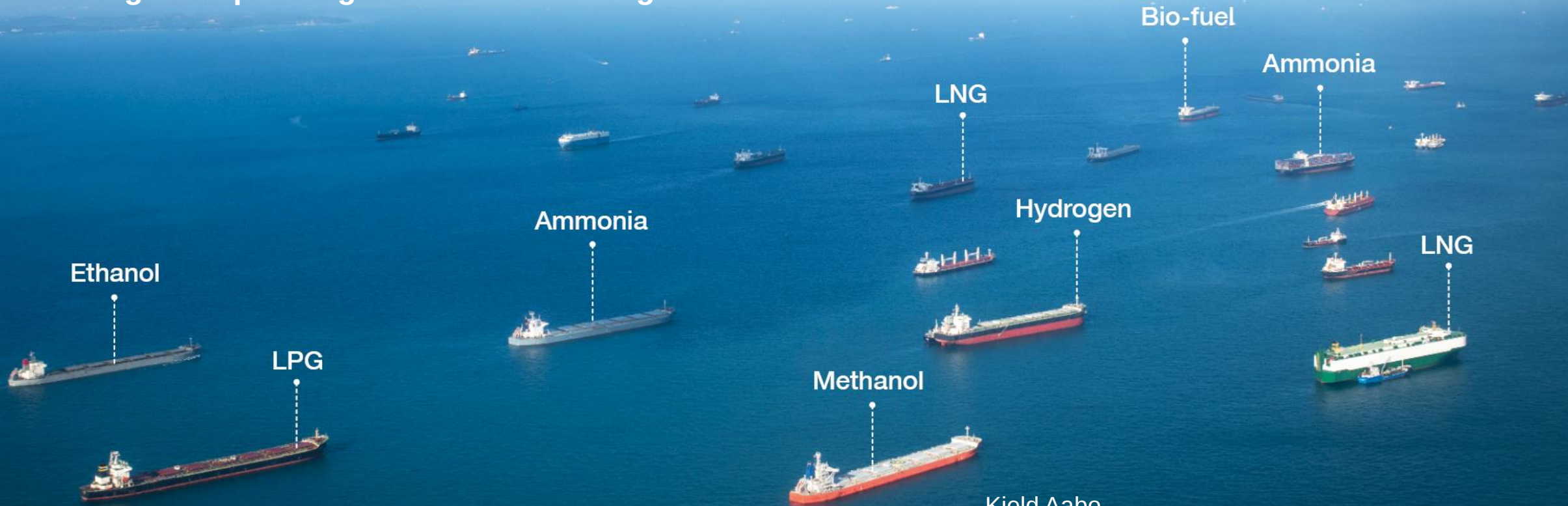


Lund Methanol day 05-11-2020

ME-LGIM engines operating at Methanol for large merchant marine vessels



MAN Energy Solutions
Future in the making

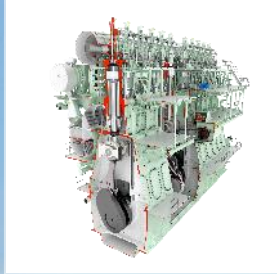
Kjeld Aabo

Director New technologies

Sales and Promotion Two stroke Marine

Member of WG ISO 8217 & Chairman CIMAC Fuels

The world's leading designer of two-stroke Diesel engines



**Design of
two-stroke engines**



**Production of
spare parts**



PrimeServ Academy



R&D Centre



Diesel House



The test engine no 2 comes to Copenhagen 2020.



ME-GI – Summarized

Second-to-none ultra low methane slip

- Impeccable cylinder condition and high combustion stability with with no load, methane number or ambient limitations in dual fuel mode operation.
- Low fuel consumption obtained by high thermal efficiency and low SPOC
- Maximum gas operation availability ensured by Gas Cylinder Cut-Out (CCO)
- Maximized reliability with simplified design and significant operational benefits
- References on LNG Carriers, Bulk Carriers, Tankers, PCTC, Container Vessels and Con-Ro

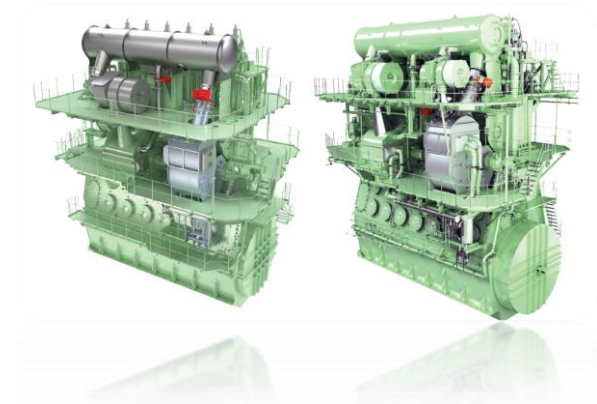
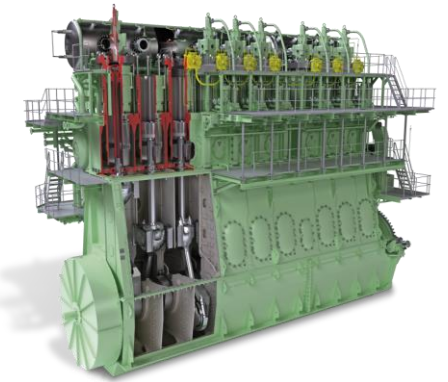
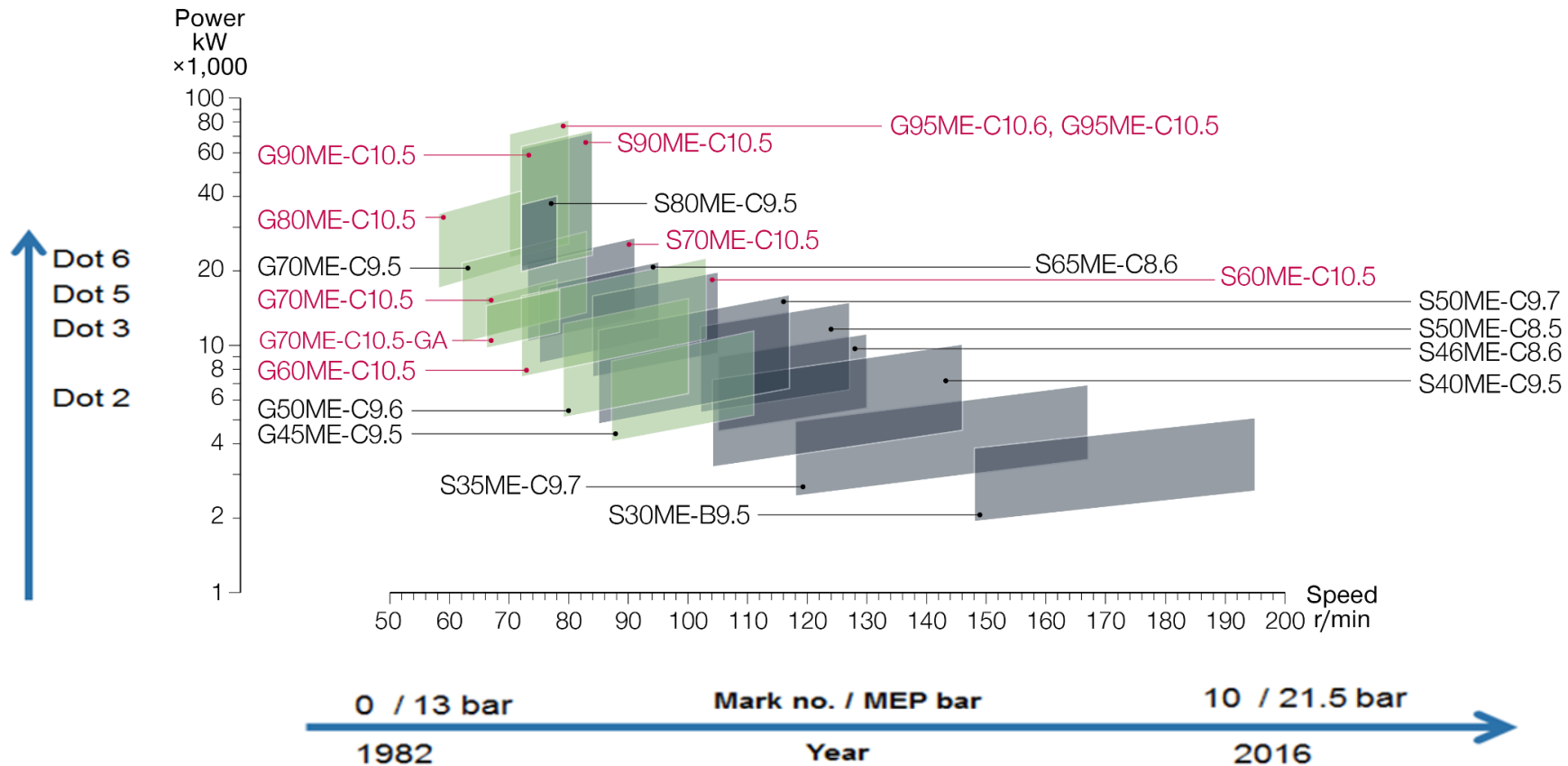
1.500.000

Dual fuel reference list

Engine type	Number of engines		Stroke	Bore	Total engines	Engines in service
ME-GI	235	6	S	90	333	<u>120</u>
		19	G	90		
		3	S	80		
		4	S	70		
		179	G	70		
		5	L	70		
		3	G	60		
		2	S	60		
		9	S	50		
		1	G	50		
		4	G	45		
ME-LGIM	26	23	G	50		
		3	S	50		
ME-GIE	28	21	G	60		
		3	G	50		
		4	S	50		
ME-LGIP	42	33	G	60		
		2	S	60		
		2	G	50		
		5	S	35		



Engine Programme Development



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

CSSC-MES Diesel Co.



Fuel flexibility

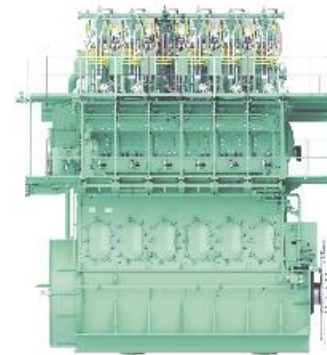
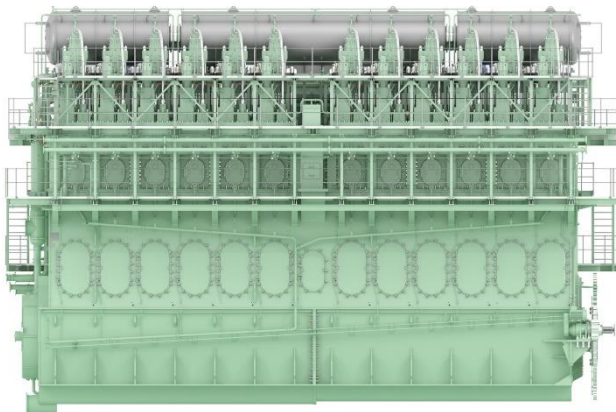
MAN B&W technology available for the combustion of the following fuels



ME-C

ME-LGIM/LGIP

ME-GI/GIE



ME-LGI Methanol - Development Milestones

Historical timeline

1st sea trials on
methanol
MNS *Taranaki Sun* & HMD *Lindanger*



Order book of 14 LGIM engines in total, 8 in service
>65.000 running hours accumulated on methanol



2015

LGI demonstration event at RCC
4T50ME-X



Test at MES
7S50ME-B9.3-LGIM



Test at HHI
7G50ME-B9.3-LGIM



2016

2017

2018

Development of
Tier III compliance by
Water in methanol



2019

NOx certification 6G50ME-
C9.5-LGIM-W at HHI June 2019

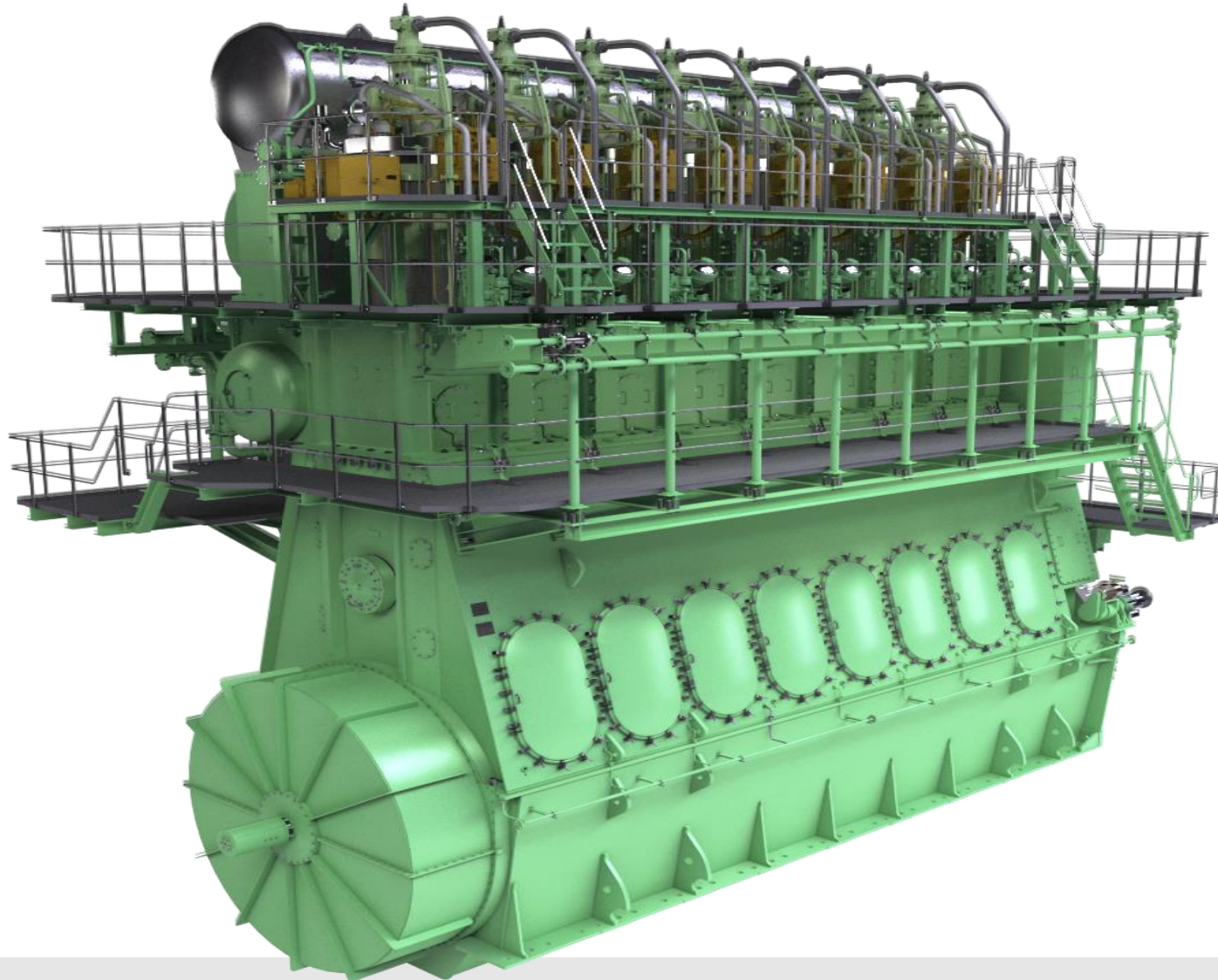


2020



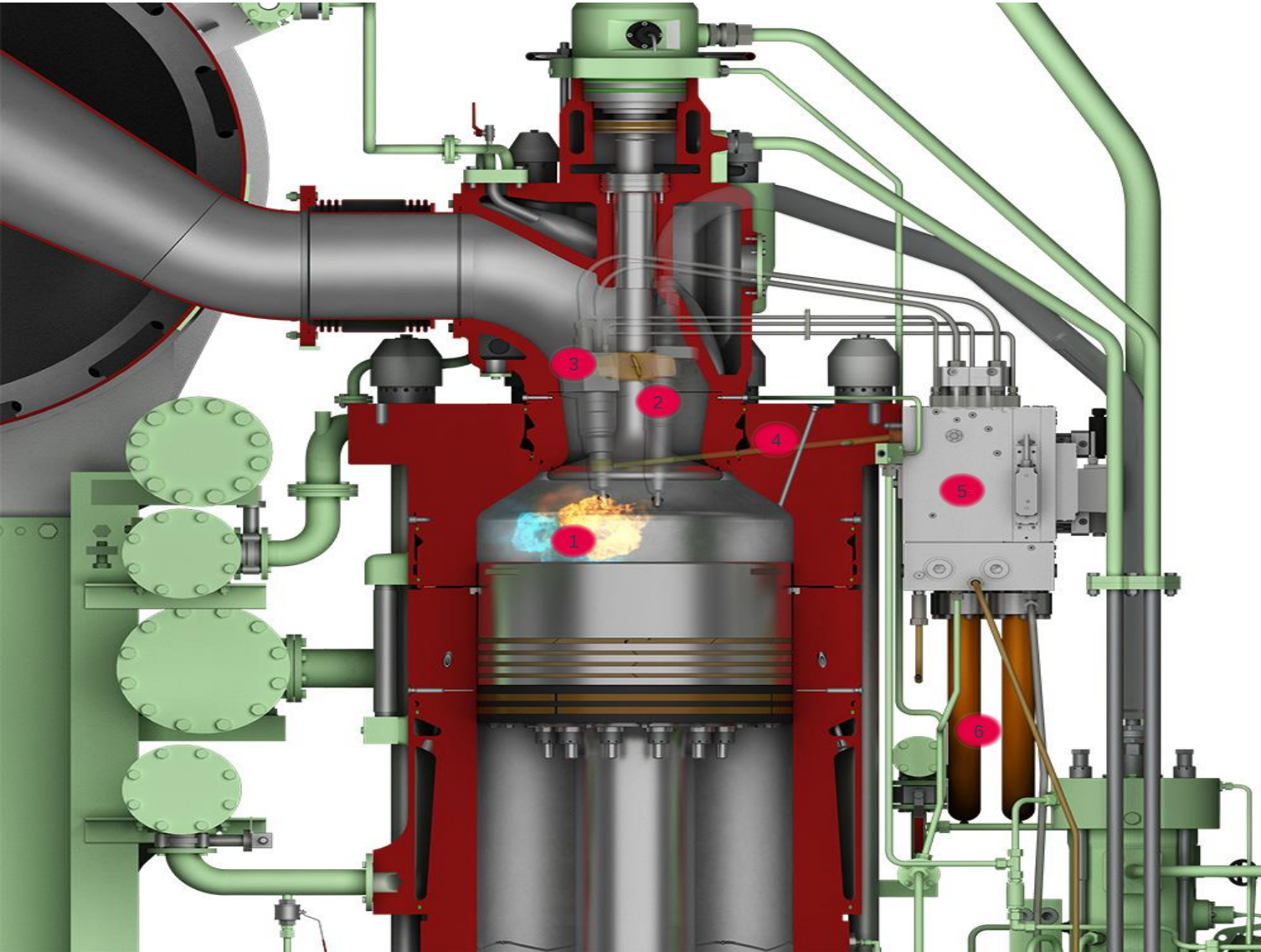
ME-GI engine

GI components



ME-GI Concept

Combustion Concept



- 1 Direct injection of pilot oil and gas

Yellow = pilot oil
Blue = gas

- 2 Conventional slide fuel valve
- 3 Gas fuel valve
- 4 Gas distribution channel
- 5 Gas block
- 6 Gas chain link double-walled pipes

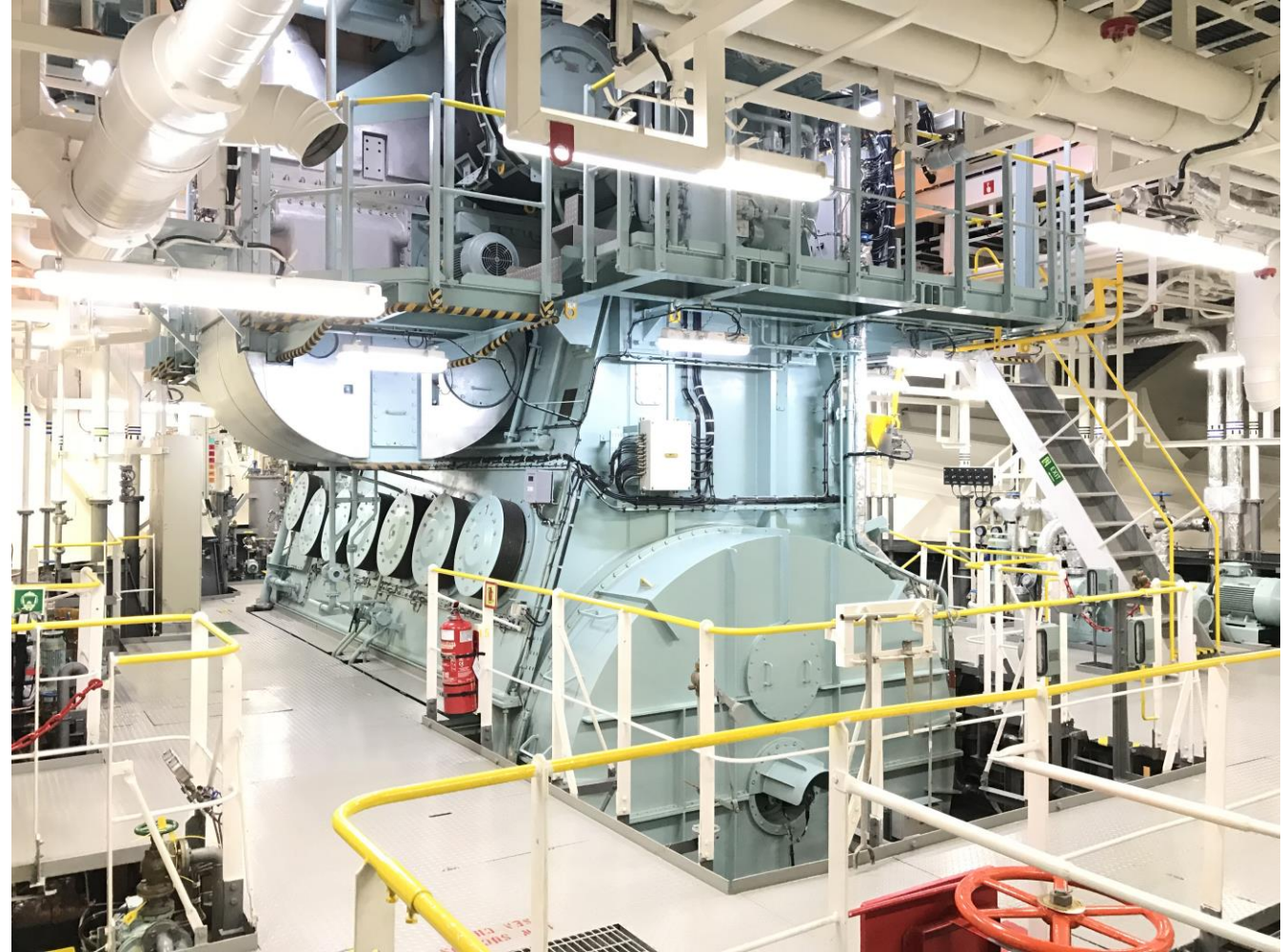
6G50ME-B9.3-LGIM Engine

Cleaner than most peoples kitchen

- Mari Jone has reached 12.000 operation hours solely on methanol

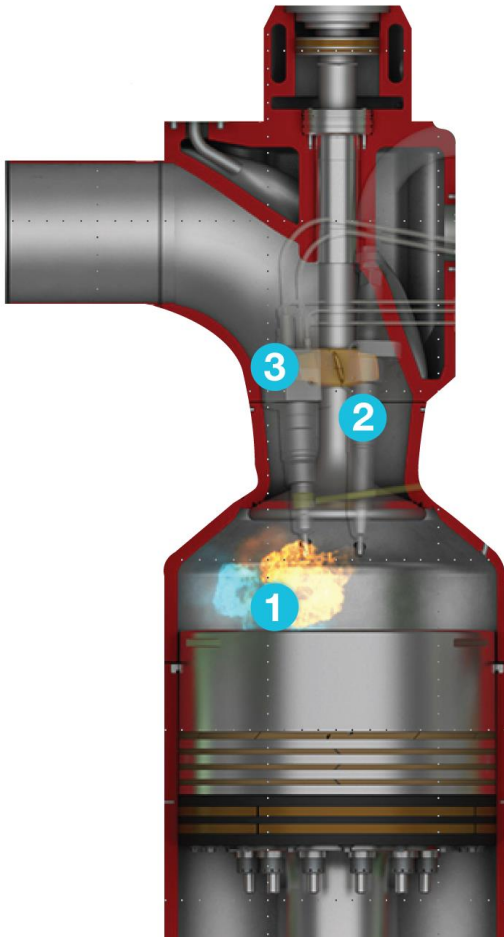
The picture is from Mari Jone, and it is taken after 10.000 operation hours.

- ✓ No signs of oil anywhere in the engine room.



The LGIM engine

Concept



1 Combustion illustration

Yellow = pilot oil
Blue = Methanol

2 Conventional slide fuel valve

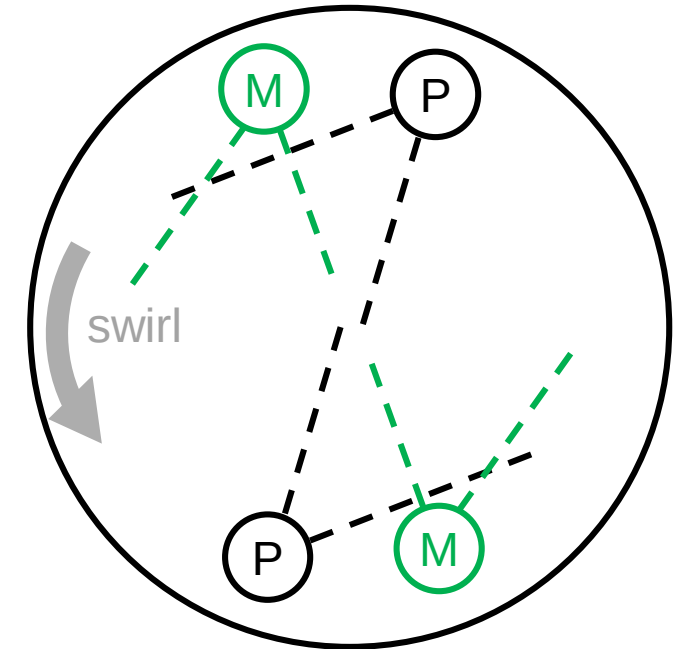
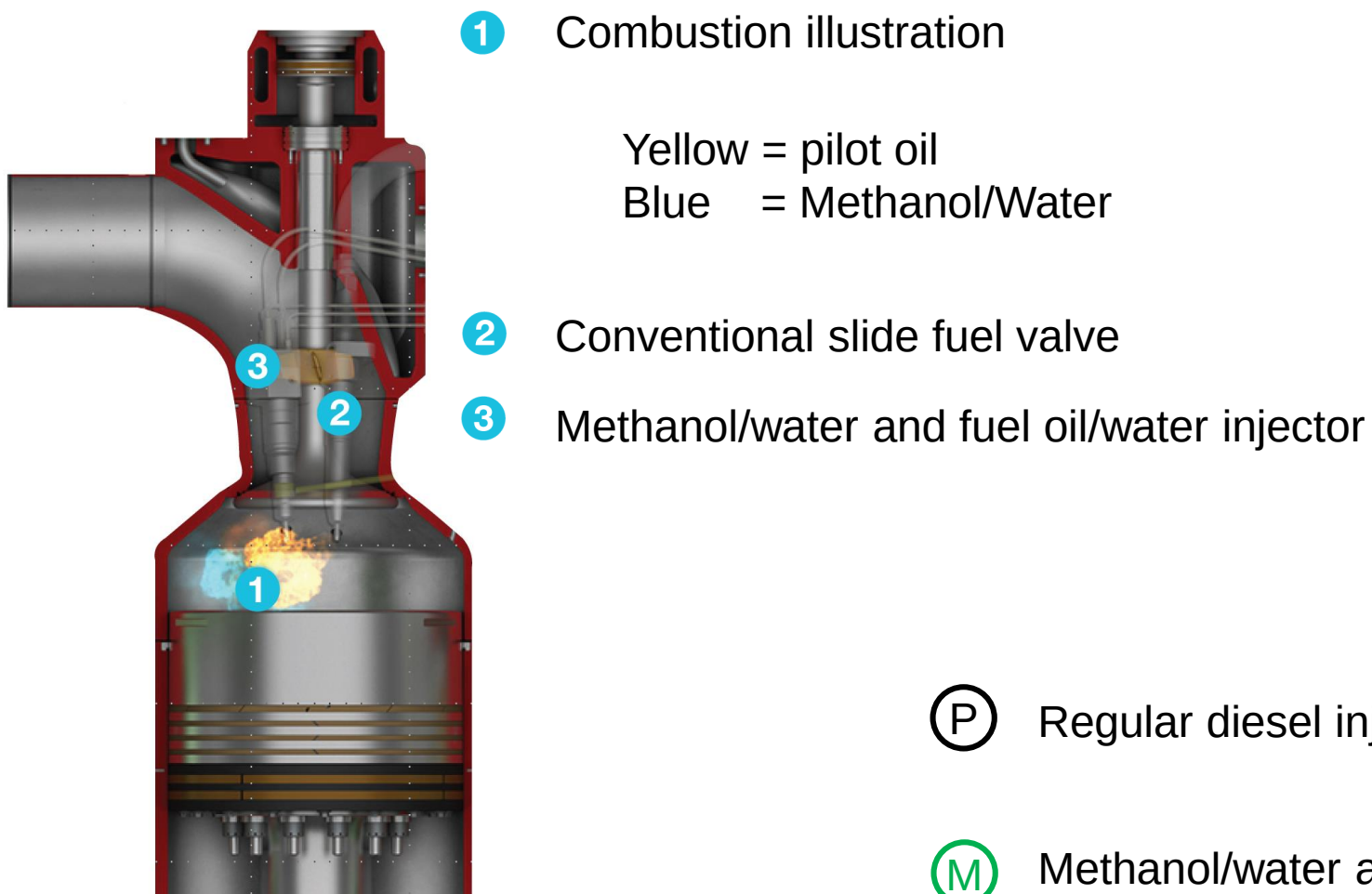
3 Methanol injection valve (FBIV-M)

The ME-LGIM engine is derived from the industry standard ME engine

- Diesel Cycle operating principle with high efficiency
- High fuel flexibility
- No risk of knocking
- A robust gas consumption – unchanged load response – unaffected by ambient condition

Development of LGIM-W (methanol/water and fuel oil/water) Tier III engine

Concept



(P) Regular diesel injector for pilot injection

(M) Methanol/water and fuel oil/water injector

Examples

of ship types where LGIM could be applied

50,000 dwt tanker

6G50ME-C9.6-LGIM EcoEGR

SMCR 7,500 kW at 85.0 r/min



15,000 teu Container Vessel

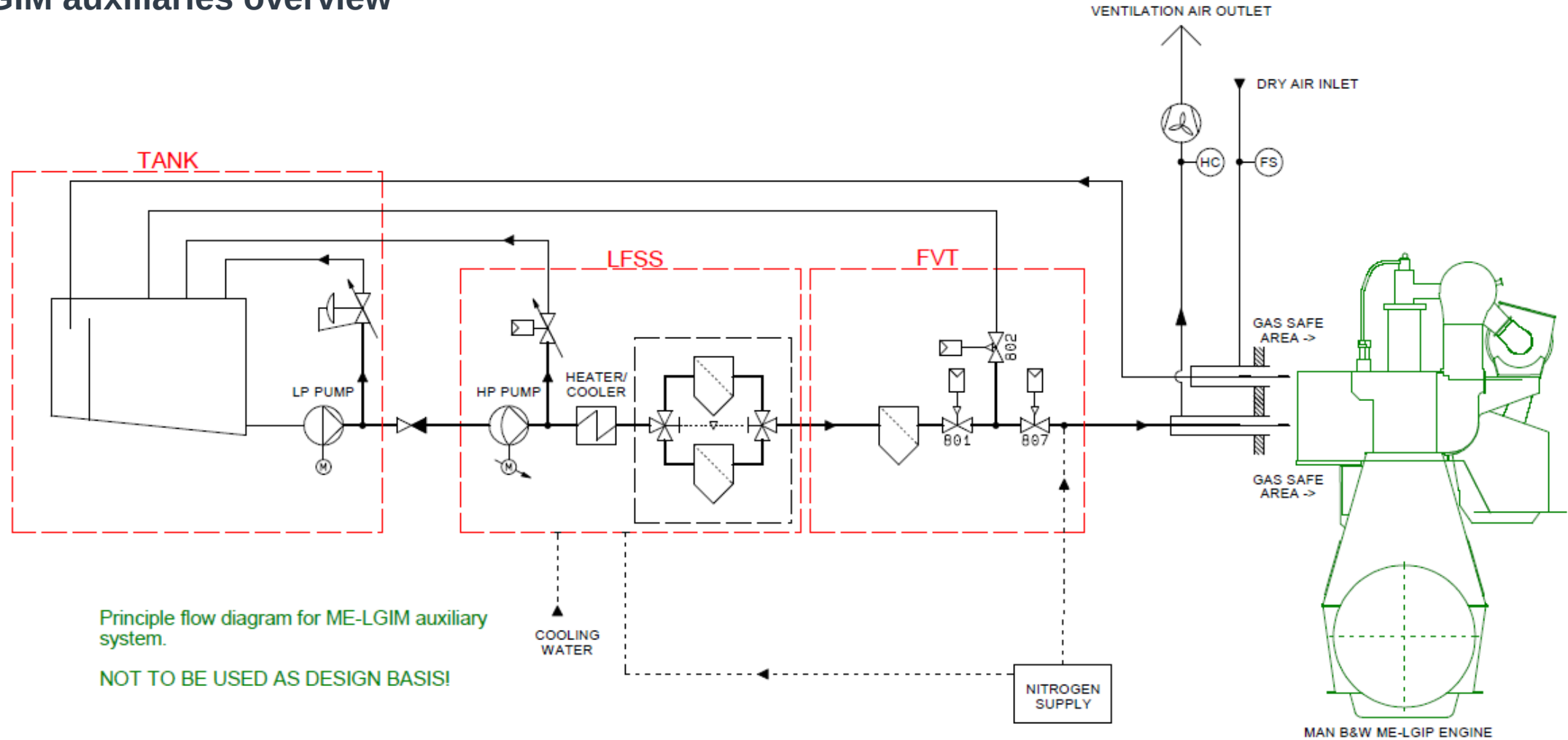
8G95ME-C10.5-LGIM EcoEGR (alt. 9G95ME-C10.5)

SMCR 45,000 kW at 75.0 r/min



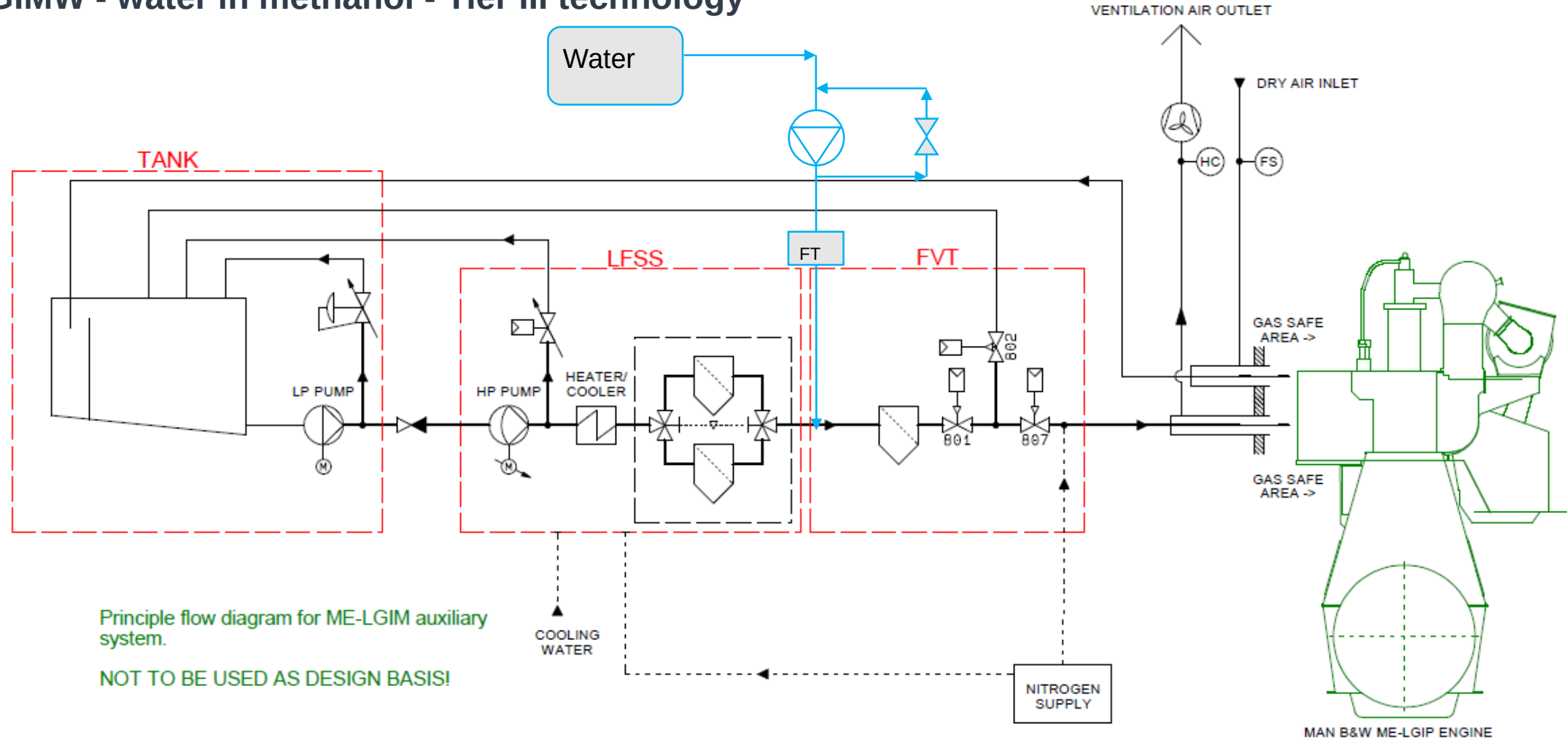
Fuel supply system

ME-LGIM auxiliaries overview



Fuel supply system

ME-LGIMW - water in methanol - Tier III technology



Thank you very much!