The Methanol Institute (MI) was established in 1989
Three decades later, MI is recognized as the trade association for the global methanol industry
We facilitate methanol’s increased adoption from our Singapore headquarters and regional offices in Washington DC, Brussels, Singapore, Beijing and Delhi
Our Members

Tier 1

Tier 2

Tier 3

Tier 4

www.methanol.org/join-us
The Simplest of Alcohols

- A simple molecule rich in hydrogen, with only a single carbon bond

- Clear and colorless liquid at room temperature and ambient pressure

- Sometimes known as ‘wood alcohol’ methanol can be produced from a wide range of feedstocks

Formula: CH₃OH
Density: 0.792 g.cm⁻³
Molar mass: 32.04 g mol⁻¹
Appearance: colorless liquid
Feedstocks and Markets

feedstock
natural gas ~65%
clean coal ~35%
biomass & renewables <1%

conversion
methanol synthesis

derivatives
other 7%
solvents 4%
chloromethanes 2%
MTO 18%
methylamines 3%
DME 8%
biodiesel 3%
gasoline blending 9%
MTMA 2%
MTBE 8%
acetic acid 9%
formaldehyde 27%
source: IHS

markets
appliances
automotive
construction
electronics
fuel
paint
pharma
and...
marine

2019: Global Methanol Demand = 86 Million Metric Tons or 28.6 billion gallons

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Renewable Methanol Emission Reductions: CO2 by up to 95%; NOx by 80%; virtually eliminating SOx and Particulate Matter (PM)
The International Maritime Organization has adopted emission regulations transforming the shipping industry.

- In 2020, global SOx reductions took effect.
- By 2030, interim requirements targeting 40% reduction of carbon intensity from shipping.
- By 2050, greenhouse gas emissions must be cut in half.
Reducing Conventional Pollutants

Methanol is among the lowest emission fuels for marine engines

Source: Stena Lines -- Emission reductions when compared to alternative fuels currently available (fuel oil)
IMO GHG Interim Strategy

• In operation, conventional methanol offers lower CO2 emissions compared to conventional marine fuel.

• If produced from one of numerous renewable pathways, such as biomass or renewable electricity combined with recycled carbon dioxide, methanol has the potential to significantly reduce CO2 emissions on a well-to-wake basis.
Maersk and Renewable Methanol

May 26, 2020

Maersk, DSV Panalpina, DFDS, SAS and Ørsted formed partnership to develop an industrial-scale sustainable fuels production facility in Copenhagen

When fully-scaled up by 2030, the project will deliver 250,000 tonnes of sustainable fuel, including renewable methanol for Maersk fleet

“In Denmark, we have an opportunity now to accelerate the green transformation and take lead in powering the future with sustainable energy and I am pleased that we can contribute with concrete actions. We need many such projects both in Denmark and around the globe to achieve our ambition in Maersk of becoming carbon neutral by 2050.”

Søren Skou, CEO, A.P. Moller - Maersk

IMO Methanol Safety Guidelines

Amendment of the International Code of Safety for Ship Using Gases or Other Low-flashpoint Fuels (IGF Code) to include Methanol
# Methanol Vessels on the Water

## Dual Fuel
- **Vessel Type:** Chemical Tankers, Ropax Ferry, Pilot Boat, Tourist Boat, Ferry
- **Owner:** MOL, WL, Marinvest, Mitsui, NYK, Waterfront Shipping, Mitsui O.S.K. Lines, Ltd, Westfal-Larsen Management, Marinvest/Skagerack Invest, IINO Kaiun Kaisha, Ltd., Mitsui & Co Ltd., and the NYK Group
- **Engine Type:** 2 Stroke Man, 4 Stroke Wärtsila, High Speed Scania, Weichai
- **Design:** New Build, Retrofit

## Fuel Cell
- **Vessel Type:** Stena Line, MI/SMA ScandiNaos, Innogy HTWG Konstanz, Viking Line
- **Owner:** SUMMETH/MARTEC, Lean Ships, Methaship, Billion Miles¹, iFtech², IWAF³, PCG Product Vessel⁴, NTU², GMM, Fastwater, Port of Rotterdam Barge, Jupiter, Paxell, Methanex Fishing⁵
- **Engine Type:** Serenergy Fuel Cell Stacks
- **Design:** New Build & Retrofit

## Project R&D
- **Vessel Type:** Cruise Ships, Fishing Boats, Barges, Dredges, Others
- **Owner:**
- **Engine Type:** Si Hybrid, Dual Fuel, etc.
- **Design:** New Build & Retrofit

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All projects are based in the EU unless noted otherwise China/SG⁶, EU/China/SG², India⁷, Malaysia⁸, China⁹

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www.methanol.org/join-us
More on the Way

**Sweden/Switzerland:** Proman Stena Bulk – joint venture of shipowner Stena Bulk and Proman Shipping a subsidiary of methanol producer Proman – to build two 50,000 dwt tankers with methanol dual fuel engines

**Netherlands:** Damen Shipyards has developed new concept Offshore Support Vessel (OSV) to operate on methanol

**Germany:** Shipowner Liberty One has ordered new multipurpose (MPP) ship powered by methanol

**Germany:** Shipowner SAL Heavy Lift to install FUELSAVE hydrogen/methanol injection system in 6 vessels

**Germany:** Abeking & Rasmussen shipyard designing “green cruise” concept vessel using methanol fuel cells for hotel load and methanol propulsion engines

**Germany:** AIDAnova will employ methanol fuel cells for propulsion as early as 2021 under Pa-X-ell2 project
Joint Marketing – MAN ES

THE MARINE FUEL OF THE FUTURE

METHANOL AS A SUSTAINABLE SOLUTION

SUSTAINABLE BIOMASS
(Residues, MSW, etc)

SYNTHETIC FUELS

CO₂

Fermentation
Gasification
Kraft Process

Bioenergy
Carbon Capture

Hydrogen
Sugars

Nongas
Reactor & Distillation

Methanol
Bio-Methanol

RETROFITS ECONOMICALLY Viable

METHANOL FUELED VESSELS AND PILOTS

DUAL FUEL

CHEMICAL TANKERS 11
HAGOS FERRY 1
Ferry 1

FUEL CELL

Towed Boat 2

PROJECT R&D

Electric Reefs, Floating Refineries, Barges, Shipyards, Others 4

METHANOL IS MORE EFFICIENT THAN DIESEL IN ICE

METHANOL AVAILABLE IN OVER 100 PORTS TODAY

LNG VS METHANOL

MGO VS METHANOL

www.methanol.org/join-us

Methanol Institute
What do the Operators say?

**STENA LINE**

“We are very enthusiastic about Methanol’s possibilities and it has the potential to be the maritime fuel of the future”

Carl-Johan Hagman
CEO
Stena Line

**MARINVEST / SKAGERACK INVEST**

“We have found the technology for handling Methanol is well developed and offers a safe dual-fuel solution for low-flashpoint liquid fuels”

Patrik Mossberg
Chairman
Marinvest/Skagerack Invest

**MITSUI O.S.K. LINES, LTD.**

“Investing in technology that encourages the use of a fuel like Methanol that significantly reduces emissions is a step forward for both our company and the shipping industry”

Akio Mitsuta
Senior Managing Executive Officer
Mitsui O.S.K. Ltd

**WESTFAL-LARSEN MANAGEMENT**

“We have found Methanol to be one of the best alternative fuels due to its wide availability, the use of existing infrastructure, and the simplicity of the engine design and ship technology”

Rolf Westfal-Larsen Jr.
CEO
Westfal-Larsen Management

www.methanol.org/join-us
Current Projects

Major Dutch maritime firms join forces to study methanol as fuel

A consortium of major Dutch maritime companies has joined forces to look into the feasibility of using methanol as a sustainable alternative marine fuel under the Green Maritime Methanol project.

The consortium includes shipowners Boluda, The Royal Netherlands Navy, Van Oord, Van Oordac, Klaaspijper, and shipbuilders Damen Shipyards, Damen Shiprepair, Franna, Royal Uhde, engine manufacturer Pio Yaver, and its trading associate YTV, owners of Skanska and Huisman, and other providers including C-Safety, Nodal Architect Norand, and others.

Work is underway to analyze production, carbon chain for methanol, and a potential pathway for the development of the Netherlands' two largest ports. Other shipyard suppliers include Stocan and Van Oord and trade.

Antwerp launches initiative to achieve fossil-free shipping

The Port of Antwerp has launched the FASTWATER consortium, an initiative designed to demonstrate how methanol can be used to achieve fossil-free commercial shipping.

In a statement, the port said the consortia wanted to examine the potential for using methanol on retrofit and newbuild vessels as a "pathway" towards greener operations.

With funding from the European Commission, FASTWATER will focus on high impact outcomes, designing solutions for existing ships and designs for newbuilds, demonstrating methanol as a future-proof marine fuel to create a fast track to carbon-neutral shipping.

How does Antwerp compare to other major ports in Europe?
Green Maritime Methanol

- MI has joined an industry consortium organized by TNO to study the use of (green) methanol in short sea shipping, a spin-off from the Horizon 2020 LeanShips project.

- TNO is an internationally renowned research institute with a great reputation for objective analysis.

- The study will set the stage for a pilot with actual ships on the water with project partners (Horizon 2020 or other).

- Focus is on renewable methanol but the technology, safety guidelines and policy can be used for conventional methanol too.

[Links to related articles and websites]

https://www.einnews.com/pr_news/477078882/major-dutch-maritime-companies-join-green-maritime-methanol-project
https://https://www.leanships-project.eu/home/
FASTWATER

• Consortium of Europe’s maritime research and technology leaders formed in 2020

• Demonstrate the feasibility of retrofit and newbuild vessels to operate on methanol as a pathway to fossil-free shipping

• Funded by European Commission, FASTWATER will focus on high impact outcomes, designing solutions for existing ships and designs for new buildings

www.fastwater.eu
FASTWATER

• Aims to commercialize medium and high-speed methanol-fueled engines for shipping, and will demonstrate feasibility on a harbour tug, pilot boat and coast guard vessel

• Conversion concepts and validation for a river cruise ship including a universal, scalable retrofit kit for converting diesel fueled ships (200 kW - 4 MW)

• Training programs for crew and port staff | R&R

• Demonstrate the complete value chain for bunkering methanol and elaborate a business plan for methanol as marine fuel

• Identify CO2 and conventional pollutant reductions facilitated by the next generation methanol propulsion systems
China WTRI study

China Waterborne Transport Research Institute

• Study to produce a roadmap for adoption of methanol as a marine fuel in China

• Partners: WTRI, Methanex, Shanghai Huayi, SINOPEC, Methanol Institute

• Key elements will include: Policy Analysis; Recommendations; Best Practices

Assumptions

• China bunker demand 30m mtpa

• 630,000 vessels operating in China coastal regions
  • Fishing
  • Inland waterways (140,000)

• Potential methanol demand of several million metric tonnes per year

Targeted outcome is to achieve China MSA endorsement of the study and policy recommendations, which will allow China Classification Society to class methanol-fueled vessels, allowing MI to begin to promote methanol and buildout the market
• Techno-Economic Study: In April 2020, with support from Methanol Institute, Lloyd’s Register published an assessment of the current and future fuels available to help define solutions for the maritime industry as it seeks to reduce GHGs

• Bunkering Technical Reference: MI and Lloyd’s Register have developed a methanol bunkering technical reference, work which was requested by shipping organizations studying methanol

• ISO: Following a request from IMO, the International Standards Organization (ISO) began work on a methanol marine fuel standard in mid-2019
Compliance Cost Comparison

“Methanol is an economically competitive marine fuel over the cycle”

Paul Hexter, CEO Waterfront Shipping
Availability in Over 100 Ports

https://public.tableau.com/profile/quantzig#!/vizhome/MethanolAvailabilityDataTopGlobalMaritimePorts/MethanolFuelAvailabilityatPorts
Simple, Clean Bunkering

• Methanol is liquid at atmospheric pressure/temperature
• Available in many ports and inland terminals around the world
• Bunkering has low infrastructure cost (no cryogenics)
• Flexible, modular system
• Biodegradable product means low risk for environment/location
Pollution in Perspective

**LC 50: Lethal Dose: Fish**

- **Gasoline** [1] 8,2 mg/l
- **Methane** [2] 49,9 mg/l
- **Diesel** [3] 65 mg/l
- **Heavy Fuel Oil** [4] 79 mg/l

**Methanol** [5] 15,400 mg/l

- Methanol is a more environmentally-benign fuel in marine environments
- In a waterbody, nearly 200 times more methanol is needed to kill half the number of fish than marine heavy fuel oil

Sources:
[1] Petrobras/Statoil ASA, Safety Data Sheet, ECHA registration dossier Gasoline
[4] GKG/ A/S Dansk Shell, Safety Data Sheet
Methanol as A Marine Fuel

- A simple, safe liquid fuel, miscible in water
- Plentiful, available globally, price competitive to MGO
- Works with existing engine technologies as a drop-in or a dual fuel
- Complies with IMO2020 provides a pathway to IMO 2030 and 2050
- Requires only minor modifications to current bunkering infrastructure