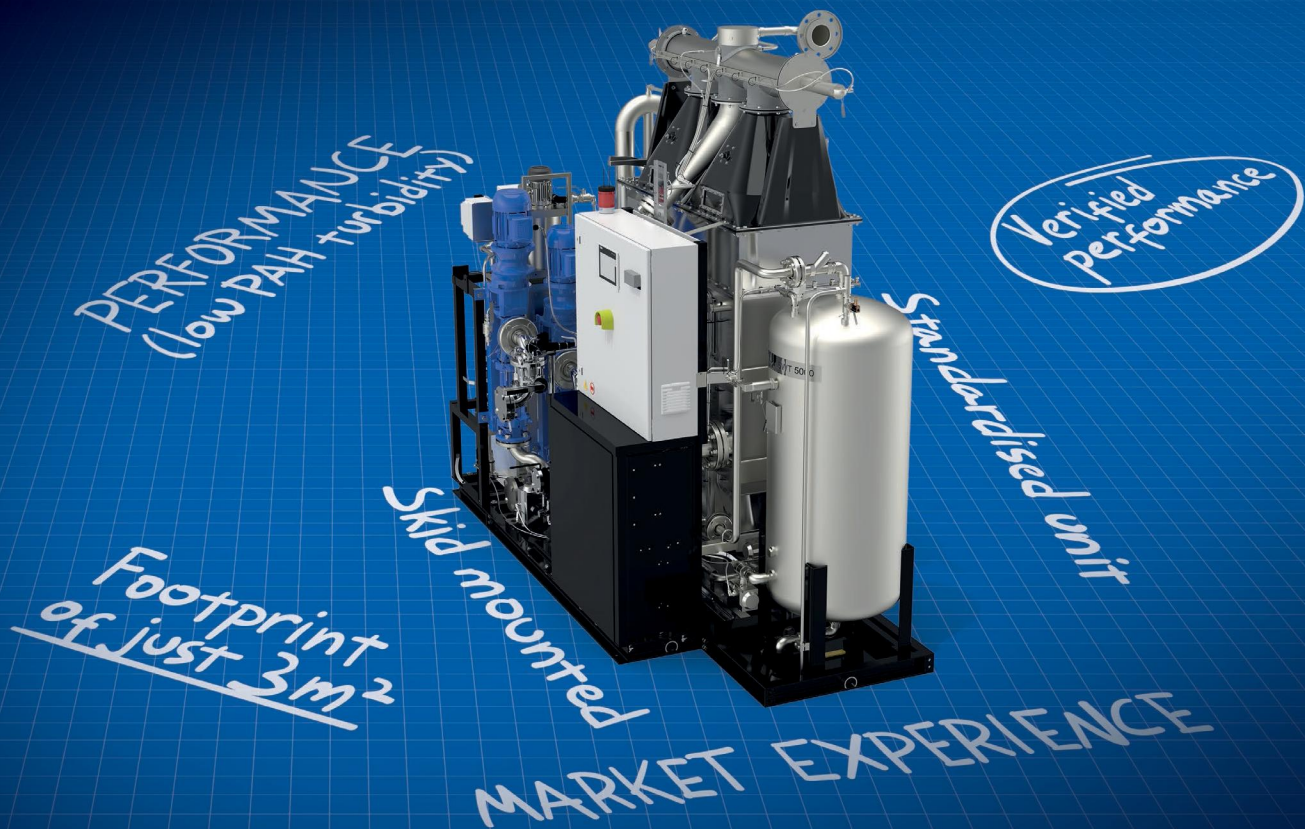


WÄRTSILÄ SCRUBBER WATER TREATMENT SYSTEM



Due to existing regulations on air emissions from the International Maritime Organization (IMO), the marine industry will need to choose path on how to achieve compliance. Ship owners must switch to costly low sulphur fuel, or choose abatement technology to meet the 0.1% sulphur level regulations in Emission Control Areas.

To support scrubber system operations Wärtsilä offer a Scrubber Water Treatment system to produce clean effluent which fulfils the IMO quality requirements and can be safely discharged into the ocean.

The Wärtsilä Scrubber Water Treatment system manages and treats scrubber water to enable it to be safely discharged into the ocean. It is often referred to as the heart of the scrubber system and our latest version – the SWT 5000 offers great improvements in producing and handling safe and clean effluent.

The Wärtsilä Scrubber Water Treatment system can today be installed together with scrubber systems as a new installation but additionally as a retrofit standalone system for upgrading

of old or non-working systems. The main feature with the system is the outstanding treatment results achieved without the need of any filter. The system is also unaffected by pitch and roll, meaning it isn't sensitive to the movement of the vessel.

The Wärtsilä Scrubber Water Treatment system can be offered alongside all Wärtsilä and other scrubber manufacturer hybrid and closed loop scrubber systems.

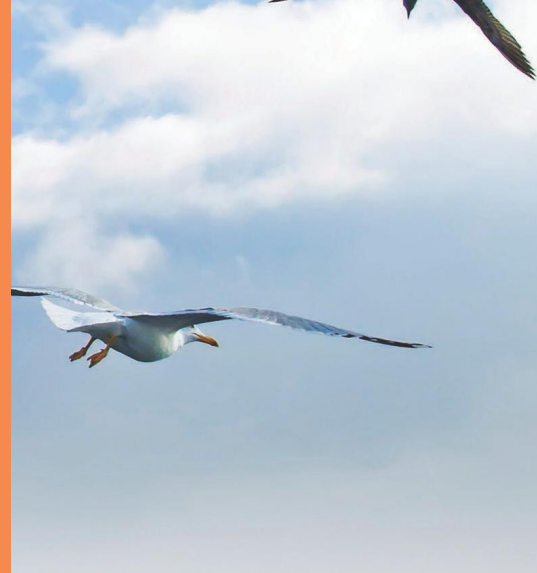


VERSATILE & FLEXIBLE TECHNOLOGY

Wash water is generated from all types of scrubber systems and if not treated can cause environmental damage to our oceans.

The Wärtsilä Scrubber Water Treatment system removes all accumulated impurities from the scrubbing water and clean effluent can safely be discharged into the sea.

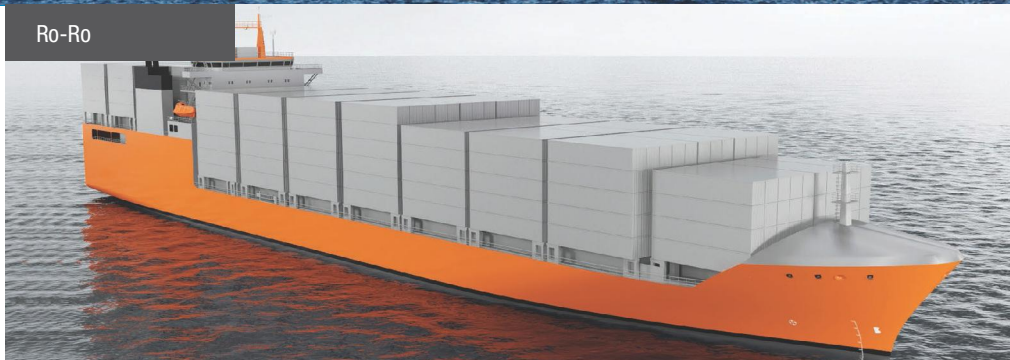
The technology is versatile and flexible enabling it suitable for many different applications. The systems has been fully tested according to all regulated scenarios and have up to date more than 10,000 operating hours on different installations.



TYPICAL APPLICATIONS

The Wärtsilä Scrubber Water Treatment system has been designed to serve the different needs and requirements for each segment and vessel type and has already been successfully installed in various applications. Its typical applications include;

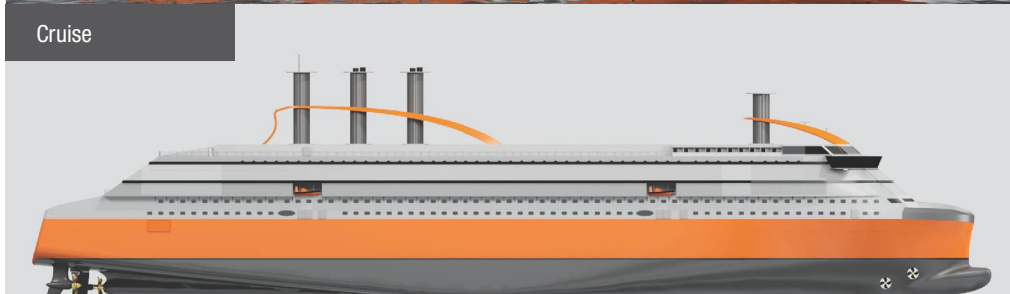
Ro-Ro



Merchant



Cruise

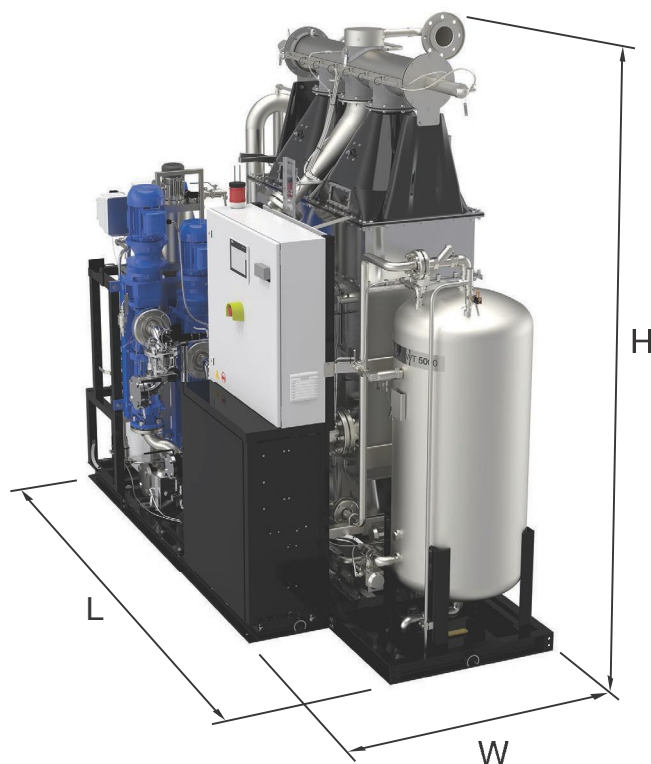


ADVANTAGES

- 5 years of scrubber water treatment experience.
- Extensive knowledge about scrubber water quality.
- > 10,000 operating hours over a wide range of operational settings.
- Tested the system to the highest capacity and extreme pollutant concentrations.
- Suitable for various operational conditions.
- Continuous work to optimize operations and minimize operational costs.

FOOTPRINT SWT 500

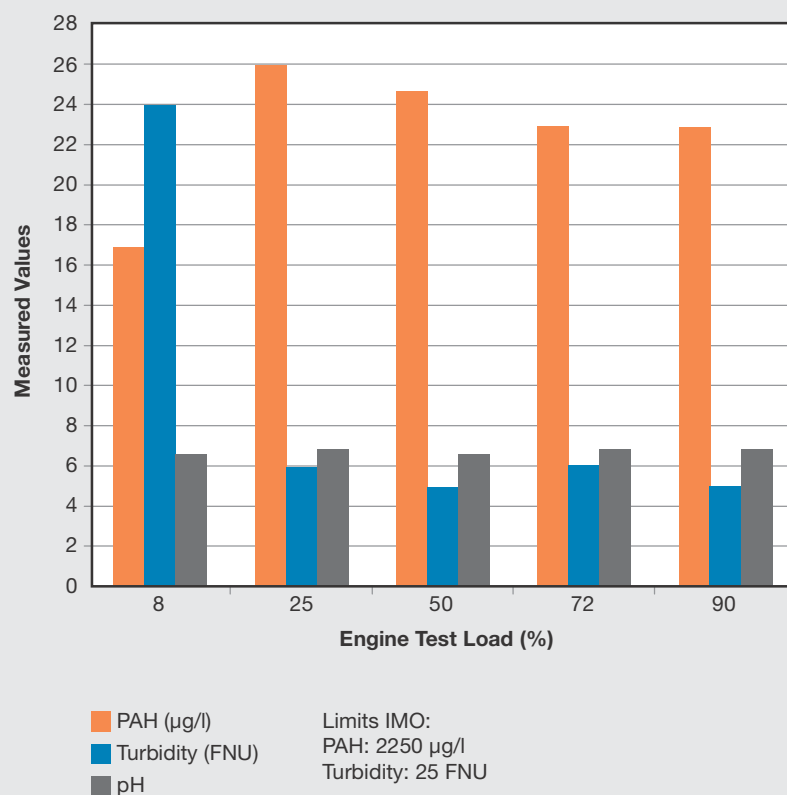
Model	Capacity m³/h	Capacity gal/h	Size (mm)			Size (inches)		
			Length (L)	Width (W)	Height (H)	Length (L)	Width (W)	Height (H)
SWT	5.0	31700	2760	1100	2565	108.7	43.3	101.0



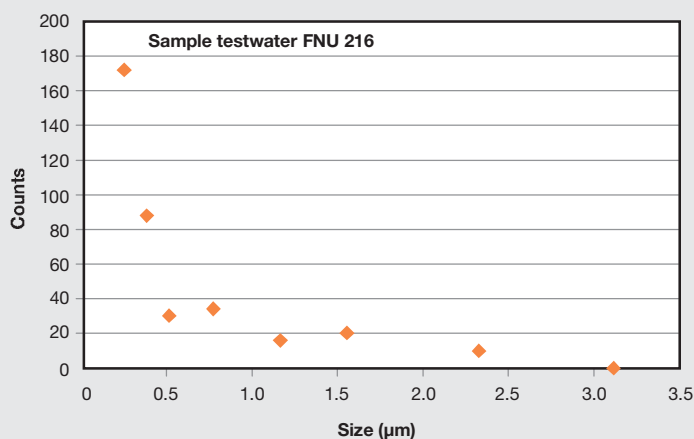
CAPACITY AND PERFORMANCE

- Capacity 5m³/h
- Effluent characteristics (in accordance to IMO requirements)
 - < 25 FNU
 - < 2250 µg/l PAH
 - > 6.5 pH
 - < 1350 nitrates mg/l
- Chemical consumption
 - Coagulant 0.05 - 0.2 l/MWh
 - Flocculant 0.005 - 0.015 l/MWh

pH, PAH AND TURBIDITY VALUES AFTER THE BLEED-OFF TREATMENT UNIT WITH HIGH SULPHUR FUEL (2,83% M/M)

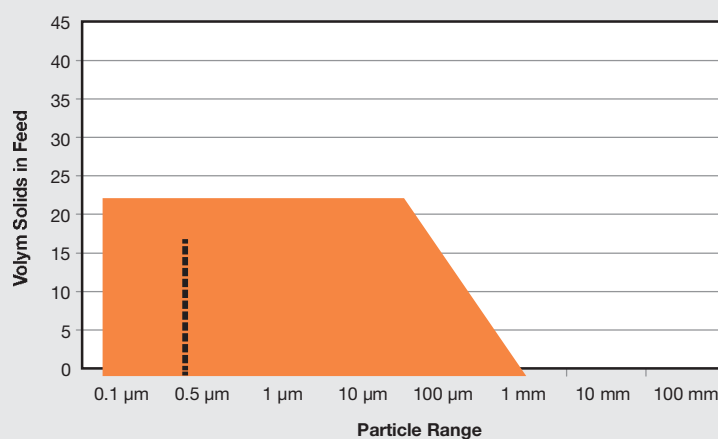


ANALYSIS OF PARTICLES IN SCRUBBER WATER



Source: Swedish Environmental Institute, www.ivl.se, Dr Fredrik Norén
Method: Leica Laborlux LM @100x, n.a.=1.3 optical resolution 0.23 µm

Scrubber water composition is a very complex mixture of soot, sulfite, sulfate and heavy metals. Analysis of water shows that the major particles are very small. Considering the small size of the particles, technologies such as centrifugal separation is not suitable for this application.



The Wärtsilä Scrubber Water Treatment system is designed to handle the specific high amount of small particles of soot and other purifications in the scrubber water composition.

AFTERSALES, SERVICE & SUPPORT

Wärtsilä supports its customers throughout the lifecycle of their installations by optimizing efficiency and performance. We offer expertise, proximity and responsiveness for all our customers in the most environmentally sound way.

Our services and support solutions range from basic support, installation and commissioning, performance optimization, upgrades and conversions to service projects and agreements focusing on overall equipment performance and asset management.

We deliver aftersales support through our network of service centres in over 70 countries worldwide.

