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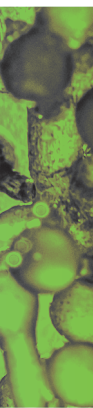
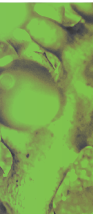
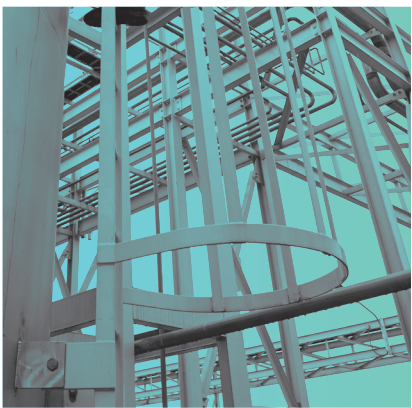
MARINE METHANOL

Future-Proof Shipping Fuel

Fact Sheet:

Case Study:

A.P. Moller - Maersk Bets on Green Methanol



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Marine Methanol in Shipping

A.P. Moller - Maersk Bets on Green Methanol

A.P. Moller-Maersk is an integrated container logistics company working to connect and simplify its customers' supply chains. The second-largest shipping company in the world, Maersk operates in more than 130 countries and employs around 100,000 people. In August 2021, the company announced it would be accelerating its fleet decarbonization plans with the delivery of eight large ocean-going vessels operating on carbon-neutral methanol.

The number of dual-fuel engines on order has now gone up to 19, with feeder vessels arriving in 2023 and the first large ocean-going vessel due to enter into operation in the first quarter of 2024. Maersk is spending \$7 billion on the fleet upgrade. The vessels are being built by Hyundai Heavy Industries and have a nominal capacity of about 16,000 twenty-foot equivalent unit (TEU) containers.

They will feature a methanol propulsion configuration developed in collaboration with makers including MAN Energy Solutions, Hyundai and Alfa Laval. Maersk says the propulsion units represent a significant scale up of the technology, from a previous size limit of around 2,000 TEU. The vessels will be classed by the American Bureau of Shipping and sail under Danish flags.

The series will replace older vessels, with the first eight ships generating annual CO₂ emissions savings of around 1 million tons. In its 2021 announcement, Maersk said additional capital expenditure for the dual-fuel vessels would be up to 15 percent of the total price. In October 2022, Maersk announced the order of an additional six vessels with incremental pricing per vessel reduced to 8-12 percent compared with standard diesel-fueled vessels. The move to methanol fuel follows more than half of Maersk's 200 largest customers, including Amazon, Disney, H&M Group, HP, Levi Strauss & Co, Microsoft and Novo Nordisk, setting or planning science-based carbon reduction or zero-carbon targets for their supply chains.

"We are investing in methanol as one of several promising technologies of the future," says Berit Hinnemann, interim head of green fuels sourcing at Maersk. "The reasons for our belief in green methanol are three-fold: speed, optionality and cost. Green methanol allows us to make an impact on greenhouse gas reduction this decade, and green methanol is feasible to scale up from a cost perspective.

"We also work on other promising future technologies such as green ammonia but find that ammonia as a shipping fuel is not ready to be implemented yet and needs further technical and safety work."

Despite this, Hinnemann says getting hold of green methanol is not easy at present, since green methanol is only produced in small amounts today and production needs to be scaled up. The company has signed seven green methanol partnerships around the world, with the most recent, with Chinese bioenergy enterprise Debo, being inked in August 2022. The agreement with Debo will see

Strategic Partnerships Signed by AP Moller-Maersk to Source Renewable Methanol

Strategic Partners	Type of fuel	Production Capacity in 2024 (end of year) tons/year	Production capacity added after 2015 tons/year	Production capacity added after 2025 tons/year	Geography
CIMC ENRIC	Bio-methanol	50,000		200,000	China
Debo	Bio-methanol	200,000			
European Energy	E-methanol		2-300,000		North & South America
GTB	Bio-methanol	50,000		300,000	China
Orsted	E-methanol		300,000		North America
Proman	Bio and e-methanol		100,000		North America
WateFuel	Bio-methanol	30,000			South America
Total		330,000	6-700,000	500,000	

Source: Green Maritime Methanol, 2021

the provider developing a Chinese bio-methanol project for Maersk with capacity of 200,000 tons per year to start commercial operation by fall 2024.

In March 2022, Maersk announced partnerships with CIMC ENRIC, European Energy, Green Technology Bank, Ørsted, Proman and WasteFuel, with the intent of sourcing at least 730,000 tons of green methanol per year by end of 2025. “The most important challenge is the availability of green methanol at scale, and here partnerships across the value chain are key to accelerate the development and scale-up,” Hinnemann says.

“We also need infrastructure at port for storage and bunkering, and here green corridors and other initiatives may play a key role”, says Berit Hinnemann.