MAN Energy Solutions
Future in the making

New engines

Newbuilds and retrofits

These are the technologies we rely on to help our clients achieving the target of ‘net zero’.

PEM-Electrolysis

Green Engines

Retrofits

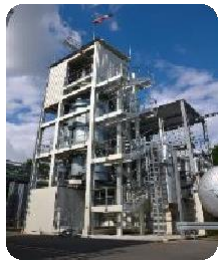
Carbon Capture

Heat Pumps

MAN Energy Solutions Technology Footprint

PEM Electrolysers

PtX process technology



Reactor competence for Synthetic fuel production (SNG, Methanol,…)

H2 driven buses

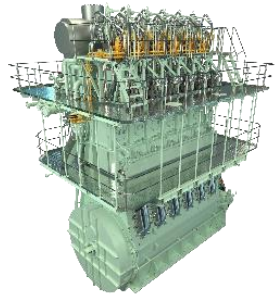
1999- Buses in Munich airport
2006- Buses in Berlin

Cryogenic Tanks and H2 storage

LNG and Liquid H2 tanks
LOHC (*). Partner with:
hydrogenious LOHC TECHNOLOGIES

(*) Liquid Organic Hydrogen Carriers

Two Stroke Engines



Natural Gas, BioFuels, SNG, Methanol, LPG, Ethane
Ammonia (2024)

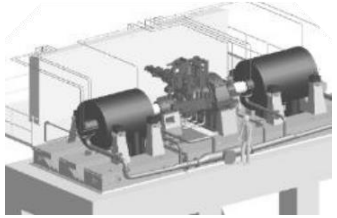
Four Stroke Engines

Natural Gas, SNG, BioFuels
Methanol (~2024)
Natural Gas/SNG blend with Hydrogen (25%).
100% Hydrogen (>2025)
100% Ammonia (>2025)

Gas Turbine

Natural Gas, Methanol, SNG, Natural Gas/SNG blend with Hydrogen (20%). 100% Hydrogen (>2025)

Ammonia Synthesis

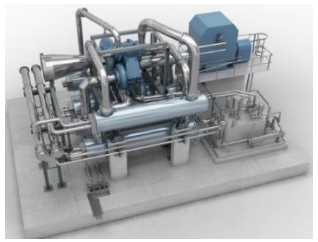


Highly efficient compressor train solutions for Ammonia process conditions

Methanol Synthesis

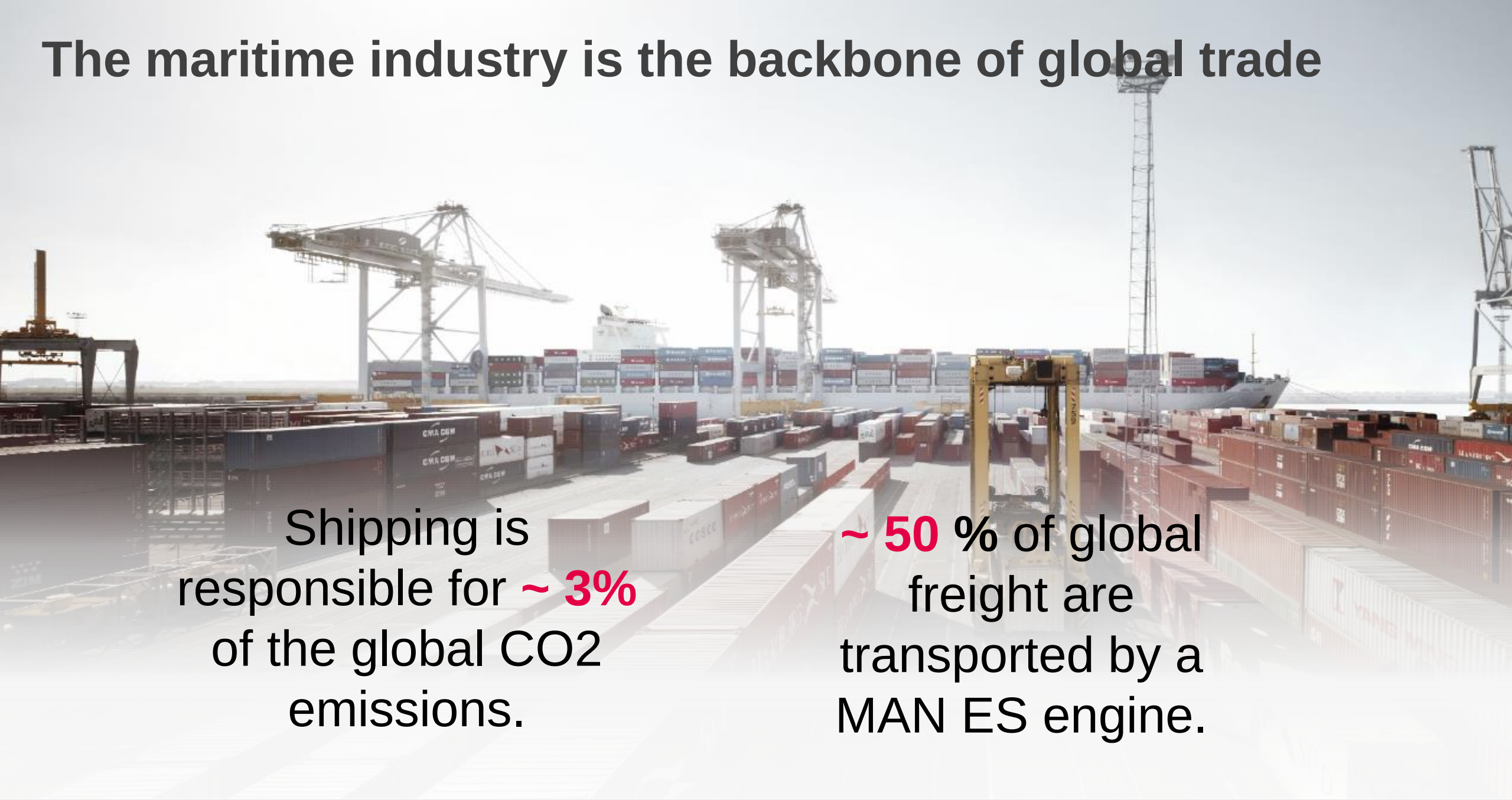
Highly efficient compressor train solutions for Methanol process conditions

Carbon Capture



Compressor trains
Partnership with Aker Solutions
Leader in CO2 compression

The maritime industry is the backbone of global trade



Shipping is responsible for **~ 3%** of the global CO2 emissions.

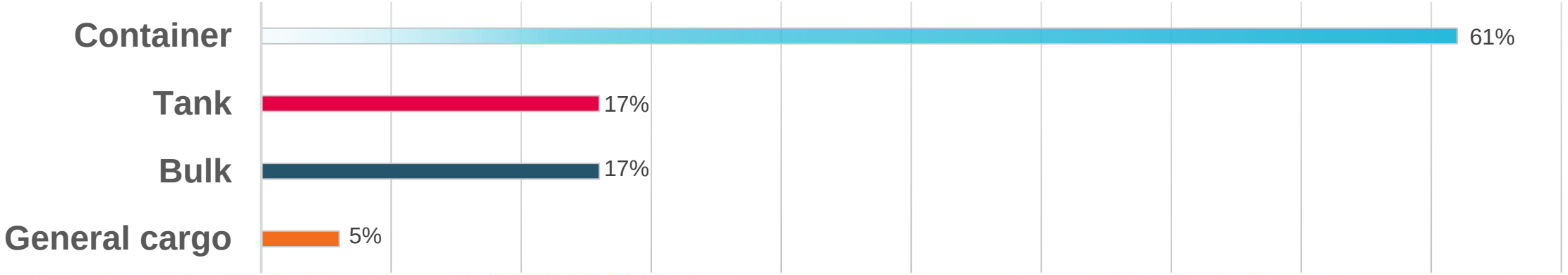
~ 50 % of global freight are transported by a MAN ES engine.

Powering sustainable shipping by opening clear routes

MAN Energy Solutions supports all

LNG		Ethane	Methanol	LPG	Ammonia
ME-GI 556 engines	**ME-GA** 242 engines	**ME-GIE** 39 engines	**ME-LGIM** 101 engines	**ME-LGIP** 146 engines	**2024**

Methanol – 33% of newbuilding project pipeline





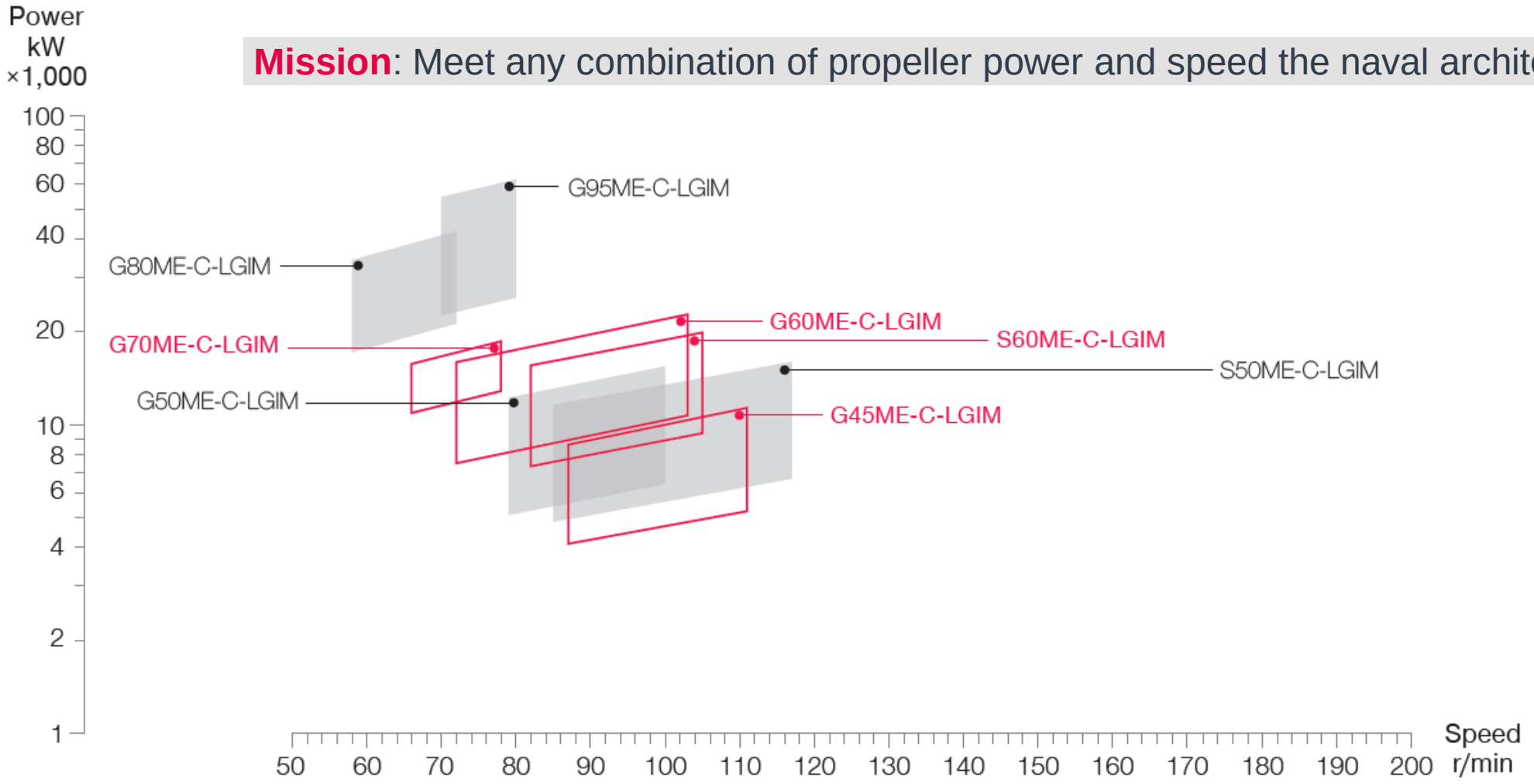





MAN B&W Methanol Two stroke engines

Existing S50, G50, G80 and G95-LGIM engines, alongside new G45, S/G60 and G70 LGIM engines of which design plans have been published.

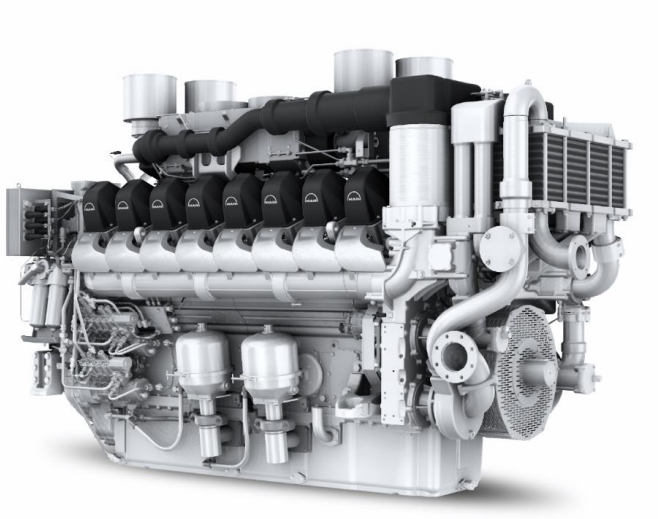
Mission: Meet any combination of propeller power and speed the naval architects will need



Modular design enables extensive retrofit options

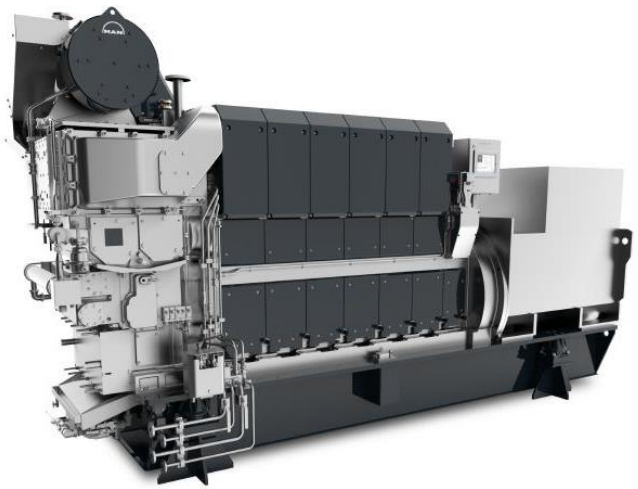
Modularity to rely on

MAN Methanol Four stroke engines



MAN 175D High Speed

- Methanol Ready
- Output: 1.700 – 4.400 kW
- Retrofit: 2026



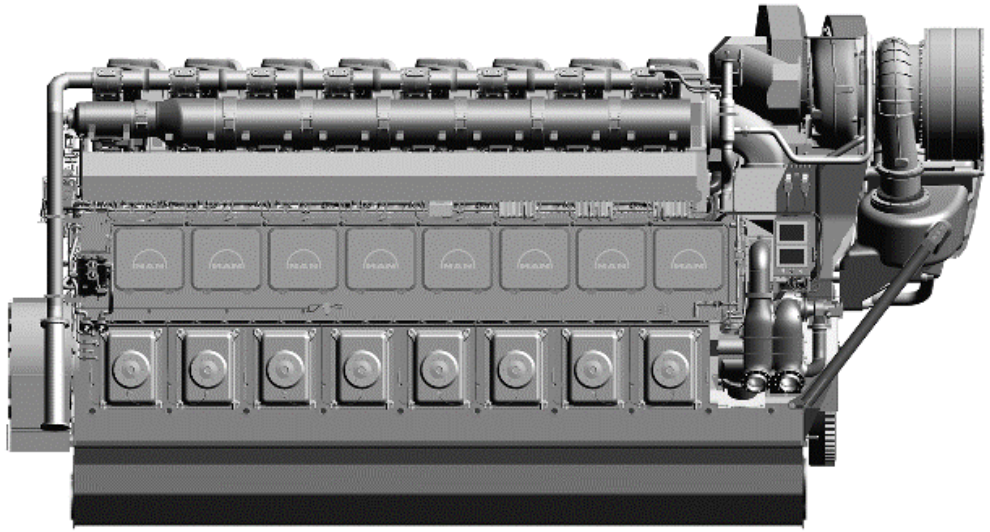
MAN L21/31l

- Methanol Ready
- Output: 1.000 - 1.980 kW
- Retrofit: 2025

MAN 32/44CR

- Methanol Ready
- Output: 3.600 – 12.000 kW
- Retrofit: 2028

MAN Methanol Four stroke engines



MAN 48/60, MAN51/60DF, MAN 49/60DF

– Output: 7.200 – 18.200 kW

MAN Energy Solutions

Press release

Copenhagen, 3rd October 2022

MAN Energy Solutions Signs Agreement with Norwegian Cruise Line Holdings

Memorandum of Understanding (MoU) with NCLH for retrofit of four-stroke MAN 48/60 engine to dual-fuel for diesel/methanol operation

Press release

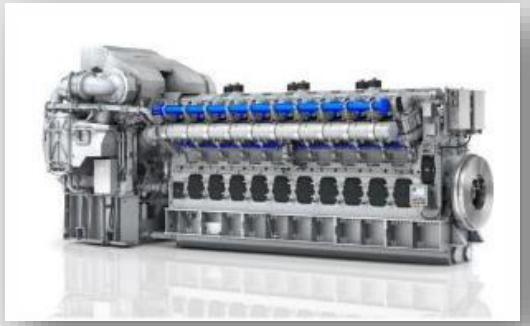
Copenhagen, 10.08.2022

MAN Energy Solutions Signs MoU with Stena and Proman

Memorandum of Understanding defines terms of project to investigate retrofit of MAN 48/60 engines to dual-fuel diesel/methanol operation

Hydrogen and Ammonia

Spark ignited (SI)

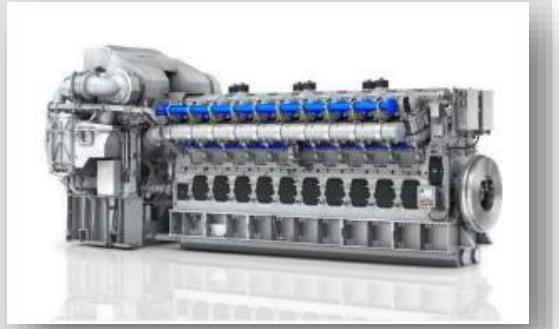


CH_4 and H_2 fuel mixtures within up to 25% vol. H_2,

Dual-Fuel (PFI)

Port fuel injection (PFI)

Dual-Fuel (DI)



Direct injection (DI)

AmmoniaMot

AMMONIAMOT

Supported by:

Federal Ministry for Economic Affairs and Energy

on the basis of a decision by the German Bundestag

An industry consortium including MAN Energy Solutions will develop a medium-speed, ammonia-fuelled engine; project called ‘AmmoniaMot’.

Summary

The technologies are ready!

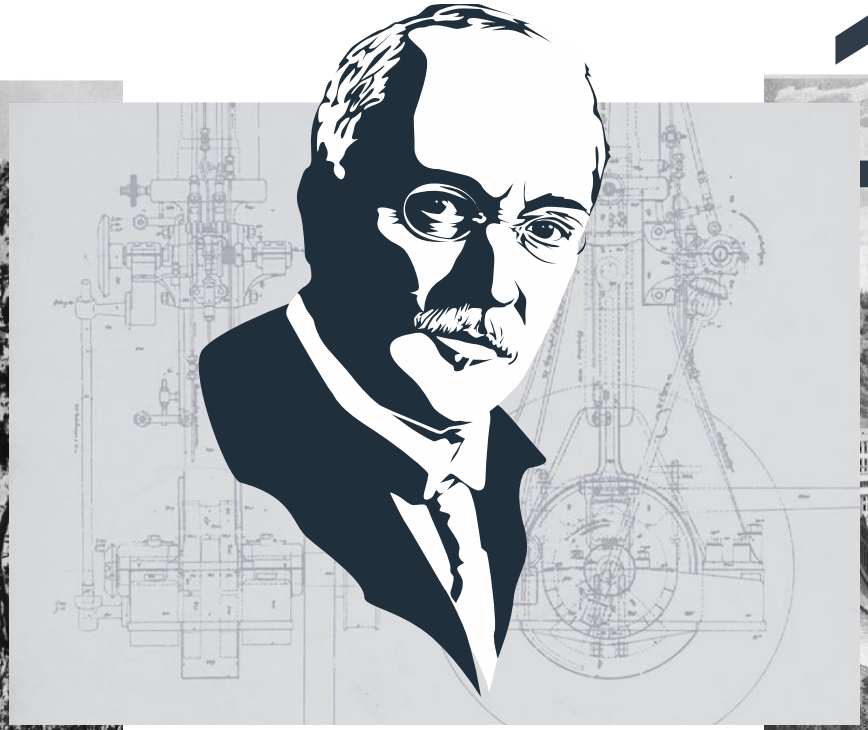
- However **regulations** are needed to drive the uptake of dual-fuel engines and production of green fuels.
- There will **not be a single clear winner** among alternative fuels.
- The selection of fuel will depend on vessel **type**, **size**, **trading** patterns, **charter** parties and preference.
- Currently **LNG is the leading** alternative fuel in newbuilding contracting.
- **Methanol** engine contracting is increasing significantly and is expected to make up 1/3rd of dual-fuel engine contracting in a few years.
- **Ammonia** as a marine fuel is expected to pick up towards the end of the decade.
- **Methanol engine retrofits** projects will increase significantly with the first orders expected soon.
- **Online connectivity:** All new MAN B&W engines are connected to MAN PrimeServ Assist, where our experts perform real time monitoring and feedback in order to optimize engine efficiency and reliability.

Twin roots of our company history

Company foundation dates back 260 years

1758

1758: St. Antony in Oberhausen



Rudolf Diesel 1858 – 1913

1840

Sander’sche Maschinenfabrik in Augsburg

Home of the Diesel engine

Disclaimer

All data provided in this document is non-binding.
This data serves informational purposes only and is especially not guaranteed in any way.
Depending on the subsequent specific individual projects, the relevant data may be subject to changes and will be assessed and determined individually for each project. This will depend on the particular characteristics of each individual project, especially specific site and operational conditions.

MAN Energy Solutions
Future in the making

Thank you very much!

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