HYUNDAI LNG Carrier Now and in the future - Design development of fuel efficiency and introduction of MEGI fuel supply system for HYUNDAI LNGC

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1. Introduction

Today the market for LNGC is growing after atomic power plant accident and export shale gas from USA government has been permitted gradually. Especially, the export of shale gas of Sabine pass project had already contracted at 2011 with BG group, Gas Natural Fenosa, Gail and Kogas and Freeport LNG project has been under progress of final approval from US government. In connection with these new projects including expansion Panama canal and new IMO requirement for the Green Ship, some new demands are required by Buyer for example "Post Panamax Class LNGC", "Eco-Ship" and so on. Considering these requirements, the conventional LNGC design concept was changed and several kinds of new technology and development are selected and tried to improve ship's performance and reduce the emission. Hyundai Heavy Industries has developed new class of standard LNGC considering new panamax requirement, high efficiency design and Green ship requirement.

2. Overview of Hyundai Heavy Industries Group

Hyundai Heavy Industries Group consists of Hyundai Heavy Industries Co., Ltd.(HHI), Hyundai Mipo Dockyard Co,. Ltd.(HMD) and Hyundai Samho Heavy Industries Co., Ltd.(HSHI).
Hyundai Heavy Industries Co., Ltd(HHI) had its ground-breaking ceremony in 1972 in Ulsan and today HHI accounts for about 15% share of the global shipbuilding market. HHI is capable of building all types of ships to meet various demands from its clients as it has ten(10) large-scale dry docks with seven huge 'Goliath Cranes' and HHI has so far delivered more than 1,200 ships(Over 220 ship owners) since 1972. In addition, we are having various World's records, such as The world's largest vessel : 365K ULCC, The world's biggest Propeller : 106.3 ton/9.1m and On-land Shipbuilding technology and so on.

3. HHI Performance Record & onboard List for LNGC

3.1 Reference list – LNGC Delivered : Total 40 vessels

- 125K LNGC x 3 vessels : MOSS Type (Steam Turbine, Single)
- 137K LNGC x 8 vessels : MOSS Type (Steam Turbine, Single)
- 140K LNGC x 2 vessels : MOSS & MEMB. MK III type (Steam turbine, Single)
- 141K LNGC x 1 vessel : MOSS (Steam turbine, Single)
- 150K LNGC x 8 vessels : MEMB. MK III (Steam turbine, Single)
- 155K LNGC x 6 vessels : MEMB. MK III (DFDE, Single)
- 177K LNGC x 2 vessels : MEMB. MK III (DFDE, Single)
- 216K LNGC x 8 vessels : MEMB. MK III (DRL, Twin)

3.2 Reference list – LNGC On Order : Total 29 vessels

- 155K LNGC x 3 vessels : MEMB. MK III (DFDE) -> Single Screw
- 155K LNGC x 3 vessels : MEMB. MK III (DFDE, Single)
- 155K LNGC x 2 vessels : MEMB. MK III (DFDE, Twin)
- 162K LNGC x 14 vessels : MEMB. MK III (DFDE, Single)
- 170K FSRU x 4 vessels : MEMB. MK III (DFDE, Single)
- 174K LNGC x 4 vessel : MEMB. MK III (DFDE, Twin)
- 177K LNGC x 2 vessel : MEMB. MK III (DFDE, Twin)

4. Hyundai new developed standard LNGC

SHIP TYPE / ITEM	LNG CARRIER					
	155K(UST) Single skeg	155K(DFDE) Twin skeg	165K(DFDE) Twin skeg	174K(DFDE) Twin skeg	180K(DFDE) Twin skeg	216K(DFDE) Twin skeg
L.O.A (m)	288.0	288.0	290.0	290.0	299.5	315.0
B. mld (m)	44.2	44.2	45.0	46.4	46.4	49.0
D. mld (m)	26.0	26.0	26.4	26.4	26.4	27.0
DRAFT (dd/ds) (m)	11.48 / 12.5	11.48 / 12.48	11.5 / 12.5	11.6 / 12.6	11.6 / 12.6	12 / 13
CARGO TANK NO.	4	4	4	4	4	5
- CAPACITY (m3)	154,900	155,100	165,100	174,100	180,500	216,200
MAIN ENGINE	Ultra Steam Turbine	DFDE	DFDE	DFDE	DFDE	DFDE

5. Design development for LNGC

- Improvement of Full form (Bulbous Bow Optimization) : about 3% power saving at service speed
- Optimization at various speed ranges and drafts(Laden and ballast draft)
- Shaft angle optimization for twin screw : about 0.4% power saving
- Propeller optimization : about 1.2% power saving
- Rudder optimization to Full Spade Rudder : about 0.5% power saving
- Energy saving devices : about 1% power saving
- Lower BOR (Insulation thickness from 270mm to 400mm) : 0.1% BOR
- Lower BOR (Blowing Agent from CO2 to HFC-245 fa) : 0.09%
- Reinforced Cargo Containment System(MK III)

6. MEGI Fuel Supply System

- MEGI F.G.S.S with Reliquefaction Plant
- MEGI F.G.S.S with High Pressure Compressor
- MEGI F.G.S.S with High Pressure Compressor + High Pressure Pump
- MEGI F.G.S.S with High Pressure Compressor + High Pressure Pump + Partial Reliquefation Plant

7. Comparison of Various Propulsion Systems

- RST(Reheat Steam Turbine) Application
- DFDE(Dual Fuel Diesel Electric) Application
- MEGI(Slow Speed Dual Fuel Engine) Application

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