 2 + Suez 1 or Single 6) during on-board.

# 7. KGS Service Experience DF Engine (9L50DF at Dubai Dock 2020)



**KOREA INTEGRATED MAINTENANCE PROVIDER**  
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 • ELECTRIC SWITCHGEAR : 660V, LOW VOLT, HIMA/SYMAP  
 • D/G ENGINE : HINSEN, MAN, HOLBERY, WARTSILA  
 • RCS/BNS : BARTESCO, KONGSBERG, ACONS, ABB/SPS  
 • KGS/KA MKS : PUMPS, DECK MC, H/AIR, A/C, KANGRIM BOILER  
 • GENERAL REPAIRS : HULL, OUTFITTING, YDR, QYRO, DMD3S

**KOREA GLOBAL SERVICE**  
 Room 404, 26/F, 303 Samsung Bldg,  
 Samsung Bldg, Nam-Gu, Ulsan,  
 Korea 54112  
 Tel : +82-52-716-5356  
 Fax : +82-52-719-8007  
 E-mail : kgs@kgsplus.com

## SERVICE REPORT

Shipowner	D...	Date of report	29 <sup>th</sup> Aug' 2020
Ship name	LNG/C C...	Reported by	JEEHOON PARK
Place	Dry dock world Dubai in U.A.E	Work period	04 <sup>th</sup> ~ 24 <sup>th</sup> Aug' 2020
Subject	No.1 & 4 MGE Overhauling	Reference No	

### 1 Summary

#### Subject of call

Upon owner's request/order, Korea Global Service (KGS) team attended the vessel "LNG/C ..." to carry out maintenance work base on the 24,000 engine running hours overhaul planning for No.: 1 and 4 Main Generator Engine (MGE). The work was performed with good support of ship's staff during her staying shipyard (Dry Dock World) at Dubai in United Arab Emirate (U.A.E) on 05<sup>th</sup> ~ 24<sup>th</sup> of Aug' 2020.

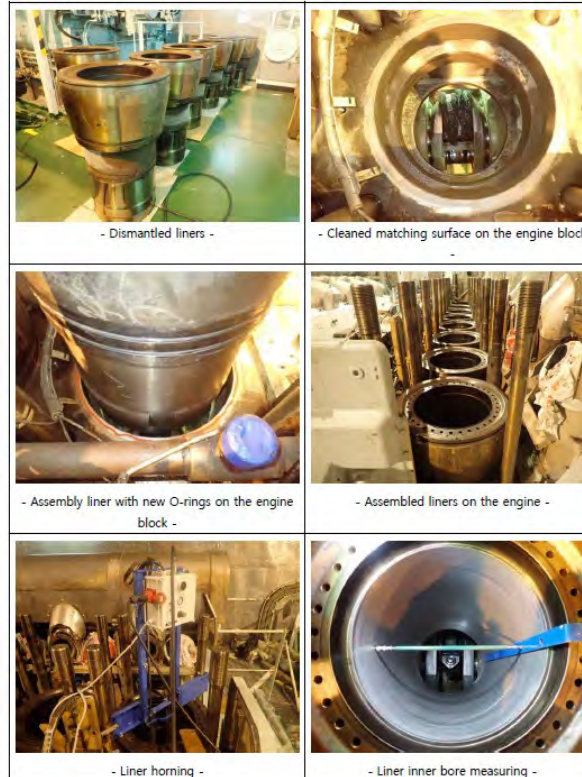
#### Conclusion

The work scopes as below mentioned of No.: 4 MGE were performed by KGS team with good cooperation of ship's engine staffs according to base on the 24'000 engine running hours overhaul planning. After maintenance complete, the engine running test with load was carried out and it has confirmed as satisfied result.

In case of No.: 1 MGE, almost maintenance scope was carried out as No.: 4 MGE. But engine running test could not carried out due to the vessel was on the dry dock.

#### ➤ Work scope

- 1) All (8 sets) of piston and connecting rods assembly with new piston rings and anti-polishing rings.
- 2) All (8 sets) of marine head (connecting rod lower part) assembly with new connecting rod bearing shells.
- 3) All (8 sets) of cylinder liner dismantling and inspection.
- 4) All (8 sets) of cylinder head assembly with reconditioned one.
- 5) Crankshaft axial clearance and deflection measurement.
- 6) One main bearing lower shell open inspection. (No.: 4 MGE only)
- 7) Flexible coupling radial-axial clearance measurement. (No.: 4 MGE only)
- 8) Engine test running (No.: 4 MGE only)





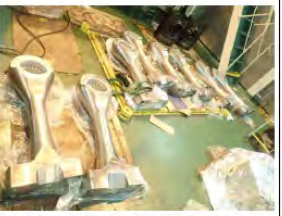




# 8. KGS Service Experience DF Engine (9L50DF at Dubai Dock 2020)

 KOREA GLOBAL SERVICE

	
- Dismantling piston and connecting rod -	- Dismantled piston pins -
	
- Dismantling marine head upper housing -	- Dismantling marine head lower housing -
	
- Dismantled No.1 piston crown and body -	- New stud, nut, spacer and O-ring for No.1 piston -

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 KOREA GLOBAL SERVICE

	
- Crack check on combustion area of pistons -	- Reconditioned con-rod for No. 1 MGE -
	
- cavitation on marine head upper housing -	- Oil way condition before and after cavitation remove on No.1 marine head upper housing -
	
- Oil way condition before and after cavitation remove on No.2 marine head upper housing -	- Oil way condition before and after cavitation remove on No.3 marine head upper housing -

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 KOREA GLOBAL SERVICE

	
- Hyd jack overhauling for marine head due to leakage -	- Assembly marine head with Hyd pressure. (1 <sup>st</sup> step=250 → 2 <sup>nd</sup> step=800 → 3 <sup>rd</sup> step=800 Bar check)-
	
- Crack check on the combustion area of all pistons -	- Prepared piston pin and reconditioned con-rod -
	
- Measuring clearance between piston pin and piston pin bush -	- Crack check on snap ring for piston -

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## 9. KGS Technical Support

### **KGS Ulsan office**

E-mail: [sales@koglos.com](mailto:sales@koglos.com)

Room 320, Skyrex,  
303 Samsanro, Samsan-Dong,  
Nam-Gu, Ulsan  
Korea 44713



PIC1: Justin Jang/Director

Tel. +82 52 710 5006

Mobil +82 10 2562 2344

E-mail: [justinjang@koglos.com](mailto:justinjang@koglos.com)

**Electric & Control service, DF engine**

PIC2: Brian Son/General Manager

Mobil +82 10 9467 8289

E-mail: [brianson@koglos.com](mailto:brianson@koglos.com)

**MC/ME engine, general spares**

# PROMPT & POSITIVE SUPPORT