

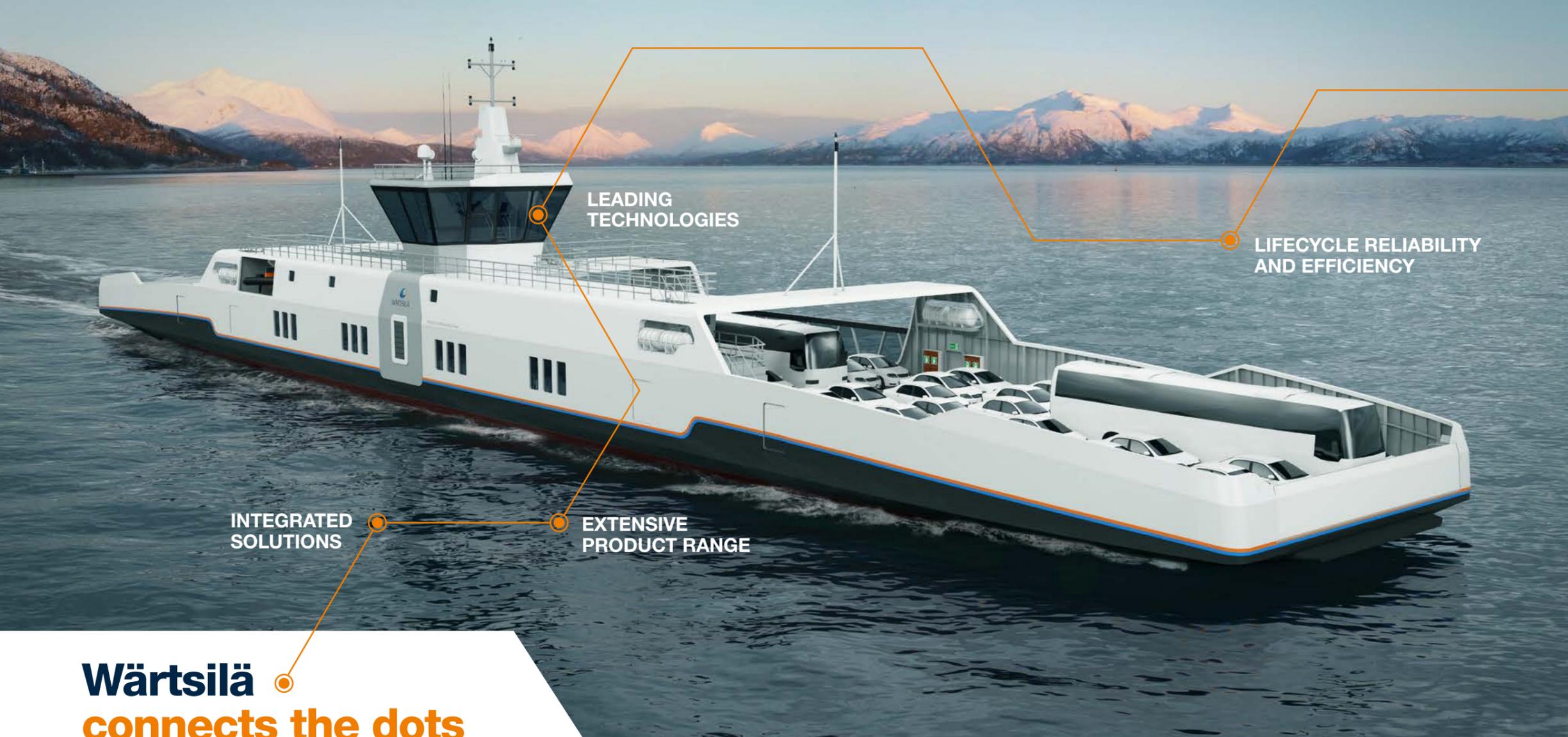
Ferry Solutions by Wärtsilä



LEADING
TECHNOLOGIES

EXTENSIVE
PRODUCT
RANGE

INTEGRATED
SOLUTIONS



● **Real Value**

The benefits of Wärtsilä's single-source supply

Wärtsilä's unique position as a single-source provider of products, systems, and solutions to the ferry industry provides a host of benefits. These include:

- A single point of contact and single responsibility
- Reduced risk of incompatibilities
- Time savings in design and engineering
- Simpler procurement procedures with lower timing and supply risks
- Fewer project participants enables faster decision making and fewer coordination difficulties
- Co-engineering with the yard's design department
- On-site support during installation and commissioning

Wärtsilä connects the dots

At Wärtsilä we understand the marine industry. We know the current regulations and anticipate those to come, we listen to our customers and appreciate their needs, we develop leading technologies that move the industry forward, and we integrate our extensive range of products, systems and solutions to provide lifecycle reliability and efficiency. By connecting all these individual dots, we provide real value for our customers.

Wärtsilä has become an established leader – not by chance, but by connecting the dots that bring greater value to our customers' businesses around the world.

Solutions that meet the challenges faced by ferry operators

No sector of the marine industry is more affected by the current and anticipated environmental regulations than the ferry industry. Similarly, the need to curb operating costs and maximise efficiencies is most

keenly felt by ferry operators in today's competitive environment.

Wärtsilä understands these concerns and is committed to helping its customers meet the challenges that threaten profitability. By continuously developing the needed technologies, and by providing solutions that enhance operational efficiency, reliability and environmental compliance, we strive to be a reliable and innovative partner to our customers throughout the lifecycle of their ships.

Reducing operating costs. Both the capex and opex of a ferry will benefit from a perfectly matching portfolio of all machinery, automation and services during the vessel's construction and its many years of operation. Wärtsilä's value propositions in both fields are unrivalled in the industry.

Propulsion machinery. Wärtsilä's comprehensive portfolio of world-class main and auxiliary engines, gears, propellers and thrusters has efficiency as the central feature. Through integrating these individual products into a single, fully optimised propulsion system, we can reduce operating costs significantly.

Power electric systems. Wärtsilä's well proven and reliable diesel-electric propulsion systems with converter technology increase efficiency for lower operational costs. The advantages also include low noise and vibration free

operation, notably improved efficiency in partial propulsion power mode, plus high reliability, availability and redundancy, with fewer emissions and less wear and tear.

Lowering maintenance costs. Unplanned downtime and maintenance based on pre-set schedules rather than actual need create high and often unnecessary costs. Wärtsilä helps to lower maintenance costs through its broad scope of monitoring, analytic, and condition-based service systems. By knowing the actual condition of the machinery, and through accurately predicting where and when overhauls will be required, the timing of maintenance can be optimised to keep downtime to an absolute minimum.

Systems integration. Under the motto "from bridge to propeller" we provide full integration of all the various

electrical and automation systems, typically in close partnership with the shipyard. The level of integration varies from a package delivery of products, including product related engineering, to complete systems integration to provide a turnkey solution.

Leading design & engineering. Optimising propulsion systems for maximum efficiency through sophisticated design and engineering capabilities is a Wärtsilä speciality. Our propeller designs are based on the latest CFD technology to ensure the lowest possible fuel consumption, while minimising noise and vibration.

Global support. Wärtsilä has the marine industry's most complete and extensive global network of workshops and service facilities. No matter where you are or when you need help, Wärtsilä is there 24/7.

Economy & environment

Fuel economy and environmental compliance go together and are at the top of the agenda for most ferry operators today. In all its development work, Wärtsilä emphasises these essentials. We ensure our customers are compliant everywhere they need to be.



know-how to design the most advanced SCR solutions. All Wärtsilä systems meet the IMO Tier III requirements for NO_x abatement.

Waste water treatment. Wärtsilä's sewage treatment plants offer a cost-effective and safe means to avoid discharging waste water to the sea, thereby helping to preserve the quality of the world's oceans. Our sewage treatment plants are certified to meet IMO MEPC 227(64) guidelines, and are optimised for the treatment of black and grey wastewater flows.

Ballast water management systems. The Wärtsilä Aquarius® Ballast Water Management System range comprises two product series specifically developed to enable our customers to meet their global ballast water discharge regulatory obligations.

Both technical solutions, one based on filter UV and the other on filter side stream electro-chlorination (EC), have achieved IMO type approval status and

both have been AMS accepted by the USCG.

High voltage shore connection systems. Wärtsilä also now offers a series of modular high voltage shore connection systems (HVSC) to provide in-harbour electrical power without the use of auxiliary engines.

Expert consultancy. No single means of achieving compliance with emission regulations suits everyone. This is why Wärtsilä not only works hard to provide a range of state-of-the-art technologies, but supports this with expert consultancy to ensure each operator has the solution that best meets his needs.

Seals & bearings. Even our broad assortment of advanced seal and bearing solutions promotes environmental sustainability. For example, our water lubrication and double barrier oil sealing systems adhere to the US EPA's 2013 VGP (Vessel General Permit).

Because ferries operate close to shore and with frequent port calls, they are directly affected by environmental legislation. Wärtsilä's environmental offering to the ferry industry is, therefore, extensive. Our priority is discharge reduction, and we can ensure the safe discharge of everything; from exhaust gases to oil, waste and ballast water.

Reducing emissions to air. Wärtsilä offers a range for achieving SO_x and NO_x emission reductions. These include multi-fuel engines capable of operating on marine diesel, LNG, bio-fuels and even methanol. Wärtsilä has pioneered multi-fuel marine engine technology and is a leader in this field.

In addition we have a range of exhaust gas cleaning technologies available.

Scrubbers. Wärtsilä's exhaust gas cleaning technology is an economical and environmentally friendly solution for tackling all existing and future SO_x emission regulations. It provides a flexible and reliable means for cleaning the exhaust and ensuring global compliance.

SCR technology. The Wärtsilä NO_x Reducer utilizes the company's validated and reliable Selective Catalytic Reduction (SCR) technology for 4-stroke engines. Having delivered more than 1200 catalyst systems over the past 20 years, Wärtsilä has the experience and



Zero emission ferries

Wärtsilä has recently launched a complete concept for a series of innovative and cost effective shuttle ferries, featuring zero or very low levels of emissions.

The design characteristic focuses on high energy efficiency with low resistance, both above and below the water line. The ferries are designed to run entirely on batteries, or in a battery-engine hybrid configuration where the fuel options are LNG or biofuel. In plug-in operation, the fuel consumption is reduced by 100% compared to conventional installations, and all local emissions are completely eliminated. With

the plug-in hybrid configuration, emissions are reduced by 50%.

The concept features Wärtsilä's new wireless inductive charging system, which for typical shuttle ferry operations involving 20,000 or more departures a year, represents a notable benefit in terms of time and energy savings. The system eliminates physical cable connections, thus reducing wear and tear and enabling charging to begin immediately on arrival at the quay.

In addition to this design concept for newbuilds, Wärtsilä can also provide battery and hybrid solutions for retrofitting existing ferries in order to meet new regulations.



Leading the way into the gas age



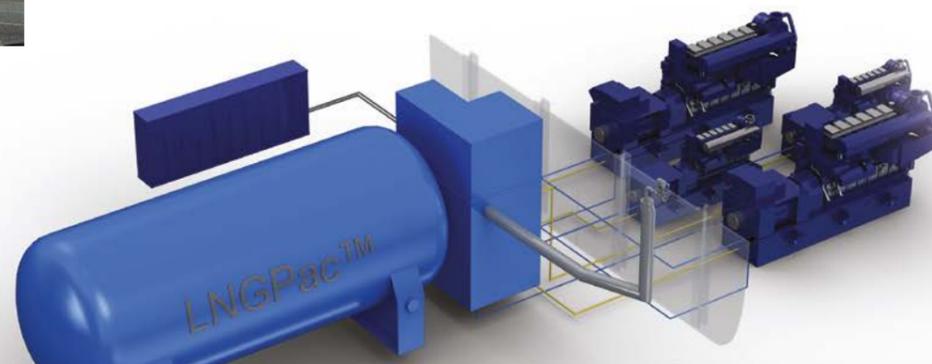
Wärtsilä has led the way in developing and fine tuning technologies that make LNG a viable, safe, and cost effective marine fuel. Our first dual-fuel engines capable of operating on either gas or conventional diesel fuels were introduced already in the 1990s, and our first conversion project changing an existing large vessel from diesel to LNG fuel, successfully took place in 2011.

However, the widespread acceptance of the use of LNG fuel for ships has come about because the technology development didn't end with the dual fuel engine. To be truly viable, efficient onboard storage and supply systems are essential and here again Wärtsilä has taken a leading role. The company's patented LNGPac system, a complete system for LNG fuel handling, including the bunkering

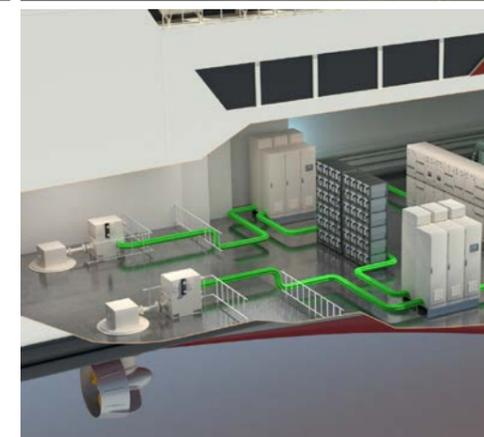
station, the storage tank and all essential control and monitoring systems, was introduced in 2010. This unique innovation has proven to be a valuable enabler for the switch to gas in marine applications.

Global shipping, including the ferry industry, is entering the gas age. The benefits are both economic and environmental. With LNG as fuel, SO_x emissions are eliminated entirely, NO_x emissions are 85% lower than with diesel, and CO₂ emissions are reduced by 30%. In fact, LNG has the lowest emissions factor, i.e. fewer emissions of CO₂ for the same weight of fuel.

Wärtsilä is involved at all stages of the gas value chain, and we can advise and help our customers to decide whether or not LNG should be part of their fleet's future.



The latest in Electrical & Automation systems



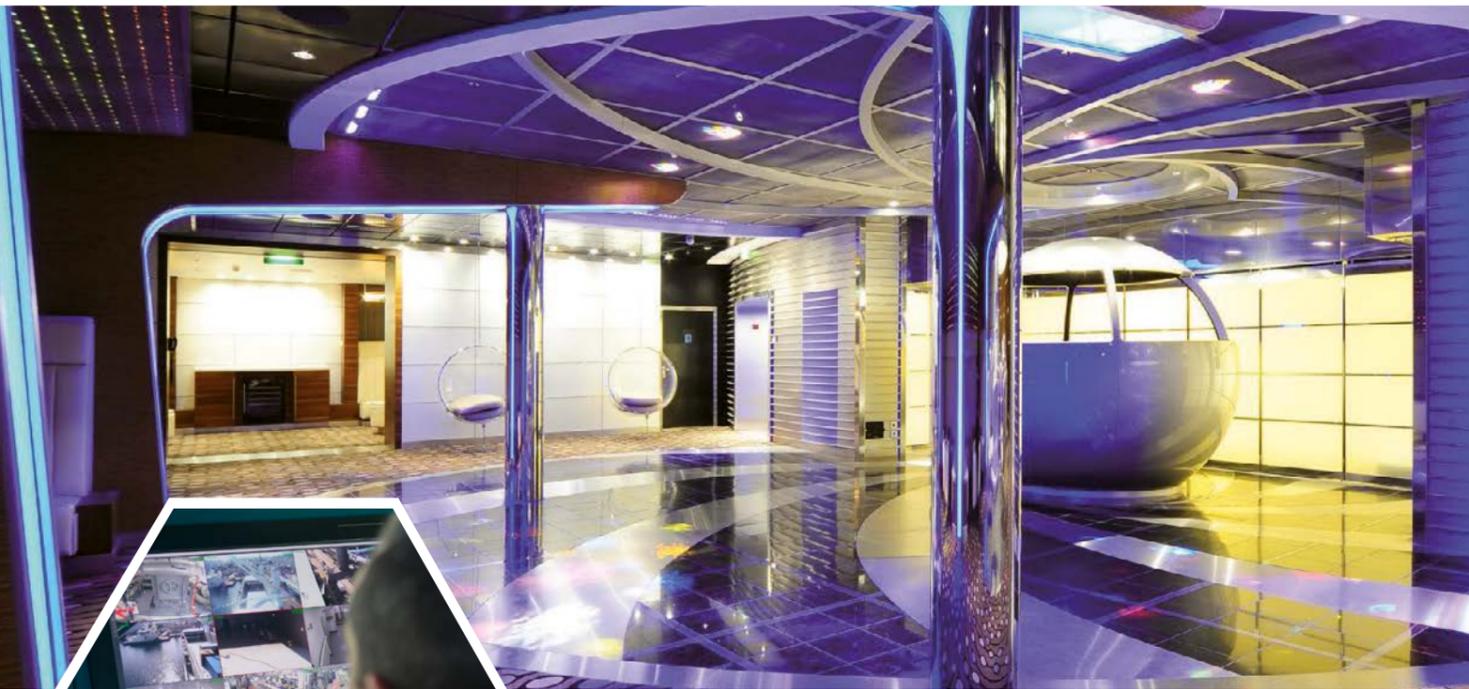
Wärtsilä's E&A systems offering is today unmatched in the ferry industry. The company's comprehensive scope is supported by deep in-house know-how and years of experience.

Integrated Control Systems. The Wärtsilä NACOS Platinum system uniquely combines the control systems for navigation, automation, dynamic positioning, as well as power and propulsion into a single integrated system. This allows the vessel to be navigated, controlled, and monitored from various onboard locations. The truly multi-functional operator stations enable unequalled flexibility and convenience.

Hybrid Energy Storage Systems. By combining different power sources with energy storage devices, significant efficiency improvements can be

achieved, for example through running the engines at optimal load and absorbing many of the load fluctuations using batteries. With the latest in inductive charging technology, Wärtsilä offers total plug-in solutions.

Power Distribution. Wärtsilä offers low and medium voltage systems and UPS systems for uninterrupted, reliable power distribution, as well as shore connection systems adapted to customer needs. The Wärtsilä GPM500 integrated system has been developed to protect and control power supply systems. A power management function is also available. The protection system can be operated independently or in combination with other systems via data bus. Interfaces to automation and other control systems can be provided.



Safety & Security. Wärtsilä has the expertise and experience to design and integrate comprehensive safety and security systems that meet increasingly stringent regulations. Wärtsilä also offers telephone and paging systems, general and fire alarm systems, as well as onboard safety monitoring.

Entertainment & Network Systems. Complete entertainment systems using the latest technology are also offered by Wärtsilä. The product scope includes both ship-wide systems, such as SAT TV reception and head end distribution, digital signage and network, as well as local systems for crew and passengers, such as audio and video systems.



Wireless Charging System

Wärtsilä and Cavotec have jointly developed the world's first induction charging and automatic mooring concept. Wireless charging eliminates the cable connection between the vessel and shore, thereby securing and facilitating safe connections and disconnections. Damage to electrical outlets caused by seawater, snow and ice is also avoided. The new integrated system will be capable of transferring more than 1 MW of electrical energy, which is some 300 times more than that of current chargers used by electric cars.

By making wireless charging of ship batteries possible, the electrification of coastal shipping is enhanced, resulting in major reductions in harmful exhaust emissions.



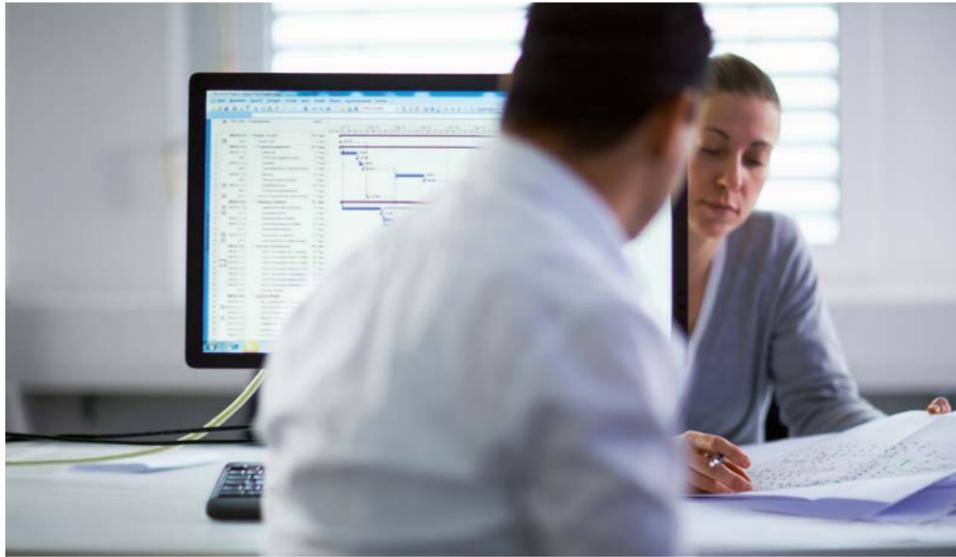
Wärtsilä works harder to serve the ferry industry better

We work hard to understand the needs of our ferry sector customers. We appreciate that the safe transport of passengers and rolling cargo is the priority; we know that reliable service is essential, whether it's peak or low season and irrespective of the weather or sea conditions; we understand the importance of comfort to both day and night passengers; and we realise that excellent manoeuvrability is vital in ensuring short turnaround times.

Our efforts in product development are all geared towards these needs for safety, reliability, comfort, and propulsion efficiency. The solutions that we provide range from ship design to engines and all power and propulsion equipment, to electrical & automation systems, to navigational controls, to environmental solutions, and new gas-age fuel systems.

We provide lifecycle support, all the way from initial design to daily operations, and our focus is constantly on fuel and operational efficiencies that lower operating costs.

All of this is backed by more than 180 years of experience. This is how we serve you better.



Recent references

Viking Grace – the world's largest Ro-Pax ferry operating on LNG fuel

A new era in ferry operations was established in 2013 with the launch of the world's largest Ro-Pax ferry operating on LNG fuel. This vessel features four Wärtsilä 50DF dual-fuel engines and a complete Wärtsilä LNGPac system that includes the storage tanks, the fuel supply system, and all equipment needed for bunkering and related safety and automation systems. Wärtsilä also supplied the bow and stern thrusters, the fixed pitch main propellers and shaft lines with seal systems. The Viking Grace is also equipped with Wärtsilä's NACOS Platinum Automation and Navigation system.



The world's fastest LNG fuelled Ro-Pax ferries

Two sister ferries being built for Rederi AB Gotland, Sweden, will be powered by Wärtsilä 50DF dual-fuel engines running on LNG. When launched they will be the world's fastest LNG powered Ro-Pax ferries. Wärtsilä is also supplying the gearboxes, controlled pitch propellers with remote control, Wärtsilä Energo-pac rudders, tunnel thrusters, Wärtsilä 20DF dual-fuel auxiliary engines, the LNGPac fuel gas handling systems, gas valve units, a compact silencer system, a Wärtsilä ballast water management system, an oily water separator with a bilge water guard, as well as project management services. They will both be equipped with Wärtsilä's NACOS Platinum Automation and Navigation system.



Spirit of British Columbia & Spirit of Vancouver converted to operate on LNG

The flagship vessels of British Columbia Ferry Services, Canada, are to be converted to operate on LNG fuel. Wärtsilä is contracted to provide a comprehensive scope of engines, propulsion machinery, integrated automation systems, and gas handling systems required for this mid-life upgrade. Wärtsilä's unique capabilities as a systems integrator, together with its unmatched portfolio of products, systems and solutions, was the essential element in bringing the project planning to fruition.





Wärtsilä is a global leader in complete lifecycle power solutions for the marine and energy markets. By emphasising technological innovation and total efficiency, Wärtsilä maximises the environmental and economic performance of the vessels and power plants of its customers.

www.wartsila.com