Research and development

Wärtsilä is strongly committed to research and development. The aim of its R&D activities is to continuously strengthen the company’s technology leadership position, and to further improve its competitive edge in the global marine and energy markets. This is achieved by developing products that are based on reliable, efficient, and cost-competitive technologies, and which address customer needs.

The focus of Wärtsilä’s R&D activities is on products and solutions that are flexible, efficient, reliable, safe, cost-efficient to operate, and that have a minimal environmental footprint throughout their lifecycles. A substantial proportion of the company’s investments in product development is targeted at securing environmental compliancy and providing short- and long-term benefits for the company’s customers.

By focusing on the initial stages of the development process and by utilising modularity, simulation, virtual testing, and validation, Wärtsilä is able to reduce the lead time for new solutions without compromising quality, reliability and safety aspects.

Validation testing on site with existing installations, in cooperation with the customers, is an important element in furthering the improved performance of existing solutions. It also assists in finding new and better solutions while, at the same time, gaining long-term experience under real field conditions. A field installation also provides an opportunity to gain valuable learning and insight regarding new technologies and solutions.

When the product has successfully passed all the validation process steps, both in the laboratory and in the field, and its performance meets Wärtsilä’s high standards, it can be delivered to the market.

Wärtsilä protects innovation and competitiveness through close attention to Intellectual Asset Management and the continuous development of internal key competences. Networks and clusters are formed to further extend the company’s know-how, skills, and capabilities by committing to long-term relationships with suppliers, engineering companies, university partners, and with licensees and other Original Equipment Manufacturers.
RESEARCH AND DEVELOPMENT EXPENDITURE

![Graph showing R&D expenditure from 2011 to 2015.](image)

R&D EXPENDITURE
PERCENT OF NET SALES

* Restated, figures include continuing operations.

MINIMISING ENVIRONMENTAL FOOTPRINT THROUGH R&D

**IMPROVEMENTS IN EFFICIENCY**

- **TOTAL SHIP EFFICIENCY**: An efficient and low emission system for the entire vessel is achieved by combining optimised ship design with Wärtsilä’s knowledge of automation, machinery, propulsion, and control systems. Wärtsilä has developed numerous efficiency concepts, such as Low Loss Concept (LLC) and Low Loss Hybrid (LLH).

- **ENGINE EFFICIENCY IMPROVEMENTS**: A long-term focus on improving engine efficiency has resulted in Wärtsilä engines having the highest efficiency ratings among existing prime movers. A key success factor has been the development of integrated engine functionalities that enable low emissions and high engine efficiency. The new Wärtsilä 31 has the best 4-stroke engine fuel economy in the world.

- **PROPELLER EFFICIENCY UPGRADES**: Propulsion products incorporate environmental features and are critical for the overall environmental impact of the vessel. The new generation propulsion units from Wärtsilä result in significant fuel efficiency improvements (5-12%) that also result in fewer emissions.

**REDUCING EMISSIONS TO AIR**

- **GREENHOUSE GASES (GHG)**: Wärtsilä focuses on the development of technologies that reduce GHG emissions and improve engine efficiency.

- **SO₂ EMISSIONS**: Wärtsilä’s technology development supports solutions that enable the use of fuels with different sulphur contents, as well as systems that clean sulphur from the exhaust gas, and enable alternative fuels, e.g., to natural gas.

- **NOₓ EMISSIONS**: All Wärtsilä engine portfolio products are IMO NOₓ Tier II compliant.

**REDUCING EMISSIONS TO WATER**

- **BALLAST WATER MANAGEMENT SYSTEMS**: Wärtsilä provides Ballast Water Management systems. Its Aquarius® range of Ballast Water Management Systems has been developed to comply with the Ballast Water performance requirements from both the IMO and the USCG.

  - Selective Catalytic Reduction (SCR)
  - Gas engine (dual fuel in gas mode)
The HERCULES programme and CLIC innovation, sustainable innovation through partnerships

The long-term HERCULES R&D programme was conceived in 2002, and has been set up within the context of the EU’s sixth and seventh Framework programmes. Sharing a joint vision, the major low- and medium-speed engine manufacturers, Wärtsilä, Winterthur Gas&Diesel, and MAN Diesel & Turbo, are collaborating with universities, research institutions, and other industrial partners to develop new technologies for marine engines and related systems. The fourth phase kicked off in 2015 in the form of the HERCULES-2 project that aims at creating fuel flexible large marine engines that are optimally adaptive to their operating environment.

The project HERCULES-2 comprises four R&D Work Package Groups:

- I: Fuel flexible engine
- II: New Materials (Applications in engines)
- III: Adaptive Powerplant for Lifetime Performance
- IV: Near-Zero Emissions Engine

The HERCULES-2 consortium comprises 32 partners of which 30% are Industrial and 70% are Universities/Research Institutes. HERCULES-2 is planned to run for three years, from 2015 to 2018, with a total budget of EUR 25 million. The project was made possible by a EUR 20 million funding through the European Commission Horizon 2020 Innovation Programme and a contribution from the Swiss government.

2015 saw the merger of CLEEN Oy and Finnish Bioeconomy Cluster FIBIC Oy into one new company, CLIC Innovation Oy. CLIC is an innovation company that is directly involved in the bioeconomy and cleantech investments of the Government Programme with a determined objective of global impact. CLIC will identify and bring together value chains and offer a wide range of novel services for the entire field of research, development, and innovation. Wärtsilä participates in the Future Flexible Energy Systems (FLEXe) research programme, which was started on 1 May 2015. FLEXe is a consortium in Finland gathering 27 organisations covering the entire value network of energy systems. The aim is to create novel technological and business concepts enhancing the radical transition from the current energy systems towards sustainable systems. FLEXe combines smartness, flexibility, environmental performance, and economic success with customer acceptance and engagement.