



OUR JOURNEY TO DATE: DECARBONISING SHIPPING

Enabling sustainable societies
with smart technology

December 2020

OUR JOURNEY STARTED YEARS AGO

Emission reductions, and especially greenhouse gas (GHG) reduction, is the challenge of the century for the maritime industry. Being the most efficient mode of transportation doesn't mean that it's an excuse for not acting. The industry has now recognised that in order to tackle climate change, shipping must make a significant contribution.

A de-fossilised future: how can we meet the challenges ahead?

The International Maritime Organization (IMO) regulation is a major driver for industry transformation. On April 2018, the IMO committed to reducing GHG by 40% by 2030 and total annual GHG emissions on a fleet level by at least 50% by 2050 compared to 2008. But due to an increasing number of vessels, by 2050 the increase should be 70% or even 80% on a vessel level.

As a company with the most comprehensive portfolio at hand in the industry, we turn technology into solutions to enable a sustainable maritime industry.

We have recognised and analysed that the journey to lowering GHG emissions requires combining data and technology like Wärtsilä's hybrid solutions or Air Lubrication System with green fuels and biofuels to meet the short-term targets.

Wärtsilä's division Marine Power does this by developing technology and fuel flexibility to create the path towards decarbonisation of the maritime industry. In our view, combustion engines that use LNG as a fuel are the most economically viable and reliable solution to initiate the transition to sustainable fuels. This means that the powertrain systems for such vessels are fuel flexible and can be retrofitted and upgraded to run on green fuels. Our portfolio of engines, propulsion systems,

hybrid technology, and integrated powertrain systems deliver the reliability, safety, and environmental performance.

In the meantime, a transition to more advanced technologies combined with R&D developments on future fuels is ongoing to investigate the usage of fuels like ammonia, methanol & hydrogen to meet the 2050 target.

Today, there is no silver bullet to power a sustainable future, and the solution will eventually include green fuels that today are not widely available.

But just as important is the fact that collaboration in an ecosystem will be needed. This is a challenge that Wärtsilä is taking head on, together with its customers, partners and other stakeholders. Examples of our R&D investments, partnerships and references can be found at the pages: 24-30.

DRIVING SUSTAINABLE SHIPPING

Data, technology, LNG, biofuels and renewables will take us to reducing -40% GHG levels by 2030 Sustainable fuels and advanced technologies will take us to reducing -50% GHG levels by 2050

ENERGY SOURCE AND FUEL FLEXIBILITY

ENERGY EFFICIENT TECHNOLOGIES

DATA

ADOPTED IN A SMART MARINE ECOSYSTEM



NEVER HAS IT BEEN CLEARER, THAT THE MARITIME INDUSTRY NEEDS TO STEP UP ITS SUSTAINABILITY GAME

1.

What can we offer to help you phase out emissions today?

Page 8-19

2.

How to help you better understand the future fuel developments?

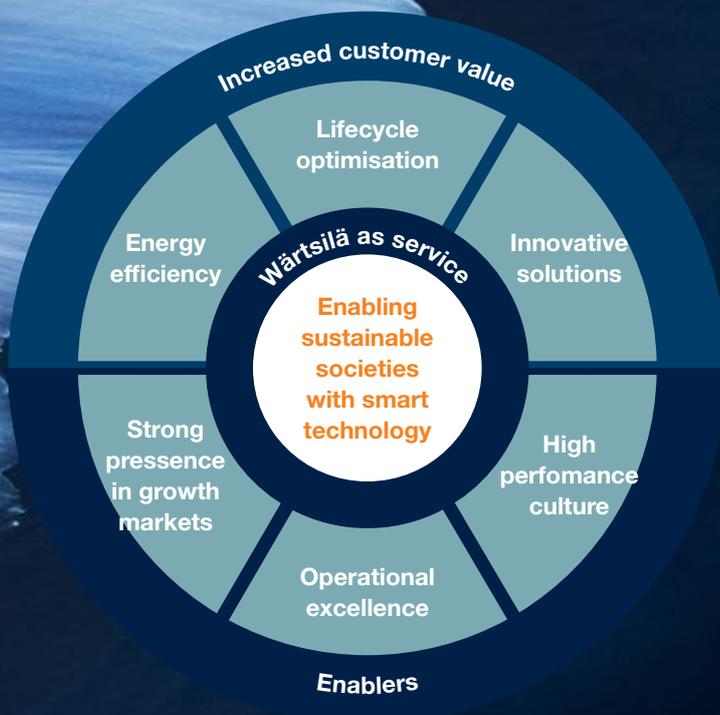
Page 20-23

3.

How can we partner within shipping and across sectors to achieve decarbonisation through an ecosystem approach and lower barriers to success?

Page 24-27

OUR PURPOSE IS TO ENABLE SUSTAINABLE SOCIETIES WITH SMART TECHNOLOGY



[Discover our purpose, click here](#)

‘AN OCEANIC AWAKENING’ AND SEA20 HERALD A WAKE-UP CALL

to the potential of our Oceans in an era of unprecedented global change

The future is not what it used to be. Witness the momentous first step of an oceanic awakening.

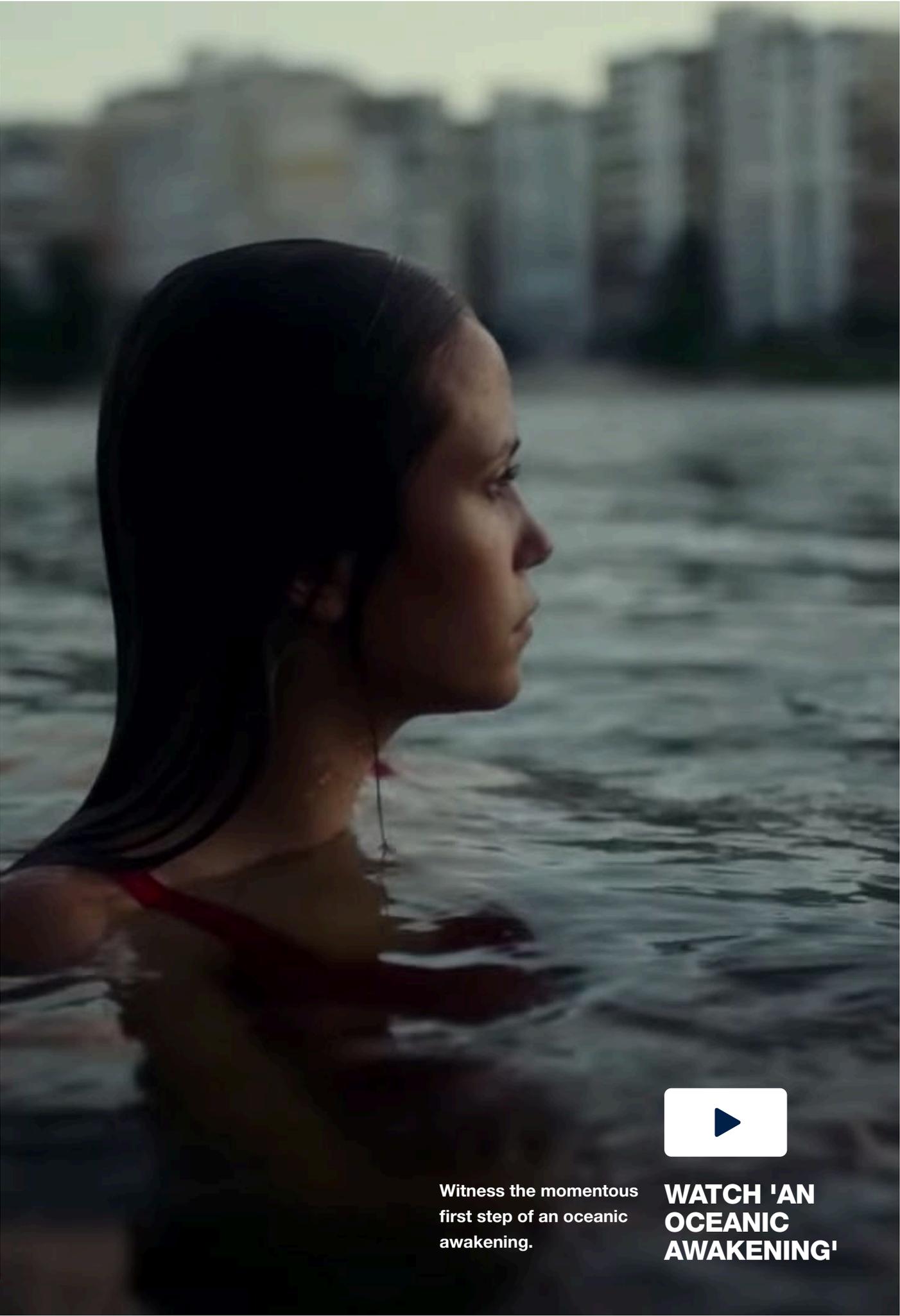
‘An oceanic awakening’ is a global movement focused on the radical transformation of the world’s marine and energy industries into one supremely efficient, ecologically sound, digitally connected and collaborative ecosystem.

One company cannot tackle these issues alone. Every one of us has a part to play.

Discover the movement – and get involved – at SEA20.org

Made possible by Wärtsilä

Launched Sept 2018



Witness the momentous
first step of an oceanic
awakening.



**WATCH 'AN
OCEANIC
AWAKENING'**

A GLIMPSE OF OUR ENGINE TECHNOLOGY PROGRESS

- 1834** ● Wärtsilä founded
- 1970** ● First medium speed engine HFO
- 1986** ● The Wärtsilä dual fuel engine technology started
- 1991** ● Development of Wärtsilä spark ignited (SG) engine
- 1997** ● Sold the first Wärtsilä 32DF dual fuel engine
- 2000** ● MARPOL annex VI NO_x emission limits - tier I
- 2001** ● Sold first Wärtsilä 50DF dual fuel engine
- 2002** ● Development of first bio fuel engines
- 2011** ● MARPOL annex VI NO_x emission limits - tier II
- 2015** ● World's first methanol-powered commercial vessel
- 2015** ● Released blending opportunity. Up to 25% hydrogen mix in natural gas. Applicable on Wärtsilä SG and DF engines.
- 2016** ● MARPOL annex VI NO_x emission limits - tier III
- 2017** ● Introduction Wärtsilä 32TS - 2 stage turbo charging engine
- 2019** ● Introduction Wärtsilä 31SG pure gas marine engine
- 2020** ● The global upper limit on the sulphur content of ships' fuel oil reduced to 0.50%
- 2020** ● LPG fuel supply system the first ever to undergo engine testing
- 2020** ● Sold first Wärtsilä 14 EU stage V compliant engines
- 2021** ● World's first full scale ammonia engine test
- 2021** ● First pure hydrogen engine test
- 2030** ● Ghg reduction of CO₂ emissions per tonne-mile by at least 40%
- 2050** ● Imo ghg reduction 50% Compared to 2008 & CO₂ reduction 70% compared to 2008

WE MUST ACCCEL THE PACE OF INTRODUCTION CARBON-NEUTRAL

AMBITION

In decarbonisation scenario neutral fuels reach between 10% and 100% of the fuel mix in 2050

REALITY

First vessels capable of operating on ammonia were introduced in 2009. Today 1.7%** of the world's fleet is capable of operating on ammonia

*DNV GL Maritime Forecast 2020

**Source: Clarkson Research Services, % of total GT capable of operating on ammonia

ACCELERATE TRANSITION OF SHIPS TO ALTERNATIVE FUELS

Scenarios carbon-
neutral by 2050
between 60% and
2050*

3. World fleet is
running on LNG
as a fuel

of running on LNG

EMISSIONS & GASES EXPLAINED

Roughly speaking, you can make a distinction between two categories of emissions: local emissions and greenhouse gases.

LOCAL EMISSIONS

- **NO_x (nitrogen oxides)**: cause smog and health problems and result in the acidification and over-fertilisation of the natural environment.
- **SO_x (sulphur oxides)**: cause acid rain and encourage the formation of particulates.
- **Particulates**: the air pollution that contributes to the development of lung cancer and other health problems.

GREENHOUSE GASES

- **CO₂ (carbon dioxide)**: is part of the cause of global warming.
- **CH₄ (methane)**: is part of the cause of global warming. On balance, it does 28 times as much damage as CO₂, but it is much less present in terms of absolute volume.

ENERGY EFFICIENCY MEASUREMENTS

- **Energy Efficiency Design Index (EEDI)**. The EEDI for new ships is the most important technical measure and aims at promoting the use of more energy efficient (less polluting) equipment and engines.
- **Ship Energy Efficiency Management Plan (SEEMP)**. This is an operational measure that establishes a mechanism to improve the energy efficiency of a ship in a cost-effective manner. The SEEMP also provides an approach for shipping companies to manage ship and fleet efficiency performance over time using, for example, the Energy Efficiency Operational Indicator (EEOI) as a monitoring tool.
- **Energy Efficiency Operational Indicator (EEOI)**. The EEOI enables operators to measure the fuel efficiency of a ship in operation and to gauge the effect of any changes in operation, e.g. improved voyage planning or more frequent propeller cleaning, or introduction of technical measures such as waste heat recovery systems or a new propeller.
- **The Annual Efficiency Ratio (AER)**. The AER divides the annual carbon dioxide emissions of a ship by the product of the distance sailed and the deadweight of the ship.

Read more at the web page of IMO, [click here](#).

THE PATH TO DECARBONISATION MUST BE TAKEN IN STEPS

Wärtsilä's approach to decarbonisation is to explore future fuel opportunities and methods to improve the efficiency of shipping through digitalisation – while also offering solutions that immediately increase the fuel flexibility and fuel efficiency of vessels. We can do this through engine upgrades and vessel retrofits, along with digital solutions based on connectivity that improve vessel efficiency. These measures also help our customers to comply with frameworks like the Poseidon Principles and Sea Cargo Charter to ensure continued access to finance and cargo.

Ship finance and bridge climate change commitments: **THE POSEIDON PRINCIPLES**



The **Poseidon Principles** were developed in recognition of financial institutions' role in promoting responsible environmental stewardship throughout the maritime value chain. They are an initiative unique to ship finance and bridge climate change commitments set out by the International Maritime Organization (IMO) as well as the expanding environmental expectations of financial institutions.

How can my financial institution become a Signatory?

The financial institution must complete and send the formal declaration and application to the Secretariat of the Poseidon Principles Association. Financial

institutions are welcome to use the templates provided in the technical guidance of the Poseidon Principles.

What is carbon intensity? How is it measured?

In shipping, carbon intensity represents the total operational emissions generated to complete one unit of transport work, which is measured in grams of CO₂ per ton-nautical miles. For the Poseidon Principles, this is measured using a carbon intensity measure known as Annual Efficiency Ratio (AER), which is reported in unit grams of CO₂ per dwt-nm (gCO₂/dwt-nm). The IMO DCS enables the calculation of the AER, thus ensuring that the Poseidon Principles are consistent with the IMO's regulations. [Read more FAQ's here.](#)



GLOBAL
MARITIME
FORUM



FRIENDS of
OCEAN
ACTION

THE GLOBAL MARITIME FORUM

Wärtsilä is a member of the Getting to Zero Coalition. The Getting to Zero Coalition is an industry-led platform for collaboration that brings together leading stakeholders from across the maritime and fuels value chains with the financial sector and other committed to making commercially viable zero emission vessels a scalable reality by 2030. The Getting to Zero Coalition is a partnership between the Global Maritime Forum, the Friends of Ocean Action, and the World Economic Forum. [Read more.](#)



SEA CARGO
CHARTER

A global framework for responsible ship chartering: **THE SEA CARGO CHARTER**

The Sea Cargo Charter is a global framework for assessing and disclosing the climate alignment of chartering activities. It establishes a common, global baseline to quantitatively assess and disclose whether chartering activities are in line with adopted climate goals. Thus, it also serves as an important tool to support responsible decision-making.

The Sea Cargo Charter is applicable to all bulk charterers: those with interest in the cargo on board; those who simply charter out the vessels they charter in; as well as the disponent owners and all charterers in a charter party chain. It must be applied by Signatories in all bulk ship chartering activities that are:

- on time and voyage charters, including contracts of affreightment and parceling, with a mechanism to allocate emissions from backhaul and ballast voyages,
- and for voyages carried out by dry bulk carriers, chemical tankers, oil (crude and product) tankers and LNG carriers,
- and where a vessel or vessels are of at least 5,000 gross tonnage and engaged in international trade.

The Sea Cargo Charter is consistent with the policies and ambitions of the International Maritime Organization, a UN agency responsible for regulating shipping globally, including its ambition for GHG emissions to peak as soon as possible and to reduce the total annual GHG emissions by at least 50% by 2050 compared to 2008.

The Sea Cargo Charter has been primarily developed for the traditional cargo owners. However, many shipowners, even

though this is not their primary activity, also have significant chartering activities. The Sea Cargo Charter has been developed with this in mind and allows for such owners to become Signatories too.

Currently 17 charterers are Signatories to the Sea Cargo Charter. Signatories are bulk cargo owners from a variety of segments – grains & agricultural products, chemicals, energy, metals & mining -, commodity traders and shipowners who have an interest in advancing good environmental stewardship through their business activities. More charterers are expected to become Signatories in the near future.

Signatories commit to implementing the Sea Cargo Charter in their internal policies, procedures, and standards and to work in partnership with ship owners, disponent owners, and partners on an ongoing basis to implement the Sea Cargo Charter.

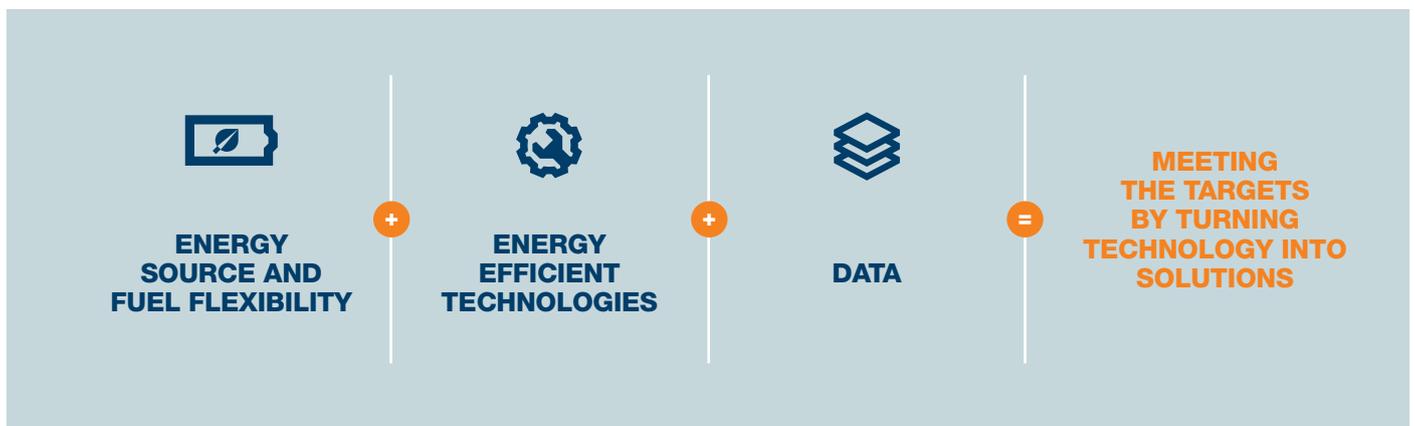
The Sea Cargo Charter is intended to evolve over time to include other issues where the collective influence of charterers can help improve the contribution the industry and its charterers can make to society. [Read more.](#)

OUR OFFERING AT A GLANCE

Upgradability is key for both existing ships and new builds

As a company with the most comprehensive portfolio at hand in the industry, we turn technology into solutions to enable a sustainable maritime industry. We have recognised and analysed that the journey to lowering GHG emissions requires combining data and technology like Wärtsilä's hybrid solutions or Air Lubrication System with green fuels and biofuels to meet the short-term targets.

This means that the powertrain systems for vessels are fuel flexible and can be retrofitted and upgraded to run on green fuels. Our portfolio of engines, propulsion systems, hybrid technology, and integrated powertrain systems deliver the reliability, safety, and environmental performance.



RETROFIT & UPGRADE SOLUTIONS

We offer an endless amount of solutions for upgrades. The area of expertise varies from 2-stroke engines, 4-stroke engines, Environmental Services, Propulsion Services and more. [Click here to see them all.](#)

WÄRTSILÄ MARINE LIFECYCLE UPGRADES

Optimise your vessel's performance across its entire lifecycle. [Click here.](#)



ENGINE PERFORMANCE UPGRADES

Engine performance upgrades are a tailored solutions that boosts engine performance by optimising the combustion process and tuning the engine to the most frequently used operating range. The solution make use of modern higher efficiency turbochargers, and when combined with engine tuning the engine's performance is maximised with regards to fuel oil consumption and generated emissions.

The benefits of Performance optimization can be sought for in areas such as full load or low load optimization, emission reduction, or optimization with regards to SFOC and emission reduction in general. A reduction in fuel consumption of up to 4 percent can be achieved. [Watch the video here.](#)

WÄRTSILÄ'S ENVIRONMENTAL SOLUTIONS

We offer complete solutions for reducing your environmental footprint. [Click here.](#)

1.

SHORE CONNECTION SYSTEMS

A shore connection system enables ships to meet their electrical power requirements when the engines are shut down. Taking the power from the shore instead of from the engines eliminates exhaust emissions and noise pollution. [Read more.](#)

Benefits:

- Fulfill power requirements in port without generating exhaust emissions or noise pollution
- Ensure compliance with existing and future regulatory requirements relating to environmental performance.

2.

INTELLIGENT DIGITAL SOLUTIONS

Intelligent data collection and analysis enable vessel operators and owners to efficiently and reliably monitor and report data in a compliant manner – including fuel consumption and CO₂ emissions, distance travelled, time spent at sea and other energy efficiency indicators required by regulations. [Read more.](#)

Benefits:

- Optimise trim in real time to save fuel and reduce emissions
- Optimise speed and equipment usage to save fuel and ensure just-in-time arrival, and optimise operational efficiency of equipment
- Analyse a vessel's route to make more efficient navigational decisions

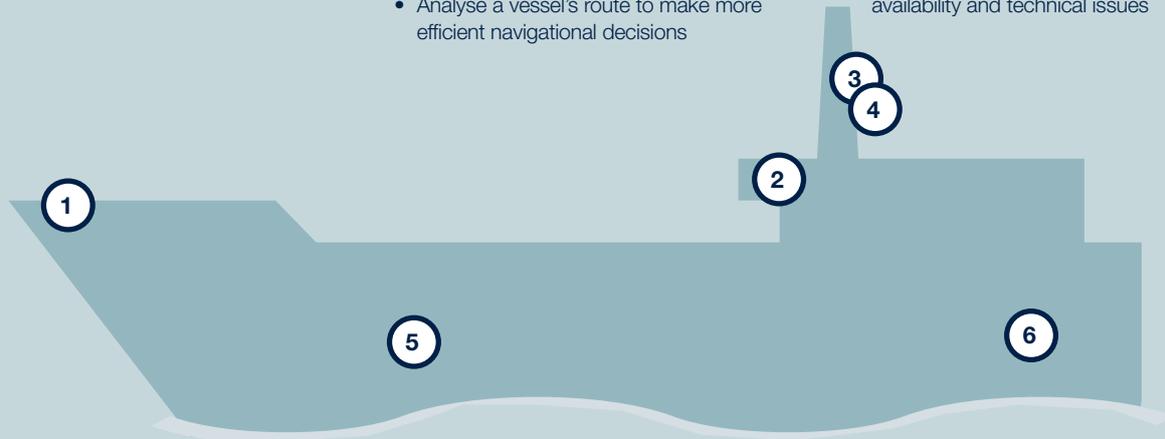
3.

WÄRTSILÄ SO_x REDUCTION

Wärtsilä has developed a full wet scrubber portfolio to fit each of our customer needs, and to meet their requirements in the reduction of SO_x. The range of Wärtsilä exhaust gas cleaning system (EGCS) have been tested and certified according to IMO guidelines, thus ensuring safe operation and compliance. [Read more about scrubbers, click here.](#)

Benefits:

- Comply with emission regulations while reducing environmental impact
- Reduce operating costs through access to less costly fuel
- Avoid fuel switching and storage, availability and technical issues



4.

WÄRTSILÄ NO_x REDUCTION

The Wärtsilä NO_x Reducer (NOR) is an emission after-treatment system based on the Selective Catalytic Reduction (SCR) technology for Nitrogen Oxide (NO_x) reduction. The NOR is optimized and validated for Wärtsilä medium speed engines in terms of reliability, flexibility, size and easy installation and maintenance onboard. [Read more about NOR, click here.](#)

Benefits:

- Comply with emission regulations while reducing environmental impact
- Enable operation with different fuels globally
- Reduce emission-based operation fees

5.

HYBRID SYSTEMS

Battery and diesel or dual-fuel hybrid systems optimise energy efficiency by running the engine at optimal load and absorbing load fluctuation into the batteries. Hybrid control algorithms for load sharing between units and efficient power and energy management are a key element in these systems. Reference case: [Viking Princess](#).

Benefits:

- Optimise engine operation
- Ensure cost efficiency and flexibility
- Comply with environmental regulations
- Lower emissions, lower fuel consumption
- zero emissions in ports, safety and redundancy, instant power available

6.

FUEL CONVERSIONS

LNG is available and popular as a marine fuel. Retrofitting a vessel to run on LNG reduces CO₂ and NO_x emissions while eliminating SO_x emissions when compared to HFO vessels. [Read more: Services catalogue: Wärtsilä marine LNG conversion.](#)

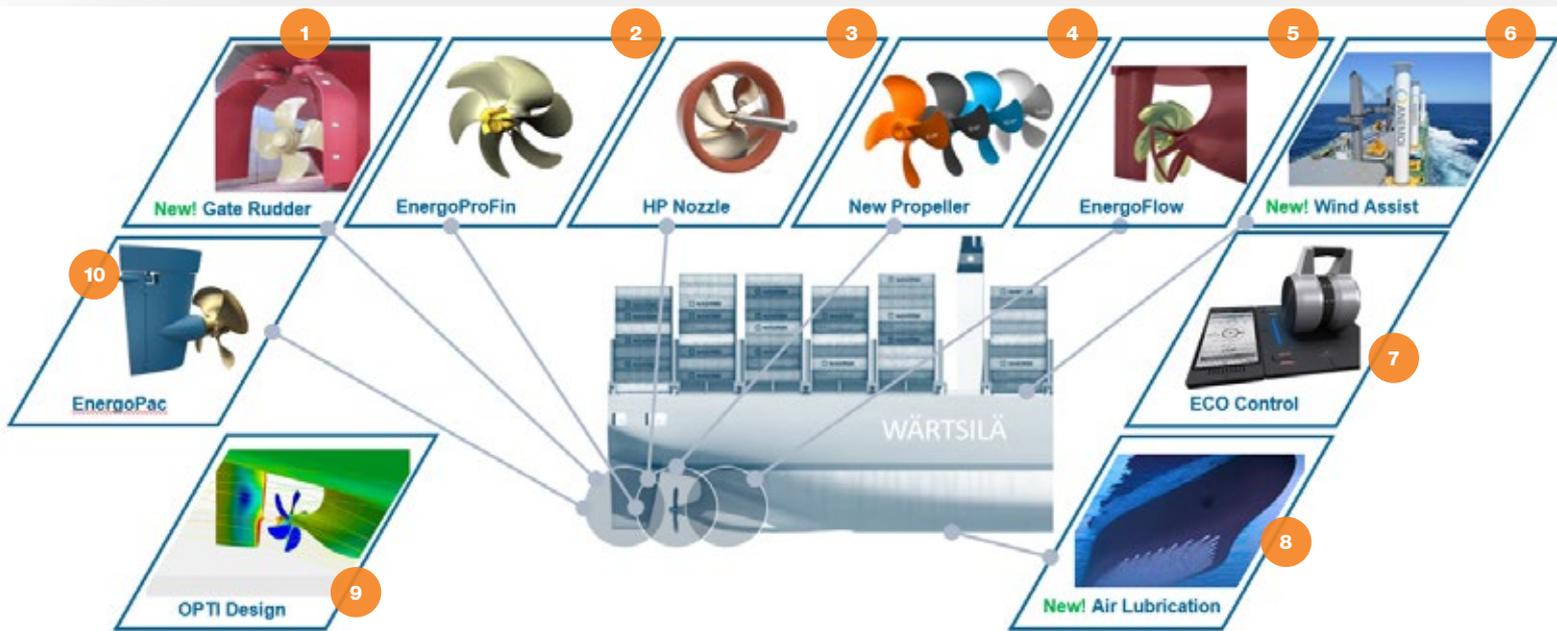
Benefits:

- Reduce emissions, emission-related fees, and fuel costs
- Enhance a company's sustainability credentials



PROPULSION ENERGY SAVING TECHNOLOGY

With the shipping industry facing increased environmental legislation and increasing operational costs, today's shipowners and operators are demanding more efficient solutions improving both environmental and economic impact. Wärtsilä offers an integrated package of propulsion solutions that help on the journey to decarbonisation. For new build and upgrades. [Discover our propulsion portfolio.](#)



1.

GATE RUDDER

The Wärtsilä Gate rudder system is an innovative energy saving and manoeuvring device. It performs by placing two foils on either side of the propeller, as opposed to the traditional arrangement of a single rudder in the slip stream.

This rudder arrangement reduces a vessel's fuel consumption by replacing the drag of a traditional rudder system, with a thrust generating arrangement. At the same time it provides excellent manoeuvring capabilities and reduced noise and vibration. Placing the high-lift rudder foils either side of the propeller enables turning at higher speeds stable course keeping and quicker crash stop.



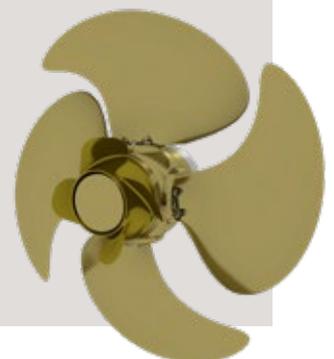
2.

ENERGOPROFIN

The Wärtsilä EnergoProFin is an energy saving propeller cap with fins that rotate together with the propeller. This solution provides average fuel savings of 2%, with a payback time of less than one year.

- For Fixed and Controllable pitch propeller applications
- Reduction of underwater noise
- Incentives on harbour fees (Vancouver, Prince Rupert)
- Cost attractive, easy to integrate in Wärtsilä delivery

[Discover more.](#)

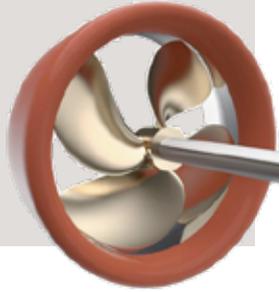


3.

HP NOZZLE

Propulsion efficiency upgrade with Nozzle

Improvement of propulsion efficiency is probably the most effective way to reduce exhaust gas emissions. The Wärtsilä High Performance (HP) Nozzle improves propulsion efficiency resulting in increased thrust and fuel savings and performs significantly better than the industry standard nozzle types, such as the 19A or 37 type nozzles. [Discover more.](#)



4.

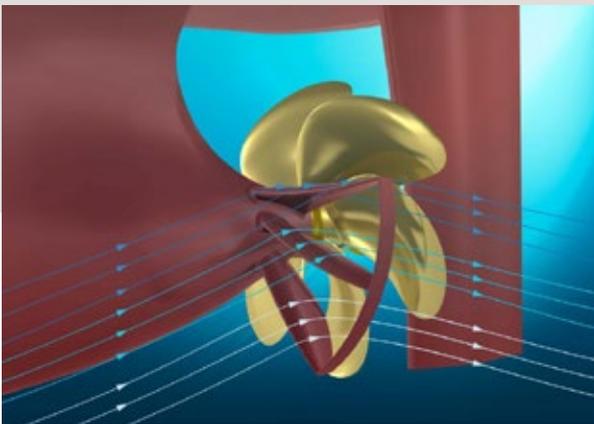
NEW PROPELLER

By re-designing and replacing existing propellers using Wärtsilä state-of-the-art design tools, notable efficiency improvements can be achieved. For example, by designing a Fixed Pitch Propeller to accommodate slow steaming at reduced vessel speed and power levels, efficiency improvements of up to 15% are possible. [Discover more.](#)

5.

ENERGOFLOW

The Wärtsilä EnergoFlow is an innovative and cost-effective pre-swirl stator, that creates optimal inflow for the propeller by guiding one side of the stern flow in the opposite direction to the propeller rotation, generating pre-swirl. This can increase fuel efficiency by up to 10%.



6.

ROTOR SAILS

Rotor Sails, also referred to as 'Flettner Rotors', are comprised of vertical cylinders which capitalise on the aerodynamic phenomenon known as the Magnus Effect to provide additional thrust to vessels and deliver significant fuel and emission savings.

Through a partnership with Wärtsilä, the Anemoi Marine Technology's Rotor Sail System is available within Wärtsilä's portfolio of energy saving technologies. [Read more.](#)

7.

ECOCONTROL

The Wärtsilä EcoControl's active combinator uses a smart control system that seeks and combines the optimal propeller pitch with the optimal engine loading. In this way, fuel consumption is reduced to its most efficient level during transit sailing modes.

The Wärtsilä EcoControl enables:

- Significant fuel cost savings
- Cruise control functionality
- Visual awareness of actual fuel consumption

[Discover more.](#)

8.

AIR LUBRICATION SYSTEM

The Air Lubrication System (ALS) creates a thin layer of air made up of uniform micro bubbles, as small as 1-3 millimeters in diameter. The micro bubbles reduce the drag on the vessel, which in turn lowers thrust requirements and decreases the amount of engine power needed to propel the vessel.

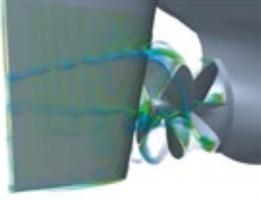
Through a partnership with Wärtsilä, the Silverstream® System is available within Wärtsilä's portfolio of energy saving technologies. [Read more.](#)



9.

OPTI DESIGN

CFD calculations analyse not only the propeller performance, but most importantly also, the interaction between the propeller and hull. By utilizing these numerical calculations of the flow to determine the effects of interaction between the propulsion unit and the vessel itself, the OPTI Design process delivers optimal efficiency. This in turn leads to reduced fuel consumption



10.

ENERGOPAC

- EnergoPac is based on optimization of the combined propeller, rudder and bulb design, can effectively reduce the operational costs for any vessel with a considerable share of free sailing time in its operational profile.
 - Reduced fuel consumption up to 6%
 - Excellent noise and vibration behavior
 - Superior maneuverability
- [Discover more.](#)



CONTROLLABLE PITCH PROPELLER

Wärtsilä Controllable Pitch (WCP) propeller systems provide excellent performance and manoeuvrability, and are recommended for vessels with frequent sailing routes that involve multiple operating conditions. These can be, for example, vessels requiring full power in both bollard pull and freesailing conditions, or that make frequent port calls. By integrating a suitable gearbox and Power Take Off/In, the WCP propeller system can also be transformed into a hybrid propulsion system.



SHIPPING IN THE 2020 ERA
Selection of fuel and propulsion machinery

[DOWNLOAD PDF](#)



INDETAIL ARTICLES
Offering today Wärtsilä 31, LNGPac, customer case Ultramax 2030, Sailing towards a carbon-neutral future

[DOWNLOAD FILE](#)



WHITEPAPER
Wärtsilä EnergoFlow - Robust and Reliable

[DOWNLOAD FILE](#)



WHITEPAPER
'The future of shipping'. How to enable just-in-time arrivals and eliminate wasteful practises in shipping operations?

[DOWNLOAD FILE](#)



Wärtsilä 31DF

DUAL-FUEL ENGINES = FUEL FLEXIBILITY = FUTURE READY

The Wärtsilä dual-fuel engine is the ultimate 'fuel flexibility' solution. It is a four-stroke engine that runs on light fuel oil (LFO) or heavy fuel oil (HFO), and can switch over from gas to LFO/HFO and vice versa smoothly during engine operation. The Wärtsilä dual-fuel engines are available in power range from 0.8–17.5 MW having speed range from 500–1200 rpm.

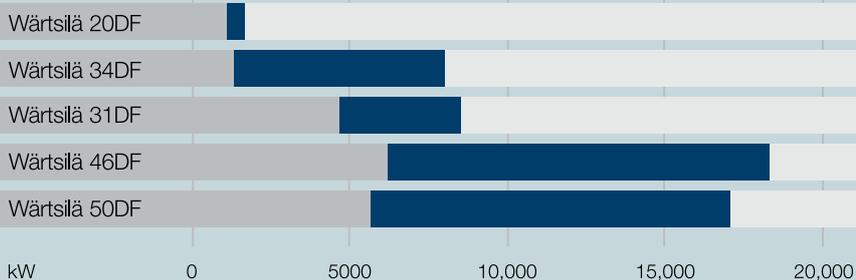
Key benefits of Wärtsilä Dual Fuel engines

- Fuel flexibility
- Application flexibility
- Proven and reliable dual-fuel technology
- Long overhaul intervals
- Low exhaust gas emissions
- Fuel economy over the entire engine operation range
- Low gas feed pressure
- Embedded automation system

[Click here for our engine types.](#)

Power range for Wärtsilä engines

Wärtsilä dual-fuel engines



WÄRTSILÄ 14 (EU STAGE V) ENGINE

The Wärtsilä 14 is the most compact engine in its power range in the marine market, and serves both propulsion and auxiliary genset applications in the global marine and offshore markets.

[Read more.](#)

[Wärtsilä 14 EU Stage V compliant engines selected for Swiss Inland ferries](#)



Watch the webinar "Decarbonising Shipping – is it only about the alternative fuels?", [click here.](#)



FUEL GAS SUPPLY SYSTEMS

Using LNG engines decreases fuel costs while ensuring compliance with increasingly stringent regulations.

Whether a vessel can be converted to operate on LNG depends mainly on the space required by the LNG tanks and additional equipment required. Wärtsilä can manage your project on all aspects from feasibility studies, financing solutions, solution proposals, execution planning and implementation to full EPC solution. [Read more, click here.](#)

LNGPAC

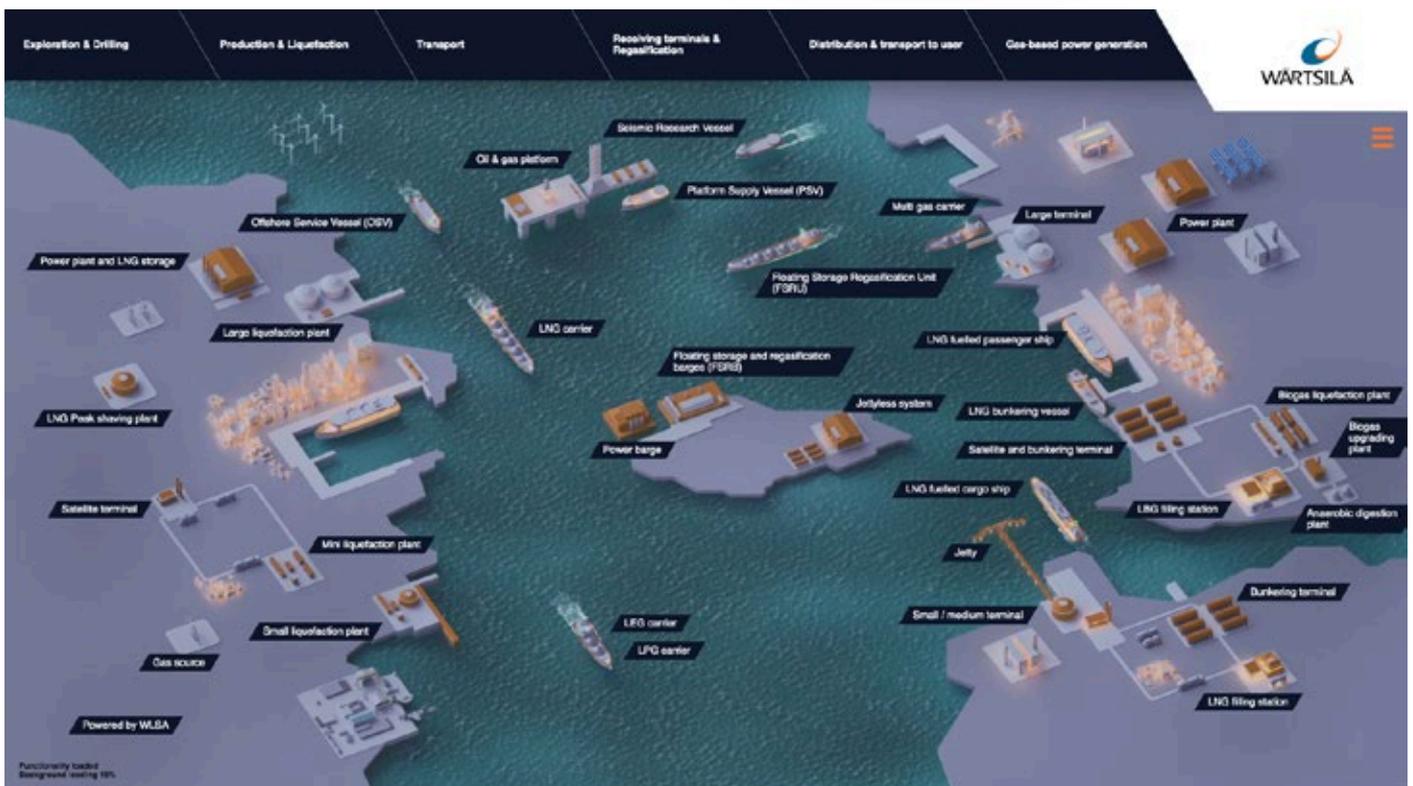
Wärtsilä LNGPac™ is a complete fuel gas supply system for LNG fuelled ships and includes the bunkering station, LNG tank and related process equipment as well as the control and monitoring system.

The LNG fuel system can be offered as a standalone product, as well as a part of a complete propulsion system. Wärtsilä can deliver LNG systems for propulsion and power generation for any applicable types of ship or engine. [Read more about the LNGPac, click here.](#)

GAS VALUE CHAIN

As part of the energy transition, the maritime industry has to adapt to new energy sources and ways of working. With Wärtsilä's expertise across the whole gas value chain, we are here to support our customers in implementing new fuels like LNG, LPG, Ammonia, Hydrogen and Bio/SyntheticLNG.

[View our expertise, click here.](#)



ENGINE METHANE CALCULATOR

See also our [Wärtsilä Methane Number Calculator](#): we have developed this tool for ship owners and operators to calculate the Methane Number of the fuel gas. The calculation result indicates whether or not the given gas quality is suitable for use in Wärtsilä dual fuel engines. [Calculate now.](#)

Wärtsilä Methane Number Calculator

We have developed this tool for ship owners and operators to calculate the Methane Number of the fuel gas. The calculation result indicates whether or not the given gas quality is suitable for use in Wärtsilä gas and dual fuel engines.

Methane CH_4	100 mol%	Neo-pentane (2,2-Dimethylpropane) $neo-C_5H_{12}$	0.00 mol%
Ethane C_2H_6	0.00 mol%	Mix-hexane $Mix-C_6H_{14}$	0.00 mol%
Propane C_3H_8	0.00 mol%	Mix-heptane $Mix-C_7H_{16}$	0.00 mol%
Iso-butane (2-Methylpropane) $i-C_4H_{10}$	0.00 mol%	N-Octane $n-C_8H_{18}$	0.00 mol%
N-butane $n-C_4H_{10}$	0.00 mol%	Carbon dioxide CO_2	0.00 mol%
Iso-pentane (2-Methylbutane) $i-C_5H_{12}$	0.00 mol%	Carbon monoxide CO	0.00 mol%
N-pentane $n-C_5H_{12}$	0.00 mol%	Hydrogen H_2	0.00 mol%
Ethylene C_2H_4	0.00 mol%	Nitrogen N_2	0.00 mol%
Propylene C_3H_6	0.00 mol%	Hydrogen sulfide H_2S	0.00 mol%
Total		100 mol%	

[CALCULATE >](#)



WÄRTSILÄ 31 DF

The Wärtsilä 31DF is the most powerful in its class and available in the range from 8 to 16 cylinder configurations. The power output ranging from 4.6 to 9.6 MW, at 720 and 750 rpm. The Wärtsilä 31DF introduces a 4-stroke engine having the best fuel economy of any engine in its class. [Read more.](#)

WÄRTSILÄ 31SG PURE GAS ENGINE FOR MARINE

Providing the lowest total cost of ownership and environmental footprint for operation in areas with a secure gas supply

- 20-30% less greenhouse gas emissions vs diesel engines
- 10-20% less greenhouse gas emissions vs the already low dual fuel engine emissions
- 5% reduction in operating cost through reduced consumables and maintenance

The Wärtsilä 31SG is based on the successful Wärtsilä 31 product platform which includes the world's most efficient 4-stroke diesel engine – as recognised by Guinness World Records. [Read more.](#)



FUEL CONVERSION

Concern for the marine environment is rising and new measures have been, and will continue to be implemented to protect the oceans and seas. Switching to an environmentally friendly fuel can be considered a way of future-proofing it against tightening regulations. Liquefied natural gas, or LNG, is an attractively priced and sustainable fuel that reduces environmental risks and harmful emissions. Using LNG engines decreases fuel costs while ensuring compliance with increasingly stringent regulations.

Whether a vessel can be converted to operate on LNG depends mainly on the space required by the LNG tanks and additional equipment required. Wärtsilä can manage your project on all aspects from feasibility studies, financing solutions, solution proposals, execution planning and implementation to full EPC solution. [More information: click here.](#)

Read the white paper '[LNG as a marine fuel boosts profitability while ensuring compliance!](#)

HYBRID

The Wärtsilä Hybrid systems are designed and integrated into the vessel to optimise the overall operation, energy creation, distribution and consumption. The system ensures fuel savings and reduced maintenance costs, in addition to substantial reductions in emissions. [Read more, click here.](#)

HYBRID & DECARBONISING SHIPPING

WEBINAR Hybrid solutions for marine applications
- Optimise your operational performance



WEBINAR Hybrid Ferry & Tug Solutions -
Development and delivery



WEBINAR Say 'HY' to the future:
The hybrid (r)evolution



HYBRID UPGRADE AND NEWBUILD

Wärtsilä Hybrid solutions are suitable for a variety of vessel types in wide array of configurations to suit the operating profile, available space and power needs - and can be retrofitted or as part of a new build.

INSTALLATION EXAMPLES

MERCHANT

- [Bulk carrier - Misje Rederi](#)
- [Marfin Paolo Topic](#)

FERRY

- [Wightlink Victoria of Wight](#)
- [Boreal Sjö Zero emission](#)

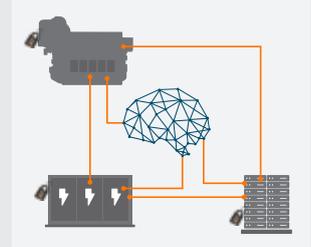
TUG

- [Port of Luleå, Vilja](#)

Environment Lower emission levels Green image Green mode enabled	Design Built-in redundancy Power boost available Less installed cylinders Better EEDI GA flexibility DP benefits	Operations High op. flexibility Peak shaving Optimal engine loads Stable parameters Instant backup (safety) Instant load taking Less engines running hours	Operational costs Lower fuel consumption Lower maintenance costs

Wärtsilä HY is different from a hybrid system

- Ad-hoc components design:**
Internal components are pre-designed to work in the Wärtsilä HY environment, allowing best results and advanced features
- Next-generation EMS:**
The Energy Management System works as the brain, enabling advanced features (start/stop, cold start...) and controlling energy flows towards energy efficiency, performance, safety, emissions and smoke levels, etc.
- Customization:**
Hardware and software are optimized for specific ship types and they can be customized for specific requirements
- Tuning:**
Wärtsilä HY can be tuned over time based on field data collection and to cope with evolving requirements and op. profiles



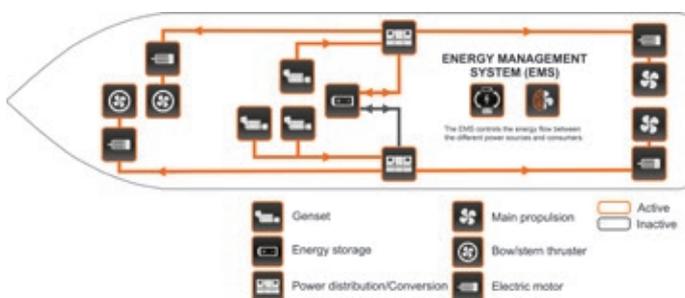
WÄRTSILÄ SHORECONNECTION

Providing electricity to ships from the shore is a smart way of complying with port emission requirements, and our Shore Connection is the simplest and most cost effective way to do it. [Discover more, click here.](#)



SHAFT GENERATORS

The shaft generator systems generating power for a ship's auxiliary systems from its main engines, reduces fuel consumption as well as the environmental footprint. Wärtsilä has a proven track record of delivering shaft generator systems for more than 50 years. [Read more, click here.](#)



IMPROVE EFFICIENCY THROUGH DIGITALISATION AND ASSET PERFORMANCE MANAGEMENT

Wärtsilä's approach to decarbonisation is to explore future fuel opportunities and methods to improve the efficiency of shipping through digitalisation – while also offering solutions that immediately increase the fuel flexibility and fuel efficiency of vessels.

Expert analysis is often the key missing ingredient to ensure that digitalisation initiatives in the marine industry pay off. Continuously gathering and processing data from a vessel's equipment is not enough in itself to generate improvements. Through the combination of latest advancements in analytics and AI for data processing and enrichment, the results are further refined with subject matter expertise for true insights and actionable advice by our experts in the Wärtsilä Expertise Centres.

Creating and driving value out of data requires analytics and technical product experts who can make sense of the data and give actionable advice. A partnership approach through Lifecycle Solutions agreements between Wärtsilä and ship owners, operators and onboard crew – all with access to data – enables pursuing a predictive maintenance strategy and new possibilities to optimise asset performance for driving business growth.

Through partnership we can provide performance management and optimisation including remote troubleshooting and tuning of equipment and systems, as well as remote guidance for technical site operations. Combining data and human expertise enables us to significantly optimise maintenance throughout the asset lifecycle improving fuel efficiency and consequently reduce emissions."

With Wärtsilä's Lifecycle Solutions, operators in the marine industry enjoy:

- Improved asset availability and operational reliability to avoid unexpected downtime
- Optimised energy efficiency and long-term cost predictability
- New ways of working and business models
- Transparency around automated regulatory reporting and asset performance

This covers activities throughout a vessel's lifecycle, from strategic and business planning and new-building phases to operation and maintenance, as well as the continuous performance improvements needed to ensure asset performance over the years.

[Read more about this](#), or watch the video by [clicking here](#).

"Digital Transformation is not about adopting technology just for its own sake - it's about driving business value to customers at pace. We have re-wired the Wärtsilä organisation and focused on our people. By creating an empowered and collaborative culture we accelerate their personal transformation. It is the people that drive the change."

Interested to learn more about our digital solutions? Please check the possibilities as part of our Lifecycle Solutions offering: [click here](#).



Download the whitepaper 'Driving profitable business in the marine industry', [click here](#).

WÄRTSILÄ'S VIEW ON FUTURE FUEL PATHWAYS



Mikael Wideskog
Director, Sustainable Fuels & Decarbonization

Shipping plays a critical role in the global economy, transporting 90% of world trade. The challenge is that it also accounts for 3% of all greenhouse gas (GHG) emissions, and that figure is set to grow dramatically. To mitigate the environmental impact of shipping, the International Maritime Organization (IMO) has adopted a strategy aimed at reducing GHG emissions from shipping by 50% by 2050 compared to 2008 levels.

To comply with the IMO target, radical change is needed, in terms of both vessel design and power generation. However, the main challenge is fuel – and the related global investments in its production and infrastructure. Wärtsilä is leading the way in developing a wide range of engine and fuel gas supply systems to help ship owners navigate the route to reduced GHG emissions – whatever fuels they choose.

STRIVING FOR LOWER EMISSIONS

Before we begin discussing future fuels, an important distinction should be made between so-called ‘carbon-neutral’ and ‘zero-emission’ fuels.

- Carbon-neutral fuels are those that have no net carbon emissions, meaning their production and use does not increase the amount of CO₂ in the atmosphere. Examples include synthetic fuels made with renewable energy and certain biofuels.
- Zero-carbon fuels release no CO₂ when used as they do not contain any carbon. While hydrogen is an example of a zero-carbon fuel, it may or may not be carbon neutral depending on how it was produced.

To power shipping in the future, Wärtsilä is investigating a wide range of fuels, including bio and synthetic liquefied natural gas (LNG) and natural gas along with ammonia, methanol, hydrogen and biofuels. Wärtsilä’s research draws on deep

experience gained through decades of building engines as well as supply and storage systems for a wide range of fuels.

When moving towards a complex fuel future, Wärtsilä’s goal is simple: to continue to be a provider of complete fuel supply and engine solutions for all future fuels. Given the market demand, in the next decade we will commercialise engine technology and fuel gas supply systems that will allow ship owners to be prepared to make use of all fuels currently under discussion. Given the modularity of modern engines this means that, as long as ship owners consider storage requirements, they can already plan to use new fuels on vessels being built today.

A FOCUS ON LNG – AND FUEL FLEXIBILITY

There are uncertainties around every prospective fuel, including when and where they will be available and at what price. Building fuel

flexibility into new vessels – and, where appropriate, retrofitting flexible powerplants in older vessels – offers a hedge against these risks.

To start with, Wärtsilä believes that the transition to clean fuels will be easiest, most cost effective and fastest for those vessels powered by LNG, which already offers GHG emission reductions of between 5 and 21% compared to heavy fuel oil. Bio and synthetic LNG can be used initially as drop-in fuels alongside conventional LNG to reduce carbon content and later, as supply increases, to replace conventional LNG entirely. Additionally, this solution requires only existing infrastructure, minimising the amount of investment needed. Bio LNG also has the big advantage that it can be produced using many kinds of sustainable feedstocks, from manure via sewage residue to forest residue and many other types of waste.

Other alternative fuels might take between 10 and 20 years to be accepted by marine classification societies, in addition to the time required to develop reliable, global fuel supply, infrastructure and bunkering facilities. However, LNG is not a perfect solution – methane leakage during production and combustion is still a challenge that negatively impacts the GHG footprint of LNG. Nevertheless, over the last 20 years we have reduced methane leakage by 85% and are continuing to reduce it further with new combustion technologies.

Exploring many alternative fuels
There are many fuels that can be used in marine engines. These are the main candidate fuels for the future in addition to LNG:

“Wärtsilä will continue to be a supplier of complete systems, regardless of the fuel being used”

AMMONIA

The exploration of ammonia as a fuel is progressing fast. It has several advantages over hydrogen, for example its greater energy density and the fact that it does not need to be stored under compression or at very low temperatures. But ammonia is toxic and highly corrosive, making it challenging to handle, especially for passenger vessels. Furthermore, the current ammonia supply is fossil based so in future it would have to be made in an environmentally sustainable way as it the case with synthetic ammonia.

Wärtsilä is not starting from scratch in this area. We have several years' experience of designing cargo-handling systems capable of handling ammonia for use on LPG carriers. On the fuel storage and supply side, we are participating in the EU project ShipFC to develop systems that will supply ammonia to fuel cells that will be installed on Eidesvik Offshore's supply vessel Viking Energy by 2023. We have performed combustion tests with ammonia in our fuel laboratory, and the next step is full-scale engine tests.

METHANOL

Until now, methanol has not been widely used as a marine fuel. This easily and cheaply produced industrial alcohol is today made predominantly from natural gas, but the use of hydrogen from renewable electricity and recaptured carbon to

make green methanol would make it carbon neutral. And with better combustion and easier storage and handling than ammonia, methanol is a key component of decarbonisation in the maritime industry.

Only a few marine engine builders have experience with methanol engines. A project to convert a Wärtsilä Z40 engine on the ro-pax vessel Stena Germanica to burn methanol began in 2015. The engine now runs mainly on methanol, and the success of the installation has inspired Wärtsilä to investigate this fuel further.

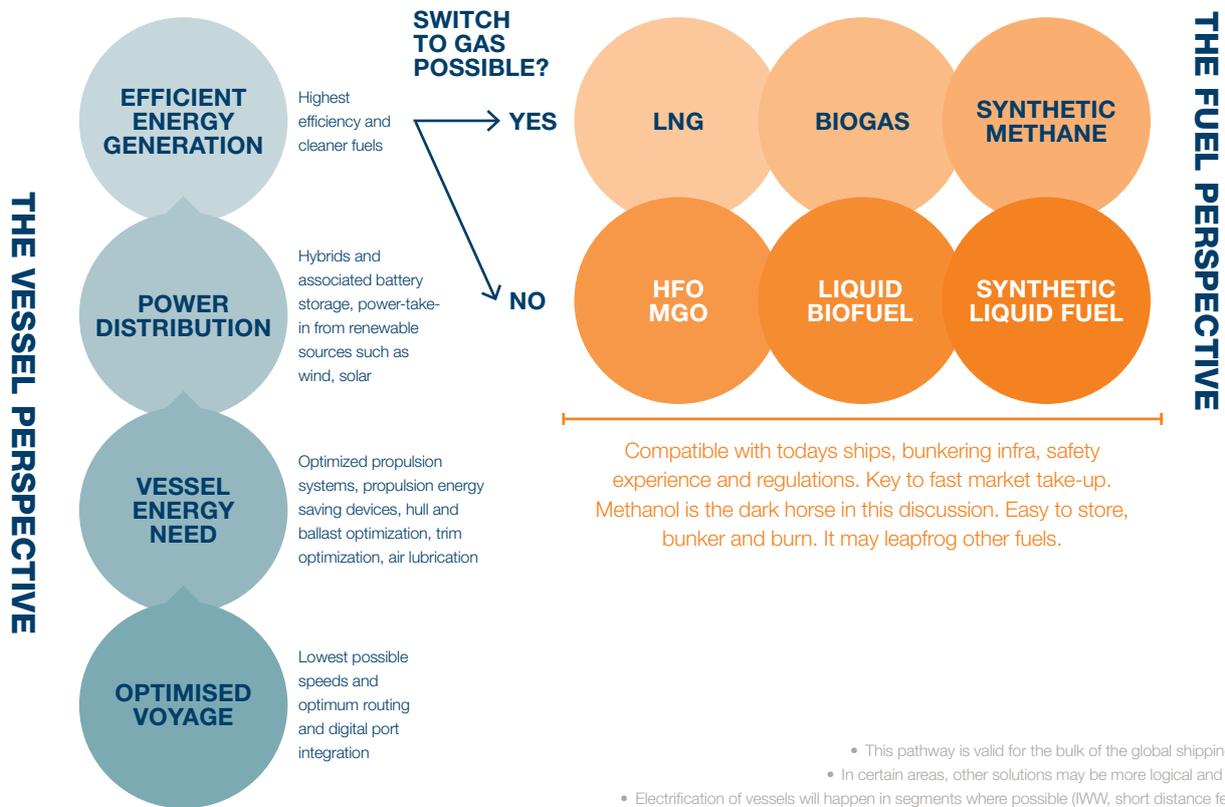
BIODIESEL

Fuels derived from biomass have great potential as a carbon-neutral energy source. They can be made in a variety of forms that can be used in both diesel and gas engines, either as a drop-in fuel or as a standalone fuel. As biofuels are compatible with existing engine, fuel supply and storage technologies they could offer simple and capital efficient decarbonisation of shipping.

Wärtsilä has been continuously experimenting with many different biofuels since the 1990s, and over the past ten years has been developing advanced combustion techniques to further improve efficiency and fuel flexibility. More recently, Wärtsilä worked with Boskalis and biofuels company Goodfuels to develop and test



JOURNEY TO DECARBONISATION



- Notes:
- This pathway is valid for the bulk of the global shipping industry.
 - In certain areas, other solutions may be more logical and profitable.
 - Electrification of vessels will happen in segments where possible (IWW, short distance ferries, etc.)
 - The advent of on-road electromobility will continue to drive down battery and possibly fuel cell prices.
 - For longer haul applications, physics preclude the use of full battery electric ships.
 - Hydrogen and Ammonia seen to play a smaller role for the coming 2 decades due to missing rules/regulations/experience
 - Synthetic fuels are "hydrogen carriers"; built from green hydrogen and other elements to build a useable and practical fuel

biofuels suitable for use in shipping. We already have several products in our portfolio that can use biodiesel, for example our W20, W31, W32 and W46 diesel and dual-fuel engines.

HYDROGEN

Wärtsilä already has a strong understanding of hydrogen, and our dual-fuel engines and spark-ignited gas engines can already run on a fuel mix comprising between 15 and 25% hydrogen, further highlighting the flexibility of dual-fuel engines. We first experimented with using hydrogen in our gas engines in 2015 and are continuing development towards a pure hydrogen engine. But fuel storage and supply remain

a challenge for hydrogen due to its low volumetric energy density and its explosive and corrosive nature. Synthetic hydrogen will take around a decade to be globally and reliably available; green hydrogen is produced using only renewable energy sources.

THE FUTURE CAN'T WAIT

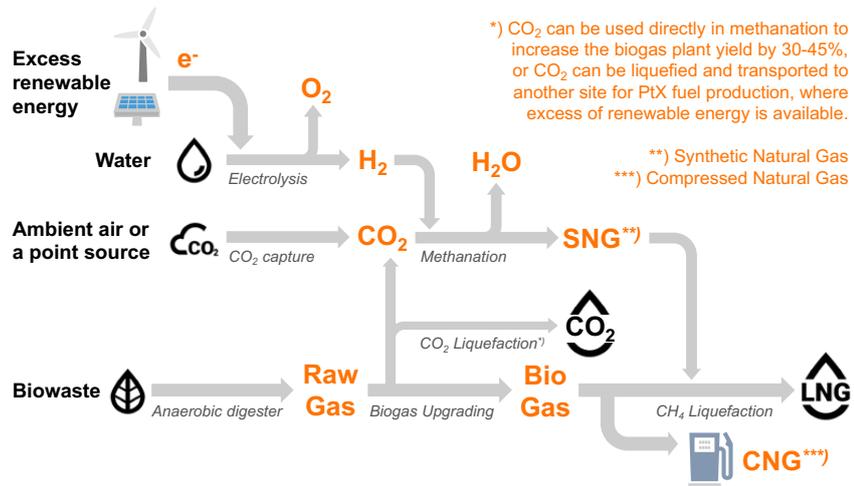
The future of the marine fuel market is far from certain, but investment in ships cannot simply stop. To manage this risk, it's essential that ship owners prepare to build fuel flexibility into their vessels. To reach the targets set out in the Paris agreement and the IMO's 2050 strategy, players in the marine industry need to start acting now

– which means increasing the use of LNG with a parallel increase in production capacity for bio LNG and synthetic LNG using renewable energy.

Ultimately, our aim at Wärtsilä is to ensure that the global marine fleet can be powered cleanly and reliably, whichever fuels ultimately help shipping reach its emission-reduction ambitions.

WEBINAR Fuels for the future: the steps towards zero emission shipping

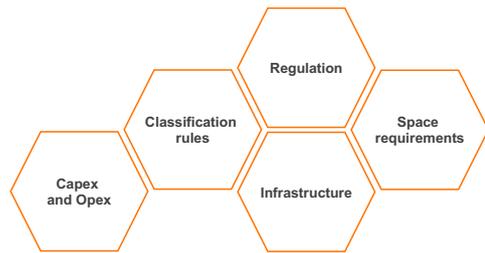




HYBRID SYSTEMS WILL BE PART OF THE SOLUTION

Fuel cells and energy storage will be integrated into the power train of the future

Both are technologically feasible, however commercial viability is far behind the internal combustion engine



WE HAVE TODAY THE TECHNOLOGY NEEDED TO USE MOST FUTURE FUELS. DEVELOPMENT IS ON-GOING FOR THE REST

Wärtsilä Technology	Diesel	LPG	LNG	FAME/ HVO*	Bio-methane	Hydrogen	Ammonia	Methanol	Synthetic methane
Diesel	●			●			●	●	
DF (Dual Fuel)	●	●	●	●	●	●	●	●	●
SG (Spark Gas)		●	●		●	●	●		●
GD (Gas Diesel)	●	●	●	●	●		●	●	●
LG (Liquid Gas)	● (MGO only)	●		●			●	●	

- Ready solution
- Industrialisation needed
- Development needed

* FAME, HVO, biodiesel



ARTICLE Sailing towards a carbon-neutral future

indetail, P46-49
Click here

EXAMPLES OF CASE STUDIES & REFERENCES

Click on the titles to read the full stories

GENERAL

Wärtsilä is ready to combat the US\$1 trillion climate problem with smart technologies →



6 ways container vessel companies are reducing their environmental impact →

Wärtsilä's future fuel capability efforts voted as a Top 10 innovation for 2020 →



A fireside chat with shipping economist Martin Stopford →

- The next 30 years could be as revolutionary to shipping as steam engines were in the age of sail. British economist Martin Stopford discusses his vision of the industry in light of Covid-19, climate change and smart shipping.
- Martin Stopford has built a glowing maritime career both in business and academia. He is currently the non-executive president of Clarkson Research. Stopford chats with us about his paper on the possible future of the shipping industry in light of the pandemic and current events.
- Read more on [wartsila.com](https://www.wartsila.com), [click here](#) →.



The award-winning concept: TEEKAY and Wärtsilä have partnered to create the most environmentally friendly shuttle tanker ever built →

RETROFIT, UPGRADES & ENERGY EFFICIENCY

Shipowners should use pandemic downtime to retrofit →



Improved reliability for re-powered dredger UKD Marlin →

Performance-based agreement with Carnival Corporation's fleet →

The 25,000 dwt product tanker Bit Viking was the first vessel ever to undergo a conversion by Wärtsilä from Heavy Fuel Oil (HFO) to Liquefied Natural Gas (LNG) operation →

Wärtsilä solutions selected as E-Marine upgrades its fleet →

Rise of offshore wind power boosts the demand for larger, more efficient offshore vessels →

PROPULSION

Wärtsilä EnergoProFin improves the fuel efficiency of bulk carrier MV Arvika →

Wärtsilä high-efficiency propulsion solutions selected for special high-speed ferry →

How a propulsion retrofit led to savings of 800 litres of fuel in 24 hours →

Whitepaper Wärtsilä EnergoFlow - Robust and Reliable →

Wärtsilä delivers low-noise propulsion solutions for Canadian Coast Guard research vessels →

HYBRID

Finnlines orders Wärtsilä engines and hybrid systems for its two new eco-friendly ferries →

Wärtsilä achieves new marine benchmark with hybrid solution for bulk carriers →

Innovative energy storage solution for Eidesvik Offshore →



Hybrid solution upgrade brings significant fuel savings for offshore vessel →

Fully integrated Wärtsilä Hybrid Solution selected for new Misje Rederi bulk carriers →

Charging ahead - A bright future for zero-emissions ferries →

Upgrading OSVs to take advantage of wind farm growth →

Wärtsilä and CBO to partner in Latin America's first hybrid vessel upgrade project →

Three new Finnlines Hybrid RoRo ferries →

Harvey Gulf orders Wärtsilä Energy Storage for another four LNG-powered Supply Vessels →



SHORE CONNECTION AND WIRELESS CHARGING

Wireless charging for hybrid coastal ferry successfully tested →



First autodocking vessel →

Fully automated Wärtsilä Smart Docking system installed on Molslinjen fast ferry →

ENGINES & COMBINATION OF FULL POWER TRAIN SCOPE

Wärtsilä 14 (EU Stage V)

Wärtsilä 14 EU Stage V compliant engines selected for Swiss Inland ferries →

Wärtsilä 20DF

40 Wärtsilä 20DF engines will power China's first fleet of LNG fuelled PSVs →

Wärtsilä 31DF & Wärtsilä 31SG

Wärtsilä solutions chosen for first Japanese built LNG-fuelled ferries →

Wärtsilä 31DF dual-fuel engines capable of operating on liquefied natural gas (LNG) and biogas →

Wärtsilä 31SG gas engine generating set awarded German Grid Code compliance certification →

Best-in-its-class Wärtsilä 31DF engine gets even more power →

Wärtsilä 34DF

Wärtsilä integrated solutions will deliver efficiency and sustainability to three new short-sea vessels →

Wärtsilä 46DF

Two cruise ships to run on LNG with Wärtsilä 46DF engines, and with Wärtsilä LNGPac systems →

Wärtsilä 50DF

Provalys: the ship is propelled by dual-fuel engines and electric propulsion. The heart of the system is four dual-fuel engines; three 12-cylinder and one 6-cylinder Wärtsilä 50DF, giving a combined output of 39.9 MW. →

COMBINATION OF FULL POWER TRAIN SCOPE

The Aurora Spirit, launched at Samsung Heavy Industry's shipyard in South Korea, is the first of six new-generation e-shuttle tankers →

(TESTING) FUELS

LNG

Cutting greenhouse gas emissions from LNG engines →

Wärtsilä solutions chosen for first Japanese built LNG-fuelled ferries →

CMA CGM the largest LNG-powered container ship ever built features Wärtsilä solutions largest LNG vessel →



BIO LNG

Webinar: The potential of bioLNG for the maritime industry →

LPG (FUEL SUPPLY SYSTEM)

Wärtsilä LPG Fuel Supply System the first ever to undergo engine testing →

AMMONIA

Wärtsilä advances future fuel capabilities with first ammonia tests →



What does an ammonia-ready vessel look like? →

First ammonia check already won as Top 10 innovation award in Japan →

METHANOL

Industry celebrates five-year anniversary of world's first methanol-powered commercial vessel →



WÄRTSILÄ WEBINARS
Find all our webinars [here](#).



CONTACT INFORMATION
All Wärtsilä offices worldwide
[Click here](#).

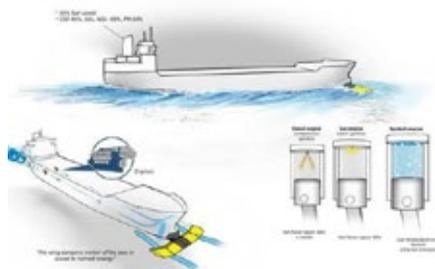
PARTNERSHIPS AND PROJECT INVOLVEMENT

Some highlighted



Launched in 2019, the ZEEDS (Zero Emission Energy Distribution at Sea) initiative envisions a series of offshore platforms to make zero emissions fuels available to the shipping industry.

In just one year, the founding partners have formed a solid collaboration, and built a highly efficient culture of innovation based on transparent cooperation and mutual trust. [More info on zeedsinitiative.com](http://zeedsinitiative.com)



SEATECH

The technology group Wärtsilä, together with a consortium of six other industry and academic partners, has been awarded EU funding for a major project aimed at reducing fuel consumption and lowering emission levels for shipping. The SeaTech project consortium has been formed to develop two symbiotic ship engine and propulsion innovations that when combined, could lead to a 30 percent reduction in fuel consumption. At the same time, the project envisions 99 percent reductions in emissions of sulphur oxides (SO_x) and nitrogen oxides (NO_x), a 46 percent reduction in CO₂ emissions, and a 94 percent reduction in particulate matter emissions. [Read more.](#)



ZERO EMISSION SERVICES

ZES is introducing a new energy system for making inland shipping more sustainable. This will be realized with emission-free navigation infrastructure that is accessible to everyone. Clean, climate-neutral and ready to compete with fossil fuels. ZES offers a complete range of products and services, based on interchangeable battery containers charged with renewable power, charging stations, technical support and an innovative payment concept for ship owners. ZES was founded by the companies ING, energy and technical service provider ENGIE, maritime technology company Wärtsilä and the Port of Rotterdam Authority. The Ministry of Infrastructure & Water Management is supporting this initiative together with the Province of South Holland. [Read more at ZeroEmissionServices.nl](http://ZeroEmissionServices.nl)



H2OCEAN

STATUS: JUST INITIATED

Project is gathering several Marine industry players altogether such as Repsol / Murueta / Port Bilbao / Sener / Tecnalia / Ingeteam and Wärtsilä. Hydrogen as future energy vector for the Marine industry in order to reach IMO 2050 decarbonisation targets. The project will include the creation of a system environment for the H₂ production, map of the consumers, up to a living lab represented by floating barge/s pushed by zero emission technology tugs sailing on Bilbao river.

INTELLITUG

The first project to be co-produced at the Wärtsilä Acceleration Centre is the Wärtsilä IntelliTug. By partnering with PSA Marine and MPA, Wärtsilä has embarked on a venture to enhance the capabilities of the harbour tug.

With more than 90,000 towage jobs in each year, the PSA Marine tug operations are an important lifeline for Singapore. To meet the demands of the evolving port, the collective is collaborating to bring to life a smarter tug that will perform a range of routine missions designed to further improve tug safety and efficiencies, while reducing operator workload and pressures in one of the world's most demanding harbour environments. [Read more at wartsila.com/intellitug](http://wartsila.com/intellitug)



THE FUEL CELL PROJECT CURRENTLY UNDERWAY IN NORWAY

Wärtsilä is committed to researching the use of future carbon-neutral fuels for viable use in marine engines, and is active in investigating alternative means for eliminating emissions, including the use of fuel cells. The main partners in the project are Odfjell, a major shipping operator, Prototech, a specialist company in fuel cell technology, and Lundin, a leading offshore oil & gas company. [Read more.](#)



WÄRTSILÄ SELECTS SHELL AS TEST OIL PARTNER FOR FACTORY TESTING

Shell was selected because of its complete range of market leading lubricant oils for stationary engines running on gas, heavy fuel oil, gasoil, or liquid biofuel. Recognising that the engines are meticulously engineered and knowing the high quality of the production process, Shell's lubricants will help ensure that the equipment is well protected and able to perform optimally. [Read more.](#)

THE SEABIN PROJECT

The Seabin Project was created by enterprising Australians to help address the huge global environmental challenge that plastic and other waste is causing to the oceans of the world. In 2017, Wärtsilä signed up – as the first big industrial company – to partner with the project.

As Atte Palomäki, Wärtsilä's Executive Vice President, Communications & Branding, said at the time; "As one of the leading solution providers in the marine industry, we are constantly developing new environmental technology, such as plastic for fuel, which we are currently testing. However, the most important thing to remember is that every one of us can do our bit for the cleanliness of the marine environment."

Due to Wärtsilä's Finnish heritage, the cities of Helsinki, Vaasa and Turku were part of Seabin pilot locations in April 2017. Since then, Wärtsilä has donated 40 Seabins in various locations globally. Besides Seabins donated by Wärtsilä, there are approximately 860 Seabins in total worldwide and they can capture 3 613 kilograms ocean litter every day. [Find out more here.](#)

PUBLICLY FUNDED R&D PROGRAMS

Both active and finalised

EDGE

FINALISED

Objectives: The targets for the EDGE research project are to balance the computational intelligence between the Edge onboard the vessel and the cloud, enabling real-time safety-critical operation regardless of communication availability. Developed solutions and methods will be verified and validated using demonstrators, e.g. ship engines, forest machinery, shipyard cranes, and the electrical grid. The EDGE research consortium includes, in addition to the Wärtsilä Engine Research Initiative partners, ten other small, medium and large companies.

Wärtsilä's contribution within the EDGE-project will be to define the analytical requirements for autonomous engine operation and to study automated detection of leakages, follow-up of lubrication oil and fuel quality as well as combustion. The EDGE project will also focus on connecting machinery to the cloud on vessels where a broadband connection is not available and on evaluating the possibilities of running analytics developed in the cloud.

Duration: Till November 2020

INTENS

Objectives: INTENS is an industry-wide joint effort dedicated to advancing and promoting the digital transformation in Finnish marine industries and beyond. By implementing and further developing the Digital Twin approach, it is possible to holistically integrate ship energy systems at the component, system, ship and fleet levels, aiming to achieve intelligent and optimal design and operation of ship energy systems throughout their lifecycles. Consequently, it can potentially change and disrupt the ways how the marine industries operate currently and pave the way for future shipping.

Learn more at intens.vtt.fi

ACTIVE
PROGRAM

HERCULES

FINALISED

Objectives:

- Improving fuel flexibility
- Formulating new materials to support high temperature applications
- Developing adaptive control methodologies to retain lifetime powerplant performance
- Achieving near-zero emissions
- Advanced engine development; new combustion concepts, fuel nozzle modelling, turbocharging, multi-fuel engines
- Optimization of ship energy management
- Advanced adaptive engine control technologies for operation in extreme conditions
- Integration of sequential after-treatment for near-zero emissions
- Development of technologies and materials for sustained engine life-cycle performance
- Increasing engine efficiency
- Decreasing fuel consumption
- Decreasing CO₂ emissions

Duration: 2004-2018

[Watch the Hercules video by clicking here.](#)

SUORA

Objectives: Increasing functionality of products by Direct Write technology (printing electronic components directly on materials)

FINALISED

Duration: 01.01.2010 - 31.12.2011

Read more: ["Tulostamalla elektroniikkaa suoraan tuotteiden pintaan jo valmistusvaiheessa", by VTT](#)

VALPAS

Objectives: Development of a design model to improve product reliability and maintenance service

FINALISED

Duration: 01.01.2009 - 31.12.2010

Tampere University of Technology

REFUEL

Objectives: Optimization of diesel combustion technology for synthetic and renewable fuels

Duration: 01.01.2009 - 31.12.2011

FINALISED

FREFA

Objectives:

- Calculation rules based on multi-axial failure criteria
- Developing fretting maps
- Fatigue and fracture mechanical testing

Duration: 01.01.2004 - 31.12.2006

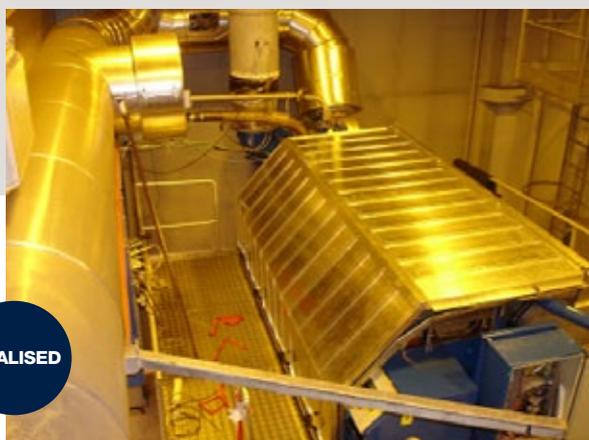
FINALISED

NOISE

Objectives:

- Improving know-how on noise generation in engines
- Studying noise-related calculation methods
- Reducing engine noise

Duration: 16.08.2004 - 31.05.2006



FINALISED

GENSET

Objectives:

- Designing a generating set up to 35% lighter and 30% shorter than current sets
- Finding new energy-saving methods through advanced engine controls

Duration: 01.08.2005 - 31.07.2007

FINALISED

LEER

Objectives: Reducing exhaust gas emissions

Reports (internal):

- Survey of filtering systems for exhaust particles
- Feasibility study of particle emission reduction
- Effects of swirl in medium speed diesel engine
- Test proposal for exhaust particle reduction systems
- About cylinder pressure measurement through an indicating cock
- Feasibility Study: Selective, Non-Catalytic Removal (SNCR) of NO_x

FINALISED

WÄRTSILÄ KNOWLEDGE CENTRES

Innovation is Wärtsilä's middle name. This is reflected in all the knowledge centres.

WÄRTSILÄ LAND & SEA ACADEMY

Competence and learning are key to success in any business. The Wärtsilä Land and Sea Academy (WLSA) provides high-quality training services for the marine and energy markets, ensuring that your personnel have a strong knowledge of how to manage your assets. Our global training solutions cover all aspects of managing and operating your installation, including maintenance, safety, availability, reliability and performance. The courses and programmes are delivered in the way that works best for your organisation – whether that's on board, on site, in training centre or online. [Read more.](#)

WÄRTSILÄ HELSINKI CAMPUS

Over 500 Wärtsiläns are settled in at the Wärtsilä Helsinki Campus. It features the latest smart real estate technology to ensure the best employee and customer experience. It supports a new ways of working and promotes the company's capabilities to succeed globally as an innovative and customer centric technology service company.

Wärtsilä Experience Centre, utilising the latest audiovisual technology, has been created in conjunction with the reception. In the dark, 250-square-metre exhibition room, our customers, personnel and other stakeholders get to experience how Wärtsilä's smart technological products and innovative solutions work. The virtual reality enables, for example, visiting a power station or a cruise ship, and the real-time remote control of engines can be observed through an interactive presentation.



INTERNATIONAL MARITIME CYBER CENTRE OF EXCELLENCE

The world's very first International Maritime Cyber Centre of Excellence (IMCCE) in Singapore contains the Maritime Cyber Emergency Response Team (MCERT) and a Cyber Academy. The IMCCE was set up together with Templar Executives. The centre will contribute to cyber awareness and the response to cyber incidents.

Cyber is an important topic for the maritime industry. Because the sector is vulnerable in the event of a cyberattack, and because the maritime sector is an important part of the infrastructure of countries that are under fire, and because the sector has to deal with regulations that are still under development.

The MCERT component is an international platform that contributes to the cyber-resilience of the entire maritime ecosystem. MCERT is available to the entire maritime sector worldwide and operates based on membership. MCERT informs, advises and supports in the event of cyberattacks. It also provides members with access to the Cyber Security Reporting Portal (CSRSP). The Cyber Academy component offers various courses on cyber-related topics. [Read more.](#)



WÄRTSILÄ HYBRID CENTRE

The Hybrid centre, located in Trieste, Italy, is the world's first real-scale hybrid centre comprising an engine, batteries, power drives, a propeller load simulator utilising an electric motor, a power take off/ in motor generator, together with the overall energy management system, the 'brain' of the Wärtsilä HY. It is capable of simulating operational data from the field, which will thus enable optimisation of the hybrid system to reach unprecedented levels.

The investment will, by providing owners and operators the chance to experience and familiarise themselves with the Wärtsilä HY, accelerate the introduction of hybrid technologies to the marine market, thereby boosting the environmental sustainability of shipping. Successful testing has already been carried out on Wärtsilä's patented electric start-up procedure, utilising the power from batteries to deliver a smokeless start of the main engine.

In addition to being used to validate hybrid technologies, the centre will also welcome customer groups to learn in very practical terms the technical aspects of the Wärtsilä HY, as well as the value adding benefits it offers.





SMART TECHNOLOGY HUB

Wärtsilä is building the Smart Technology Hub, a new integrated centre of research, product development and production, in Vaskiluoto, Vaasa. The Smart Technology Hub is the latest tangible step in Wärtsilä's vision of smart marine and a smart energy sector. The Hub will implement both visions of Smart Marine Ecosystem and a 100% renewable energy future by linking different marine and energy business lines including lifecycle to maximise customer value proposition.

The Hub will be unique in its field, enabling more agile, more efficient testing and product development of solutions for the maritime and energy industries. The Hub will be one uniform agile testing facility linking together various Centres of Excellence to improve product and

solution development by maximising synergies. In this way we are able to effectively put to use all of the know-how we have in Wärtsilä all over the globe.

As a part of the project, Wärtsilä is investing 83 million euros in modern testing and production technology for the Hub. The total investment in the Smart Technology Hub will be in the region of 230 million euros, consisting of office and factory buildings, logistics and infrastructure. As of 2021, all of Wärtsilä's functions and personnel in central Vaasa will be moved to the new Hub, along with the logistics and maintenance workshop operations from Runsor, Vaasa.

Find out more at smarttechnologyhub.com

WÄRTSILÄ ACCELERATION CENTRE

Industry, knowledge institutes and local partners work together on innovation in the new Acceleration Centre.

The objective is to reinforce and develop Singapore's maritime ecosystem. The opening of the centre is a result of the agreement that Maritime and Port Authority of Singapore (MPA) and Wärtsilä signed in April 2018, in which parties agreed to cooperate on the development of intelligent vessels, intelligent harbour facilities, safety and digital acceleration.

The first project at the Acceleration Centre is the development of the Wärtsilä IntelliTug, a tugboat that can navigate autonomously through the use of the very latest technologies such as an advanced radar system and video analysis. The deployment of the sustainable

IntelliTug should result in more safety and efficiency and reduced workload in the harbour. During the course of 2019, Wärtsilä, together with its development partners MPA and PSA Marine will test the IntelliTug in the busy waters of Singapore.

From the Acceleration Centre, Wärtsilä connects important partners in order to create permanent improvements to Singapore's harbour. In this manner, Wärtsilä's Smart Marine Ecosystem is becoming quite palpable. Lam Pin Min, Singapore's state secretary for Transport and Health is pleased with this development: "Thanks to projects like the Acceleration Centre, new concepts arise that contribute to the efficiency and future of our harbour." [Read more.](#)



BENEFITS FOR PARTNERING WITH WÄRTSILÄ

- Have an overview of the expected technical content of the IMO's new GHG regulations, timeline and implications on your current + new fleet
- Get clear insights on carbon intensity and its link with Energy Efficiency Design Index (EEDI)
- Better understand why and how carbon pricing for ships is becoming increasingly likely
- Discover the role of emissions trading and other market-based measures in reducing shipping's carbon footprint
- Learn the energy-saving technologies, smart energy solutions combining batteries and conventional marine engines that can significantly raise efficiency levels, lower costs and optimize overall vessel efficiency
- Understand the utilization of energy efficiency improvements to realize emission reduction goals
- Propulsion efficiency package: integration and optimization of Energy Saving Technologies – offers our customers a highly attractive efficiency improvement realised by a single party
- Integration: synergies in delivery process (design, project management, commissioning, warranty)
- Machinery room and propulsion sizing: embed efficiency impact Energy Saving Technologies
- Machinery room layout integration: conditions based optimization (shaft generators, hybrids > machinery comparisons)
- Life-cycle support: the operator makes use of Wärtsilä's global service network
- Integration of automation: system integration with ship navigation and automation system. Possibility to validate and optimise with Wärtsilä's digital capabilities

FOLLOW OUR JOURNEY TO DECARBONISING SHIPPING

wartsila.com/marine/decarbonisation



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