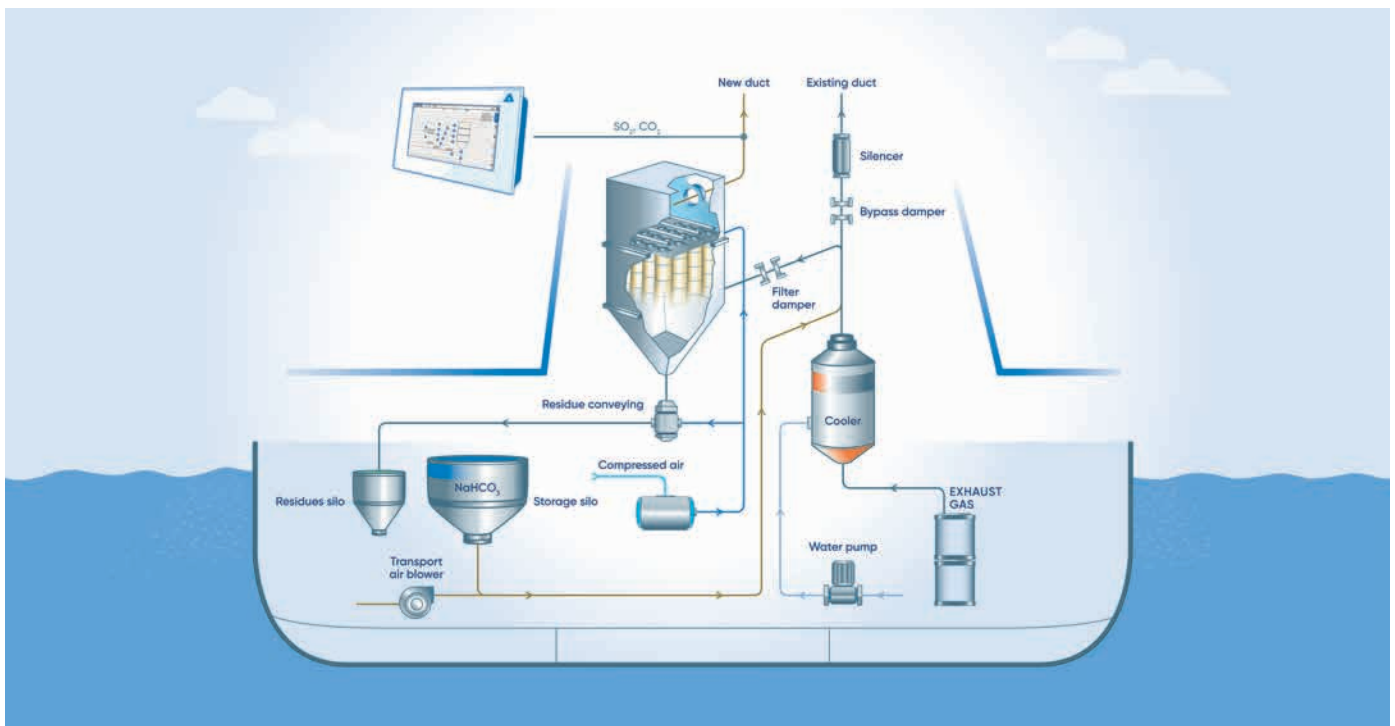


Dry desulphurisation and dedusting processes

EXHAUST GAS CLEANING To clean ship exhaust gases, Austria-based Andritz AG offers wet scrubbers (SeaSOx_{wet}) in open loop, closed loop, and hybrid versions. The company's latest development is a combined dry-based desulphurisation/dust removal plant – the Andritz SeaSOx_{dry}.



Operating principle of Andritz SeaSOx_{dry}

Source: Andritz

January 1st 2020 was the due date for the entry-into-force of tightened sulphur emission legislation. In order to comply with the new limits, ships must either use low-sulphur fuel or have a system for desulphurisation of exhaust gases in place.

Additionally, particulate matter emissions are moving more and more into the focus of discussions. As they can only be tackled to a limited extent with conventional wet scrubbers, Andritz has developed a system to combat SOx and dust emissions at the same time: the Andritz SeaSOx_{dry} technology.

In this desulphurisation process, powdered sodium bicarbonate (NaHCO₃) is added in metered doses to the exhaust gas stream. As a result of the high temperatures in the exhaust gas, the sodium bicarbonate is activated, causing it to decompose into reactive sodium carbonate that subsequent-

ly reacts with the SO₂ and SO₃ in the exhaust gas. This activation process requires temperatures of more than 150°C. The product of this reaction is solid sodium sulphate (Na₂SO₄). The reaction product, the excess sodium bicarbonate, and the soot and heavy metal particles from the exhaust gas form a porous layer – the so-called filter cake – on the surface of the filter bags in the fabric filter installed.

Without this filter cake it would be impossible to achieve the low SOx emission values required in ECAs (0.1%). What is more, the filter cake improves contact between the SOx molecules and the sodium bicarbonate, resulting in much better utilisation and lower consumption of the absorption agent. When a pre-set, maximum differential pressure is reached, the filter cake is cleaned off the filter bags by jets of compressed air and the solid material pro-

duced drops into the filter's collection hopper where it is discharged downwards. A conveying receiver is placed beneath each filter hopper and conveys the solids to the residual material container by means of compressed air.

In order to prevent damage to the filter bags as a result of the exhaust gas temperatures being too high, the gas temperature can be lowered by injecting water. As an alternative, it is possible to install a fan to mix cool outside air with the flow of hot exhaust gas. It is important to underline the fact that no waste water (or other residual material) is discharged into the sea, unlike the open-loop scrubber process. The auxiliary and operating materials do not present any health risks, and the noxious soot and dust from the exhaust gas is contained in the residual material in a bonded state.

According to Andritz, the SeaSOx_{dry} has the following advantages:

- › SO₂ removal to achieve a 0.1% sulphur content;
- › Low pressure loss in filter <15 mbar;
- › No waste water;
- › No exhaust gas plume (“hot” exhaust);
- › No chemicals of concern (NaHCO₃ is also known as baking powder);
- › Additional dust separation > 99%;
- › Exhaust gas from several sources can be cleaned at the same time;
- › No drydock required for installation;
- › Not dependent on sea water quality (can also be used in brackish or fresh water).

First system in use.

In 2018, a contract for an Andritz SeaSOx_{dry} system was signed with a customer in the South of France. After an intensive planning and construction phase by the project partners – La Méditerranéenne (shipping company), Solvay (supply and disposal of the reactants as well as technology provider) and Andritz (technology supplier and industrial plant engineer) – installation went ahead in April 2019. The *Piana* – the ship on which the equipment was retrofitted – is a passenger and car ferry with an output of 9.4 MW for each main engine and 1.3 MW per generator. The ship has a total of four main engines and two generators on board. One main engine and one generator were connected up to the SeaSOx_{dry} system. The system has been fully functional since May 2019. According to the first measurements by an independent, certified test institute, all of the emission targets laid down in the contract have been achieved without any difficulty; also when operating with high-sulphur fuel.

The supply of sodium bicarbonate is extremely flexible for this project, Andritz said. Depending on requirements, a silo truck drives onto the ship and is connected directly to the plant’s supply system, it explained. Disposal of the residual material is handled in the same way. Hence, the customer does not have to install separate storage tanks on board.

With its MED-G certification from DNV GL in July 2019, Andritz was awarded the first certification for a dry desulphurisation system. This is an important milestone for acceptance of the innovative technology by potential customers.

The qualification test for the IMO certification was successfully performed in October 2019.



The Andritz SeaSOx_{dry} system installed

Source: A.Ehrenhöfer, Andritz



The vessel *Piana* with filter installed beside the funnel

Source: S. Sauerzapfe