The Wärtsilä 46DF is a four-stroke dual-fuel engine that can be run on natural gas, heavy fuel oil (HFO) or marine diesel oil (MDO). The engine can smoothly switch from gas fuel to HFO/MDO operation and vice versa without loss of power or speed. The Wärtsilä 46DF design is based on the well proven and reliable Wärtsilä 46F and Wärtsilä 50DF engine families, which have operated successfully on the market since the early 2000s.

Both engines have an outstanding track record, with more than 900 engines in operation and over 10 million running hours experience using Wärtsilä’s leading DF technology.

The Wärtsilä 46DF extends Wärtsilä’s dual-fuel engine family by covering the power range from 6.8 MW to 18.3 MW at 600 rpm.

**Application Flexibility**
The Wärtsilä 46DF is designed for a broad range of marine applications. Thanks to its fuel flexibility and the modular, compact design, the engine can be optimized for constant speed diesel electric operation. It also meets the need for direct drive main engine propulsion, operating at either constant speed or along a combinator curve. The multi-fuel operation capability offers new machinery opportunities for various vessel applications.

The Wärtsilä 46DF is an optimal prime mover solution for, amongst others:
- LNG Carriers
- Cruise ships
- RO-RO/PAX
- Ferries
- Large Offshore Units

### Key Benefits
- IMO Tier III Compliant
- Lowest gas fuel consumption in the industry
- Lowest fuel oil consumption in the industry
- Most powerful 4-stroke gas engine on the market
- Fuel flexibility
- Proven and reliable dual-fuel technology
- Long overhaul intervals
- Low exhaust gas emissions
- Low gas feed pressure
- Embedded automation system
Technology and Operation Advantages

Wärtsilä’s proven dual-fuel technology enables owners and operators to choose both gas and liquid fuel, and switch between the two according to cost, availability, and local environmental regulations. The switch between fuel types is made without loss of power or speed. The engine automation adapts automatically to the relevant fuel selection, both in normal and emergency modes.

In gas mode, the natural gas is fed to the engine at low pressure. This facilitates a simpler and space saving engine room configuration, while providing easier and faster maintenance activities.

The engine’s gas piping is double-walled as standard, and the advanced integrated automation system enables enhanced safety and local monitoring. This leads to safer and more reliable operations, under all conditions. The complete built-in automation minimizes the need for external controls, thus saving engine control room space.

The Wärtsilä 46DF is available with a choice of two performance criteria, depending on the application and customer requirements. The prime mover machinery can be optimized for either:

**Power** - to produce the best available power per weight ratio in its class, or

**Efficiency** - to give outstanding fuel energy consumption performance across the entire operating range regardless of the fuel mode selected.

### Technology and Operation Advantages

- 1800 ton/year less NO\textsubscript{x} emissions
- 75 ton/year less SO\textsubscript{x} emissions
- 25 ton/year less particulate emissions

**Assumptions:**
- MDO Price 620 €/ton, GAS price 410 €/ton
- 6500 hours/year sailing
- Fuel bill savings up to 10M €/year
- 30000 ton/year less CO\textsubscript{2} emissions

### Engine and Dimensions

**Wärtsilä 46DF**

**Dual-fuel vs conventional diesel**

**Case study subject:** ROPAX

**45 MW installed**

**6500 hours/year sailing**

- Fuel bill savings up to 10M €/year
- 30000 ton/year less CO\textsubscript{2} emissions

**Cylinder bore**

- 460 mm

**Piston stroke**

- 580 mm

**Cylinder output**

- 1145 kW/cyl

**Mean effective pressure**

- 23.8 bar

**Speed**

- 600 rpm

**Piston speed**

- 11.6 m/s

**CO\textsubscript{2}**

- -25%

**NO\textsubscript{x}**

- -85%

**SO\textsubscript{x}**

- -99%

**Particulates**

- -99%

**Diesel engine**

- Emission values [%]

### Engine Dimensions (mm) and Weights (tonnes)

<table>
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<tr>
<th>Engine type</th>
<th>A</th>
<th>A'</th>
<th>B</th>
<th>C</th>
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### Rate of Performance

**Engine type**

- kW

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</table>

**CO\textsubscript{2}**

- 7590 kJ/kWh @85%MCR

**NO\textsubscript{x}**

- 7485 kJ/kWh @85%MCR

**SO\textsubscript{x}**

- 7530 kJ/kWh @85%MCR

**Particulates**

- 7485 kJ/kWh @85%MCR

**BSGC**

- 7590 kJ/kWh @85%MCR

**BSEC**

- 7485 kJ/kWh @85%MCR

**DAMAGE**