A clean environment
Towards zero-emission shipping

BUSINESS WHITE PAPER

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KEY BENEFITS

- Compliance with local and global regulations
- Energy and cost savings from improved operational efficiency
- Reduced emissions and better environmental performance
- Enhanced credentials as a sustainable business
1. Introduction

Environmental protection is a key driver in the maritime industry today, both in terms of meeting legislative requirements intended to safeguard marine life and reduce emissions, and helping ensure a clean, sustainable future for our planet. In addition, society in general is becoming increasingly aware of sustainability issues, and investors are also showing greater interest in this area, including the need for social return on investment.

Beyond helping to ensure compliance with regulations, integrating environmental issues into business planning can bring considerable competitive advantages in the form of more cost-efficient operations and an enhanced brand image.

Vessel owners and operators should seek to partner with organisations that can help them ensure compliance and reduce their environmental footprint in the most efficient way possible. In order to comply with the vast number of different regulations, a holistic approach that takes into account the whole life cycle of the vessel is needed – from feasibility studies to installation and maintenance. The goal is to significantly reduce emissions while simultaneously optimising performance and reducing downtime, fuel consumption and costs. The result is a win-win – better for the environment and better for vessel owners’ balance sheets.

2. Striving for sustainable performance and ensuring compliance

Shipping connects countries and markets, and forms the backbone of international trade, while the global cruise industry continues to grow at a rapid pace. The maritime industry has a responsibility to strive for sustainable performance in order to minimise exhaust gas emissions and other forms of pollution caused by shipping. The industry is subject to a wide variety of environmental regulations, both local and global, meaning that regulation management and ensuring compliance are a critical part of any organisation’s environmental planning. Consequently, working with a partner who has a thorough understanding of the operative environment and the applicable environmental requirements brings significant benefits.

REGULATIONS FOR CLEANER AIR

The main pollutants from maritime transportation are greenhouse gases (GHGs), sulphur oxides (SO\textsubscript{X}), nitrogen oxides (NO\textsubscript{X}) and fine particle emissions.

The reduction of sulphur oxide (SO\textsubscript{X}) emissions from marine vessels has been a priority for some time due to the harmful impact they have on both human health and the environment. Rules have been introduced stipulating global limits and specifying local Emission Control Areas (ECA) limits. The year 2020 will be a turning point for both the maritime industry and worldwide shipping operations as a whole as the IMO’s global 0.5% sulphur cap comes into force.

According to the Third IMO Greenhouse Gas Study 2014, maritime transport emits around 1,000 million tonnes of CO\textsubscript{2} annually and is responsible for about 2.5% of global GHG emissions. When it comes to limiting CO\textsubscript{2} and other GHG emissions, the EU’s MRV regulation requires all ship owners and operators with merchant vessels larger than 5,000 GRT to monitor and report the verified amount of CO\textsubscript{2} emitted by their vessels on voyages to, from and between EU ports. The IMO also plans to introduce a global CO\textsubscript{2} reporting standard. A new major international agreement plans to reduce GHG emissions by 50% from 2008 levels by 2050.

REGULATIONS FOR CLEANER WATER

To avoid whole ecosystems being destroyed by the introduction of alien organisms, new rules regarding ballast water have been introduced. The Ballast Water Management (BWM) convention, which came into force in September 2017, means that every ship above 400 GRT will have to install a type-approved ballast treatment system at its next mandatory International Oil Pollution Prevention (IOPP) survey.

Global regulations relating to wastewater include Annex IV and Annex V of MARPOL. Annex IV contains regulations for the prevention of pollution by sewage from ships, while Annex V contains regulations for the prevention of waste discharge from ships, including specific restrictions for various types of waste. There are also numerous initiatives for dealing with such areas as black and grey water discharge, including non-discharge zones and port facilities compete with onboard cleaning.
NOX REGULATIONS
The combustion of fossil fuels is by far the dominant source of NOX emissions. NOX contributes to acid deposition and eutrophication, which in turn can lead to potential changes in soil and water quality. The subsequent impacts of acid deposition can be significant, including adverse effects on aquatic ecosystems.

SOX REGULATIONS
These regulations seek to limit emissions of sulphur oxides, which have serious impacts on both human health and global warming. Shipping SOX emissions are substantially higher than those of road transport (by a factor of 1.6 to 2.7), and international shipping produced approximately 80 times more SOX emissions than aviation in 2000.

THE BALLAST WATER CONVENTION
This legislation aims to mitigate the risk of the anthropogenic spread of invasive species across the globe, reducing the effects these species have on both the economy and environment of the receiving ecosystem. Ballast water management solutions (BWMS) enable vessels to comply with local and global regulations and function as a passport to international trade.

BLACK AND GREY WATER REGULATION
The discharge of sewage and other wastewater is regulated by Annex IV of the International Convention for the Prevention of Pollution from Ships (MARPOL) as well as by local regulations. In practice, systems for handling waste enable better possibilities to reuse and recycle the water. All water used on a vessel should be processed through a grey and black water treatment system. The dried waste is handled together with biomaterial and other burnable waste that can be incinerated on board.

The maritime industry has a responsibility to strive for sustainable performance in order to minimise exhaust gas emissions and other forms of pollution caused by shipping.
3. Cutting costs and emissions through intelligent planning

Environmental planning and intelligent investments help companies to reduce emissions and comply with regulations. And when a company integrates environmental thinking into its business planning, it also improves operational efficiency, resulting in cost savings.

The increasing availability of alternative liquid fuels and gas, together with stricter environmental and safety requirements, creates opportunities to improve the operational efficiency of vessels while simultaneously reducing their environmental impact.

Wärtsilä strives to develop smart, innovative solutions that enable our customers take their operations towards the industry’s ultimate goal – zero-emission shipping. While many of these solutions come as standard in new builds, Wärtsilä Services is focused on helping our customers stay compliant by offering solutions that make their existing fleet more environmentally friendly – throughout the whole life cycle of a vessel.

EXAMPLES OF ENVIRONMENTAL SERVICE SOLUTIONS

1. HYBRID SYSTEMS
Battery and diesel or dual-fuel hybrid systems optimise energy efficiency by running the engine at optimal load and absorbing load fluctuation into the batteries. Hybrid control algorithms for load sharing between units and efficient power and energy management are a key element in these systems. 

Benefits:
— Optimise engine operation
— Ensure cost efficiency and flexibility
— Comply with environmental regulations

2. NOX REDUCTION
Selective catalytic reduction systems are an efficient way to reduce NOx emissions. The solution should be designed for vessels seeking to meet the IMO Tier III NOx limit and regional NOx regulations, and should be able to be switched on or off while operating within or outside an ECA.

Benefits:
— Comply with emission regulations while reducing environmental impact
— Reduce operating costs through access to less costly fuel
— Avoid issues relating to fuel switching, storage and availability as well as technical issues

3. SO2 REDUCTION
SO2 wet exhaust gas cleaning systems should be tested and certified according to IMO guidelines, ensuring safe operation and compliance with MARPOL Annex VI, Regulation 4. Exhaust gas cleaning systems not only reduce SO2, but also remove large levels of particulate matter (PM) and black carbon.

Benefits:
— Comply with emission regulations while reducing environmental impact
— Reduce operating costs through access to less costly fuel
— Avoid issues relating to fuel switching, storage and availability as well as technical issues

4. BALLAST WATER MANAGEMENT SOLUTIONS (BWMS)
A BWMS mitigates risk of the anthropogenic spread of invasive species across the globe, reducing the affects these species have on both the economy and environment of the receiving ecosystem. A good BWMS should ensure compliance with both local and global regulations.

Benefits:
— Comply with local and global regulations
— Safe, automatic and cost-efficient operation
5. FUEL CONVERSIONS
LNG is becoming increasingly viable and popular as a marine fuel. Retrofitting a vessel to run on LNG reduces CO₂ and NOₓ emissions while eliminating SOₓ emissions when compared to vessels that run on HFO.

Benefits:
— Reduce emissions, emission-related fees, and fuel costs
— Enhance sustainability credentials

6. INTELLIGENT DIGITAL SOLUTIONS
Intelligent data collection and analysis enables vessel operators and owners to efficiently and reliably monitor and report data in a compliant manner — including data relating to fuel consumption, CO₂ emissions, distance travelled, time spent at sea and other energy-efficiency indicators required by regulations.

Benefits:
— Optimise trim in real time to save fuel and reduce emissions
— Optimise speed and equipment usage to save fuel and ensure just-in-time arrival as well as optimise operational efficiency of equipment
— Analyse a vessel’s route to enable more efficient navigational decisions

7. SHORE CONNECTION SYSTEMS
A shore connection system enables ships to meet their electrical power requirements when the engines are shut down. Taking the power from the shore instead of from the engines eliminates exhaust emissions and noise pollution.

Benefits:
— Fulfil power requirements in port without generating exhaust emissions or noise pollution
— Ensure compliance with existing and future regulatory requirements relating to environmental performance

8. WET AND DRY WASTE MANAGEMENT
A complete, fully integrated wet and dry waste treatment solution enables compliance with existing environmental standards that require effluent to be clean and safe.

Benefits:
— Reduce waste storage and energy needs
— Comply with regulations while reducing environmental impact

9. FRESH WATER GENERATION SOLUTIONS
Desalination and evaporator technologies are both viable solutions for generating fresh water on board a vessel.

Benefits:
— Ensure a reliable supply of high-quality drinking water
— Reduce vessel impact on local water supply

Wärtsilä strives to develop smart, innovative solutions that enable our customers take their operations towards the industry’s ultimate goal – zero-emission shipping.
4. Transparency and its impact on the bottom line

In addition to legislation, there are a number of other factors driving decisions relating to environmental performance, in particular an increasing level of awareness among society in general. Companies need to be more transparent when it comes to sustainability and the actions they are taking to improve their performance in this regard. In this way, public opinion has a direct impact on the bottom line.

Society is increasingly demanding that private and public companies serve a social purpose. To succeed in the long term a company must not only perform well financially, but also clearly demonstrate how it is making a positive contribution to society. In the future, the pricing of climate risk by financing institutions will motivate capital to flow from fossil towards renewable sources of energy. A large environmental footprint will have a negative impact on a company’s credit rating and may result in poorer credit terms. In the worst case scenario it may even limit or completely block access to capital and new sources of finance.

The journey from fossil fuels towards zero-emission shipping has already begun and will be facilitated by the development of new technologies. New, stricter environmental regulations on SO₂, NOₓ and GHG emissions will drive the development of new technology. Lastly, public opinion will play an increasingly important role in driving the industry towards a more environmentally friendly direction.

HOW WÄRTSILÄ CAN ASSIST WITH COMPLIANCE AND IMPROVING COST EFFICIENCY

Wärtsilä believes that the the zero-emission shipping of the future must be based on a combination of different technologies and solutions. These will include cleaner fuels, more efficient vessel designs, hybrid propulsion technologies and intelligent vessels.

Wärtsilä Services helps vessel owners and operators to improve both fuel efficiency and environmental performance by implementing upgrades, reconditioning projects, fuel conversions and retrofit solutions. Our solutions enable compliance with environmental legislation while extending the operational lifetime of the vessel, as well as meeting the growing sustainability demands of customers, other stakeholders and society as a whole.

WE OFFER:
— End-to-end retrofit services – from engineering to installation and maintenance – that ensure vessels are compliant with regulations and future-proofed
— Energy efficient, innovative and flexible solutions that reduce environmental impact by reducing or eliminating emissions
— Upgrades and modernisations that minimise downtime

To succeed in the long term a company must not only perform well financially, but also clearly demonstrate how it is making a positive contribution to society.
5. Conclusion

Environmental awareness among both maritime industry stakeholders and society at large is increasing and playing a major role in decision-making. Meeting these needs while at the same time complying with environmental regulations requires vessel and fleet performance to be optimised, thereby reducing emissions and increasing the cost-effectiveness of operations. Environmental planning helps you to reduce emissions and take regulatory requirements into account while improving operational efficiency and building a reputation as a sustainable business.

LEARN MORE:
To explore our environmental services, please visit wartsila.com/services/areas-of-expertise/environmental-services
Lifecycle services that enhance your business

Wärtsilä Services provides lifecycle services that enhance our customers’ business performance. We provide the industry’s broadest range of services for shipping and power generation. Our solutions range from spare parts and basic support to maximising installation lifetime, improving efficiency and guaranteeing equipment or installation performance. – safely, reliably and in an environmentally sustainable way.