



# Fire Protection Technology for LNG Installation

Shipbuilding Technology Forum

PREPARING FOR GROWTH THROUGH EXPORT

Dec 8, 2015 - Ottawa

[WWW.FIREALARMS.COM](http://WWW.FIREALARMS.COM)

ONE COMPANY - TOTAL SOLUTION



# Current LNG Situation

- LNG as a marine fuel is here – we are in the midst of the first wave of North American vessels
  - **Dual fuel configurations – diesel and LNG**
    - Provides maximum flexibility
- Drivers:
  - **Tightening limits for air pollution** (Annex VI of the International Convention for the Prevention of Pollution from Ships)
  - **Competitive price vs. diesel fuel**



# Considerations & Trends

- Benefits of LNG as marine fuel
  - **No need for additional emission control equipment**
- LNG challenges
  - **Lower cost but lower specific energy**
    - Energy density is 60% of diesel (ie: 1.7 liters of LNG has the same energy as 1.0 liter of diesel)
    - Larger fuel capacity needed for same range
    - This raises operational challenges
- Political & Regulatory
  - **Strong “green” push worldwide**
  - **LNG facilitates energy independence for North America**



# LNG Characteristics

- Not hazardous when stored in insulated fuel tanks as a liquid
  - **Storage: 1 to 10 bar @ -162 deg C**
  - **Odorless, colorless, non-toxic, non-corrosive**
- Hazardous when released to environment
  - **LNG absorbs heat and flashes from liquid to gas**
    - Freezing hazard can cause structural damage
  - **Vaporizes and achieves combustible fuel/air mix**
    - Burns at high temperature
    - Suppression with dry chemical system is best solution
    - Any gas leak poses an explosion hazard
    - We want to prevent the release of LNG to the environment



# Ongoing Projects – N. America

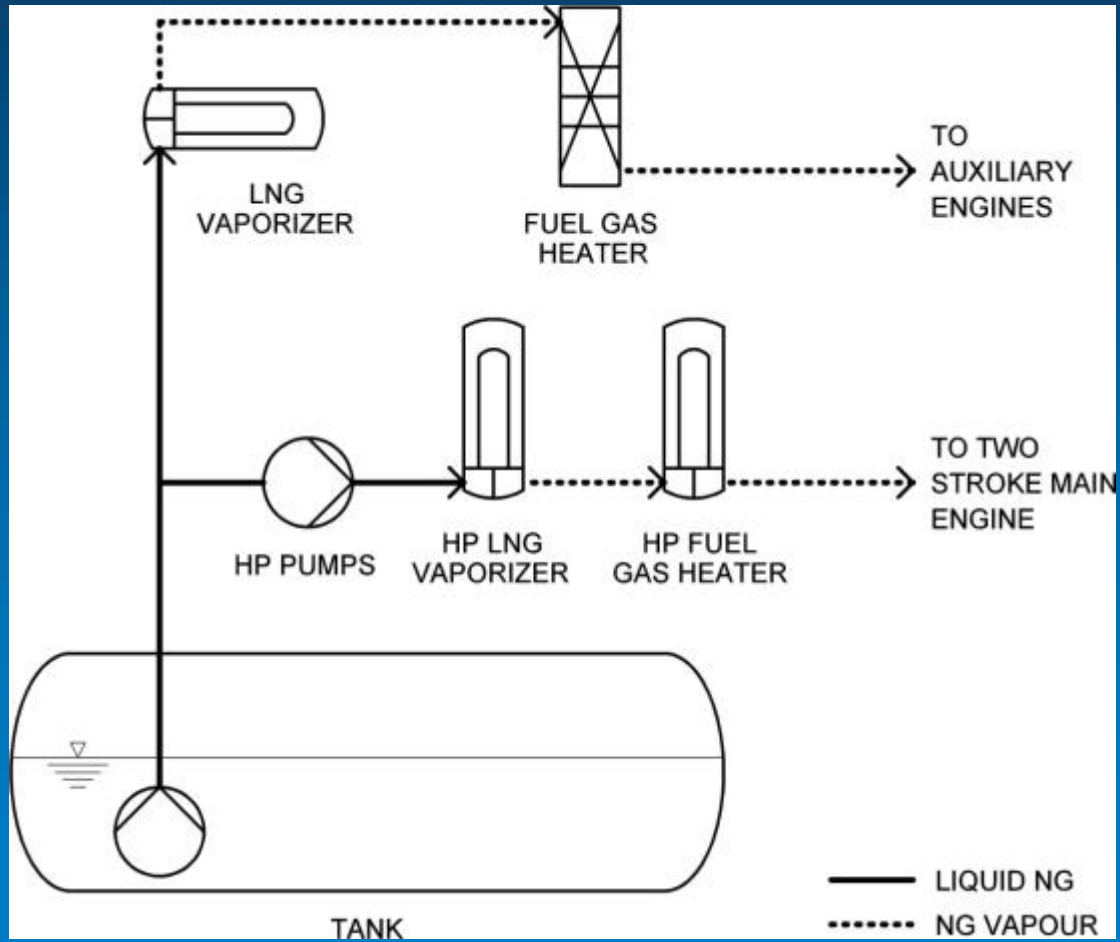
- STQ Ferries / Davie & Fincantieri
- BCF Intermediate-class newbuilds
- BCF Spirit-class re-powers
- TOTE / NASSCO Marlin-class containerships
- TOTE / AMFELS RO-RO Orca-class re-powers
- Crowley / VT Halter CON-Ros
  - Note that many other new ships are “LNG-ready”
- Bunker barges – Wespac Midstream and others



# LNG – Start to Finish

- Load fuel on ship (bunkering)
  - Pumped on as a liquid
- Stored in LNG fuel tanks
  - Either above or below deck
- LNG is supplied to engines when ship is in LNG mode
  - LNG must be degasified (heated, vaporized and pressurized)
  - Injected into combustion chambers
  - Some fuel is recirculated
- Complex control system





# Fire Protection Design Considerations

- Containment and early detection are most important
- LNG tank location
- Processing (re-gasification) equipment location
- Bunkering areas
- Monitoring & detection are critical
- Ventilation & pressure relief must be considered

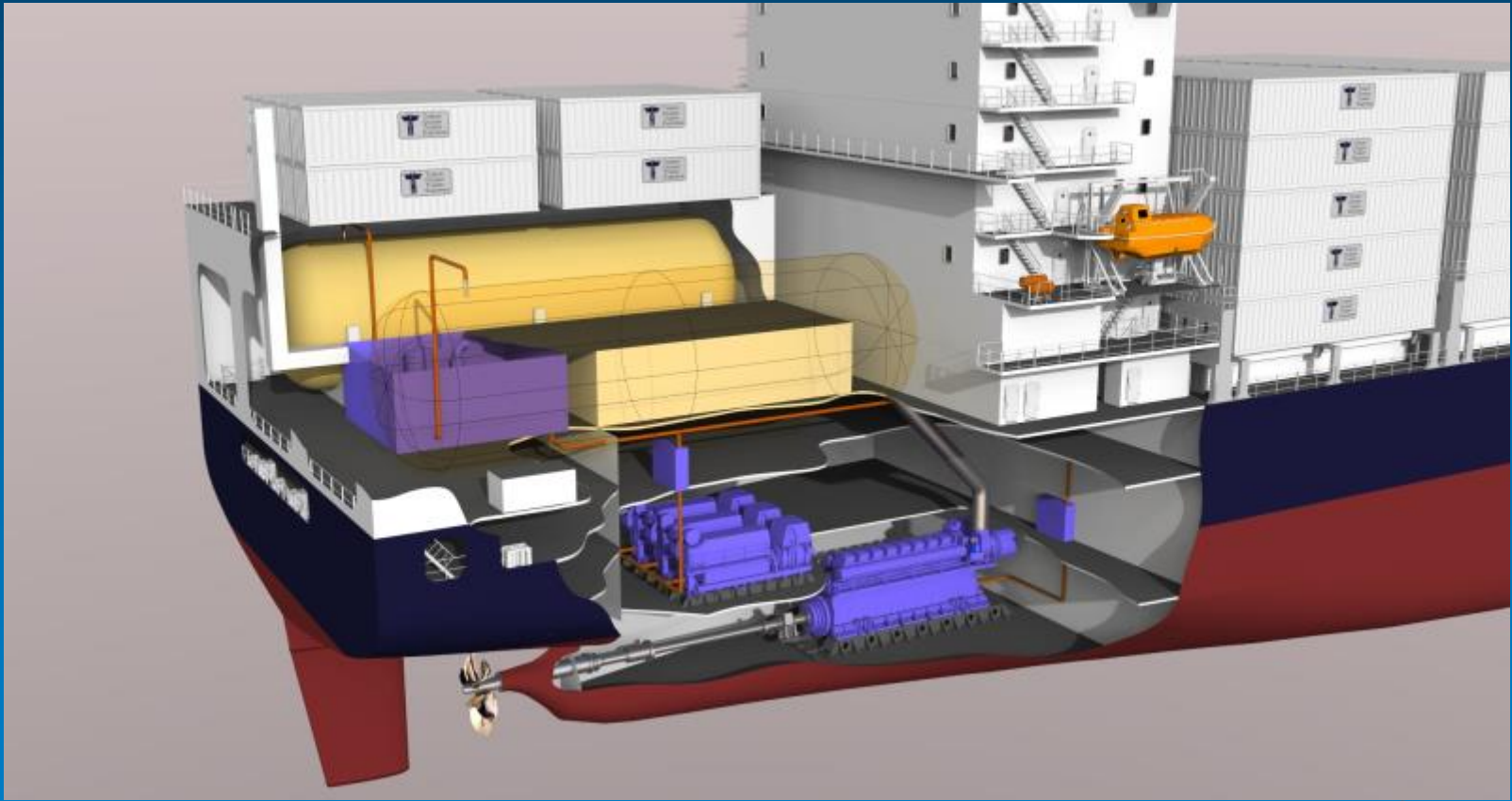






Shipbuilding Technology Forum  
PREPARING FOR GROWTH THROUGH EXPORT





# LNG Regulations

- IGF Code (International Code of Safety for Ships using Gases or other Low-flashpoint Fuels)
  - June 2015 - adopted by IMO, mandatory per SOLAS
  - Provisions for arrangement, installation, control and monitoring of machinery, equipment and systems
  - Supersedes IMO Interim Guidelines MSC 285(86)
- Classification society rules
- Flag administration rules
  - ie: USCG Policy Letters, etc.



# Fire Protection Methodology

- Prevent leaks
- Detect leaks
- Other protection as usual
  - All non-LNG hazards are the same (ie: lube oil fires, etc.)
  - Most vessels are dual fuel



# FP Requirements – Engine Room

- Engine room protection is the same as any motor ship of the same classification
  - **Fire detection and fire suppression shall be per**
    - Flag
    - Class
    - SOLAS requirements
- There are two design standard choices for LNG fueled vessels
  - **ESD (Emergency Shutdown)**
  - **Intrinsically Safe Engine Room Design (ISRD)**



# ESD – Emergency Shutdown

- Double walled LNG fuel pipes used
  - Leak detection & gas detection within double walls
  - Pressurized N<sub>2</sub> inert volume between double walls
    - N<sub>2</sub> pressurized above LNG pressure
- Detailed emergency shutdown requirements
  - Refer to MSC Circ. 285(86)
    - Table 1 “Monitoring of Gas Supply System to Engines”
    - States the combinations of alarm and shutdown conditions





# ISRD - Intrinsically Safe

- Fuel lines may be single wall
- All equipment must be explosion proof
  - **No ignition sources allowed**
- Detailed emergency shutdown requirements
  - **Refer to MSC Circ. 285(86)**
    - Table 1 “Monitoring of Gas Supply System to Engines”
    - States the combinations of alarm and shutdown conditions



# FP Requirements – Other Areas

- Other hazard areas requiring protection
  - LNG bunkering station
  - LNG tanks
- Bunkering stations
  - Fixed or portable dry chemical system (purple K)
  - Stainless steel drip trays to prevent low temp damage
- Tank room
  - Gas detection
  - Fire detection





# Summary

- The use of LNG as a marine fuel is increasing
  - **Based upon availability, costs, environmental requirements, etc.**
- LNG poses many challenges for marine use
  - **Storage, bunkering, transportation**
- There are important Fire Protection issues with LNG
  - Storage Areas, Bunkering Areas, Gas Detection, and additional Fire Detection



# Thank you



Shipbuilding Technology Forum  
PREPARING FOR GROWTH THROUGH EXPORT

