CEO review

2015 was in many ways a successful year for Wärtsilä. Net sales and profitability grew steadily from the previous year as a result of the Company’s well-positioned offering, its growing Services business, and the focus on continuous improvement. Given the developments in our market environment, we can be pleased with our performance.

Conditions in the power generation markets were challenging. The decline in our Energy Solutions order intake reflected hesitancy on the part of our customers to commit to investment decisions in the wake of continued macro-economic uncertainty. Nevertheless, industrialisation and changing demographics continue to drive growth in electricity consumption in the emerging markets, and the increasing share of renewables within the energy mix raises the need for dynamic balancing power. The flexibility and efficiency of our power plant offering positions us well to benefit from the trend towards decentralised, sustainable power production.

In the marine markets, contracting activity remained under pressure. Low oil prices reduced exploration and development activities, which resulted in a sharp decline in demand for offshore vessels. At the same time, the shipping industry continues to suffer from overcapacity and low freight rates. While our broad market exposure and extensive offering has enabled us to navigate the current shipbuilding cycle relatively well, we need the flexibility to adapt to changes in market dynamics. Therefore, during the summer, we announced measures to realign our Marine Solutions organisation. The decision to adjust capacity is never made lightly, but it became necessary in order to maintain our competitive position in the global market.

Services’ net sales reached an all-time high level of EUR 2,184 million.

The Services business was a key contributor to our improved financial performance. We have worked actively to develop a more targeted sales approach, and to enhance our value proposition, in order to achieve our growth ambition for this business area. The 13% growth in Services’ net sales clearly demonstrates that our efforts have paid off.

Environmental awareness and changing energy needs are increasingly influencing investments in the markets in which we operate. During the summer, we revised our strategy and mission to reflect these changing industry dynamics. Our aim is to shape the marine and energy markets with advanced technologies and focus on lifecycle performance to enhance our customers’ businesses and benefit the environment. We seek growth by offering innovative and energy efficient lifecycle solutions, as well as by leveraging our leading position in gas based technology. Digitalisation will support our growth ambition, as we utilise the increasing amount of data available to optimise our customers’ operations and equipment, as well as our own internal processes and performance.

During 2015, our digital presence was expanded by the launch of a new digital service portfolio as well as by the acquisition of L-3 Marine Systems International.

The emphasis we place on sustainable innovations becomes increasingly important as the regulatory environment intensifies. The agreement reached during the Paris Climate Conference last fall was a clear milestone in the universal effort to limit global warming. In the marine industry, the ratification of the Ballast Water Convention is close at hand, and the sulphur directive has been implemented in environmentally controlled areas as of the beginning of 2015. Our R&D activities, which represent 2.6% of net sales, are focused on developing clean technologies to support our customers in improving the environmental performance and efficiency of their installations.
Attracting and retaining skilled and committed people is central to our success.

Our aim is to foster an inclusive corporate culture, emphasising diversity and high ethical standards. In this context, we are committed to supporting the UN Global Compact and its principles with respect to human rights, labour, the environment, and anti-corruption. Ensuring the safety of our personnel is our priority and I am pleased that we have continued to move steadily closer to our on-going target of zero lost-time injuries.

We expect the market environment to remain more or less unchanged in 2016. Nevertheless, we anticipate modest growth in sales and profitability based on our solid order book and pipeline.

I would like to take this opportunity to thank our shareholders for your confidence in our future development, our customers for your trust in our products and services, and last but not least, the entire staff of Wärtsilä for your commitment towards reaching our common goals.

Jaakko Eskola
President & CEO

Key figures

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Net sales</td>
<td>5 029</td>
<td>1 590</td>
<td>1 222</td>
<td>1 230</td>
<td>988</td>
<td>4 779</td>
<td>4 607</td>
</tr>
<tr>
<td>Energy Solutions</td>
<td>1 126</td>
<td>374</td>
<td>243</td>
<td>327</td>
<td>182</td>
<td>1 138</td>
<td>1 459</td>
</tr>
<tr>
<td>Marine Solutions</td>
<td>1 720</td>
<td>598</td>
<td>448</td>
<td>354</td>
<td>321</td>
<td>1 702</td>
<td>1 309</td>
</tr>
<tr>
<td>Services</td>
<td>2 184</td>
<td>619</td>
<td>531</td>
<td>548</td>
<td>485</td>
<td>1 939</td>
<td>1 842</td>
</tr>
<tr>
<td>Depreciation, amortisation and impairment</td>
<td>-124</td>
<td>-33</td>
<td>-32</td>
<td>-30</td>
<td>-29</td>
<td>-115</td>
<td>-120</td>
</tr>
<tr>
<td>Operating result¹</td>
<td>612</td>
<td>215</td>
<td>160</td>
<td>137</td>
<td>100</td>
<td>569</td>
<td>557</td>
</tr>
<tr>
<td>Operating result¹, %</td>
<td>12.2</td>
<td>13.5</td>
<td>13.1</td>
<td>11.1</td>
<td>10.1</td>
<td>11.9</td>
<td>12.1</td>
</tr>
<tr>
<td>Profit before taxes</td>
<td>553</td>
<td>199</td>
<td>132</td>
<td>140</td>
<td>82</td>
<td>494</td>
<td>544</td>
</tr>
<tr>
<td>Earnings per share, EUR</td>
<td>2.25</td>
<td>0.79</td>
<td>0.49</td>
<td>0.54</td>
<td>0.43</td>
<td>1.76</td>
<td>1.98</td>
</tr>
<tr>
<td>Order intake</td>
<td>4 932</td>
<td>1 403</td>
<td>1 086</td>
<td>1 159</td>
<td>1 285</td>
<td>5 084</td>
<td>4 821</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance sheet total</td>
<td>5 589</td>
<td>5 589</td>
<td>5 609</td>
<td>5 622</td>
<td>5 271</td>
<td>5 280</td>
<td>5 209</td>
</tr>
<tr>
<td>Interest-bearing liabilities, gross</td>
<td>724</td>
<td>724</td>
<td>778</td>
<td>779</td>
<td>648</td>
<td>666</td>
<td>665</td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>334</td>
<td>334</td>
<td>250</td>
<td>269</td>
<td>382</td>
<td>571</td>
<td>388</td>
</tr>
<tr>
<td>ROI, continuing operations, %</td>
<td>21.0</td>
<td>21.0</td>
<td>20.3</td>
<td>20.8</td>
<td>22.0</td>
<td>20.3</td>
<td>22.6</td>
</tr>
<tr>
<td>Gearing</td>
<td>0.17</td>
<td>0.17</td>
<td>0.26</td>
<td>0.25</td>
<td>0.14</td>
<td>0.05</td>
<td>0.15</td>
</tr>
<tr>
<td>Order book, end of period</td>
<td>4 882</td>
<td>4 882</td>
<td>5 112</td>
<td>5 325</td>
<td>4 931</td>
<td>4 530</td>
<td>4 311</td>
</tr>
<tr>
<td>Year-end market capitalisation</td>
<td>8 314</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7 315</td>
<td>7 055</td>
</tr>
<tr>
<td>Personnel, number at end of period</td>
<td>18 856</td>
<td>18 856</td>
<td>19 237</td>
<td>19 427</td>
<td>17 707</td>
<td>17 717</td>
<td>18 315</td>
</tr>
</tbody>
</table>

¹ Figures exclude non-recurring items.
* Figures related to the statement of income have been restated due to the two-stroke business being classified as discontinued operations.
Wärtsilä in brief

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

In 2015, Wärtsilä’s net sales totalled EUR 5 billion with approximately 18,800 employees. The company has operations in over 200 locations in more than 70 countries around the world. Wärtsilä is listed on Nasdaq Helsinki.

Energy Solutions

Wärtsilä Energy Solutions is a leading global supplier of flexible power plants of up to 600 MW, capable of operating on most gas and liquid fuels. The company’s portfolio includes power plant solutions for base load, load-following, peaking, and fast reserve applications. As of 2015, Wärtsilä has installed 58 GW of power plant capacity in 175 countries around the world. The portfolio of LNG solutions consists of small and medium scale terminals and distribution systems.

Marine Solutions

Wärtsilä Marine Solutions enhances the business of its marine and oil & gas industry customers by providing innovative products and integrated solutions that are safe, environmentally sustainable, efficient, flexible, and economically sound. Being a technology leader, and through the experience, know-how and dedication of our personnel, we are able to customise solutions that provide optimal benefits to our customers around the world.

Services

Wärtsilä Services supports its customers throughout the lifecycle of their installations by optimising efficiency and performance. The company’s service network of approximately 11,000 professionals in 160 locations is unmatched in the industry, delivering services to more than 12,000 customers every year. The portfolio of services – from spare parts to complete operational, maintenance, and optimisation services – is constantly being developed, not only to improve the availability of customers’ installations, but to support them in growing their businesses. Wärtsilä is committed to providing high quality, expert support and the availability of services in the most environmentally sound way possible, whenever, wherever.

Corporate strategy

Wärtsilä aims at profitable growth by providing advanced technologies and lifecycle solutions to its marine and energy market customers.

Increasing environmental awareness and changing energy needs are affecting the way that our customers operate. With our integrated products and services, we are well positioned today to respond to the need for energy efficient and flexible solutions. We will meet the increasing demand for gas based technologies with our industry leading multiple fuel products and LNG solutions. We will leverage our project management and engineering competences to achieve growth by offering our customers new and innovative solutions. Our growth ambitions are supported by our superior global service network.
With our production and supply chain management, we constantly seek ways to provide high quality and maintain cost efficiency – often in co-operation with leading industrial partners in our key growth markets. Our market driven investments in R&D and our focus on digitalisation create a strong foundation for securing and strengthening our position at the forefront of technological innovation. This innovative culture, together with our constant emphasis on safety, diversity, and high ethical standards, attract skilled and committed people and lead to a high performing organisation. Our entrepreneurial drive, customer focus, and passion for doing right not only create new opportunities and environmentally sustainable solutions, but also bring value to all our stakeholders.

**Sustainability**

Wärtsilä’s aim is to meet shareholder expectations and contribute toward the well-being of society. This requires efficient, profitable, and competitive company operations. Good economic performance establishes a platform for the other aspects of sustainability – environmental and social responsibility.

Wärtsilä’s overriding promise is to supply power solutions that offer high efficiency with low environmental load. Our objective is to continuously improve the environmental performance of our products and services, as well as to maintain technological leadership by utilising new technologies and collaborating with our customers and other stakeholder groups. In doing this, we help our customers and society at large to meet the goals of the tightening global environmental regulations and guidelines.

Wärtsilä acts as a good corporate citizen wherever we are active. Our business operations and relations with our stakeholders are governed by our Code of Conduct. Wärtsilä is a responsible employer, and we seek to offer our employees an interesting and exciting workplace where openness, respect, trust, equal opportunities and, scope for personal development prevail. A further aim is to offer a hazard-free working environment to our employees and contractors, and to minimise the health and safety risks associated with the use of our products and services. Supply chain management and development are integral elements of our operations.

**VISION, MISSION AND VALUES**

**VISION**
We will be our customers’ most valued business partner.

**MISSION**
We shape the marine and energy markets with advanced technologies and focus on lifecycle performance, to enhance our customers' business and benefit the environment.

**Energy Excellence Excitement**

**Customer Centricity**

**Entrepreneurial drive**

**Passion for doing right**
Financial targets

Net sales

TARGET
Our target is to grow faster than global GDP.

DEVELOPMENT
In 2015, Wärtsilä’s net sales increased by 5% to EUR 5,029 million. Wärtsilä’s CAGR 2005-2015 was 7.2%.

GROWTH OVER THE CYCLE


* Restated, figures include continuing operations.
Our operating profit margin (EBIT%) target is 14% at the peak of the cycle. At the trough of the cycle, our target is to keep the operating profit margin above 10%.

In 2015, our operating profit was EUR 612 million, 12.2% of net sales.

Figures are shown before non-recurring items.

* Restated, figures include continuing operations.
Capital structure

TARGET
Our target is to maintain gearing below 0.50.

DEVELOPMENT
In 2015, our gearing was 0.17.

GEARING

* Restated due to the revised IAS 19.
Dividend

TARGET
Our target is to pay a dividend of at least 50% of earnings over the cycle.

DEVELOPMENT
The Board of Directors proposes that a dividend of 1.20 euro per share be paid for the financial year 2015, which represents 53% of operational earnings.

EARNINGS-SHARE, DIVIDEND-SHARE

1 Proposal by the Board 2015.
# Sustainability targets

## Wärtsilä’s targets for reducing GHG and other emissions

<table>
<thead>
<tr>
<th>TARGET</th>
<th>SCHEDULE</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>To reduce energy consumption by at least 10% in terms of absolute consumption (GWh) by 2016 compared to mean energy consumption in 2005.</td>
<td>2016</td>
<td>By the end of 2015, energy savings of 42 GWh were achieved, representing 89% of the final target.</td>
</tr>
<tr>
<td>To create medium-sized LNG storage solutions to replace the liquid fuel infrastructure.</td>
<td>2015</td>
<td>The Manga project in Tornio, Finland is under execution. In 2015, Wärtsilä further expanded its portfolio of small scale LNG infrastructure solutions with a new floating LNG storage and regasification barge designed for shallow waters. As this complete barge can be built in a shipyard, it is ideal for remote or environmentally restricted sites where construction of an onshore terminal would be difficult.</td>
</tr>
<tr>
<td>To enable emission reductions through gas conversion projects.</td>
<td>2015</td>
<td>During 2015, Wärtsilä received gas conversion orders for two power plant installations in Indonesia and Mexico with a total capacity of 146 MW. In total, Wärtsilä has converted more than 900 MW of generating capacity to gas and has more than 300 MW under delivery.</td>
</tr>
<tr>
<td>To increase total net electrical efficiency in simple and combined cycle power plants in cyclic operations.</td>
<td>2015</td>
<td>In 2015, standby conditions have been further developed and tested. As a result, engine pre-heating temperatures have decreased and energy use during stand-by status has been reduced. Currently, two Dry FlexiCycle power plants, with high electrical efficiency and minimal water consumption, are under installation.</td>
</tr>
<tr>
<td>To influence developing dynamic power markets in order to enable wide scale renewable integration.</td>
<td>2015</td>
<td>In 2015, Wärtsilä has provided electricity market design recommendations based on studies for decision makers in Germany and the EU. Wärtsilä has also responded to the consultation on energy market design launched by the European Commission, and has conducted an active dialogue with various stakeholders concerning dynamic power markets.</td>
</tr>
<tr>
<td>To enable the reduction of power losses in electrical propulsion by 3-5% using a medium voltage system.</td>
<td>2015</td>
<td>MV development has been slowed due to unfavourable market conditions.</td>
</tr>
<tr>
<td>Objectives</td>
<td>Year</td>
<td>Details</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>To develop performance management solutions for different vessel types, thereby enabling better efficiency.</td>
<td>2012</td>
<td>The development of performance management solutions has been merged into the Wärtsilä Genius services concept described below.</td>
</tr>
<tr>
<td>To develop 10 new Wärtsilä Optimiser solutions enabling the lifecycle performance of customer installations to be optimised.</td>
<td>2015</td>
<td>The original target project was closed in 2015. As part of Wärtsilä Services’ digitalisation development, a new product family, Wärtsilä Genius services, was launched at the end of 2015. These services include Wärtsilä Optimise, Wärtsilä Predict, and Wärtsilä Solve services. Depending on the primary needs of the customer, different solutions ranging from condition monitoring, hull cleanliness predictions, to different advisory services and remote support, such as virtual engineering, will be offered. Wärtsilä Genius services will be an essential part of Wärtsilä Service’s digital offering and development of these services will continue during the coming years.</td>
</tr>
<tr>
<td>To reduce GHG emissions by 3% by improving engine efficiency.</td>
<td>2015</td>
<td>The Wärtsilä 31 engine featuring record breaking efficiency was released to the market in 2015. The target has been achieved.</td>
</tr>
<tr>
<td>To expand the gas portfolio.</td>
<td>2015</td>
<td>The Wärtsilä LNGPac was selected for 21 installations in 2015, and the first orders for the ECA Fuel Pump for LNG were received. In addition, the first 2-stroke Wärtsilä low pressure fuel gas handling system was sold. New LNGPac features were included in many project specifications and are becoming the new standard. In other areas of gas value chain Wärtsilä signed the orders for three more regasification modules for large scale FSRU vessels in 2015 as well as cargo handling systems for 18 LPG-/multi-gas carriers.</td>
</tr>
<tr>
<td>To stimulate growth for LNG-fuelled OSV’s (offshore support vessels).</td>
<td>2015</td>
<td>Harvey Gulf’s two LNG-powered PSV’s, to which Wärtsilä has supplied integrated solutions, were delivered during 2015. These are the first LNG powered vessels for the offshore market segment in the USA.</td>
</tr>
<tr>
<td>To expand the field of LNG applications beyond present vessel types and to facilitate LNG re-engining.</td>
<td>2015</td>
<td>Wärtsilä received orders to supply LNG powered vessel orders beyond types previously supplied:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Inland Waterway Transport (IWW) vessels for the river Rhine</td>
</tr>
</tbody>
</table>
• First dual-fuel cable layer and repair vessel
• First dual-fuel Trailing Suction Hopper Dredger (TSHD)
• First dual-fuel application for a Floating Storage & Regasification Unit (FSRU)
• Dual-fuel ferries and the first Mechanical Drive application passenger and cargo vessel
• Dual-fuel re-engining on a RORO vessel

To deliver environmental and energy efficiency consultancy projects: 10 projects. 2015 In 2015, the consultancy projects sold included engineering or advisory services for 13 vessels.

Wärtsilä’s targets for reducing water consumption

<table>
<thead>
<tr>
<th>TARGET</th>
<th>SCHEDULE</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>To further develop the dry concepts for high-efficiency combined cycle power plant solutions.</td>
<td>2015</td>
<td>Wärtsilä has been contracted to supply a major Flexicycle power plant in El Salvador. This power plant will be the first plant running on natural gas in Central America and utilising Wärtsilä’s Dry Flexicycle technology with a closed loop cooling system and zero water consumption making it the most environmentally advanced thermal power plant in the region.</td>
</tr>
</tbody>
</table>
### Wärtsilä's targets for improving overall performance

<table>
<thead>
<tr>
<th>TARGET</th>
<th>SCHEDULE</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>To conduct three lifecycle assessments.</td>
<td>2015</td>
<td>The first LCA assessment is ongoing. An LCA approach concerning a simplified LCA model for different product categories is under review.</td>
</tr>
</tbody>
</table>

### Wärtsilä's social targets

<table>
<thead>
<tr>
<th>TARGET</th>
<th>SCHEDULE</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>To make Wärtsilä a workplace where all employees have the opportunity to show their best and develop their career – to build a company of equal opportunities.</td>
<td>Continuous</td>
<td>In 2015, 54% of open vacancies were filled through internal selections for job level 3 and up, and 46% through external selections. There were 3.0 average training days per employee.</td>
</tr>
<tr>
<td>To develop a new way of working in supplier relations, so as to safeguard Wärtsilä's commitment to sustainability.</td>
<td>2015</td>
<td>Periodical assessments for key suppliers are conducted based on the supplier assessment and development model. By the end of 2015, Wärtsilä had rated 688 of its key suppliers (1,126 in total), covering 96% of the total spent on Wärtsilä Supply Management supplies. Renewal of the Supplier Qualification Process begun in 2015.</td>
</tr>
<tr>
<td>Development discussion coverage 100%.</td>
<td>Continuous</td>
<td>Altogether, 92% of the company's employees had completed development discussions by the end of 2015.</td>
</tr>
<tr>
<td>To implement certified EHS management systems in all subsidiaries (excluding purely sales offices).</td>
<td>Continuous</td>
<td>Wärtsilä currently has 49 certified ISO 14001 companies and 48 certified OHSAS 18001 companies. The management system coverage is presented in the management system section.</td>
</tr>
<tr>
<td>To reach the long-term goal of zero lost-time injuries.</td>
<td>Continuous</td>
<td>The positive trend in improving, consolidating, and spreading a safety culture within Wärtsilä continued. The corporate lost-time injury frequency rate target for the year 2015 was 3.0, and a result of 2.8 was achieved. This represents an 18% improvement compared to the previous year's result (3.5). ZeroMindset</td>
</tr>
</tbody>
</table>
The value of sustainable innovations

As a global leader in complete lifecycle solutions for the marine and energy markets, Wärtsilä plays a key role in providing environmental sound solutions and services that enable its customers to develop their businesses in a sustainable way. This approach is the basis of our sustainability work and it is supported by our strong commitment to responsible business conduct.

The growth in the world’s energy needs, combined with increasingly stringent environmental requirements and the scarcity of natural resources, create a challenging operating climate for companies in Wärtsilä’s line of business.

To secure our leading position at the forefront of sustainable innovation, we continuously invest in technology development. We focus on improving the energy efficiency of our products, while we simultaneously strive to reduce emissions from them. As part of our sustainable innovation approach, we also assess the benefits that our solutions bring to, for example, power systems.

Innovation in product development and the willingness to explore new technologies is essential in order to meet the current needs of our customers, to be prepared for future requirements, and to remain an industrial frontrunner. We strive to develop environmentally sound products and solutions across a wide front, including technologies related to efficiency improvement, the reduction of gaseous and liquid emissions, waste reduction, noise abatement, as well as effluent and ballast water treatment. Our proactive approach to meeting future demand has resulted in the development of both primary and secondary abatement technologies, and has broadened the range of usable fuels. The commitment to

<table>
<thead>
<tr>
<th>Objective</th>
<th>Year</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure commitment to the Code of Conduct throughout the organisation.</td>
<td>2014</td>
<td>Training records are continuously monitored. At the end of 2015, 16,430 employees covering 87% of the total number of employees had successfully participated in training programmes.</td>
</tr>
<tr>
<td>To reinforce the Anti-corruption/ Broker training of key employee groups and obtain anti-corruption commitments from all key employees trained.</td>
<td>2014</td>
<td>Training records are continuously monitored. At the end of 2015, 14,877 employees (78%) had successfully participated in training programmes.</td>
</tr>
<tr>
<td>To conduct three community support projects by 2015.</td>
<td>2015</td>
<td>The target was reached in 2014 with three community projects.</td>
</tr>
<tr>
<td>To improve well-being at work and increase productivity by reducing sickness day costs.</td>
<td>2015</td>
<td>An analysis was conducted and action plans implemented in respective local companies. For example, Wärtsilä companies in Finland have a comprehensive programme supporting well-being and the ability to work.</td>
</tr>
</tbody>
</table>
investing in research and product development benefits Wärtsilä’s customers as well as the environment, both in the short-term and over a longer time span.

The key features of Wärtsilä’s environmentally sound solutions include:

- Reliability, safety and, long lifetime
- Solutions to reduce emissions
- Alternatives to heavy fuel oil
- Flexibility in fuel use
- Solutions to maximise efficiency with the lowest lifecycle cost
- Solutions to minimise water consumption
- Optimisation of vessel design and operations

By combining the key features and through understanding the system level benefits of our offering, we are able to provide solutions that enable the development of sustainable shipping and power systems.

**THE VALUE OF SUSTAINABLE INNOVATION**

| SUSTAINABLE POWER SYSTEMS                                      | • Wärtsilä contracted to supply a Smart Power Generation power plant for flexible generation to Kansas, USA  
| • World’s largest engine power plant in Jordan - helping to integrate renewable energy  
| • Wärtsilä contracted to supply a Smart Power Generation power plant in Kazakhstan  |
| SOLUTIONS TO REDUCE EMISSIONS                                  | • Queen Mary 2 cruise ship meet strict environmental regulations with Wärtsilä wastewater treatment systems  
| • Wärtsilä exhaust scrubber systems ordered to achieve emissions compliance for two Stena Line ferries  
| • Wärtsilä explosion proof (EX) -certified Ballast Water Management Systems ordered for four new chemical tankers  
| • Wärtsilä Hybrid Scrubber System chosen to clean exhaust emissions from three new container vessels  |
| FLEXIBILITY IN FUEL USE                                        | • Wärtsilä to boost efficiency and reduce emissions through conversion of a Mallaven power station to operate on natural gas  
| • Wärtsilä 50DF engine successfully demonstrates its capability to operate on ethane gas  
| • Wärtsilä begins collaboration with GoodFuels Marine and Boskalis in a marine bio-fuels programme  |
| SOLUTIONS TO MAXIMISE EFFICIENCY WITH LOWEST LIFECYCLE COST    | • Wärtsilä launches the new Wärtsilä 31 engine: a breakthrough in efficiency achieves Guinness World Records title  
| • Wärtsilä launches new series of fuel efficient LNG Carrier designs  
| • Wärtsilä and Carnival Corporation announce agreement to partner piloting technologies and systems to optimise vessel operations  
| • Wärtsilä, MAN Diesel & Turbo, and Wärtsilä Fuel Cell Technology to collaborate on major EU-funded project Heracles+2, aimed at fostering environmentally and more efficient shipping  |
| GAS AND SHIPPING                                               | • Wärtsilä’s energy efficient propulsion system selected for world’s first ever LNG carrier  
| • Wärtsilä agrees with Cryorener to develop advanced LNGPac fuel system for the inland waterway market  
| • Wärtsilä introduces new ECA Fuel Pump (EFP) for efficient and environmentally sustainable gas operations  
| • Wärtsilä contracted to power the world’s first dual-fuelled dredger  |
Sustainability highlights 2015


28.1. Wärtsilä receives order to supply integrated propulsion solution for three new natural gas fuelled tugs in Norway.

5.2. Wärtsilä’s energy efficient propulsion system selected for world’s first ever CNG carrier.

6.2. Queen Mary 2 cruise ship to meet strict environmental regulations with Wärtsilä wastewater treatment systems.

9.2. New LNG bunker vessel ordered for Shell to be powered by Wärtsilä dual-fuel engines.

10.2. Wärtsilä’s Sustainability Report 2014 published as part of the Annual Report.

11.2. Wärtsilä contracted to supply five new icebreaking LNG carriers with dual-fuel engines.

16.2. Wärtsilä agrees with Cryonorm to develop advanced LNGPac fuel system for inland waterway market.
**17.2.** Wärtsilä exhaust scrubber systems ordered to achieve emissions compliance for two Stena Line ferries.

**18.2.** Wärtsilä is included in the 2015 edition of RobecoSAM’s The Sustainability Yearbook.

**24.2.** Wärtsilä to boost efficiency and reduce emissions through conversion of a Maltese power plant to operate on natural gas.

**3.3.** First Wärtsilä explosion proof (EX) -certified Ballast Water Management Systems ordered for 8 new chemical tankers.

**4.3.** Wärtsilä contracted to supply a Smart Power Generation power plant for flexible generation to Kansas, USA.

**6.3.** Wärtsilä and Clean Marine Energy align to offer ship owners “scrubber finance”, a solution to drive the uptake of exhaust gas cleaning technology.

**10.3.** Global Wärtsilä Safety Day with “Save your fingers” theme.

**12.3.** Contract for new Baltic Sea ferry to be powered by environmentally sustainable Wärtsilä dual-fuel engines.
23.3. Wärtsilä launches new series of fuel efficient LNG carrier designs.

23.3. Wärtsilä selected to Ethibel Sustainability Index Excellence Europe.

9.4. Wärtsilä introduces new ECA Fuel Pump for efficient and environmentally sustainable gas operations.

21.4. Wärtsilä launches new environmentally sound Anchor Handling Tug Supply vessel design at Sea Asia exhibition.

27.4. Over 1,000 Wärtsilä 34SG engines delivered.

29.4. World’s largest engine power plant IPP3 by Wärtsilä inaugurated in Jordan - helping to integrate renewable energy.

4.5. Wärtsilä 50DF engine successfully demonstrates its capability to operate on ethane gas.

8.5. Wärtsilä and Carnival Corporation announce agreement to partner piloting technologies and systems to optimise vessel operations.
11.5. Wärtsilä ordered to deliver scrubber systems to clean the exhaust from two Dutch RoRo carriers.

25.5. Wärtsilä offers complete propulsion packages compatible with Environmentally Acceptable Lubricants in US waters.

28.5. First ‘Dragon’ class liquid gas transport vessel featuring Wärtsilä integrated systems and engines is delivered.

1.6. Wärtsilä selected to MSCI Global Sustainability Index Series.

2–5.6. Wärtsilä launches a new platform supply vessel and four new fuel efficient container feeder vessel designs at Nor-Shipping.


11.6. IPP3 receives award for the Best Large-Scale Gas Engine Project in the EMEA Projects of the Year 2015 in the Power Engineering International awards.

18.6. Wärtsilä Hybrid Scrubber System chosen to clean exhaust emissions from three new container vessels.

6.7. Wärtsilä, MAN Diesel & Turbo, and Winterthur Gas & Diesel to collaborate on major EU-funded project Hercules-2, aimed at fostering environmentally sustainable and more efficient shipping.
6.8. Wärtsilä contracted to power the world’s first dual-fuelled dredger.

28.8. Wärtsilä awarded repeat order to supply exhaust gas cleaning systems for three Finnlines vessels.


24.9. Wärtsilä contracted to supply a Smart Power Generation power plant in Kazakhstan.

7.10. Wärtsilä begins collaboration with GoodFuels Marine and Boskalis in a marine bio-fuels programme.

26.10. Wärtsilä launches innovation contest for ideas to digitalise the marine industry.

27.10. Wärtsilä introduces new LNG storage and regasification barge concept.

23.11. Internal release of a video in which President & CEO Jaakko Eskola discusses the importance of sustainability for Wärtsilä.
7.12. Wärtsilä contracted to supply a 40 MW Smart Power Generation LNG-fired peaking power plant to Kerala, India.

8.12. Mobile application for Wärtsilä WeCare incident reporting and investigation programme launched.


11.12. Wärtsilä contracted to supply combined inert gas generators and gas combustion units with minimal environmental footprint for 17 new LNG carrier vessels.

17.12. Wärtsilä China selected as a Winner of the 2015 Best Employee Development Plan Company Award.


30.12. Wärtsilä contracted to supply a 47 MW Smart Power Generation power plant running on natural gas to Minnesota, USA.

31.12. The annual lost-time injury frequency index reached record low again.
Energy Solutions review

Wärtsilä’s power plants are used for a wide variety of purposes. These include base load generation for national grids and industrial needs; load following, dynamic balancing services and peak power for power systems; and fast starting grid reserves. The company’s energy solutions are tailored according to the specific requirements of its customers, utilising modular products and services.

Wärtsilä plants consist of multiple independent units, which enable very flexible operations over a broad load range. They can be expanded in size later as power production needs increase. The delivery scope is adapted to customer requirements, ranging from equipment deliveries to complete turnkey power plants, all of which are supported by Wärtsilä’s superior project management capabilities. The fuel flexibility of the solutions enables the choice and utilisation of most feasible fuels, including natural gas and many other gases, as well as most fuel oils. Also offered is the option to run on multiple fuels or to convert from heavy fuel oil to gas. Wärtsilä provides project development and financial services to help customers arrange and assemble complex projects with multiple interconnected contracts, as well as a wide palette of services to support them through the lifecycle of their installations.

The same logic is applied for the LNG terminal business. Wärtsilä is developing a range of modular products and services, and offering complete small to medium scale LNG terminals, distribution infrastructures, and liquefaction and regasification solutions. In the future, it is expected that there will be more projects where an LNG terminal is integrated with a Smart Power Generation power plant to form a complete turnkey solution, utilising gas as fuel in places where gas was not earlier available.

Focus on flexibility

The increasing level of variable renewables in many power systems has created a rapidly growing need for greater flexibility to enable the full and efficient utilisation of such renewable energy. Gas fuelled power plants are technologically the most flexible and environmentally sound alternative for the purpose of balancing renewable sources.

Of the gas power plant alternatives, Smart Power Generation power plants support the power system best by offering the highest degree of flexibility, providing major savings, and enabling an optimised response to rapid changes in variable generation. The savings are materialised throughout the system, as investments in flexible assets enable the system operators to operate less flexible coal and nuclear power plants in steadier state conditions, thereby optimising also their performance while reducing emissions.

Wärtsilä serves three main customer segments

Wärtsilä’s three main customer segments are:

- Utilities
- Independent Power Producers (IPP’s)
- Industrial customers.

Serving all these customers competitively requires the capability to adjust the offering to the specific needs of the customer.

Utilities supply electricity to residential, commercial and industrial end users, and typically also generate some or all of the power themselves. They invest in various types of power plants to ensure adequate load coverage in the most cost
effective and reliable manner. Utilities produce the base load, the intermittent load, and the peak load, and maintain necessary reserves for contingencies. Fuel efficiency is required in all applications. In the intermittent, peak load, and reserve applications, operational flexibility (including fast starting & ramping, and a wide load range) is also necessary, as is a lower capital cost because of the fewer operating hours.

IPP’s are financial investors investing in power plants and selling the generated power to utilities. Their investments are return driven, and as with utilities, their technical requirements are dependent on the type of application.

Industrial customers are mainly private companies with production in an energy intensive factory, such as cement or iron ore production facilities. By investing in captive power, they can achieve lower energy costs and compensate for any grid reliability problems to ensure security of supply. Industrial customers have less power industry experience and, therefore, they rely on the knowledge and experience of large global power plant providers such as Wärtsilä. Wärtsilä serves the top end of this customer group, i.e. large industries requiring a relatively high electrical load.

Operating environment

General market drivers in the Energy Solutions business

The main drivers for Wärtsilä’s Energy Solutions business are:

- Growth in electricity consumption
- Ageing generation capacity
- Renewable energy investments & an increased need for flexibility in power systems
- Increase in the use of gas as a power plant fuel

Population and economic growth jointly drive increases in electricity consumption. Looking ahead, growth is expected to be higher in non-OECD countries because of increasing industrialisation and improving living standards.

In the emerging markets, the demand for flexible base load power plants, as well as for industrial self-generation, is driven by the price of electricity purchased from the grid, and by fuel price developments. With the introduction of gas supply networks to the emerging markets, the demand for gas and dual-fuel driven power plants increases. Wärtsilä has a leading position in these markets.
In the OECD countries, tightening emission legislation is forcing the closure of ageing capacity, which in turn drives the demand for new investments. Another driver is the political emphasis towards low carbon power systems, which means rapidly increasing levels of renewable generation. This has already created a substantial need to add flexibility to power systems. Wärtsilä’s Smart Power Generation power plants are the most efficient solution for backing up variable renewable generation, and enabling the transition to a sustainable, reliable, and affordable low carbon power system.
The demand for gas is driven by environmental issues, which are making the use of coal more and more difficult in many markets. Gas resources are abundant and, through expansions to the infrastructure, LNG is being introduced to energy intensive areas where pipeline gas is not viable. The share of gas in the global energy mix will continue to grow and most...
of this growth will occur in non-OECD countries. Wärtsilä offers a broad range of solutions to support customers in their transition to gas:

- Dual-fuel power plants, capable of using the most inexpensive liquid fuels until gas becomes available
- LNG terminals and distribution infrastructures
- Fuel conversion packages
- Flexible and highly efficient gas power plants that enable power system optimisation.

**Energy Solutions’ competition**

In larger gas-fired projects, Wärtsilä is creating increased competition for gas turbine manufacturers, such as GE and Siemens. In smaller gas power plant projects, and in the heavy fuel oil power plant market, the competitors are mainly other engine suppliers, such as MAN Diesel, GE Jenbacher, Caterpillar (MAK), and Rolls-Royce.

In competing against gas turbines, the main value elements are crystallised in the Smart Power Generation triangle. The combination of competitive efficiency, better fuel flexibility, and superior operational flexibility enables Wärtsilä to present better value propositions and business cases to many customers and projects. As the industry is quite conservative, the need is to shape this market utilising a value based market approach.
Wärtsilä’s advanced gas and dual-fuel engine technology, modular power plants, project management capabilities, and the service support provided throughout the lifecycle of installations, have led to Wärtsilä’s position as market leader in the gas and liquid fuel engine power plant markets.

**GAS TURBINE AND ENGINE MANUFACTURERS**

1-9/2015 MARKET <500MW 17.0 GW (16.5)

- **Wärtsilä**, 9.9%
- GE, 38.8%
- Siemens, 25.2%
- MHI, 19.8%
- Ansaldo, 5.5%
- Other gas turbine manufacturers, 0.8%

Market data includes all Wärtsilä power plants and other manufacturers’ gas and liquid fueled turbine based power plants with prime movers above 5MW, as well as estimated output of steam turbines for combined cycles. The data is gathered from the McCoy Power Report. Other combustion engines not included. In engine technology, Wärtsilä has a leading position.
Energy Solutions' strategy

Wärtsilä Energy Solutions’ mission is to provide superior value to its customers with distributed, flexible, efficient, and environmentally advanced energy solutions, which enable a global transition to a more sustainable and modern energy infrastructure.

Wärtsilä is focused on achieving its strategic goal of becoming a globally recognised leader in liquid fuel and gas power plants by:

- Growing strongly in the large utility gas power plants market by capturing market share from combustion turbines
- Maintaining a leading position in heavy fuel oil and dual-fuel power plants by enhancing the value proposition
- Growing in the small to medium scale LNG terminal business by introducing a new value proposition to selected markets.

The company’s value propositions are based on customised solutions with guaranteed performance, one-stop-shopping project services, and lifecycle commitment through long-term operation and maintenance agreements.

Modularity and repeatability are key enablers for ensuring cost competitive solutions. Wärtsilä will continuously expand the fuel portfolio to ensure wide market coverage, and will focus on products and projects that make economic sense and provide unquestionable environmental benefits.

Energy Solutions and sustainability

The development of a more sustainable energy infrastructure is driven by climate policies, energy security, and economics. Carbon-intensive energy sources are being replaced by low carbon fuels, such as natural gas and renewable solutions. Energy savings and efficiency improvements are encouraged, and even legally enforced, at every level. This development is evident on a global scale, even though short-term actions can vary in different regions.

In line with its commitment to sustainability and responsible business conduct, Wärtsilä has taken an active role in the development of markets and solutions, advising national decision makers on changes in the power markets, and on relevant technical and commercial norms. In this way, Wärtsilä helps speed the transition to more sustainable power systems. Wärtsilä strives to maintain a deep understanding of market requirements, and to develop its solutions in a way that enables them to contribute effectively to improved energy system performance in the various regions of the world.

Wärtsilä’s solutions for the energy industry offer a unique combination of flexibility, high efficiency, and low emissions. Many different fuels, including bio-fuels, can be used efficiently, which helps reduce greenhouse gas emissions. Wärtsilä’s Smart Power Generation technology enables the development of a reliable energy infrastructure, wherein most of the sustainable characteristics are already known. Moreover, integrating more wind and solar energy with flexible back-up capacity has great potential for reducing carbon emissions.

Towards sustainable power systems

The effects of climate change require a dramatic decrease in coal based power generation and a major increase in low carbon power generation, including wind, solar, and natural gas fired plants. In modern power systems, the majority of electricity will be generated by wind and solar power, while thermal power generation will be increasingly used for system balancing and back-up. The variability of renewable energy generation requires the balancing and back-up power to be
flexible and dynamic. Current and earlier power systems were not designed for this purpose, and in order to meet the required capacity, new flexible power generation assets need to be added to the system. Such flexible capacity is based on three elements: operational flexibility, energy efficiency, and fuel flexibility.

**Operational flexibility** is needed for reacting to the rapid changes in wind and solar output. Power plant requirements include the following capabilities:

- Frequent and fast starts and stops without negative wear and tear consequences
- Cyclic operation with high up and down ramp rates
- High full and part load efficiency
- A broad load range
- Minimal CO\(_2\) emissions.

**Energy efficiency** means that less fuel is needed to generate electricity. Lower fuel consumption results in lower CO\(_2\) levels in power generation.

**Fuel flexibility** enables the transition to more sustainable fuels when they become available. This feature becomes increasingly important when investing in new power capacity, because the plant is not fixed to any particular fuel where more sustainable fuels may be available in the future.

These three elements form the cornerstones of the Smart Power Generation technology. It enables the maximal utilisation of valuable renewable power, the smooth operation of inelastic base load thermal power plant and, according to the results from future power system modelling, enables dramatic reductions in system level CO\(_2\) emissions.

- Wärtsilä’s Smart Power Generation power plants allows true operational optimisation of the entire energy system in a cost-efficient, reliable, and sustainable way, and:
  - Enables extremely low carbon emissions from the total system
  - Enables the highest penetration of wind and solar power capacity without related balancing problems
  - Enables baseload plants to operate with high output and efficiency, thereby lowering CO\(_2\) levels
  - Minimises wind curtailment and helps to avoid negative prices
  - Reduces the amount of spinning reserve
  - Enables the efficient use of bio gas- and liquid bio-fuel resources.

- Allows the entire system to operate in the most cost effective way:
  - Removes the abusive cyclic load from plants that are not designed for it, enabling them to operate in their most cost-effective way
  - High efficiency over a wide load range enables flexible power plants to operate in the most cost effective way.

- Ensures system reliability, even during extreme conditions, such as wind variations and contingency situations.
- Enables decentralisation of the intermediate and peak load capacity:
  - Flexible plant sizing facilitates later expansions to match local needs
  - Installing generation capacity in load pockets reduces grid losses and helps to avoid investments in new high voltage grid expansions
  - Fast track delivery enables local capacity deficits to be rapidly overcome.
Energy Solutions' development in 2015

The power generation markets were challenging throughout 2015, as global macro-economic uncertainty limited investments in new power plant capacity. Growth in the emerging markets and the availability of financing continued to support demand. In the industrialised world, electricity consumption was on a low level and economic growth is needed to boost power plant investments. During the first nine months of 2015, global orders for natural gas and liquid fuel power plants up to 500 MW totalled 17.0 GW, an increase of 3% from the corresponding period of 2014. Wärtsilä’s market share was 9.9% (10.5).

Order intake for Energy Solutions totalled EUR 1,009 million, a decrease of 22% from the corresponding period last year. Of the orders received, measured in MW, 46% were for gas based power plants. Turkish owners contributed to the high level of activity in Europe, while in the USA several orders were received for peaking and renewable support power plants. Energy Solutions’ net sales was stable at EUR 1,126 million, which represents 22% of Wärtsilä’s net sales.

Marine Solutions review

Wärtsilä Marine Solutions has a strong position in the marine and oil & gas industries. The company provides optimised, environmentally sustainable, and economically sound solutions that enhance the business of its customers. Wärtsilä's reputation is based on a good understanding of customer businesses, design capabilities, a broad product portfolio, and technological leadership. The organisation is structured into end to end business lines with full control over sales, R&D, engineering, procurement, and manufacturing. This enables increased flexibility, fast decision-making, and the optimal utilisation of resources to provide superior customer service.

Serving both shipyards and ship owners

Wärtsilä’s marine customers comprise both shipyards and ship owners; the needs and demands of which differ significantly. The decision-making process of shipyard customers is typically affected by product prices, delivery times and reliability, project management, ease of installation, and the supplier’s ability to manage large delivery scopes. Ship owners, on the other hand, require safe and efficient operations, reliability and support, as well as the availability of services. Their decision-making is also impacted by freight rates, interest rates, and the capital and operating costs of the ship. Furthermore, both ship owners and operators are having to increasingly consider factors such as environmental compliance and fuel flexibility in their decision-making.

Wärtsilä is committed to meeting the needs of all customer groups. Success is achieved through an in-depth understanding of their businesses, operating models, and requirements. This understanding is backed by an extensive network, a broad product portfolio, and the ability to be involved in the life of the vessel as early as the design process. This enables the company to support its customers throughout the lifecycle of their installations with products and solutions that best serve their business interests.

The broadest offering in the industry

Wärtsilä Marine Solutions is active in all the main vessel segments with a wide range of products, services, and solutions. The company understands the particular needs and requirements related to each of these segments – from the initial vessel design choices to everyday operations throughout the vessel’s lifecycle. The portfolio also covers gas systems for land-based installations, such as gas terminals. During 2015, Marine Solutions’ electrical and automation offering was strengthened through the acquisition of L-3 Marine Systems International (MSI). MSI has extensive experience in
supplying automation, navigation and electrical systems, dynamic positioning technology, as well as sonar and underwater communications technology for a variety of vessel types and offshore installations.

Innovative and competitive products, delivered efficiently and with high quality, form the basis of Wärtsilä’s offering, which consists of:

- Medium-speed diesel and dual-fuel engines
- Low-speed engines sold through the Winterthur Gas & Diesel Ltd. (WinGD) joint venture
- Propulsion systems and gears
- Seals and bearings
- Navigation and automation systems
- Entertainment systems
- Communication and control systems
- Power distribution and management systems
- Electric power drives and motors
- Electrical design for complex vessels
- Environmental solutions, including exhaust gas cleaning, ballast water management, and fresh water systems
- Pumps and valves
- Gas systems, including LNG and LPG handling, inert gas systems, compressors, liquefaction, regasification, and equipment for small-to-medium scale onshore gas installations
- Ship design.

The ability to combine the products offered into larger systems and solutions supports the company’s strategy of being the main solutions provider to customers. This strategy provides added value to both shipyard and ship owner customers. Shipyard customers can focus on their areas of expertise and benefit from the risk of product interface problems being reduced, while ship owners can rely on benefits related to operations and maintenance.
<table>
<thead>
<tr>
<th>SEGMENT</th>
<th>VESSEL TYPE</th>
<th>MAIN OFFERING*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merchant</td>
<td>LNG carriers</td>
<td>2-st (sold through the WinGD joint venture) and 4-st main dual-fuel engines, auxiliary engines, controllable pitch propellers (CPP), gearboxes, tunnel thrusters</td>
</tr>
<tr>
<td></td>
<td>Tankers, Containers, Bulkers</td>
<td>2-st engines (WinGD), auxiliary engines, fixed pitch propellers (FPP), tunnel thrusters, 4-st engines for smaller vessels, navigation and automation systems, electric power distribution</td>
</tr>
<tr>
<td></td>
<td>Other: cargo, RoRo, car carriers, LPG carriers</td>
<td>All of the above</td>
</tr>
<tr>
<td>Offshore</td>
<td>Floating exploration: drillships, semi-submersibles, etc.</td>
<td>4-st engines, steerable thrusters, tunnel thrusters, vessel automation systems, electric power distribution, gearboxes</td>
</tr>
<tr>
<td></td>
<td>Floating production units: FPSO's, FSO, floating LNG, etc.</td>
<td>4-st engines, steerable thrusters, tunnel thrusters, CPP, vessel automation systems, electric power distribution, gearboxes</td>
</tr>
<tr>
<td></td>
<td>Service/Supply vessels: OSV's, PSV's, AHTS, AHS</td>
<td>4-st engines, steerable thrusters, tunnel thrusters, CPP, electrical propulsion systems, ship design, automation systems, gearboxes</td>
</tr>
<tr>
<td></td>
<td>Other: crane vessels, pipelayers, accommodation vessels</td>
<td>All of the above</td>
</tr>
<tr>
<td>Cruise and Ferry</td>
<td>Cruise vessels</td>
<td>4-st engines, FPP, tunnel thrusters, navigation, entertainment and automation systems, electric propulsion and power distribution</td>
</tr>
<tr>
<td></td>
<td>Ferries</td>
<td>4-st engines, CPP, FPP, steerable thrusters, tunnel thrusters, navigation, entertainment and automation systems, electric propulsion and power distribution</td>
</tr>
<tr>
<td></td>
<td>Other: ro-pax, yachts</td>
<td>All of the above</td>
</tr>
<tr>
<td>Special vessels</td>
<td>Tugs</td>
<td>4-st engines, FPP, steerable thrusters, tunnel thrusters, vessel automation systems, ship design</td>
</tr>
<tr>
<td></td>
<td>Dredgers</td>
<td>4-st engines, CPP, FPP, steerable thrusters, tunnel thrusters, vessel automation systems</td>
</tr>
<tr>
<td></td>
<td>Other: fishing vessels, ice breakers, research vessels, work boats, inland waterway vessels</td>
<td>All of the above</td>
</tr>
<tr>
<td>Navy</td>
<td>Frigates, corvettes, patrol vessels, aircraft carriers, destroyers, submarines, support vessels</td>
<td>Waterjets, seals and bearings, tunnel thrusters, 4-st engines, navigation and automation systems, electric propulsion and power distribution, underwater communication, sonar systems</td>
</tr>
</tbody>
</table>

* Excluding Wärtsilä Hamworthy’s offering, which can be installed in nearly all ship types.
Growth through gas, environmental solutions and efficient vessels

Wärtsilä Marine Solutions is uniquely positioned for growth driven by the increasing availability and use of gas as a marine fuel, the introduction of new environmental regulations, and the increased demand for more efficient vessels.

Stricter environmental regulations are driving the interest in gas as a marine fuel, as well as in emissions abatement technologies, such as exhaust gas cleaning systems and ballast water treatment systems. Marine Solutions offers its customers alternative solutions for meeting these requirements in a way that best meets the needs of their businesses and operating models, both as part of new build projects and as retrofits to vessels already in operation.

Wärtsilä’s market leading offering for the gas segment consists of gas fuelled engines, gas conversions, and gas handling systems. There is a complete offering for each step in the gas value chain, from product level to entire LNG terminals with the latest technology and innovations. In 2015, the company introduced a new LNG storage and regasification barge concept. This innovative solution provides a flexible means of meeting small to medium scale requirements where pure land-based LNG options are limited.

Wärtsilä has a strong position in exhaust gas cleaning systems, with the most extensive reference list on the market. Today, the portfolio of SOx scrubber systems is the broadest in the industry and consists of closed loop systems for fresh water use, open loop systems for seawater use, and a combination of the two, i.e. the hybrid system. For NOx reduction and IMO Tier III compliance Wärtsilä provides its customers with products based on the selective catalytic reduction (SCR) technology. For ballast water treatment, customers can select systems based on the two most common technologies: ultraviolet treatment and electro-chlorination.

Efficiency is one of the top concerns for ship owners and operators. Wärtsilä’s in-depth expertise and system skills help to optimise the efficiency of vessels and make it possible for customers to achieve the performance, cost, and environmental compliance parameters that specifically match their operating profile.

Marine Solutions' operating environment

Wärtsilä Marine Solutions serves the marine and oil & gas industries. The main vessel segments covered in the marine industry are traditional merchant vessels, gas carriers, cruise & ferry, navy, and special vessels. In the oil & gas industry, Wärtsilä is active in serving offshore installations and vessels, as well as land-based gas installations.

General shipbuilding and shipping market drivers

Demand in the shipbuilding and shipping industries is mainly driven by developments within the global economy and the resulting impact on trade and transportation capacity requirements. The global economy also influences fuel prices, which in turn has both a direct and an indirect impact on the marine and oil & gas industries. The price, availability, and demand for fuel drives development in the oil & gas industry, while in the general shipping industry, fuel costs increase the demand for efficient vessels. Other factors, such as shipyard capacity, newbuild prices, decommissioning and scrapping, and interest and freight rates, also affect these industries. Global demand for new vessels drives Wärtsilä’s Marine Solutions business, in particular ships built for seaborne cargo transportation, offshore oil drilling, production and support, cruise and ferry services, and for naval use. Another important driver is the development of environmental regulations and their impact on the demand for optimised vessel efficiency, environmental solutions, and gas as a marine fuel.
Main drivers for Wärtsilä’s Marine Solutions business

- Developments in the global economy
- Development of world trade and needed transportation capacity
- Development of gas as an energy source
- Development of oil and gas prices
- Development of new offshore oil & gas fields and infrastructures
- Environmental regulations

Competitors and market position

Wärtsilä Marine Solutions has continuously broadened its portfolio, which today ranges from engines and propulsion equipment to electrical equipment, automation, ship design, environmental solutions, gas systems, and pumps and valves. This is backed by the capability to build environmentally sound solutions, and by superior service support throughout the lifecycle of the product. Wärtsilä’s competitive advantage lies in having the industry’s broadest marine focused offering comprised of leading, innovative products, integrated systems, and engineering, which is supported by a unique sales and service network in touch with customers globally.

The field of competitors is extensive. It includes engine companies, such as MAN D&T, Caterpillar and Chinese licensee manufacturers, propeller makers such as Schottel and Thrustmaster, and environmental and auxiliary equipment providers like Alfa Laval. It also includes electrical and automation houses, notably Siemens, GE, ABB, and Kongsberg, pump and gas system providers, such as Colfax and Cryostar, and companies with broad offerings, like Rolls-Royce and Hyundai Heavy Industries. Wärtsilä is recognised as a proven supplier of innovative and sustainable technologies across its portfolio serving the marine and oil & gas markets.

<table>
<thead>
<tr>
<th>WÄRTSILÄ’S OFFERING</th>
<th>MAIN APPLICATION*</th>
<th>MAIN COMPETITION**</th>
<th>WÄRTSILÄ’S MARKET POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-stroke main engines</td>
<td>Small merchant vessels, offshore, special vessels</td>
<td>MAN D&amp;T, MAK (CAT), Rolls-Royce, HiMSEN</td>
<td>59% of the market (in kW) is controlled by Wärtsilä.</td>
</tr>
<tr>
<td>4-stroke auxiliary generating sets</td>
<td>All vessel types</td>
<td>The market is highly fragmented, price sensitive, and with heavy competition. The main competitors are MAN D&amp;T and its local license manufacturers, Yanmar and HiMSEN. High-speed engines also compete in the auxiliary engine market.</td>
<td>Wärtsilä is a market challenger, having 12% of the total market.</td>
</tr>
<tr>
<td>2-stroke engines sold through the WinGD joint venture</td>
<td>Large and medium size merchant vessels</td>
<td>MAN D&amp;T, Mitsubishi Heavy Industries</td>
<td>Market challenger, approximately 10% of the market (in kW) is controlled by Wärtsilä branded engines</td>
</tr>
<tr>
<td>Propulsion</td>
<td>All vessel types</td>
<td>Rolls-Royce, Schottel, Hyundai Heavy Industries, Mitsubishi Heavy Industries, Mecklenburger Metallguss, Thrustmaster, Brunvoll, Kawasaki, Caterpillar (Berg Propulsion)</td>
<td>CPP &amp; FPP: fragmented market, with Wärtsilä among the top players.</td>
</tr>
<tr>
<td>Category</td>
<td>Products</td>
<td>Competitors</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Electrical &amp; Automation</td>
<td>• Ship Automation systems&lt;br&gt;• Navigation and electrical systems&lt;br&gt;• Dynamic positioning technology&lt;br&gt;• Integrated bridge solutions&lt;br&gt;• Entertainment systems&lt;br&gt;• Electric propulsion&lt;br&gt;• Power distribution&lt;br&gt;• Sonar systems&lt;br&gt;• Underwater communication</td>
<td>Cruise, cargo, offshore, special vessels, navy&lt;br&gt;ABB, Siemens, Kongsberg, Rolls-Royce, General Electric</td>
<td></td>
</tr>
<tr>
<td>Ship design</td>
<td>OSV’s, merchant vessels, specialised vessels, fishing vessels</td>
<td>Skipsteknik, Marinteknik, MMC, Rolls-Royce, Ulstein&lt;br&gt;Among the leading independent ship design houses.</td>
<td></td>
</tr>
<tr>
<td>Oil &amp; Gas systems</td>
<td>• Mobile LNG (barge) offering&lt;br&gt;• Regasification systems&lt;br&gt;• Gas reliquefaction systems&lt;br&gt;• Onshore gas liquefaction systems&lt;br&gt;• Gas recovery systems&lt;br&gt;• Oil separation systems&lt;br&gt;• Fuel gas systems</td>
<td>Offshore gas processing &amp; storage vessels, LNG/LEG/LPG carriers, floating production systems, industry applications, fuel gas systems for all vessel types&lt;br&gt;TGE Marine, Cryostar, Linde GAS - AGA, Kobelco, Moss Maritime, Daewoo Shipbuilding &amp; Marine Engineering, Weir LGE, Cryonorm, John Zink, Black &amp; Veatch, Air Liquid, Aker Solutions, FMC/CDS, Cameron/Concept&lt;br&gt;Wärtsilä is among the top players.</td>
<td></td>
</tr>
<tr>
<td>Pumps and valves</td>
<td>All vessel types, on- and offshore oil &amp; gas facilities</td>
<td>Niigata, Marflex, Framo, Hyundai Heavy Industries, Shinko, Colfax, Ellehammer</td>
<td>Wärtsilä is among the top players.</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>• Deepwell cargo pumps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Pump room systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Engine room pumps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fire-fighting systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Valves</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental solutions</th>
<th>All vessel types</th>
<th>Alfa Laval, Green Tech Marine, Techcross, Panasia, Evac, Scanship, GEA Westfalia, Marinfloc</th>
<th>Wärtsilä is among the top players.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Exhaust gas cleaning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ballast water management systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Inert gas systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Water production systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Water treatment systems</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Only main applications mentioned.
** Only main competitors mentioned.
Marine Solutions' strategy

The strategic goal of Wärtsilä Marine Solutions is to be the leading provider of innovative products and integrated solutions to the marine and oil & gas industries. To achieve this the aim is to build on deep understanding of the customers' needs and:

- Solidify the company's leading position in solutions for gas fuelled vessels, environmental compliance, and efficiency optimisation
- Further develop the company's position as the shipbuilding industry's leading systems integrator
- Provide a competitive offering of products for the growing needs of the marine and oil & gas markets
- Seek further growth through the ability to offer customers the most efficient lifecycle solutions.

As a solutions provider, Wärtsilä is ready to deliver everything from a single product to complete lifecycle support of complex systems for powering ships; from concept development to operational use. As the industry’s only true provider of a total marine offering, Wärtsilä is uniquely positioned. The extensive range of products is supported by world class ship design, engineering, and project delivery capabilities, all of which facilitate the provision of solutions that optimise the lifecycle value of customers' installations.

Important mid-term growth opportunities are envisioned in solutions for gas fuelled vessels, environmental compliance, and efficiency optimisation. Wärtsilä is already well positioned in these areas, having the most extensive experience and an unrivalled track record in delivering gas engines, a unique portfolio of products for emissions control and abatement, and a holistic approach to ship-level efficiency optimisation through the company's engineering and ship design capabilities.

Wärtsilä Marine Solutions seeks organic growth that will be supported by targeted acquisitions and partnerships. The offering of innovative and competitive products is developed and delivered based on the requirements of the various
customer segments and the operating profiles of their vessels. Together with the Services business, Wärtsilä Marine Solutions offers ship owners and operators integrated lifecycle solutions, with guaranteed performance and availability. Wärtsilä will maintain its position as the shipbuilding industry's leading systems integrator, and will further strengthen its already strong foothold in the oil & gas business. Finally, the company will invest further in strengthening its presence and maximising the efficiency of its supply chain, engineering and sales, especially in the key shipbuilding areas, notably China and South Korea.

**Marine Solutions’ strengths**

- The broadest portfolio of reliable and high performing products and solutions in the marine and offshore oil & gas industries, supported by the industry’s strongest global service network
- An unmatched track record in providing gas fuelled vessels with dual-fuel technology and gas systems
- The most comprehensive selection of options for meeting the needs of customers concerning fuel flexibility, efficiency, and environmental requirements
- A strong position and good customer understanding in navigation and automation systems for cruise and large cargo vessels
- A unique synergy between ship design and engineering capabilities enabling the maximisation of a vessel’s efficiency throughout its lifecycle
- A strong presence in all the major marine and offshore oil & gas segments, thereby allowing shipbuilding cycles to be navigated

**Marine Solutions and sustainability**

The marine and oil & gas industries are at the centre of converging megatrends, namely a move towards a more diverse and cleaner energy mix, increased transparency and accountability with regards to environmental performance, and a need to improve economic performance despite uncertainties in the global economy. For Wärtsilä it is clear that improved sustainability is central to addressing all these trends.

Wärtsilä is committed to becoming the most valued business partner of its customers. Thus it is essential for Marine Solutions to have sustainability at the very core of its product and solutions development. The company's R&D and business development activities are based on a deep understanding of how these megatrends affect customers. The expansion and development of Wärtsilä’s offering to the marine and oil & gas industries over the years demonstrates the response made to the needs of customers. Gas, environmental compliance, and efficiency are the three pillars on which Marine Solutions builds its offering.

**The shift towards natural gas**

The global energy landscape is shifting towards a more diverse and sustainable energy mix, and natural gas – the cleanest fossil fuel – has a key role to play in this transition. The oil & gas industry has, during recent years, seen a dramatic rise in the demand for natural gas along with the increase in supply. The marine industry is also affected by this transition, with interest in the use of gas as a marine fuel rising sharply.

Wärtsilä develops products and services that enable the safe use, handling, and distribution of natural gas for the marine and oil & gas industries. Wärtsilä is the marine industry’s undisputed leader when it comes to gas-fuelled propulsion, with dual-fuel medium-speed engines ordered for more than 250 vessels and more than 12 million running hours accumulated in both land-based and marine applications. These milestones represent achievements that cannot be matched today by any other engine manufacturer. Thanks to a strong and safe track record in the use of gas as a marine fuel for LNG carriers, the industry is increasingly keen on expanding the use of LNG to other vessel types.
The benefits of using Wärtsilä’s well proven low-pressure dual-fuel technology are many:

- Emission reductions (when operating in gas mode): 85% less NO\textsubscript{X}, 99% less SO\textsubscript{X}, up to 99% reduction in particulates, 20-30% less CO\textsubscript{2} emissions, and no smoke
- Fuel flexibility to enhance operational security and competitiveness, with the use of heavy fuel oil, marine diesel oil, bio fuels, and crude oil possible
- Capital expenditure reductions of 15-20%, since the use of low pressure technology means simpler (lower cost) gas handling systems, and no need for further exhaust gas cleaning systems
- Reduced waste streams (liquid waste)
- No need to use secondary emission reduction systems (and hence no consumption of reagents)
- Redundancy and safety
- Stable operation on gas fuel across the entire load range, with no need to switch to diesel fuel at low loads
- Lower consumption of pilot fuel (just 1% of the total fuel used).

Enabling the use of gas as a marine fuel means much more than merely applying a proven technology to gas engines. For Wärtsilä, it also means maintaining its leading position in the design of gas fuelled vessels, and offering reliable and competitive gas storage and handling systems. Wärtsilä also supports the development of the broader gas value chain in the oil & gas industry with, for instance, its liquefaction and regasification solutions.

Environmental compliance

The marine industry is undergoing the implementation of changes in order to comply with existing environmental regulations, while at the same time evaluating the possibilities for complying with upcoming regulations. Emissions to air (CO\textsubscript{2}, NO\textsubscript{X}, SO\textsubscript{X}, particulate matter, volatile organic compounds (VOC), and others) and water are under scrutiny. Similarly, regulations relating to safe and clean operations are becoming stricter, especially for the oil & gas industry.

Wärtsilä offers a wide set of options for compliance with environmental regulations. All include working technologies, fast installation, and support throughout the company’s global network. Wärtsilä is committed to providing its customers and society at large with reliable and safe technologies for environmental compliance, which will be available for use as new regulations come into force. The company can also assist customers in evaluating the best options for compliance so as to adopt a solution that meets their specific operational needs.

In the marine industry, Wärtsilä’s offering for environmental compliance covers the following:

- For SO\textsubscript{X} and NO\textsubscript{X} compliance: gas propulsion, conversions to gas propulsion, NO\textsubscript{X} reducers, SO\textsubscript{X} scrubber systems, and retrofit services
- For ballast water compliance: products based on ultraviolet treatment and electro-chlorination technologies, and retrofit services
- For Energy Efficient Design Index (EEDI) compliance: improved efficiency of individual products and ship design
- For emissions to water compliance: waste water, bilge water, scrubber water, and sealing systems.

In addition to these, Wärtsilä’s offering to the oil & gas industry includes the following solutions to facilitate safe and clean operations:

- VOC recovery
- Flare gas recovery
- Inert gas and nitrogen systems
- Oil separation
- Waste water systems
- Oily and slop water cleaning
• Fresh water generation
• High pressure compressors.

Focus on efficiency

The global economic downturn has put enormous pressure on the cost structure of the marine industry in particular, while the oil & gas industry is also deeply affected by low oil prices. In the marine industry especially, the cost of fuel is a key driver for upgrading equipment, re-thinking operational profiles, and for new vessel designs. Investments in improved energy efficiency have both economic and improved environmental performance benefits.

Wärtsilä strives to optimise the lifecycle cost of installations. This is done because it makes economic sense to customers, and because of the company’s in-house understanding of the pressure for reducing costs and investing in developing products and solutions that will help achieve significant savings. Furthermore, improved efficiency results in better environmental performance.

For Wärtsilä, one way of improving efficiency is to continuously invest in renewing the product portfolio. During 2015, the Wärtsilä 31 engine was launched. The Wärtsilä 31 engine’s diesel fuel consumption is as low as 165 g/kWh, which is far lower than that of any other 4-stroke engine currently on the market. The engine can be operated using a range of different fuels, and comes in three alternative versions: diesel, dual-fuel, and spark-ignited gas. Wärtsilä also launched new ship designs (container feeder, AHTS, PSV, and LNG carrier designs) featuring exceptionally low fuel consumption, and a new WST-14 steerable thruster aimed at inland cargo waterway applications, which provides increased reliability and efficiency.

Marine Solutions' development in 2015

During 2015, 1,371 contracts for new vessels were registered, compared to 1,711 in the previous year. Contracting activity in the conventional merchant markets was slow and activity in the gas carrier market normalised from the strong volumes seen in 2014. Demand in the offshore market declined from the previous year due to depressed oil prices. There was a good level of contracting for cruise vessels and ferries. Wärtsilä’s share of the medium-speed main engine market was 59% (63% at the end of the previous quarter). The market share in auxiliary engines increased to 12% (9% at the end of the previous quarter).

Marine Solutions’ order intake declined by 8% to EUR 1,599 million, which was satisfactory given the general slowdown in vessel contracting and the further weakening of the offshore market. In line with the Marine Solutions strategy, Wärtsilä received several orders for the delivery of integrated solutions. Highlights included the contract to power the world’s first duel-fuelled dredger being built for DEME Group. Other strategically significant orders included the first order for the new generation Wärtsilä 31 engine, which was launched in June. The interest in environmental solutions continued to increase during 2015. Net sales for Marine Solutions was stable at EUR 1,720 million, which represents 34% of net sales.

Services review

Wärtsilä Services supports its customers by offering the most comprehensive portfolio of services in the industry, thereby optimising operational and lifecycle performance. Wärtsilä Services offers expertise, local availability, responsiveness, and the most environmentally sound solutions for all customers. The Services offering also strongly builds on digitalisation in order to utilise the opportunities opened by real-time data and related analytics. Customers recognise Wärtsilä as being a reliable service partner; namely competitive, trusted, and easy to deal with.
The service offering

Services develops close relationships with its customers, thus enabling an in-depth understanding of their business so as to extend the offering accordingly. The Services business provides full and complete support for customers operating in the marine and energy industries, as well as a comprehensive package of seals, bearings, and associated solutions to hydropower installations and industrial plants worldwide as of 2015. This support is based primarily on the equipment sold and designed by Wärtsilä, including engines, propulsion, and other systems. However, Wärtsilä Services has the capability to retrofit and service other brands as well.

An in-depth knowledge of the customers’ business and operational challenges, combined with technical expertise, forms the basis for being able to offer different levels of support:

- Spare parts for equipment, with an emphasis on excellent delivery performance and the availability of a broad range of parts
- Full maintenance and performance monitoring, utilising both equipment (spare parts) and services (field services, condition based maintenance)
- Optimising customers’ business via analytics, proactive recommendations, efficiency improvements (e.g. fuel cost savings), and shared performance targets for the operation and maintenance of their equipment.

Areas of expertise include:

Engine services

Wärtsilä Services provides a full range of services for medium- and low-speed diesel, gas, dual and multiple fuel engines, and other related systems. The wide offering ranges from standard engine overhauls to optimisation retrofits that improve the performance of mature engine designs.
Propulsion services

Wärtsilä offers a complete range of services throughout the lifecycle of propulsion systems. Parts, repairs, maintenance, modernisation solutions, and efficiency upgrades are also provided in order to keep propulsion systems running powerfully and efficiently.

Seals & Bearings services

Wärtsilä Services provides a wide range of sealing, bearing, and sterntube solutions in the form of integrated systems, packages, and products. These services provide marine and industrial customers with increased efficiency, reduced running costs, and operational longevity.

Hydro & Industrial services

The offering includes seals, bearings, and associated equipment for hydro and industrial installations (in mining, paper, oil & gas), including hydropower, tidal power, and offshore wind installations. These are complemented with a comprehensive array of services, ranging from repairs and fabrications to underwater services, retrofits, component reconditioning, and refurbishments.

Environmental services

Wärtsilä offers an extensive set of services aimed at improving efficiency and minimising emissions for energy and marine installations. These solutions include fuel conversions, low NOx solutions, and propulsion efficiency services. Furthermore, Wärtsilä’s field service organisation supports the marine retrofit market in the installation and commissioning of environmental solutions.

Service agreements

Wärtsilä tailors service agreements to enable customers to choose from different levels of partnership. Technical management agreements include provisions for regular inspections, monthly reporting, and exchange programmes for spare parts. Maintenance agreements provide fixed prices for inspections, technical support, spare parts, training, and maintenance work. Operations and maintenance agreements can cover complete operational, management and, maintenance services, as well as installation performance guarantees.

Service projects

Project management capabilities enable Wärtsilä to optimise the performance of customers’ installations through upgrades, modernisations, fuel conversions, and safety solutions.

Training services

The training services offered cover all aspects of management, operational, maintenance, and safety issues, and range from traditional hands-on training to advanced remote training systems and e-learning opportunities.
Services operating environment

Wärtsilä Services supports customers in the marine, energy, oil & gas industries. In 2015, the offering was extended to a new market segment, the hydro & industrial businesses.

Marine customers are generally ship owners or operators operating in the merchant shipping, cruise and ferry, navy, or other special vessels segments. Oil & gas customers are typically those either operating ships in the offshore segment or having land based oil and gas installations. Hydro and industrial customers are companies operating in the hydropower, ocean energy, and offshore wind sectors, and customers with specific installations in industrial applications.

The main driver in the Services business is the size and development of Wärtsilä’s installed equipment base. However, the offering and competences are constantly being developed in order to extend the servicing capabilities to multiple brand equipment.

The market conditions faced by Wärtsilä’s end customers have a direct impact on the utilisation rate of installations in operation, and dictate the need for services relating to maintenance, lay-down, or re-deployments. The lifecycle phase of an installation also affects the maintenance requirements, and possible needs for upgrades or life-extension services. Wärtsilä’s customers may also face the need for retrofits and upgrades of their equipment based on structural changes to their operating environments, such as changes in the availability or pricing of fuels, the implementation of regulations, or increased safety requirements. Interest in a full lifecycle approach from customers in the marine, energy, and oil & gas markets is increasing. This is because it is possible to optimise maintenance and performance so as to improve operational efficiency, reduce costs, and create business growth. The outsourcing of power plant operations and management to a reliable partner is normal practice in the energy industry and interest for long-term service agreements is increasing also in the marine and oil & gas service markets.
Competition and market position

Wärtsilä has a strong position in servicing equipment sold and designed by Wärtsilä. The key differentiators are a truly global presence and the capability to provide support throughout the lifecycle. Only a few other players are able to provide such a broad services offering globally; these being other Original Equipment Manufacturers (OEM) focusing on their own equipment brands, and service companies with a global or more typically local presence.

Competition is, therefore, mainly local, consisting of parts traders, repair yards, local workshops, component suppliers for spare parts (non-OEM), and field service businesses. The number of local players is quite large; consequently competition is rather fragmented and focused on a limited offering scope and speed of delivery. Wärtsilä is constantly developing its global footprint and local operations in order to serve its customers with superior quality, while meeting the speed of response of smaller local players.

The competition for long-term service agreements for operating power plants comes from a few regional players capable of offering plant operational services. In the marine market, the competition for long-term service agreements is even more fragmented with some ship management companies serving this area. Wärtsilä Services offers a variety of options to ensure the best solution for the end user.

Services' strategy

Wärtsilä Services aims to be recognised as a reliable service partner; namely competitive, trusted, and easy to deal with. Wärtsilä is committed to growing its services business by:

- Doing more business with existing customers through superior customer service
- Developing and digitalising the offering to create new competitive advantages
- Exploring opportunities within new customer segments by leveraging on current competences
- Acquiring businesses in growing markets.

Services is constantly developing its global footprint and operations in order to meet and exceed customers' expectations. This is the very basis upon which the business with existing customers will grow. Further growth is sought by strengthening our service offering in response to our customers' increased interest in long-term service agreements, thereby providing them with both lower costs and improved operational efficiency.

An important growth area is the digitalisation of the existing offering and the development of a new digital offering to further increase revenue potential, transparency, availability, and performance. Continuing the digitalisation journey in 2015, Services launched Wärtsilä Genius services, which will enable real-time optimisation of customers’ assets, improve predictability, and help solving of issues with digital solutions. Other examples of outcomes from the investments in digital innovations are the Wärtsilä Online Services platform for spare parts ordering and tracking and technical support, as well as the remote service concepts such as the Virtual Service Engineer.

Wärtsilä’s current competences and capabilities (e.g. in-situ machining, reconditioning, and field services) place the company in a unique position to provide services to new customer segments, such as Hydro and Industrial, and extending the offering to customers who operate a variety of equipment – regardless of the manufacturer.
Services' strengths

- Long-term relationships with customers and an in-depth understanding of their operations and needs
- A complete lifecycle offering
- The broadest service portfolio in the industry
- An unmatched global service network

Services and sustainability

Environmental legislation, the need for energy efficiency, and safety requirements are currently the main drivers for customers’ actions towards developing their businesses in a more sustainable way. Wärtsilä Services strives to be a leader in supporting its customers’ efforts to meet and exceed current and future business and sustainability demands. This is the essence of Wärtsilä Services’ role as regards sustainability: we continuously develop the offering in order to provide customers with solutions that will enable them to run their businesses and grow in the most sustainable way.

Furthermore, Wärtsilä conducts its business in a responsible way, including providing services from locations in close proximity to the customers' installations, and by investing and offering employment opportunities in local communities.

Energy efficiency and emissions

The increasing availability of alternative liquid fuels and gas, together with stricter environmental and safety requirements, creates opportunities for the Services business to improve the operational efficiency of customer installations, while at the same time reducing their environmental impact. Wärtsilä develops and provides services, such as upgrades, reconditioning projects, fuel conversions, and retrofit solutions that improve both fuel efficiency and environmental performance. This enables compliance with stringent environmental legislation while extending the operational lifetime of the application.

For existing installations, a set of primary upgrading solutions are available, including:

- Engine, propulsion, or electrical & automation system efficiency upgrade packages that reduce fuel and/or lube-oil consumption, thereby contributing to lower emissions and the generation of economic benefits
- Low NO\textsubscript{x} solutions that combine various engine modifications designed to find the ideal combination of compression ratio, injection timing, and injection rate. The concept has been developed so as to achieve the best possible trade-off between NO\textsubscript{x} reduction and fuel consumption.
- The conversion of propeller shaft sealing systems to an anti-pollution version that eliminates the risk of water pollution
- Diesel to gas conversions that considerably reduce emissions from the installation. The conversion of heavy fuel oil or marine diesel oil installations to operate on natural gas offers extended benefits.

For new and existing installations, secondary methods are available to integrate additional equipment that contribute towards emissions abatement. Wärtsilä Services provides unparalleled environmental solutions, as well as the field experts needed for their installation and commissioning.

Optimising the sustainability of customer operations

Wärtsilä’s offering goes beyond retrofits, upgrades, conversions, and field services expertise. The lifecycle support approach using long term service agreements, allows Wärtsilä to offer customers guarantees for reduced fuel consumption, and hence have a direct impact in reducing emissions. Furthermore, the recently launched Wärtsilä Genius
optimisation services enable increased competitiveness and effectiveness in daily operations with real-time efficiency and emissions abatement improvements:

- Engine efficiency monitoring: the bridge/dashboard monitor indicates specific fuel oil consumption to create awareness of fuel usage, and to enable a vessel’s crew to make the necessary operational adjustments to optimise the consumption. Measuring fuel consumption online, visualising it, and comparing it to other performance data over time is the first step towards ship energy efficiency monitoring plan services.
- Trim optimisation: provides an indication to the bridge/dashboard of the optimal vessel trim. Real-time optimisation of the ship’s trim provides 2-5% fuel savings, thereby contributing to lower levels of emissions.
- Hull and propeller cleaning interval optimisation: calculates the optimal cleaning dates for the hull and propeller. This results in avoiding fuel consumption increases of up to 30% caused by surface roughness, and hence enables emissions optimisation.

**Services' development in 2015**

Service market activity developed favourably in 2015. Activity in the marine industry improved globally, supported by increased investments in maintenance activities and higher demand for propulsion upgrades and thruster retrofits. Power plant service activity developed well, thanks to increased utilisation of installations under contract and the demand for spare parts in specific regions resulting from the ageing installed base. At the end of 2015, Wärtsilä’s installed base totalled 181,000 MW. Four-stroke engines accounted for approximately 60% of the installed base and two-stroke engines for approximately 40%.

Services’ order intake for the review period increased by 14% to EUR 2,324 million. Larger service projects included an order from Shanghai Electric Power to convert the Maltese Delimara Power Station to operate on natural gas. Customer focus on the optimisation of maintenance and performance strengthened interest in long-term service agreements. The signed contracts included a 5-year technical management agreement with Golar Management Oslo for its LNG carrier fleet, and a 10-year operations and maintenance agreement for Central Generadora Electrica Huinall’s flexicycle power plant, located near Monterrey, Mexico. Net sales for the Services business reached an all-time high level of EUR 2,184 million, which represents 43% of Wärtsilä’s net sales.

**Manufacturing review**

Wärtsilä’s manufacturing is focused mainly on the assembly, test running, and finishing of products and key strategic components. The company’s business model, which is strongly connected to a broad network of suppliers, guarantees flexibility in capacity. Being close to the customer is important, as is the focus on quality and the continuous emphasis placed on technology leadership in the company’s R&D activities.

Wärtsilä provides products and systems that are reliable, cost efficient, functional, environmentally compatible, technologically advanced, and capable of being integrated into solutions or delivered as stand-alone equipment.

**Manufacturing footprint**

Wärtsilä’s manufacturing footprint is global and continuously optimised for competence, availability, customer presence, and efficiency. As structural changes continue in the end markets, the focus remains on strengthening the company’s presence in key markets, such as China. This enables better service to customers locally, and allows savings to be achieved in both production and transportation costs.
Wärtsilä currently has five joint ventures globally. In Korea, dual-fuel engines are manufactured for the LNG carrier markets in partnership with Hyundai Heavy Industries Co. In China, engines are produced for local markets in two joint ventures with a third under construction. The Wärtsilä Qiyao Diesel Company Ltd joint venture manufactures medium-speed auxiliary engines, the Wärtsilä Yuchai Engine Co., Ltd joint venture manufactures medium-speed auxiliary and main engines, and, once finalised, the CSSC Wärtsilä Engine Company Ltd will manufacture medium and large bore medium-speed diesel and dual-fuel engines. The Wärtsilä CME Zhenjiang Propeller Co. Ltd. joint venture, also located in China, produces fixed pitch and controllable pitch propellers. In addition to these, the Winterthur Gas & Diesel Ltd (WinGD) joint venture with China State Shipbuilding Corporation has assumed responsibility for Wärtsilä’s low-speed engine business.

**Wärtsilä’s global supplier network supports flexibility in manufacturing**

Through close co-operation, excellent relations, and the sharing of information with suppliers, the supply of components and market-conform lead times are secured. Wärtsilä has around 1,100 suppliers globally. The sourcing strategy is to focus on carefully selected suppliers, with a strong emphasis on performance, innovation, and a presence close to Wärtsilä’s manufacturing units and joint ventures. The aim is to continuously develop and strengthen the company’s global supply chain with a strong emphasis on quality and cost competitiveness.
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

R&D EXPENDITURE
PERCENT OF NET SALES

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. Wärtsilä solutions for IMO NOₓ Tier III are:

  - Selective Catalytic Reduction (SCR)
  - Gas engine (dual fuel in gas mode)

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.
The HERCULES programme ad 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.