Future of LNG Bunkering in Singapore

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TGE Marine Gas Engineering
CONTENT

- TGE Marine Company Profile
- Market Drivers and Actual Situation
- On-board Fuel Gas Systems and Tanks
- Bunkering and Infrastructure
- Conclusions
Business activities and expertise

Cargo handling systems and cargo tanks for Gas Carriers
- LPG carriers, CO₂ carriers
- Ethylene carriers
- LNG carriers

Cargo handling systems for Offshore units
- FSO/FPSO for LPG
- FSRU and FPSO for LNG
- CO₂ liquefaction, storage and offloading units

Fuel Gas Systems for seagoing vessels
- Fuel gas supply systems
- Fuel gas tanks
- Bunker Barges, Bunker Boats
- LNG fuel storage systems
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Market drivers for LNG as fuel

- Emission reduction: new legislation for ECA and SECA-zones in Europe (North Sea and Baltic Sea)
- Proposed ECA zones for the Mediterranean and US-Coasts, further areas will follow
- LNG is a highly efficient and clean fuel ($\text{NO}_x$, $\text{CO}_2$, $\text{SO}_x$, particles); LNG price lower than other fuels
- → LNG complies with environmental requirements at competitive prices
LNG as Fuel – Actual Situation

- Operating experience for more than 10 years: small ferries (Norway) and OSVs (North Sea)
- Bunkering from small bunker station on dedicated jetties or trucks
- Dual fuel engines and gas engines are available
- Ship owners: strong interest in dual fuel systems for future newbuildings – but:
- Bunkering infrastructure for general market not yet in place
LNG as Fuel – Development of Rules

• IGF-Guideline in force since 2009 (IMO Guideline developed from Norwegian National Regulations) MSC 285(86)
• All Classes have developed Rules for Gas Fueled Vessels
• IGF-Code under development, target: IMO decision before 2014 (SOLAS Revision)
• Bunkering is not a regulatory task. Code can only address safety issues on-board the gas fuelled vessels
• BLG14 decided to address ship side bunkering issues in IGF-Code
LNG as Fuel – new LNG market

- Normal LNG terminals are not designed to handle vessels for the bunker market (size of vessels, frequency of port calls)

19-May-2010 „Coral Methane“ loading at Zeebrugge, First loading of a small carrier at a large import terminal.
LNG as Fuel – new LNG market

- Singapore LNG Corp. (SLNG) has awarded ECP contract for secondary berth project at their terminal on Jurong Island including a dedicated jetty for small LNG ships

“… to facilitate future LNG bunkering opportunities” (SLNG press release)

Artist impression from SLNG press release Aug. 2011
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“Coral Methane” - using LNG as fuel

7,500 cbm LNG/Ethylene/LPG-Carrier

Ship design and supply of cargo system including tanks and fuel gas system by TGE Marine
LNG fuel gas systems for ships other than gas carriers

- Ship types: Ferries, Ro/Ro, RoPax, passenger, container vessels, etc.
- A wide range of bunkering/storage/onboard fuel gas processing due to different type/size of ships
- Challenge: integrate LNG system to a ship, where LNG is just a utility, not the cargo
- Technology is available – TGE Marine has developed LNG fuel gas systems for all kinds of above mentioned vessels
Basic components of fuel gas systems

Auxiliary systems:
- heating system (vaporize LNG)
- inert gas system
- vent / ventilation
- valve remote operation
- safety systems
- automation & control
Fuel gas processing

- Tank design pressure 8 to 10 barg
- Tank operation pressure 6 to 8 barg
- Small in-tank-pump avoiding bottom outlet
Stainless steel tanks for 7,500 m³ LNG Carrier
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LNG bunker operations – alternatives:

- Typical onboard LNG bunker tanks: 300 … 1,000 m³
- Bunkering at fixed bunker stations → not very economic (only in special cases)
- Bunkering from trucks → too small quantities (performed in Norway)
- Bunkering by special small bunker ships ( barges ) of up to 3,000 m³
LNG vessels for bunkering market

TGE Marine’s design approach for small LNG carriers:
- Cargo tanks of IMO type C (pressure vessels)
- Cylindrical or “bi-lobe” with patented tank support design
- Design available up to 35,000 m³
20,000 m³ LNG feeder vessel
3,000 m³ LNG bunker vessel
Equipment for bunker vessels

- LNG Pumps (intank or deepwell) for different bunkering rates
- loading manifold
- mechanical/hydraulical system to handle bunker hoses or arms with coupling
- dry-break emergency release coupling
- vapour return connection
- optional transfer compressor
- signal interface (including ESD)
- possible additional services: inerting with Nitrogen, tank purging and cooling with NG/LNG, tank emptying and warming-up
- other bunker fuels
Bunkering (Artist impression)
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Conclusions

➢ LNG as fuel is an environmentally friendly and commercially highly attractive bunker product
➢ Standards and regulations for LNG bunkering are under development.
➢ Investment in LNG bunker infrastructure is a key issue to enhance the use of LNG as fuel.
➢ TGE Marine is the leading technology provider for:
  • LNG fuel gas systems
  • ship design and equipment for bunker vessels/barges.
Thank you for your kind attention

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