

# Membership case study: Wärtsilä



## Solving marine sector cost and emission challenges through the use of natural gas.

As marine sector operating costs continue to rise and regulations become increasingly stringent, Wärtsilä views natural and liquefied natural gas (LNG) as having all the potential for solving the economic and environmental challenges facing the industry

### CONTEXT & OBJECTIVES

It has become clear that curbing global warming will require a significant drop in greenhouse gas emissions. While shipping is already regarded as being the most sustainable form of world trade transportation, more can surely be done to improve the situation in an economically sound way. Change is being further driven by tightened regulations and the obvious desire to cut operational costs, of which fuel accounts for a whopping 70 percent.

Wärtsilä views natural gas, and particularly liquefied natural gas (LNG), as having great potential to be part of the solution, and the company has made a significant contribution to the promotion of gas as a marine fuel by developing appropriate engine and bunkering technologies and addressing related challenges.

### SOLUTION

**One of the more recent and most practical examples of ways in which Wärtsilä is enabling the use of gas in shipping is the passenger ferry 'Viking Grace'. The vessel entered service in January 2013 and is now operating between Turku and Stockholm in the Baltic Sea.**

The vessel was equipped with four dual-fuel main engines (Wärtsilä 8L50DF) to give it multi-fuel capability, making it the largest and most environmentally sound passenger ferry thus far to operate on liquefied natural gas. The owner of the vessel, Viking Line, has also signed a maintenance agreement with Wärtsilä, one of the goals of which is to ensure optimal operating efficiency and fuel consumption, thereby lowering operating costs.

The dual-fuel engine technology enables the use of LNG and allows this ferry to sail without restrictions in Sulphur Emission Control Areas

(SECAs) and Nitrogen Emission Control Areas (NECAs).

Wärtsilä has been at the forefront in developing dual-fuel technology and during recent years has launched a series of gas fuelled engines. These 4-stroke engines, namely the Wärtsilä 50DF, Wärtsilä 34DF and Wärtsilä 20DF, represent the best technology available in terms of efficiency and low emissions. Worldwide, the company's dual-fuel engines have accumulated more than 7 million running hours in marine and power plant applications. With the impending availability of new low pressure 2-stroke dual-fuel engines, LNG thus becomes a very viable solution for the global fleet. These engines offer the flexibility to switch between liquid and gaseous fuels without any interruption in power generation.

Besides the technology needed for utilising gas to fuel the engines, technological challenges related to bunkering the fuel have also had to be solved. The Wärtsilä LNG Pac system installed onboard the Viking Grace allows bunkering within no more than half-an-hour, while also controlling the pressure and boil off in a safe way. This is an imperative for a passenger ferry having to be loaded and unloaded within 60 minutes at each harbour.



## Viking Grace facts

Length, overall 218 m  
Breadth 31.8 m  
Draught 6.8 m  
Gross Tonnage 57 000  
Net tonnage 37 600  
Speed service 21.8 kn (85% MSP)  
Deadweight 5030 ton

**Cabins:**  
Passenger 880  
Crew outside 200  
Total 1080

**Lane metres:**  
Trailers on Deck 3 1 275 lm  
Cars on Deck 5 550 lm (abt 100 cars)

## OUTCOMES

When fuelled by liquefied natural gas, the Viking Grace's sulphur oxide emissions are almost zero, and its nitrogen oxide emissions are at least 80 per cent below the International Maritime Organization's (IMO) current stipulated level.

Furthermore, there is a reduction in particulate emissions of more than 90 per cent compared to those of conventional diesel engines, while carbon dioxide emissions are also 20-30 per cent lower.

The Wärtsilä dual-fuel engine technology, combined with the LNG Pac system, ensure that gas can be utilized without need of any special arrangements to enable the normal use of marine vessels.



Top view of LNG Tanks mounted on the stern of Viking Grace

## Customer Quote:

"It is in our best interests to co-operate with Wärtsilä, since they are experts in the development of new types of engines and the use of alternative fuels to achieve low specific fuel consumption and environmentally safe operations. Wärtsilä is a domestic supplier close to us and offers us the opportunity to collaborate regarding operational matters, engine maintenance, technical training and field testing. All this is very important, especially now that Viking Line is entering a new era of gaselectric driven operation."

## Tony Öhman

Technical Director in charge of Marine Operations and Newbuilding at Viking Line



## What are the first steps people can take to replicate this idea/initiative?

1. **Secure the availability of LNG as bunkering fuel through the expansion of de-centralised mini-scale liquefaction capability located at dedicated ports**
2. **Investigate applicable alternative sources of gas, such as biogas, Liquefied Petroleum Gas (LPG) and Volatile Organic Compounds (VOC) in combination with gasification, mini scale liquefaction capacity or gas reforming (with the Wärtsilä GasReformer system)**
3. **Consider applying gas technology also for ocean going vessels (blue shipping) with the new Wärtsilä low speed (or 2-stroke) low pressure dual-fuel engines**

Wärtsilä is committed to working within the SSI and with other members to promote the development of more sustainable solutions and practices in the industry. We see fuel alternatives as being one of the key areas for development and have invested heavily in developing gas technology for shipping and offshore applications. In order to tackle the emission challenges, the industry will have to look beyond heavy fuel oil to alternative fuels, and by investing in gas technology we are also facilitating a transition towards other gaseous fuels, such as biogas. After an initial investment premium, gas engines have been proven to both cut costs and decrease emissions, and thus through utilizing gas, shipping can decrease its' emissions in an economically sound way. The Viking Grace also shows that gas is today safe to be used for all kinds of ships.



Viking Grace at Night

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### **More information:**

Wärtsilä solutions for marine and oil & gas markets  
Wärtsilä Dual-fuel engines  
Wärtsilä LNG Pac

### **Articles:**

LNG and the future of shipping  
Enabling the safe storage of gas onboard ships with the Wärtsilä LNGPac

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