

# METHANOL AS A MARINE FUEL

A SAFE, COST EFFECTIVE, CLEAN-BURNING, WIDELY AVAILABLE  
MARINE FUEL FOR TODAY AND THE FUTURE



**A low emission fuel** that meets increasingly stringent environmental fuel regulations



**Economical fuel,** infrastructure and vessel costs



**One of the top five chemical commodities** shipped around the world each year. Unlike some alternative fuels, it is readily available through existing global terminal infrastructure



**For over 100 years,** shipped globally, handled and used safely in a variety of energy applications



**A clear, colourless liquid** that quickly dissolves in water and biodegrades rapidly

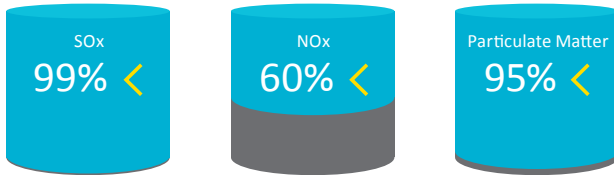


**methanex**  
the power of agility



# LOW EMISSION

**Clean-burning:** By using methanol as a marine fuel, the emissions of sulphur oxides (SOx) are reduced by approximately 99 per cent, nitrogen oxides (NOx) by 60 per cent and particulate matter (PM) by 95 per cent.



Source: Stena Lines  
Emission reductions when compared to heavy fuel oil

## IMO regulations

As a clean-burning fuel, methanol is helping the maritime industry meet new environmental regulations from the International Maritime Organization (IMO) that require ships to decrease emissions of SOx and NOx. As an ultra clean-burning fuel, methanol is a future-proofed fuel that can meet the increasingly stringent marine regulations of tomorrow.

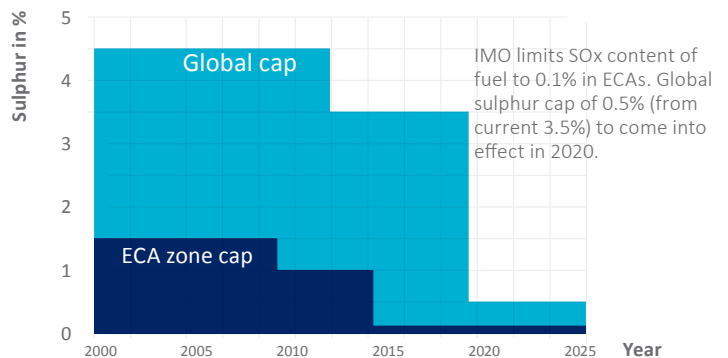
## SOx regulations

At the end of 2016, the IMO announced new sulphur regulations that require a global 0.5% cap on sulphur content in marine fuels starting in 2020.

## NOx regulations

In mid-2017, the IMO confirmed that NOx emissions will be lowered to Tier 3 levels in 2021 for new build vessels entering ECAs in Europe. Similar regulations have been in place in the North American ECAs since 2016. These policies provide further support for methanol as a fuel, as methanol reduces NOx and can reduce or potentially eliminate the need for additional capital and operational intensive equipment that other fuels may require to meet IMO Tier 3 NOx.

## IMO Sulphur Limits – Marpol Annex VI



# SAFE



## Long history of safe handling:

For over 100 years methanol has been shipped globally, handled and used safely in a variety of energy applications.



**Risk classification:** Rules have been established by risk classification societies for the safe handling of methanol and other low flashpoint fuels, and international standards are under development.



**Biodegradable:** Methanol is biodegradable and, if spilled in water, it quickly and completely dilutes to non-toxic levels. That means that the environmental effects of a methanol spill would be much lower than those from an equivalent oil spill.



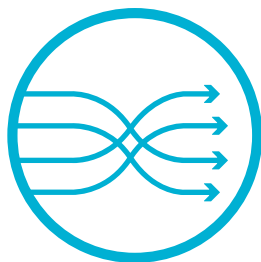
**Proven culture of safety:** Leading shipping companies such as Stena, Westfal-Larsen, Waterfront Shipping, Mitsui O.S.K. Lines and Marinvest/Skagerack Invest have selected methanol as a fuel. With over 200 years' experience in the shipping industry, Methanex's wholly owned subsidiary, Waterfront Shipping, goes above and beyond regulations with its Responsible Care® programs to improve safety and quality of life for the officers and crew on board their ships.

# ECONOMICAL AND AVAILABLE

---



**Economical:** Methanol has been cost competitive on an energy equivalent basis with competing fuels such as marine gas oil (MGO). Methanol's use as a marine fuel provides shippers and port facilities with an affordable option for compliance with tightening emission requirements.



**Flexible, future proofed fuel:** To hedge the risk of fuel price volatility, shipping companies may choose to diversify their fuel mix to operate on flex-fuel methanol/diesel engines. This enables vessel owners to always have the choice of using the lowest cost fuel, and to meet increasingly stringent air pollution regulations.



**Low costs for vessel conversion or new build:** The cost to convert vessels to run on methanol is significantly less than alternate fuel conversions. As well, when building a new vessel the cost is relatively minor for it to be able to run on methanol.



**Low infrastructure costs:** As a liquid fuel, only minor modifications are needed for current storage and bunkering infrastructure to enable methanol marine fueling in major port facilities – both easily and cost effectively.



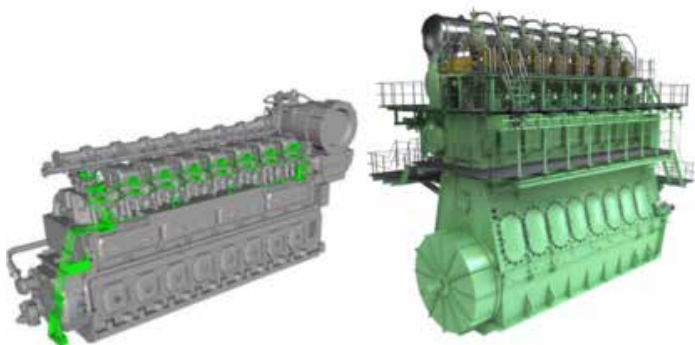
**Available:** Methanol is one of the top five chemical commodities shipped around the world each year. Unlike some alternative fuels, it is readily available through existing global terminal infrastructure and well positioned to reliably supply the global marine industry.



In addition to air quality legislation, the IMO continues to push for improvements in energy efficiency and lower greenhouse gas emissions in the shipping industry. Methanol, which can be made from renewable sources such as biomass and recycled carbon dioxide, is an ideal path to a sustainable future in which ships can be powered by renewable fuels with a lower carbon footprint.

# IN USE TODAY

---



## Methanol compatible engines for ships

Engine manufacturers including MAN Diesel and Wärtsilä have developed efficient methanol dual-fuel engines. Other engine manufacturers and stakeholders are also advancing projects to commercialize methanol as a marine fuel. These include the MethaShip project in Germany, which is focused on methanol-powered cruise ships and ferries, as well as several projects focused on the smaller marine engine market including the EU-supported Leanships and the SUMMETH and GreenPilot Projects in Sweden.

In China, Methanex is also working with Tianjin University and the Ministry of Agriculture to demonstrate methanol as a marine fuel for a fishing vessel as well as supporting the development of methanol marine fuel guidelines. As well, Singapore-based Billion Miles (S) Pte Ltd. is working to put methanol fueled harbor tugboats in the city-port.



## World's first seven ocean-going vessels capable of running on methanol: Waterfront Shipping

In 2016, Waterfront Shipping, Marinvest/Skagerack Invest, Westfal-Larsen Management, and Mitsui O.S.K. Lines, Ltd. welcomed seven new first-of-their-kind vessels built with more efficient design features that can run on methanol, resulting in lower emissions than engines burning conventional fuel. These seven 50,000 dead weight tonne methanol tankers – powered by two-stroke dual-fuel engines capable of running on methanol, fuel oil, marine diesel oil or gas oil – have been operating safely and reliably across the globe for over a year.



## World's first methanol-powered ferry: Stena Germanica

In 2014, Methanex collaborated with industry partners to complete the SPIRETH (“alcohol (spirits) and ethers as marine fuel”) demonstration project. This led to the development of the world’s first methanol-powered ferry, the Stena Germanica, which operates in the Baltic Sea. By running on methanol as its main fuel, the ferry reduces emissions of SO<sub>x</sub> by 99 per cent, NO<sub>x</sub> by up to 60 per cent, and particulate matter by 95 per cent compared to traditional marine fuel.



“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



“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



“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. Lines, Ltd.



“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

## Safety and Sustainability in the Shipping Industry

Methanex adheres to Responsible Care®, a sustainability initiative recognized by the United Nations. Through our wholly owned subsidiary, Waterfront Shipping, Methanex has a long history of supporting a strong culture of safety on board our vessels. Waterfront Shipping is a recognized industry leader for its development of safer vessel operational practices.

As a responsible product steward, Methanex strives to maintain the highest safety standards, protect the environment and share methanol safe-handling knowledge with stakeholders throughout our supply chain. For example, Methanex supported the release of the Methanol Institute's Methanol Safe Handling and Safe Berthing Technical Bulletin, which sets new marine industry standards for loading and unloading methanol cargo vessels to support best practices for shippers, port operators and methanol producers.



### Green Marine Partner

Methanex is proud to be a partner of Green Marine, a voluntary environmental certification program for the North American marine industry. Green Marine is a rigorous, transparent and inclusive initiative that addresses key environmental issues and ensures participants are taking concrete actions to reduce their environmental footprint.

To learn more, visit [www.greenmarine.org](http://www.greenmarine.org)

## About Methanex

Methanex Corporation is the world's largest producer and supplier of methanol to major international markets in North America, Asia Pacific, Europe and South America. Methanex adheres to Responsible Care®, a sustainability initiative recognized by the United Nations. In 1997, Methanex became the first chemical company in the world to receive global verification under Responsible Care. As a responsible product steward, Methanex maintains the highest safety standards, protects the environment and shares methanol safe-handling knowledge with stakeholders throughout our supply chain. In 2016, Methanex's sales volume of 9.5 million tonnes represented approximately 14 per cent of global methanol demand. As the global leader in methanol, we support the development of new applications for methanol to provide innovative solutions for the world's energy needs.

Learn more at [methanex.com](http://methanex.com)



.....  
A RESPONSIBLE CARE® COMPANY  
.....