Methanol - A good alternative for ferries and short sea shipping

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The Stena Sphere

The Stena sphere is a family owned group based in Sweden with $9 billion in turnover and 20,000 employees.

Stena has a fleet of 120 ships owned and chartered in

No of ships of different types

- Tankers 52
- LNG 3
- Ferries/RoRos 58
- Offshore units 7
Stena Line - Liner Network
SECA, Sulphur Emission Control Area
Sulphur regulations in SECA

We have studied 4 different ways of meeting the new sulphur regulations

1. Run on Marine Diesel or Gas oil with 0,1% sulphur
2. New types of fuel, LNG or Methanol
3. Install exhaust gas cleaning equipment, Scrubbers
4. Reduce operations and adjust to the new situation

The solution will be a combination of the alternatives above

Yes, possible but cost must be pushed to the custumers, (BAF etc)

Yes, possible for SOx BUT not with NECA rules

Yes, possible – modal shift !
By adding one oxygen atom a new substance, easier to handle than LNG, is created - METHANOL.

Natural Gas (LNG)

Methane $\text{CH}_4$

Methanol

$\text{CH}_3\text{OH}$
Methanol is primarily produced from natural gas.

Natural Gas \[\rightarrow\] Reforming \[\text{at} \sim 900 \degree C\] \[\rightarrow\] syngas \[\rightarrow\] Compression \[\rightarrow\] Cooling \[\rightarrow\] Synthesis \[\rightarrow\] crude \[\rightarrow\] Distillation \[\rightarrow\] chemical grade

Natural Gas \[\rightarrow\] Steam \[\rightarrow\] Oxygen \[\rightarrow\] Cooling \[\rightarrow\] Compression

Chemical formula:

\[\text{CH}_3\text{O} + \text{H}_2 \rightarrow \text{CH}_3\text{O} + \text{H}_2\text{O}\]

\[\text{CO} + \text{CO}_2 \rightarrow \text{CO}_2 + \text{H}_2\]
Methanol is used as a fuel already today – but in limited areas
Methanol

1. Methanol is a liquid at room temperature and needs neither cryogenic nor pressure tanks.

2. Methanol can be stored onboard and ashore in similar tanks as oil products.

3. Bunker barges will be small chemical carriers for methanol compared to small gas carriers for LNG.

4. Conversion kits from diesel engines to dual fuel engines (HFO/MGO – Methanol)

5. Conversion to methanol will be considerably less expensive than conversion to LNG
LNG for Newbuildings

Pure gas  
(Fjord Line)

Dual fuel  
(Viking Line)
Conversion from HFO to LNG.

M/S Bit Viking – Funded by the Norwegian NOx fund
Conversion cost; 1000 EURO/kW
Cost for a normal RoPax = abt. 20 Million Euro

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Methanol as marine fuel

- Availability, distribution and storage
- Engine technology and adjustment to the ship
- Environment and cost benefit
- Safety and regulations
Availability, distribution and storage

• Big commodity (55 million ton/year)
• Used in several industrial processes all over the world
• Liquid at room temp – no high pressure or cryogenic storage required onboard or ashore
• Significantly less infrastructure costs
• Can be transported in regular Product tankers
• Can be produced from various feedstock, eg. Natural gas, Black liquid, biofuel etc
Engine technology and adjustment to the ship

A good solution for existing vessels since conversion to dual fuel engines is significantly easier than for LNG.

**Methanol**

- Cylinder heads, fuel injectors, fuel pumps, HP fuel oil pipes
- Ventilation systems
- Inerting system
- Fuel tanks

**LNG**

- All except entablature & crankshaft to be replaced
Environment & Cost benefit

• Similar positive reductions as LNG in terms of GHG in exhaust gases but no methane slip

• Similar positive reductions as LNG in terms of NOx & SOx and PM

• Can be produced from various feedstock, eg. Black liquor, Natural gas, biomass etc

• Bio degradable

• Green energy source for the future including CCU (Carbon Capture and Use)!

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Environment & Cost benefit

= Methanol
Environment & Cost benefit

- 6 Million tons of mixed waste is incinerated each year in Sweden
- Energy content is abt. 25 % of oil
- 1 Million ton of Methanol per year with existing technology
- Cover more than all of Stena Lines annual consumption
- Sufficient to run 500,000 cars in one year
Environment & Cost benefit

Methanol Pricing: Historical SPOT Prices

Historical SPOT Reference Prices

- Basin Disconnection
- Transition Phase
- Global Price

Source: IHS/CMAI Price Forecast

- US Spot
- East China CIF
- EU Spot

- Specific gap between the basins is starting to close
- Exceptions rely on specific supply disruption impacting more heavily one specific “basin”

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Safety & Regulations

- Rules are in place for methanol in the IMO IGF – code and Class rules (LR & DnV)
- Low flashpoint fuel like LNG
  - Flashpoint Methanol + 11 C.
  - Flashpoint LNG - 188 C.
  - Self ignition Methanol + 465 C.
  - Self ignition LNG + 595 C.
- Infrastructure and safety similar to ethanol and petrol
- Liquid – no high pressure or cryogenic storage required
Project Objectives

**Scope:**
In a full scale pilot project, test the alternative non-oil-based fuels methanol and DME(OBATE) in order to contribute to finding the best environmental and economical alternative for a sustainable and successful maritime transport industry.
Next step; Full conversion, Gothenburg - Kiel

2 x

90,000 Cars
90,000 Lorries

Lifted from the road every year
Stena Germanica – EU funded full scale conversion

In a full scale project, convert four main engines to methanol-diesel operation (DF)

Wärtsila testruns starting  Q4 - 2013
Tank & systems installation  Q1 - 2014
Full conversion 2 ME´s  Q4 - 2014
All 4 ME´s  Q4 - 2015

Length  240 m
Breadth  28,7 m
Draught  6,15 m
Cargo Capacity  4000 lane meters
Passenger capacity  1300
Main engines  4 x Wärtsila 8ZAL40S, 6000 kW

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Ballast tank converted to methanol fuel tank

Transfer pump room

High pressure fuel pipes

Double walled

High pressure fuel pipes

Ballast tank converted to methanol fuel tank

High pressure pump room

Transfer pump room

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Stena’s global methanol project
Initial timeframe for converting Stena’s SECA fleet

Number of ships converted (estimate)

- 2014: 1
- 2015: 3
- 2016: 10
- 2017: 20
- 2018: 25

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Thank you!

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