Designing new breed of LNG vessels, and preparing the Greek Shipyards

Ioannis BAKAS
Technical Manager
HELENGI Engineering Ltd

LNG: The meeting point for marine, transport & energy sector in Cyprus

29 September 2017, Limassol
1) Using LNG as marine fuel
2) Case studies - LNG fuelled ships
3) POSEIDON MED II – Ships’ Design Work
4) POSEIDON MED II – Shipyards’ Preparedness
Using LNG as marine fuel

1) Using LNG as marine fuel
2) Case studies - LNG fuelled ships
3) POSEIDON MED II – Ships’ Design Work
4) POSEIDON MED II – Shipyards’ Preparedness
Using LNG as marine fuel

- **Advantages of using LNG as fuel:**
  - Environmental benefits: significant reduction of air emissions (Sox, Nox, CO2, PM)
  - Through Life Lower operational/maintenance costs
  - Strong growth in Natural Gas supply led by US shale gas and Australian intensive exports
  - Compliance with Global Environmental Regulation:
Using LNG as marine fuel

• Cont’ Advantages of using LNG as marine fuel:
  – Voyages strong safety record since early 60’s.
  – LNG Terminals have identified the small scale LNG gab and are reverting with new facilities

• Hindering the use of LNG as marine fuel:
  – Novelty – No regulatory standards in force
  – Supply chain – Is there, yet to be stabilized
  – LNG Small Scale Bunkering infrastructure - not yet in place in Mediterranean
  – Uncertainty of the relative price - LNG import countries pushing for LNG index not linked to oil crude prices
Using LNG as marine fuel

• Ship-owners can either opt for dual fuel vessels or for single fuel

  Advantages of using dual fuel vessels:
  – Reduces overall corporate risk if there is an interruption to supply of LNG and allows vessels to be interoperable in remote regions.
  – Provides corporate stability if pricing changes significantly for either Diesel or LNG.
  – Allows a “soft start” into LNG operations ensuring Companies have adequate supply, as well as proper training of shipboard teams.
Case studies - LNG fuelled ships

1) Using LNG as marine fuel
2) Case studies - LNG fuelled ships
3) POSEIDON MED II – Ships’ Design Work
4) POSEIDON MED II – Shipyards’ Preparedness
Case Studies - LNG fuelled ships under design

- Number of ships running with LNG or on order is increasing.
  
i. Total fleet & order book as of March 2017 is slightly over 200 ships.
  
ii. Between 2015 to 2022, close to 90 new LNG fuelled ships are already in operation or under design

iii Cruise sector pioneers!

MSC Cruises reveals novel look of its LNG World-class newbuilds

One year after they were first announced, MSC Cruises confirmed the order for up to four LNG-powered cruise ships of 200,000gt at STX France and released the first rendering of their novel design.
Case Studies - LNG fuelled ships under design

• Different types of LNG vessels in operation and on drawings boards: ro/pax, oil tankers, container carriers, offshore supply vessels

15,000 dwt oil/chemical tanker Ternsund, built at Avic Dingheng, China and delivered to Denmark’s Terntank Rederi at the end of June 2016

DUX – Escort Tug built in GONDAN, Spain

HONFLEUR – Brittany Ferries ferry to be built by Flensburger Shipyards
Case Studies – new built LNG fuelled ships

Viking Grace: Pioneering vessel entering service in 2013
Case Studies – new built LNG fuelled ships

- BC Ferries Salish Orca
- Bergen Viking Oil Tanker
- StavangerFjord Ro-Pax Ferry
- Megastar Ro-Pax Ferry
LNG fuelled ships – existing ships LNG Conversions

• To be considered:
  – Conversions can present more technical challenges than a new built
  – Age Factor: in general, over 20 years old ships are not preferable/suitable for conversions from a financial point of view
  – CAPEX & OPEX accurate calculations
  – Side effects during operation’s pattern, e.g. need to update Port operating procedures and company’s ISM, introduction of dedicated LNG training for onshore and offshore personnel
Case Studies - LNG fuelled ships
Bunkering Procedures

2002
Truck to Ship / Bunkering station
Shore to Ship
Typically less than 150 cbm

2010 - 2013
Small scale terminal
Terminal to Ship
Typically around 500 - 1200 cbm

2017 onwards
On purpose new builds
5,000-8,000 m³
Ship to Ship
Typically today around 2000 – 4000 cbm
Future > 6000 cbm
A QRA (Qualitative Risk Assessment) can be developed for 2 situations, where the risk is calculated:
- The LNG operation without taking into account SIMOPs
- The LNG operation with SIMOPs and defined mitigating measures
- SIMOPs is allowed and put in practice in case it is demonstrated that the relative increase in risk is not significant, provided that the overall project risk criteria can be met.
- It should be demonstrated that the proposed mitigating measures are effective in reducing the risk.
POSEIDON MED II – Ships’ design work

1) Using LNG as marine fuel
2) Case studies - LNG fuelled ships
3) POSEIDON MED II – Ships’ Design Work
4) POSEIDON MED II – Shipyards’ Preparedness
POSEIDON MED II – Ships’ design work

• 10 candidate vessels selected:
  – 1 from ARCHIPELAGO LNG (Tera Jet)
  – 5 from POSEIDON MED (Festos Palace, Nissos Mykonos, Neptune Galene, Superfast I, Highspeed 6)
  – 4 new selections (Panvision, Apiliotis, Ammochostos, Hellenic Spirit)

• Design process:
  – Basic design for 5 vessels, official submission by June 2018
  – Detailed design for 5 vessels, official submission by June 2019
POSEIDON MED II – Ships’ design work
Basic Designs

Tera Jet (SEAJETS)
Nissos Mykonos (HSW)
Panvision (Arista)
Hellenic Spirit (ANEK)
Apiliotis (ELIN)
POSEIDON MED II – Ships’ design work
Detailed Designs

Festos Palace
(MINOAN)

Superfast I
(Attica)

Highspeed 6
(HSW)

Ammochostos

Neptune Galene
(NEPTUNE LINES)
LNG Ready New Buildings

• Deliverable:
  – Conceptual and detailed design of 2 different vessels:
    ☁ Concept design of conventional LNG fuelled vessel
    ☁ Detailed design for an innovative Ro/Pax ferry

• Deliverable:
  – Report on LNG as fuel on new building designs (conceptual and detailed)
  – Status as of 29/9/2017: ready for the official submission
**POSEIDON MED II – Design Work**

**INNOVATIVE COMPACT RO/PAX VESSEL 135 m**

**Innovative elements:**
- Almost no emissions due to LNG
- Optimized hull form, resulting in 10% less resistance
- Application of novel operating systems for minimizing the environmental footprint
- Ready for “cold ironing” future installation

**Compliance with:**
- SOLAS 2009
- Safe Return to Port – SOLAS 2010
- Stockholm Agreement
Poseidon Med II – Design Work

LNG BUNKER / FEEDER VESSELS

• **Tasks**
  – Study the basic design of a newly built bunkering vessel
  – Study the detailed design of a feeder type LNG tanker
  – Study the basic design of a special retrofit for the conversion of an existing open-type car ferry to an LNG Bunkering vessel

• **Deliverable:**
  – LNG bunkering vessels designs, including retrofit of existing vessel to bunker barge
  – Status as of 29/9/2017: Officially submitted end of March 2017
LNG Bunker / Feeder vessels minimum performance requirements

- Equipped with an effective transfer system able to reach any type of LNG fuel vessels (open deck or enclosed bunker station)
- High maneuverability & turn around capability for operation in ports
- Able to load cargo from any LNG terminal with small scale LNG pier
- Efficient BOG handling system
- Able to deliver nitrogen to client vessel and to manage her BOG via vapor return line
- Unrestricted sailing capability for offering maximum supply flexibility
Poseidon Med II – Design Work

LNG BUNKER VESSEL
AMALTHEI

MAIN PARTICULARS

• Length overall: appr. 74.5m
• Breadth moulded: appr. 15.6m
• Normal speed: appr. 14 kn
• Cargo capacity: between 1000 – 1300m³
LNG FEEDER VESSELS

AMALTHEIA 7000

MAIN PARTICULARS
- Length overall: appr. 121.8m
- Breadth moulded: appr. 18.5m
- Normal speed: appr. 12 kn
- Cargo capacity: 7000m³

TWO TANK OPTIONS
- With membrane tanks @ 7000m³
- With Type C Bilobe Tanks @ 5000m³
POSEIDON MED II – Shipyards’ Preparedness

1) Using LNG as marine fuel
2) Case studies - LNG fuelled ships
3) POSEIDON MED II – Ships’ Design Work
4) POSEIDON MED II – Shipyards’ Preparedness
• **Shipyards around Attica:** 7 shipyards already evaluated, assessed and reported.
• **Shipyards outside Attica:** under preparation
• **Task:** To identify critical factors such as Gap Analysis/Diagnosis Assessment/ Performance evaluation, to evaluate the technical “mature” for implementing operations with LNG fuelled vessels as new-builds and retrofits
POSEIDON MED II – Shipyards’ Preparedness

• **Major hindering points:**
  Lack of cryogenic technical knowledge
  Lack of trained workforce
  Need for development/upgrade of land infrastructure
  Support from financial institutions is limited or restricted

• **Status as of today:**
  Under preparation for submission September 2019

• **AIM**
  To contribute and support the Greek Shipyard Industry based on the successful story of Cochin Shipyard, India.

Congratulation to Cochin Shipyard in India for being assessed and approved as “FIT” to design and build small scale LNG carriers. An MOU was signed with Engineers India for the design and construction of small scale LNG carriers. Under the MoU which is a part of the ‘Make in India’ initiative launched by the government the two companies will jointly design and build small-scale LNG carriers, CSL said in a statement.

LNG World News October 2016
THANK YOU FOR YOUR ATTENTION!

Ioannis BAKAS
HELENGI Engineering Technical Manager