



MARITIME EXHAUST GAS CLEANING

ENVIRONMENTAL PROTECTION – SAFE AND EFFICIENT

Technologies

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ENVIRONMENTAL PROTECTION: NEW REQUIREMENTS FOR SHIPPING

Stricter limits for SO₂ -emissions

Shipping is regarded to be the most environmentally friendly transportation method of goods. Offshore areas, where heavy fuel oil with a high sulfur content is used as a propellant, are severely polluted by SO₂ -emissions.

To protect the environment, the permissible sulfur content of propellants has been gradually reduced since 2012 and

in 2020 shall only amount to 0,5 %. This was stipulated by MARPOL-Annex VI-Regulation 14 of the International Maritime Organization (IMO) which came into effect in 2005.

Consequently, the use of desulphurization systems is required after 2020 for world-wide operations or compliant fuels which have to be burned by the vessels.

SINCE 2015 SPECIAL REQUIREMENTS APPLY TO ECA-ZONES

Dedicated Emission Control Areas (ECA)-zones were established, particularly in coastal areas where especially strict regulations regarding SO₂-emissions apply:

Since January 1st 2015, vessels inside ECA-zones must be equipped with desulphurization systems or utilize expensive fuels with a sulfur content of 0,1 % max. At present the North and Baltic Seas, as well as the coasts of North America, are defined as ECA-zones; this will apply to all European waters from the year 2020.

Exhaust gas cleaning: the most economical solution

By installing Scrubbers ("Washers"), sulfur emissions are cleaned from exhaust gases, allowing strict environmental requirements to be met. There are additional economic

benefits from the retrofitting and within a very short time the scrubber pays for itself.

Scrubbers from Bilfinger Engineering & Technologies:
A secure and economical investment for the future

YOUR EXPERT FOR FLUE- AND EXHAUST GAS CLEANING

40 YEARS OF EXPERIENCE TO RELY ON

Bilfinger Engineering & Technologies has been operating in the field of flue- exhaust gas cleaning since 1980. Worldwide.

As an expert in innovative and well-tested process engineering, Bilfinger Engineering & Technologies realizes individual solutions at a high technical level. We provide flue gas cleaning systems e. g. for SO₂, SO₃, NO_x, HCl, HF and dust. Our range of services includes development, design, delivery and commissioning up to operation of systems and equipment delivered by us.

Our customers benefit from a fundamental wealth of experience and a variety of successfully realized projects – from industrial systems to applications in both power plants and waste-to-energy plants.

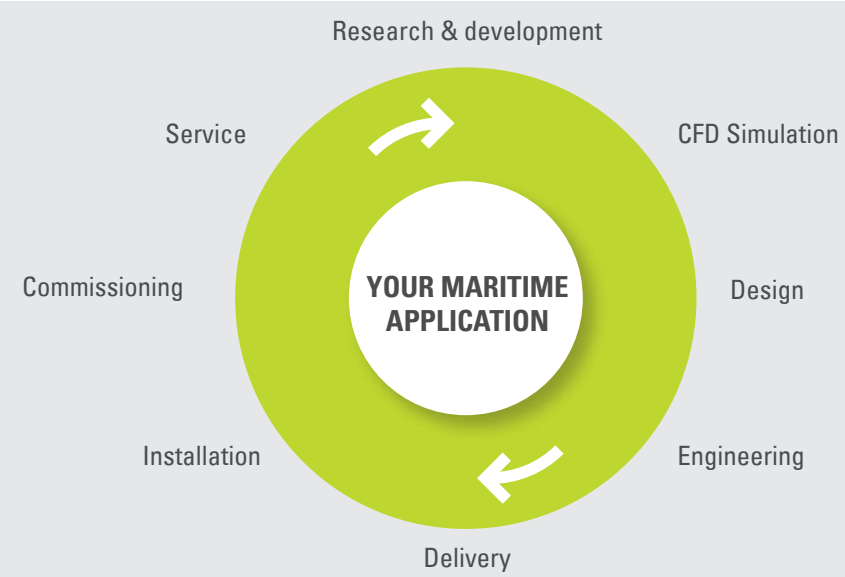
RESPONSIBILITY FOR THE OVERALL PROCESS

All services which are necessary for the successful realization of a project are provided by our engineers – from basic design to complete support of the installed system. We supply turnkey solutions with the corresponding necessary components such as absorbers, waste water treatment, pumps, measurement technology, heat exchangers and piping technology.

UTMOST DISCIPLINE: INSTALLATION IN THE SHIPYARD

To eliminate any arising complex and cost-intensive interface coordination, we also take responsibility for shipyard work with the associated design and classification services.

For short downtimes and a smooth installation.



Best Practice: Know-how transfer to maritime applications

For the development of Scrubbers for maritime applications, we rely on the proven wet process which we have successfully implemented many times onshore: due to its compact design, this washing procedure is both particularly space-saving and energy-efficient as sea water is used.

ONE SYSTEM – TWO OPTIONS

Hybrid Scrubber concept with many advantages

The Scrubber is generally applied as hybrid system on the vessel: it combines Open- and Closed-Loop operation within one scrubber unit. Our customers benefit from the opportunity to switch between both operation modes, depending on shipping routes and the corresponding statutory regulations.



THE ADVANTAGES

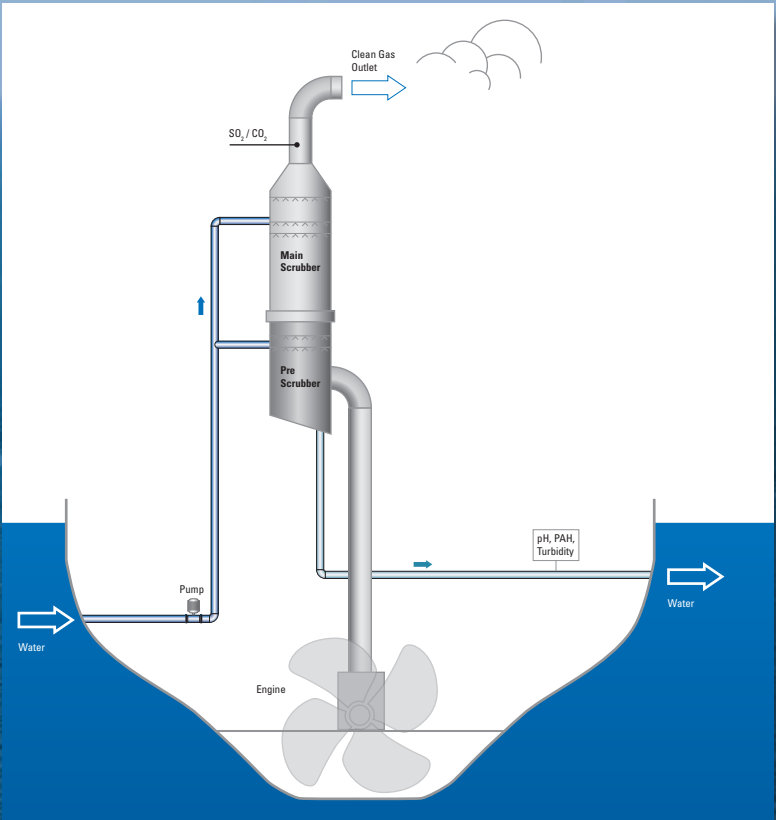
- 1 Low operating costs**
 - low fresh water and energy consumption
 - low pressure drop of plant
 - high corrosion resistance
 - low maintenance requirements
- 2 Optimal use of space due to extremely compact design**
- 3 High environmental friendliness through innovative process water cleaning**
- 4 High system reliability through the redundant layout of main components**
- 5 Well-engineered concept for the transfer of exhaust gas for multistream-applications**

For maximum efficiency
with extremely short payback periods

Open-Loop Scrubber

SIMPLE AND ROBUST

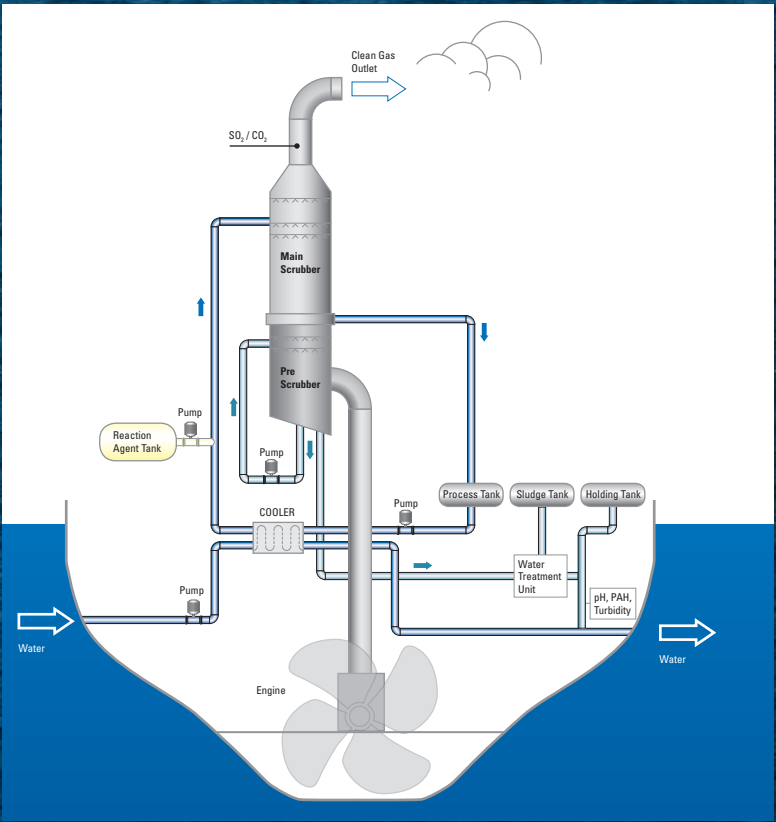
During Open-Loop operation, sulfur-containing exhaust gases are cleaned by the natural alkalinity of the seawater in a continuous process. The process water is discharged into the sea according to IMO-regulations.



Closed-Loop Scrubber

FLEXIBLE AND FUTURE-ORIENTED

During Closed-Loop operation, the Scrubber operates as a closed circulation process by supplying an additive for chemical (SO₂) separation to the wash water. As with the Open-Loop operation, the process water can be discharged or stored in a tank. In this way, waste water release in specially protected areas can be entirely avoided.



IT ALL DEPENDS ON THE EXECUTION

The system concepts of Bilfinger Engineering & Technologies also allow flexibility during execution: The Scrubber can be implemented as Single-Line or Multi-Stream.

Single-Line

The Single-Line Scrubber cleans the exhaust gas from one single emission source, typically from the main engine. Instead of the required exhaust silencer, the Scrubber is installed downstream of the main engine in the stack. The constructional expenditures are thus reduced to a minimum.

Quickly realizable –
with minimal effort

before installation

after installation

Multi-Stream

The Multi-Stream-Scrubber cleans the exhaust gases from several emission sources on a vessel e. g. main engines, auxiliary engines and boilers. The installation is usually carried out as a bypass-system. System components as well as cost-intensive emission measurement technologies are only needed once, leading to considerable savings.

Particularly space-saving –
with an optimal price-performance-ratio



A PROFITABLE INVESTMENT

Economical operation – worldwide

The Scrubber-system of Bilfinger Engineering & Technologies enables operation with proven and cost-efficient fuels in the ECA-zones as well as significant cost savings. Now and in the future.

Safety in environmental concerns

The strict regulations of MARPOL-Annex VI are fully observed by the Scrubber-system of Bilfinger Engineering & Technologies.

„With Bilfinger Engineering & Technologies we've found an extremely competent and above all reliable partner for exhaust gas cleaning. We were convinced by the economic benefits of the Scrubber-concept and the long-term experience of Bilfinger Engineering & Technologies. The project handling at the MT Aurelia is also proceeding very professionally.“

Lars Bremer, Managing Director Carl Büttner Shipmanagement

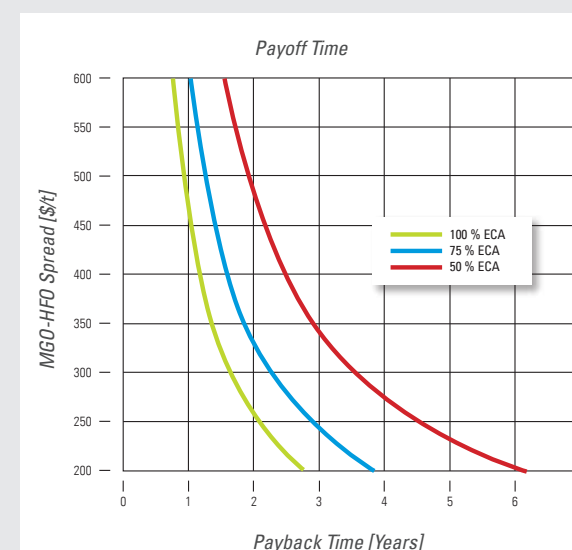
Create your own profitability profile

Our experts are pleased to advise and provide you with an individual profitability calculation tailored to your individual requirements and needs.

Free of charge and without any obligations.
Convince yourself of the benefits!

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ATTRACTIVE PAYBACK TIMES

The investment pays for itself within a short time. Depending on the length of stay in the ECA-zones and the price difference of the fuels, the system pays for itself after only 2-3 years.