

CO₂ Reduction

Bio Fuel and other technologies

Lachlan Colquhoun
Department
Day, Month, Year



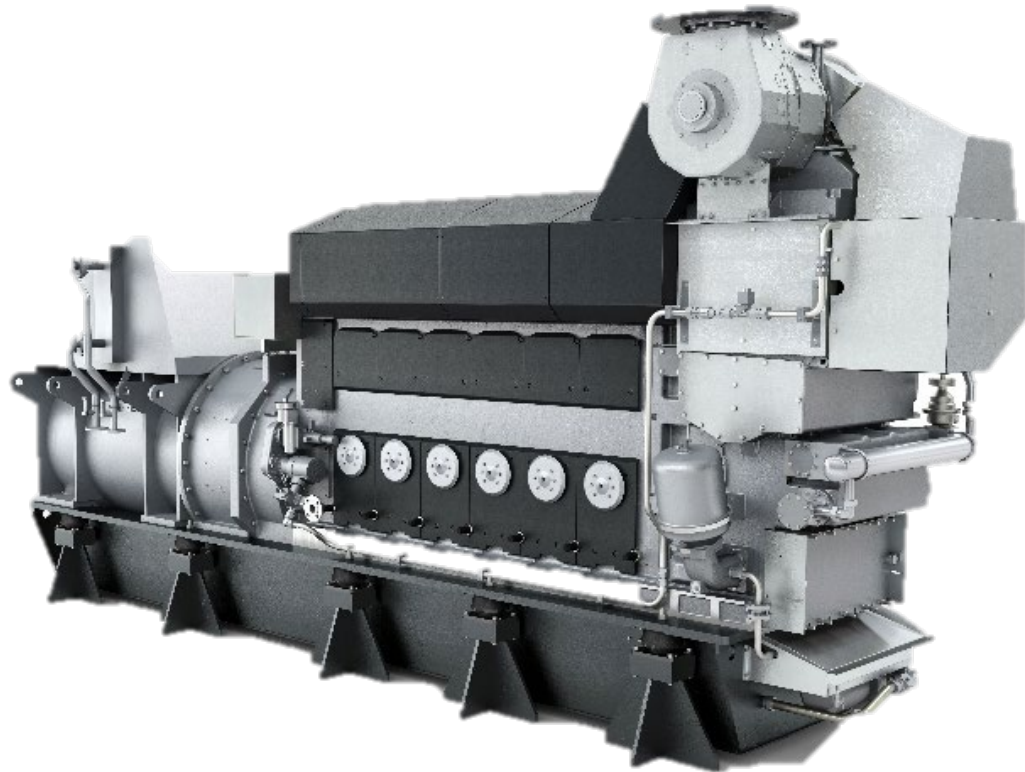
Home of the diesel engine

Rudolf Diesel 1858 – 1913



MAN GenSets support many fuels – not only HFO

Capable of burning most cetane fuels 2-700 cSt



What is Biofuel?

Fatty-Acid-Methyl-Ether
(FAME)

Crude Palm Oil (CPO)

Ethanol

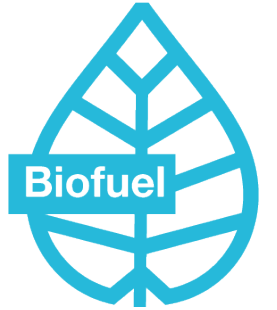
Coconut Oil

Cow Fat

Hydrogenated vegetable
oil (HVO)

Algae Fuel

Tallow





Facts and Figures

Biofuel



3%

of all road transport



B100

100% Biodiesel

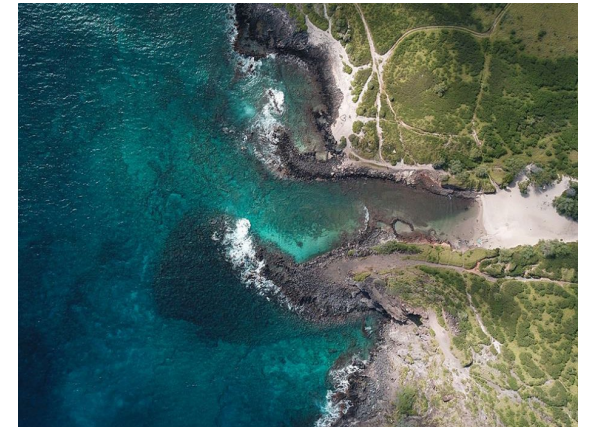
40

MAN medium speed
generators running on
biodiesel



2.7

kg of CO₂ for every litre of
diesel fuel*

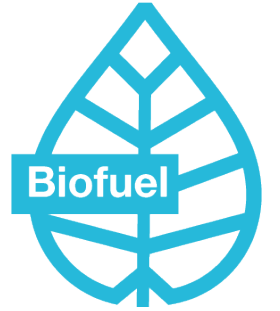


*average metric depending on specific properties of fuel.



Pure cow fat

ABP Foods, Ellesmere, Oswestry, UK – 24,000 Time Between Overhauls



Fish oil / FOME biofuel

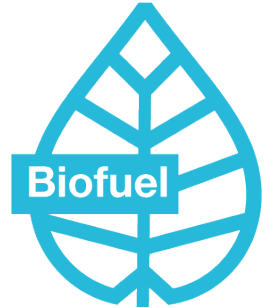
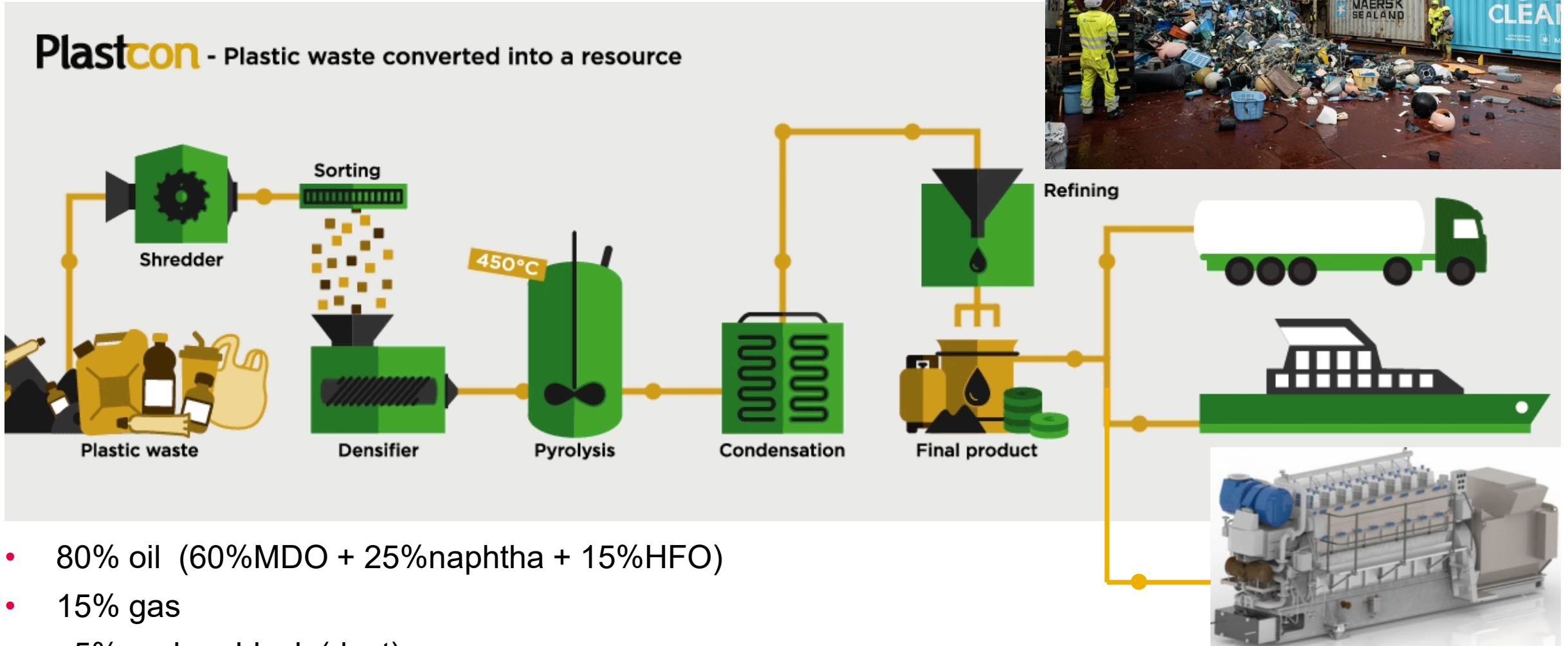


Table 1 Properties of diesel, fish oil and FOME

Properties	Diesel	Fish oil	FOME
Density at 15 C (kg/m ³)	850	923	873
Kinematic viscosity at 40 C (mm ² /s)	2.5	29.59	6.10
Specific gravity (gm/cm ³)	0.82	0.93	0.873
Iodine value (g/100 g oil)	38.30	158	85.96
Acid value (mg KOH/g oil)	0.34	2.24	–
Higher heating value (MJ/kg)	43	39.01	41.60
Flash point (C)	56	165	110



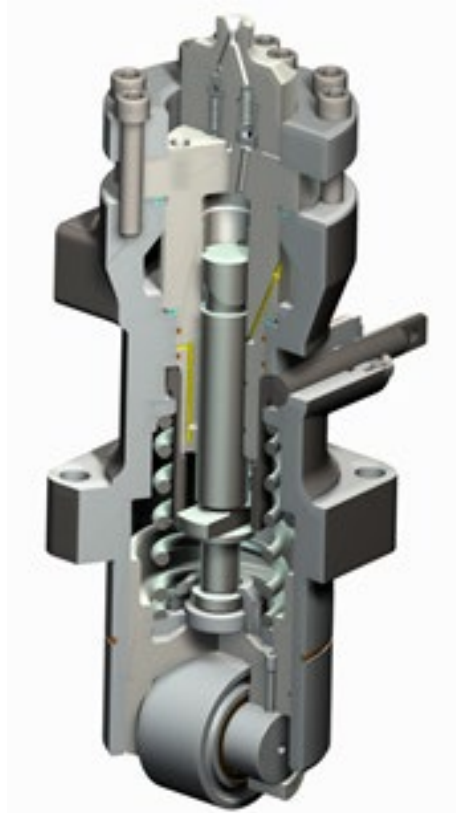
Plastic waste to fuel



- 80% oil (60%MDO + 25%naphtha + 15%HFO)
- 15% gas
- 5% carbon black (dust)



Equipment Upgrades

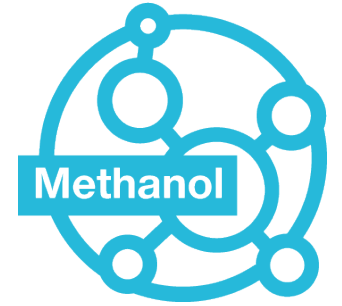


Fuel pump with WC/C coating
for low viscosity oil



Inlet/exhaust valves for higher heat resistance and less
lubrication to ensure longer lifetime

Green Methanol



"Green methanol is the best scalable green fuel solution for this decade, and we are excited to see several other shipowners choosing this path. It adds further momentum to the rapid scaling of availability needed to bring down the premium on green methanol and accelerate the evolution of climate neutral shipping," said **Palle Laursen**, Chief Fleet & Technical Officer at Maersk.

Methanol Fuel

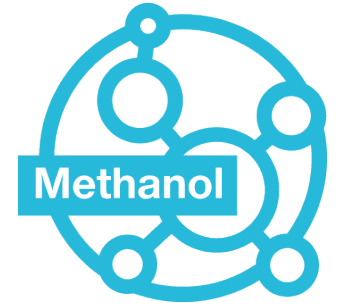
World's first ocean-going vessels capable of running on Methanol



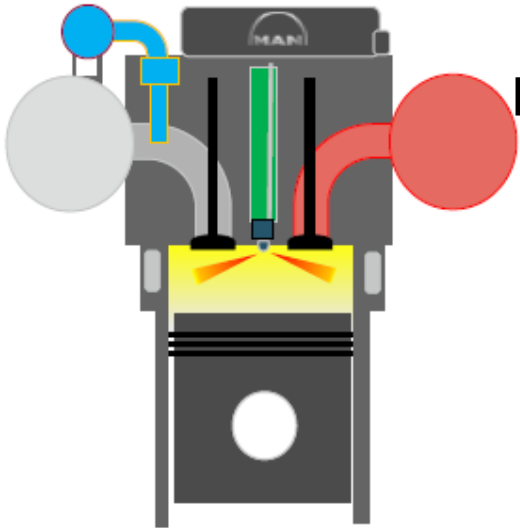
MAN B&W ME-LGI 2-stroke dual fuel engines that can run on methanol, fuel oil, marine diesel oil, or gas oil will power seven 50,000 dead weight tonnes vessels of Waterfront Shipping

Methanol GenSet Concept

Marine GenSet Concept in development – Retrofits for Power Station applications are coming !



Otto – port fuel injection (PFI)



Diesel / DF basis engine:

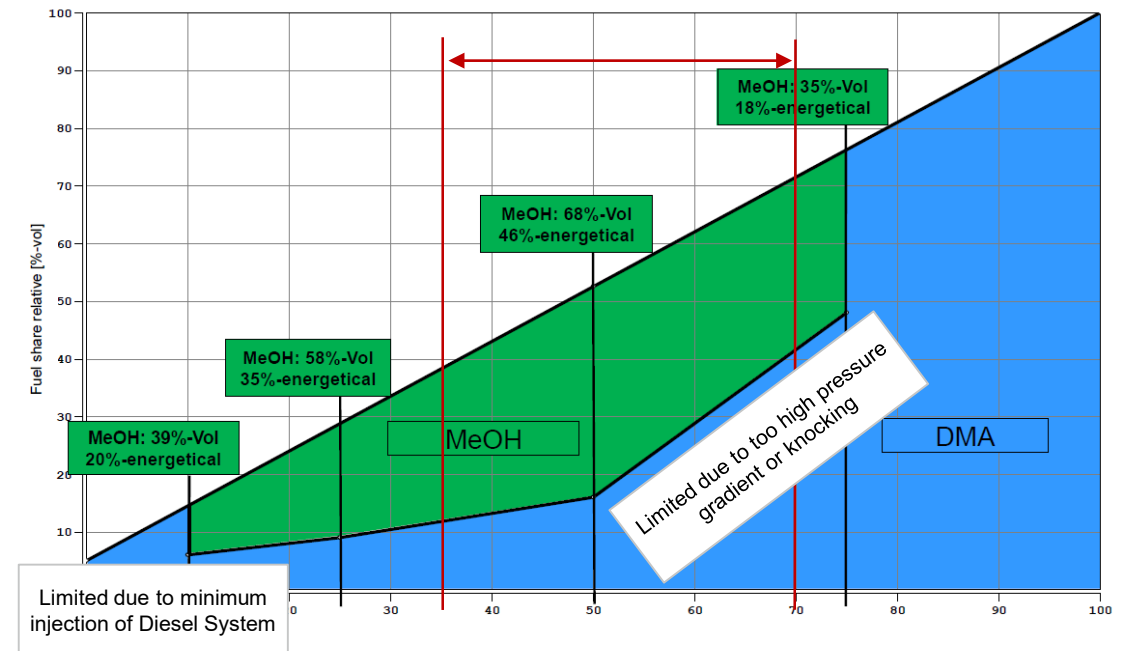
- MeOH port fuel injection (PFI) diesel main- or pilot injector for ignition
- Pre-mixed (Otto) combustion principle

PFI

21/31DF-M

1L32/44CR – MeOH-PF: Resulting operating MAP

with simulation of conventional Diesel PLD Injection System



Methanol Supply Chain

Courtesy of Methanex



Thank you very much!

Lachlan Colquhoun
Sales Manager
Lachlan.Colquhoun@man-es.com
Mb +61 407 955 537

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.