

EUROPE / GERMANY / CROATIA / NETHERLANDS /  
SWEDEN / FINLAND

# DUAL FUEL COMBUSTION IN NEW DIMENSIONS

Flexible firing solution by SAACKE Marine Systems for M/S Viking Grace – the first time LNG fuel has been used for a passenger ship of this size

With a length of 214 meters and room for 2,800 people and 500 vehicles, the passenger ferry M/S Viking Grace travels its route between Turku in Finland and Stockholm every day. The special feature: the newly constructed ship, completed in 2013, combines passenger comfort with a dual fuel concept that operates with heavy oil as well as marine diesel oil, marine gas oil and, most significantly, with natural gas. This is a world first for a ship of this size. The Viking Grace, manufactured at the STX shipyard in Turku, benefits from both fuel flexibility as well as reduced emissions. This improvement in energy efficiency is particularly important, given the existing and soon-to-be tightened provisions relating to the Emission Control Areas (ECA) at sea.

## WORLD'S FIRST DUAL FUEL BOILER PLANT ON A PASSENGER SHIP OF THIS SIZE

Due to its innovative character and the dimensions of the ship, this project posed a great challenge for everyone involved. SAACKE GmbH impressed with its dual fuel solution consisting of two FMB-VM boiler plants, each with a SKVG 50 burner, electrical control equipment, fuel supply modules for gas and oil and four exhaust gas boilers for heat recovery. SAACKE managed the entire process chain, from project planning and engineering through to manufacturing and commissioning and is also responsible for after sales service. This involved a number of different departments and locations from the international corporate network – from Germany, Croatia, Sweden and the Netherlands.

## KEY FACTS

STX Finland Turku / Viking Line

Ships & Offshore Plants

FMB-VM marine boiler  
& dual fuel SKVG burner

» The Viking Grace proves that natural gas can be used as marine fuel on a daily basis. We are proud that we were able to contribute to this innovation with our customized dual fuel boiler plant. «

Dr. Katharina Boeck – Project Manager SAACKE Marine Systems



## TASK

Deliver a boiler plant with dual fuel operation for a new ship.

## SOLUTION

Individually designed and flexible combustion system for firing gaseous and liquid fuels based on rotary cup atomizer technology.

### THE SAACKE SOLUTION IN DETAIL

The SAACKE FMB-VM is a steam boiler designed in line with the water-tube boiler principle and which is specifically intended for the shipping industry. The SKVG rotary cup atomizer is a duoblock burner with separate fan and is distinguished by its fuel and installation flexibility. The clean combustion of gaseous fuel reduces emissions and maintenance expenses for the boiler as well as the exhaust gas boiler.

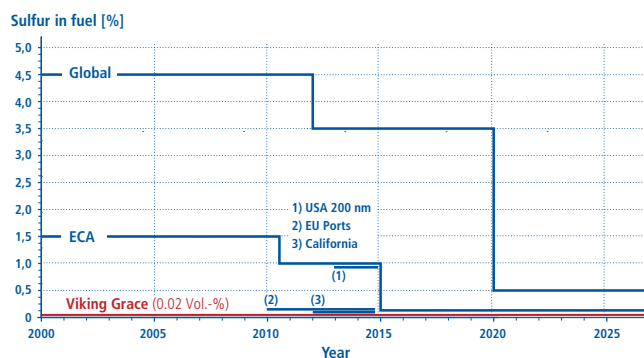
### CONCLUSION

SAACKE has been developing industrial combustion plants for over 80 years and is now one of the world's leading companies in this field. We have also been using our process know-how with a specific focus on marine boilers and gas burners for many decades. International system solutions from a single source, internally developed core components and customized products – a complete package, which also convinced our Viking Line customer.

### Key technical data

|                                     |   |
|-------------------------------------|---|
| <b>Boiler type</b>                  | 2 x FMB-VM  |
| <b>Steam generation</b>             | 7 t/h saturated steam per boiler / 7 bar  |
| <b>Design pressure</b>              | 10 bar  |
| <b>Burner type</b>                  | 1 x SKVG 50 per boiler  |
| <b>Burner capacity</b>              | 5.9 MW per boiler   |
| <b>Burner control range</b>         | 1:6   |
| <b>Fuel</b>                         | Heavy fuel oil (HFO), marine diesel oil (MDO), marine gas oil (MGO), natural gas (LNG)                      |
| <b>Emissions from gas operation</b> | At 0.2 g/kWh NO <sub>x</sub> and 0.02 Vol.-% SO <sub>x</sub> it is already well under the future IMO limits |
| <b>Exhaust gas boiler</b>           | 4 x EME-VFT   |
| <b>Steam generation</b>             | 2.05 t/h saturated steam per boiler / 7 bar   |
| <b>Design pressure</b>              | 11 bar  |

### Marpol Annex VI SO<sub>x</sub> Emission Limits



### The M/S Viking Grace

|                       |                                      |
|-----------------------|--------------------------------------|
| <b>Delivery</b>       | 2013                                 |
| <b>Length / width</b> | 214 m / 31.8 m                       |
| <b>Speed</b>          | max. 23.2 knots                      |
| <b>Capacity</b>       | 880 cabins for 2,800 passengers      |
| <b>Lane meters</b>    | 1,275 m for about 500 passenger cars |
| <b>Gross tonnage</b>  | 57,000 gt                            |

### ALL BENEFITS AT A GLANCE

- Compliance with existing and planned emission regulations
- Freedom from the price developments of individual fuels thanks to the alternative operation with HFO, MDO, MGO and LNG
- With this system it is not necessary to treat the exhaust gases, soot is not an issue
- Innovative technology for clean combustion
- High efficiency thanks to SAACKE rotary cup atomizer technology
- Improved reliability due to the low gas pressures on the burner
- Low maintenance costs and long service life

