Methanol as a Marine Fuel

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About the Methanol Institute

- First formed in 1989, the Methanol Institute (MI) serves as the trade association for the global methanol industry.

- The use of methanol as a marine fuel is viewed as an historic opportunity

- MI represents the world’s leading methanol producers, distributors and technology companies from offices in:

  Washington | Brussels | Singapore | Beijing
MI 2016 Members

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Part I. Regulations

Part II. Technology

Part III. Main findings
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Part I. Regulations

- Emission control areas (ECAs)
  - SOx
  - NOx
- California: Ocean-going vessels fuel regulation
- EU Monitoring, Reporting and Verification Rules (MRV)
- Regulatory trends
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Emission control areas (ECAs)

Limits on SOx content in fuel
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Emission control areas (ECAs)

Limits on NOx emissions for new-build ships
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Emission control areas (ECAs)
California: Ocean-going vessels regulation

“Fuel Sulfur and Other Operation Requirements for Ocean-going Vessels within California Waters and 24 Nautical Miles off the California Baseline”. (CalEPA)

- Adopted on July the 24th 2008
- Covers SOx, NOx and particulates
- Using scrubbers to mitigate emissions instead of low-sulfur fuel is not allowed
- Fuel must be distillate grade
EU Monitoring, Reporting and Verification Rules (MRV)

Under the EU Monitoring, Reporting and Verification (MRV) rules, passed by the European Parliament in April 2015, ship-owners will have to monitor CO2 emissions for each ship on a per voyage and an annual basis. (EC)
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Regulatory trends

- Regulation has progressively become more stringent (e.g. IMO proposed a global sulfur cap of 0.5% by 2020)
- Upcoming regulations are likely to target CO2 fuel emissions as well as SOx, NOx and particulates
- Life-cycle emissions and environmental impact of likely to be an important factor in regulation marine fuels
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Part I. Regulations

Part II. Technology

Part III. Main findings
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Part II. Technology

• Methanol facts
• Environmental performance
• Marine methanol projects
• Conversion and Infrastructure costs
Methanol as a Marine Fuel

Methanol Facts

- Most methanol is today produced from natural gas but it could be produced from many feedstocks (incl. renewable sources, waste etc.)
- Around 70 million metric tons of methanol are produced every year
- Methanol contains no sulfur or other impurities
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Methanol Facts

• Methanol is a liquid, making its bunkering and transportation easier than gaseous fuels

• Methanol is a low flashpoint fuel (like LNG)

• Methanol is available globally
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Methanol Facts

Methanol storage capacity estimates (thousand tons)

Source: IHS, 2015
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Environmental performance

• Methanol is completely soluble in water

• Most microorganisms can oxidize methanol, making it biodegradable

• As a result, the impact from a large spill would be much lower than from an equivalent oil spill
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Environmental performance

Lifecycle emissions and energy use of methanol compared to HFO and methane fuels (HFO = 1*)
Marine methanol projects

- **Stena Germanica**: Launched in March 2015, Stena *Germanica* features Wärtsilä methanol-fueled marine engine in EU-sponsored effort.

- **Methanex’s Waterfront Shipping**: 2016 delivery of seven new vessels with MAN dual-fuel methanol/diesel engines.

- **MethaShip project**: led by Lloyd’s Register designing cruise ship and ropax ferry over next three years.

- **2016 Pilot Boat**: conversion by ScandiNAOS with support from MI, and Swedish Maritime Administration.
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Conversion and Infrastructure costs

Costs provided below are those of the retrofit of the Stena Germanica, a 24 MW RoPax ferry operating in the Baltic sea

- Total Project Cost (incl. storage tank and bunker barge adaptation): €22 million
- Conversion Specific Costs: €13 million
- Time at yard to modify engine: 2 weeks
- This is a first of its kind. Future conversions costs are estimated to be 30 - 40% lower

ESTIMATED CONVERSION COST: €350/kW
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Conversion and Infrastructure costs

Costs of a new build methanol ship with two 10 MW MAN engines

- Engine costs: €825,000
- Work on engine: €300,000
- Fuel supply system: €600,000
- Fuel tanks: €500,000
- Piping, etc: €500,000

TOTAL COST: €270/kW
Conversion and Infrastructure costs

• Conversion or new-build of marine diesel engines to methanol fuel is
  – Technically feasible
  – Leads to lower emissions and ECA compliance
  – Is a pathway to renewable fuel
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Conversion and Infrastructure costs

Methanol (MeOH) versus other marine fuels
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Part I. Regulations

Part II. Technology

Part III. Main findings
Main findings

- Methanol is plentiful, available globally and could be 100% renewable.
- Methanol is compliant with increasingly stringent emission reduction regulations.
- Current bunkering infrastructure needs only minor modifications to handle methanol.
- Infrastructure costs are relatively modest compared to potential alternative solutions.
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Main findings

- Methanol prices show regional variation.
- Conversion costs to drop dramatically as experience mounts.
- Current engines have performed well and upcoming technologies will improve on this performance.
- Shipping and chemical industries have a long history and ample experience in handling methanol safely.
- Methanol is biodegradable.