LNG as a fuel: Case studies in Korea & Sweden and partially from TEN-T project

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SSPA provides maritime solutions

Ship Design  Research  Maritime Operations
Agenda

- Risks associated with LNG bunkering
- New standards and guidelines, how do they influence developments?
- Various scenarios for distributing LNG
- Future outlook for LNG as a fuel

Overview of LNG as a fuel project in Korea
‘A feasibility study for an LNG filling station infrastructure and test of recommendations’

- The aim of the project is to set up recommendations on the establishment of a marine LNG infrastructure encompassing a “hard” on filling stations and a “soft” on regulation and industry standards etc.

- The study started in May and be finalized in early 2012. It is part of the Trans-European Transport Network (TEN-T) – Motorways of the Seas (MoS) and the project, with a budget exceeding 1 million Euros, will end up in a strategic decision paper.

LNG hazards – another focus

Different from bunker hazards:

- Oil related hazards – environment impact

- LNG related hazards – human risks/public health
Hazards with LNG bunkering

Consequences

Categories of Outcomes after LNG Release:

- Cryogenic Damage
- Asphyxiation
- Pool Fire
- Vapour Cloud Fire
- Explosions
- Rapid Phase Transition (RPT)
### LNG Bunkering - Identified risks

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### Risk control options, RCO

**Risk treatment**

- ESD/ERS systems to prevent LNG release and to minimize released quantity quantities
- Cryogenic material – mitigating consequences of release on deck
- Fire protection
- Prevention of human error and organizational weaknesses
Accidents at sea

• Relatively small risk of groundings according to earlier studies
• Risk is connected to the relative speed
• Local conditions always important to examine

So.... is it dangerous?

5 July 2011, NMD (Norwegian Maritime Directorate) will Equal the regulations governing the carriage of refrigerated gas on ships with the regulations that apply to other types of gases and hazardous materials.

“Compared with the transport of other dangerous goods, it is found that the transport of cooled gas in a controlled manner does not pose any significant increase in risk. It is also pointed out that the transport of other goods, not marked as dangerous, may pose a greater risk when requirements for vehicles, training and procedures are lower for this type of transport. For example, a fire in a vehicle transports ordinary combustible materials have a greater chance of developing into a major fire than a fire in the ADR unit has to spread to the LNG tank.”
New standards and guidelines

How do they influence development?

ISO standard (28460-2010)

Installation and equipment for liquefied natural gas — Ship-to-shore interface and port operations (December 2010)

SCOPE:
• Pilotage and vessel traffic services (VTS);
• Tug and mooring boat operators;
• Terminal operators;
• Ship operators;
• Suppliers of bunkers, lubricants and stores and other providers of services whilst the LNG carrier is moored alongside the terminal.
Guidelines for ship to ship transfer

- Published March 2011, Scope: Applies to seagoing ships.
- Information exchange before, during, after LNG transfer
- Ship compatibility: Mooring, ESD, ERS, parallel body, vapour management etc.
- Procedures alongside: Cool down, Cargo transfer etc.
- Equipment: Cargo hoses, fenders etc.

Selection of other rules and guidelines

- **GIIGNL** (The International Group of Liquefied Natural Gas Importers)
- **OCIMF** (The Oil Companies International Marine Forum)
  - Design and Construction Spec for Marine Loading Arms
  - Int. Safety Guide for Oil Tankers & Terminals, IISGTT
  - Mooring Equipment guidelines
- **PIANC** (Permanent International Association of Navigational Congresses)
  - Approach Channels, a Guide for Design
  - Guidelines for the Design of Fender Systems
- **CEN** (European Committee for Standardization)
  - EN 1532, 2009 Installation and Equipment for LNG - Ship to Shore Interface
  - EN 1473, 2007, Installation and equipment for liquefied natural gas Design of onshore installations (and EN 13645)
- **NFPA** (National Fire Protection Association, USA)
  - NFPA 59A, Standard for the Production, Storage, and Handling of LNG
- **SIGTTO** (Society of International Gas Tanker and Terminal Operators)
  - Site selection and design for LNG ports and jetties
- **EU** (European Union)
Future

- IMO - IGF code, rules for the receiving ship, the ship using LNG as fuel
- ISO Committee working on bunker station standards
- TEN-T project to work on small scale LNG/Bunkering from sea side perspective.
- BunGas
Distribution system, South Korea

Relative small distance between LNG terminals and large ports
Focus on large ports initially

LNG infrastructure in Northern Europe
Where is the bottleneck?

Vessels in the Northern Europe, 2011

Type of ships in % of total number of ships

Age of ships in % of all ships
Potential of LNG as a fuel 2020

- 180,000 M³/week in Northern Europe (Case A) (4.2 milj. ton /Year)
- Approximately 1000 LNG fuelled ships
  Appr. 10% of the whole fleet

LNG and SSPA

- Terminal layout and operations
- Logistics and Infrastructure development
- LNG as fuel, technology
- Risk analysis, Formal safety assessment
- Environmental Assessment
- Simulations
- Regulations
- Fairways and aids to navigation design
- Ship design (HULL)
LNG Projects at SSPA

**LNG terminals and LNG as a fuel**
- Feasibility study on LNG as a fuel in Europe, DINA, EU TEN-T 2011.
- Infrastructure development for maritime use of LNG, Swedish Gas Infrastructure (Svenskt Gasinfrastruktur), 2010-2011.
- EPA/EPIC study for LNG bunkering in South Korea, KOGAS, 2010-2011.
- Nautical qualitative risk assessment for the LNG terminal in Oktoko Bay/Florida, n.n., 2008.
- Baltic Supply, EU-funded research project, 2009.
- EFNLP, Efficient shipping with low emissions, EU-funded research project, 2010.
- MACADOC, Liquified Natural Gas (LNG) as a fuel for ships, EU-funded research project, 2008.
- Safeskip, Noal for LNG tankers, EU-funded research project, 2009.

**Design, LNG Vessels**
- Centromor, Poland
- Chartiers de l’Atlantique, France
- Daewoo Shipbuilding
- Drammen Skip & Verksted, Norway
- Engenari, Brazil
- Gdynia Shipyard, Poland
- General Dynamics, USA
- Halla Heavy Industries, Rep. of Korea
- Hudong/Chartiers de l’Atlantique, China/ France
- Hyundai Heavy Industries, Rep. of Korea
- Industrias Reunidas Caneco SA
- ILMAR (AESA), Spain
- Jiangnan, China
- Kockums Varv AB, Sweden
- Malmros, Sweden
- Mosa Rosenberg Verft, Norway
- Samsung Heavy Industries, Rep. of Korea
- Sun Shipbuilding, USA
- Svendborg Skibsværft, Denmark
- Valsvik, Finland
- Wärtsilä, Finland

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Questions?

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