Change of course Symposium

JUMBO

DEK MARITIME

Conversion to alternative fuels

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Change of course Symposium

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This is Wärtsilä

Shaping the decarbonisation of marine and energy

190 years of innovation

1834

Our story begins when a sawmill is established in a Finnish village, Värtsilä.

1950s

Our first marine engines.

1970s

The first-ever 4-stroke engine operating on heavy fuel oil.

We enter the energy sector.

1995

Our pioneering dual-fuel engine can switch between fuels during operation.

2012

World's first hybrid system on-board a vessel.

2015

Guinness World Records names Wärtsilä 31 as the most efficient 4-stroke diesel engine in the world.

First engines of a customer are converted to run on methanol.

2022

Our first newbuild methanol engines.

2023

As we stand among TIME's 100 most influential companies, our story continues with world's firsts:

- 4-stroke engine-based ammonia solution for marine.
- Wärtsilä engine runs on 25 vol% hydrogen blend.

Our purpose

Enabling sustainable societies through innovation in technology and services

We are shaping the green transition in marine and energy with our advanced technologies, expertise in sustainable fuels and lifecycle service offering.

Uniquely positioned to drive global transformation in our industries

1 in 3 of the world’s vessels

are equipped with Wärtsilä solutions. That’s over 30,000 ships.

Over 180 countries

where Wärtsilä energy installations provide reliable power.

50% of sales come from services

and 90% of our lifecycle customers renew their service agreement.

A global team of experts fuelling change since 1834

17,800
people

280+
locations

130
nationalities

79
countries

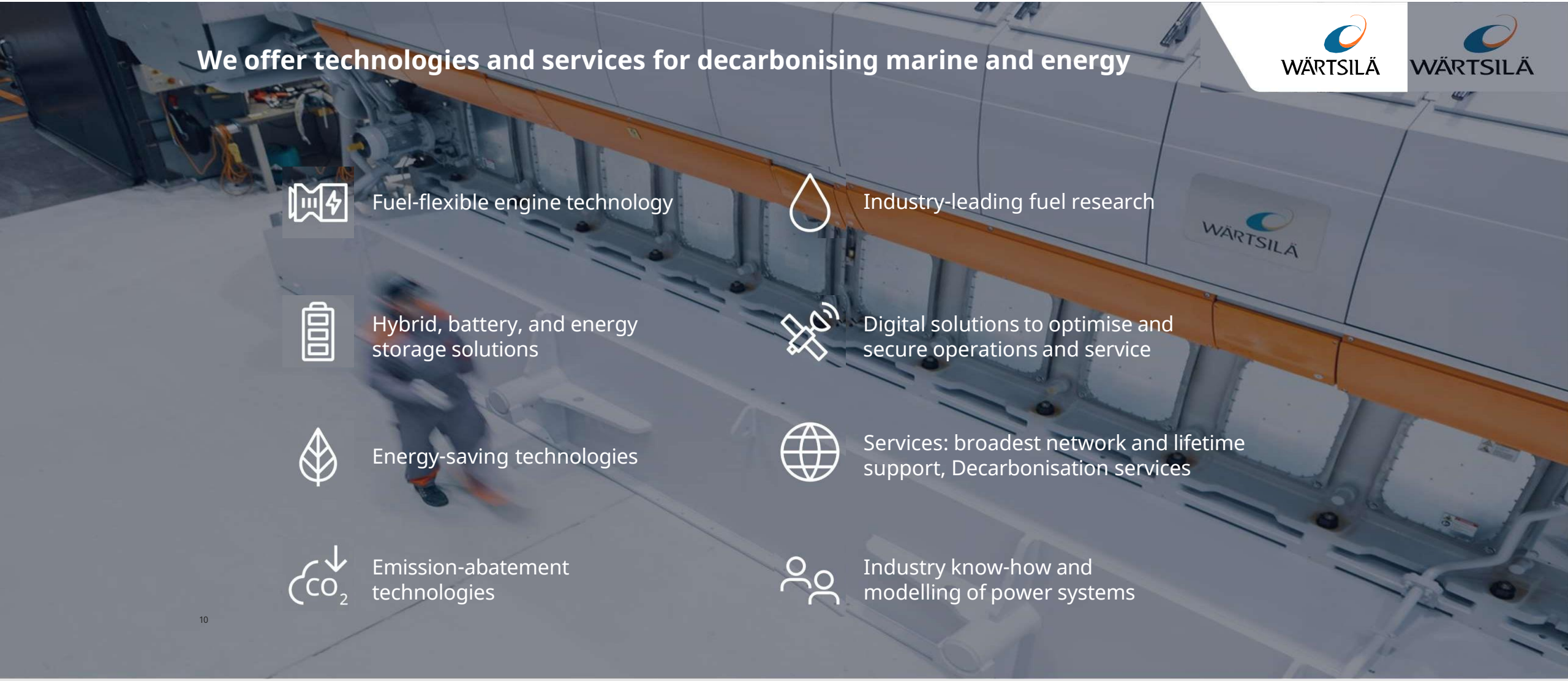
6,015
net sales, MEUR

52%
service sales of total

Figures from 2023

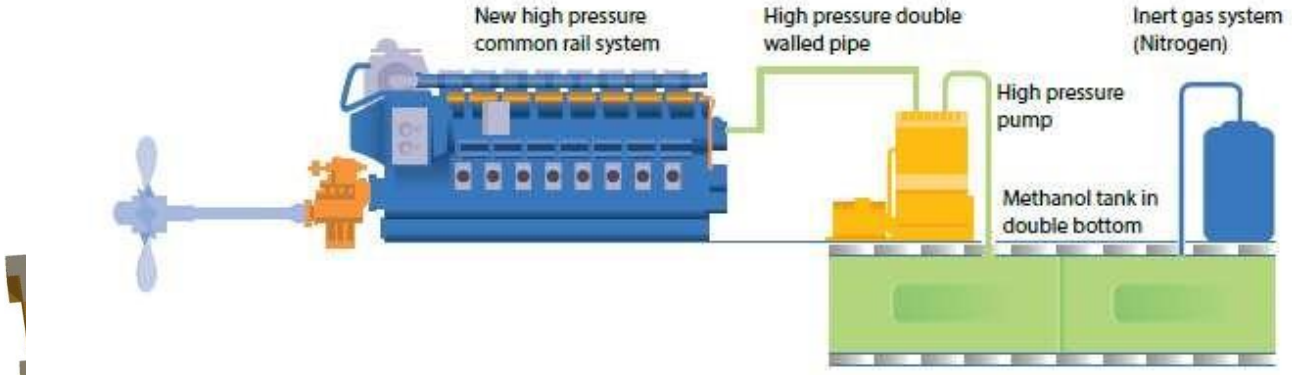
The decarbonisation of marine and energy industries is accelerating

We offer technologies and services for decarbonising marine and energy

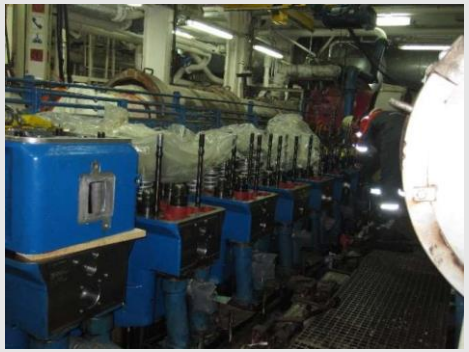


- Fuel-flexible engine technology
- Industry-leading fuel research
- Hybrid, battery, and energy storage solutions
- Digital solutions to optimise and secure operations and service
- Energy-saving technologies
- Services: broadest network and lifetime support, Decarbonisation services
- Emission-abatement technologies
- Industry know-how and modelling of power systems

STENA GERMANICA – 9 YEARS OF METHANOL OPERATION / CONVERSION SCOPE



METHANOL ADAPTATION



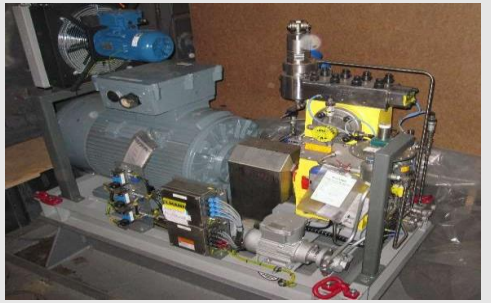
Engine conversion to dual fuel

High pressure pipes

New engine control system for all four engines

New electrical installation

Methanol storage tank painted with zinc silicate



High pressure pumps

ENGINE BEFORE AND AFTER CONVERSION

ENGINE CONVERSION KIT – FEATURES

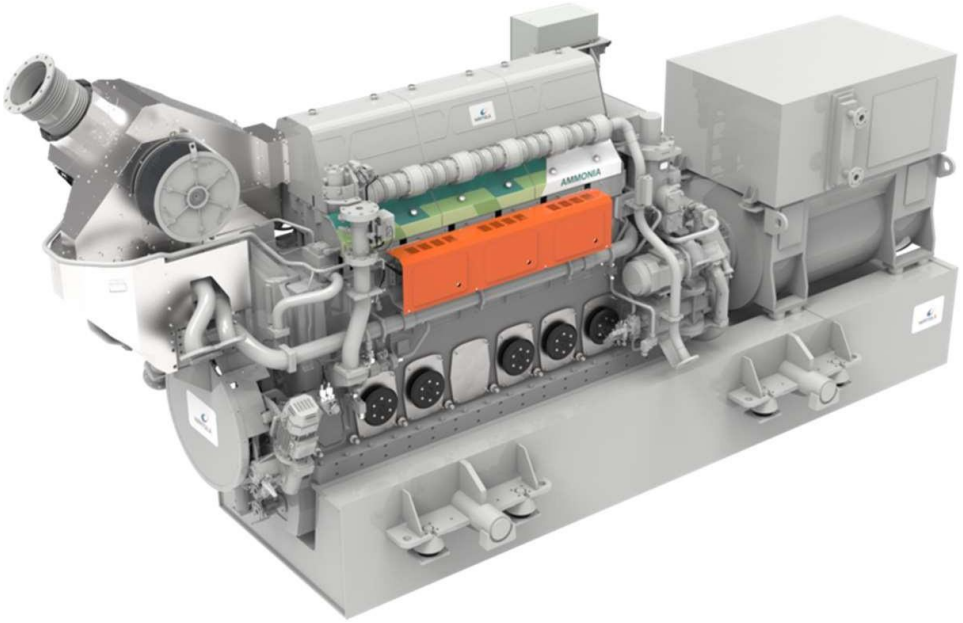
- Adaptation of proven engine technology, minor modification to the engine
- No reduction in efficiency or output running on methanol
- Load response unchanged, full fuel redundancy
- Existing fuel or ballast tanks can be converted to methanol tanks
- Short off-hire time, can be done engine by engine
- Lower thermic load on the engine
- Much lower NOx, SOx, and PM (particulates), good base for future ECA regulations
- Available methanol infrastructure (bunker fuel to be developed)

FIRST WÄRTSILÄ 32 METHANOL ORDER

- Owner: Van Oord
- Yard: Yantai Raffles
- Scope of delivery:
  - 5 x W32 Methanol main gensets
  - SCRs
  - MethanolPac
  - Retractable and tunnel thrusters
- Delivery of equipment Q2 2023

Wärtsilä 25 Ammonia

The marine sector's first 4-stroke solution for ammonia fuel



Launched to market 15th of November 2023

≥ 70% less greenhouse gas emissions with sustainable ammonia compared to diesel

- meeting current EU targets until 2050 and exceeding the IMO target for 2040

Ammonia engine technology based on LNG fuelled Wärtsilä 25DF engine

The Wärtsilä 25 Ammonia solution delivered together with Wärtsilä's fuel supply system, AmmoniaPac and aftertreatment, Wärtsilä NOx Reducer

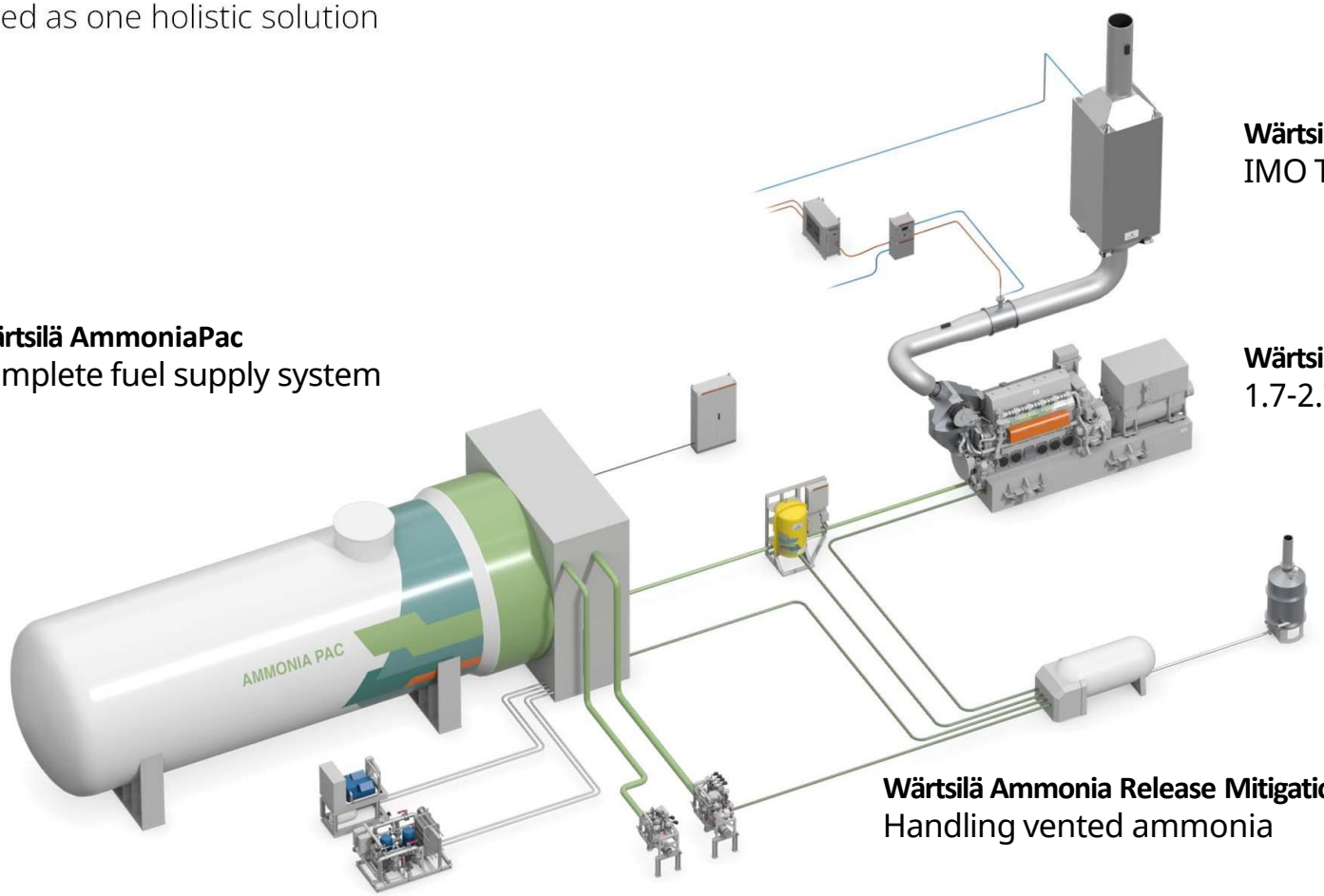
System overview

Engineered as one holistic solution

Wärtsilä NOx Reducer
IMO Tier II / Tier III

Wärtsilä 25 Ammonia
1.7-2.7MW

Wärtsilä AmmoniaPac
Complete fuel supply system



Wärtsilä Ammonia Release Mitigation System
Handling vented ammonia

AmmoniaPac – fuel supply system

Based on the well proven LNGPac design - a safe and user-friendly system for both operators and service personnel

Type-C Ammonia fuel storage tank(s)

- Single shell in carbon steel or stainless steel
- 20 bar(g) design pressure
  - Bunker Ammonia at any temperature
  - Unlimited holding time without auxiliary systems
- 9 bar(g) design pressure
  - Bunker mainly refrigerated Ammonia
  - Limited holding time (15/21 days) without auxiliary systems

Tank connection space

- Contains pump based fuel processing system
- Delivers gasous ammonia at ~9 bar(g) to GVU
- Double manhole enclosure and integrated airlock enables safe installation below deck

Thank you for your attention!!

Please find the links to the Ammonia- and Methanol-Lounge for more information:

https://www.wartsila.com/marine/explore-sustainable-shipping-in-wartsila-methanol-lounge

https://www.wartsila.com/marine/wartsila-25-ammonia

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