

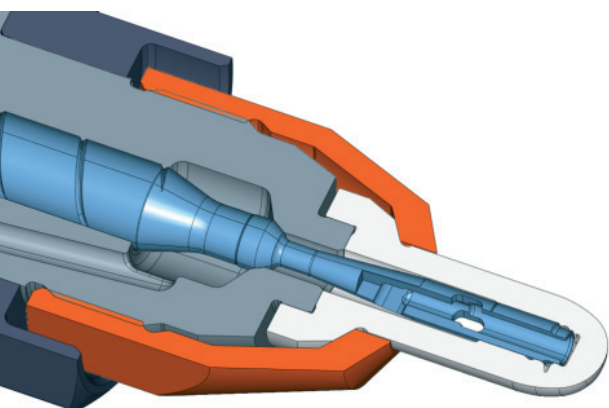
Wärtsilä FAST upgrade



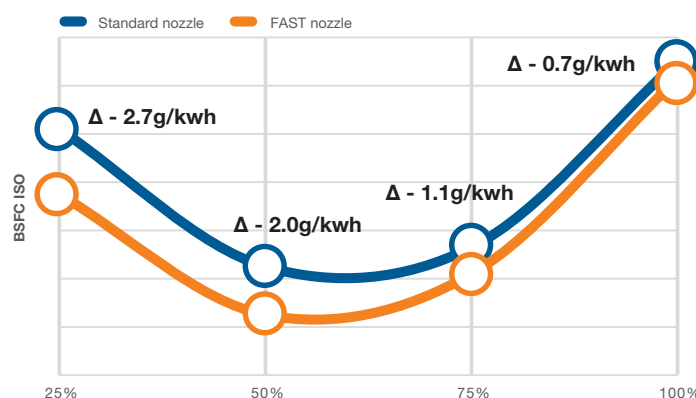
As a result of the exceptionally low freight rates in recent years, the cost pressure on ship owners and operators has risen considerably. Cutting operational costs is often the only way of staying competitive. All ship owners with Wärtsilä 2-stroke engines not yet equipped with FAST nozzles, should be looking for fuel savings and reduced fouling of the exhaust gas and piston running components.

Fuel costs make up the biggest share of the operational costs. Even if a ship owner is chartering out the vessel and the fuel is paid by the charter company, low fuel consumption is a significant benefit, as it makes the vessel more attractive for the charterer.

Unburnt fuel from the sac volume of a classical injector leads to incomplete combustion, which increases emissions and fuel consumption. This also forms increased combustion deposits in the exhaust gas system and piston running components, which may lead to extra maintenance costs for cleaning or component replacements.



Thanks to a prolonged injector needle and adapted nozzle atomizer, Wärtsilä FAST upgrade reduces the sac volume by up to 90%.



Fuel consumption measurement from RT-flex58T-D test bed running

REDUCED FUEL CONSUMPTION AND EMISSIONS

The Fuel Activated Sacless Technology (FAST) reduces the amount of unburnt fuel and reduces fuel consumption. It improves the combustion quality significantly and lowers hydrocarbon and carbon monoxide emissions.

KEY BENEFITS

- Reduced operational costs, fuel savings of up to 1%
- Reduced maintenance as exhaust and piston running components remain cleaner thanks to improved combustion
- Longer time between overhauls for injector nozzle



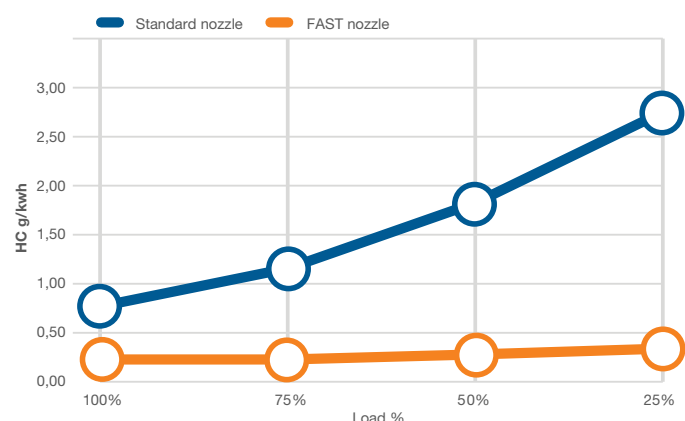
Thanks to a prolonged injector needle and adapted nozzle atomizer, Wärtsilä FAST upgrade reduces the sac volume by up to 90%. All fuel per cycle is injected with full injection pressure into the cylinder for improved atomization.

As the amount of unburnt fuel is reduced and the injection performance improved, the hydrocarbon and carbon monoxide emissions are significantly reduced. Moreover, the fuel consumption at part load is lowered by up to 1%. It has been proved that the exhaust gas components and piston running components operated with the Wärtsilä FAST upgrade are considerably cleaner than those of other engines.

The FAST upgrade is available for all Wärtsilä 2-stroke engines with the following product reference type and specification:

- **Medium size:** RT-flex50 B/D, RT-flex58T/B/D/E, RT-flex60C/CB, RT-flex68B/D Tier2, RT-flex82C Tier1 (up to 75% load Contract Maximum Continuous Rating)
- **Large size:** RT-flex82C Tier2, RT-flex82T, RT-flex84T-D Tier2 only, RTA96C, RT-flex96C-B without WHR, RT-flex96C-B with WHR (up to 75% load Contract Maximum Continuous Rating, only after confirmation of tests).

For other product reference types, please consult Wärtsilä.



Hydrocarbon emission measurement from RT-flex96CB test bed running

SCOPE OF SUPPLY

1. In-situ machining of cylinder cover to make a larger hole for a new nozzle atomizer

2. Replacement of fuel injector parts

- Nozzle body, including valve needle
- Clamping nut
- Nozzle atomizer
- Compression spring*
- Injection test bench*

*only for specific product reference types