Seminar - roundtable
THE POSSIBILITIES OF LNG

LNG fuelled vessels

MarTech LNG, Risavika, 18th of September 2013

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LNG facts
Liquefied Natural Gas

- About 90% Methane
- Odourless, colourless, non-toxic, non-corrosive
- Not explosive, not flammable
  - When vaporized to NG it will burn with an air mixture between 5-15%
- Tank storage temperature -163°C, pressure 6-9 bar
- Hazards: Flammability, Freezing, Asphyxia
LNG versus MDO

- Higher installation costs
- More space needed

+ Approx. 20-30% lower bunker price
+ Reduced maintenance costs, approx. 20%
+ Reduced lub.oil costs, approx. 50%
+ 100% SOx reduction
+ 100% Particulate reduction
+ 80-90% NOx reduction
+ 31% CO₂ reduction (compared to SCR alt.)
+ Meets requirements in IMO TIER III (2016)
Two alternative configurations for class notation «GAS FUELLED»:

- Inherently gas safe machinery space
- ESD protected machinery space
INHERENTLY GAS SAFE MACHINERY SPACE

• Machinery space considered gas safe under all conditions
• The gas fuel pipes shall be installed within a pressurized or ventilated pipe or duct
• Engine/gas system shutdown upon abnormal conditions
INHERENTLY GAS SAFE MACHINERY SPACE

Advantages:
• Normal equipment can be arranged in the engine room
• Normal ventilation
• Less steel

Disadvantages:
• Few engine alternatives on the market (higher price)
• Machinery space considered non-hazardous under normal conditions, but hazardous upon abnormal condition.

• Gas detector system arranged to automatically shutdown the gas supply system, and disconnect all non-ex equipment.

• High ventilation grade, 30 air exchanges/hour.
Advantages:
• Single gas piping accepted in the engine room.
• Multiple engine alternatives.

Disadvantages:
• Non-ex equipment to be installed in separate room
• Explosion calculated structure -> more steel -> blast panels
• Engine room access
• Ventilation
INHERENTLY SAFE ENGINE ROOMS

LNG EQUIPMENT ON BOARD

OTHER ARRANGEMENTS:
- Bunkering pipe
- Ventilation pipe
- NG Supply pipe
- Air locks

LNG BUNKER STATION

NITROGEN STORE

GAS TRAIN ROOMS

COLD BOX

INHERENTLY SAFE ENGINE ROOMS
LNG BUNKER STATION
SAFETY PRECAUTIONS:

• Bunkering from shore to avoid consequence of spill
• Hazardous area
• Approved bunkering procedure
• Trained crew
Newbuilding - gas ferry

Delivered 2010

M/F “Selbjørnsfjord” for FosenNamsos Sjø, Norway – Design MM 105 FE LNG
Car/Passenger Ferries - 120 PCU - 250 PAX - Gas Electrical Propulsion Systems

- Gas aggregates, 1 x 864 kWe - 1 x 646 kWe
- Low operation costs
- High fjord crossing frequency
- Max speed 16 knots
Newbuilding - the world's largest sailing gas ferry

Delivered 2011

M/F “Boknafjord” for Fjord1, Norway - Design MM 120 FD LNG
Car/Passenger Ferry – 242 PCU – 600 PAX – Gas Electrical Propulsion Systems
Newbuilding – Concept development

- Multi Maritime AS won the concept development contract in December 2009
- The 12\textsuperscript{th} LNG – powered ferry for Fjord1
- Operate on the two largest ferry links in Norway
- Annually 5 million passengers, 60 000 port calls

Compared to existing ferries:
- Increased capacity by 30 more cars
- More fuel efficient
- Less power (~ 2 500 kW) with the same service speed
- More environmental friendly
- Less fuel and ab. 50% reduced methane emission
- Max speed 23 knots
- Less noise and maintenance costs
Conversion project – LNG gas bunkering

M/F FJALIR - 1974

- from ferry to a LNG bunker vessel

M/V SEAGAS - 2013

- Pilot project / prototype
- Conversion to the world’s first dedicated LNG bunker vessel
- Hull and engine/propulsion system kept
- Not need shore gas terminal for the operating vessel
- Short turnaround in terminal
Innovation concept - gas transport

- Flexible and purposed built LNG shuttle barge
- Less building and operation costs (*less crew and no propulsion systems*)
- One tug can operate several LNG gas barges
- Can be used as bunkering station

Length: 72.30 m
LNG tank capacity: Approx. 2000 m$^3$ (variable)
Towing speed: Approx. 10 knots
Thank you for your attention!