

## Byline article

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### **The growing importance of flue-gas desulfurization in maritime shipping**

- **Bilfinger North America offers a one-stop source for scrubber engineering systems and equipment**
- **Orders worth more than 100 million euros secured for 71 vessels**

Despite the low CO<sub>2</sub> emissions it generates per ton-kilometer, maritime shipping has a serious environmental problem on its hands: high sulfur oxide emissions. This is because most vessels, for reasons of cost, are run on heavy fuel oil, whose sulfur content can be as high as 3.5 percent. Yet sulfur oxides are a suspected cause of respiratory illnesses and are known to acidify soils and bodies of water.

The International Maritime Organization (IMO) has responded to the problem by significantly tightening its worldwide limits on the sulfur dioxide emitted via the flue gas of ships: As of 2015, vessels travelling through special “emission control areas” (ECAs), such as the North Sea and Baltic Sea, must either use fuel with a maximum sulfur content of 0.1 percent or must be equipped with desulfurization systems. Starting in 2020, the maximum sulfur content permitted in all other bodies of water around the world will be 0.5 percent. According to information from the *Verband Deutscher Reeder* (VDR, German Shipowners’ Association), this will affect roughly 50,000 vessels worldwide.

### **Scrubbers: a clean and cost-effective solution**

This is where flue-gas desulfurization systems (scrubbers) can help. They reduce the sulfur oxide concentration in flue gas to the same extent as does the use of marine diesel or of other, comparatively more expensive low-sulfur fuels. So-called “wet” flue-gas scrubbers, which

employ seawater or freshwater for the cleaning process, are the type most often found in service today. However, regardless of the type of scrubber involved, the operative principle is always the same: Flue gases are brought in contact with water in order to initiate the cleaning process.

In the case of the so-called “open loop” scrubber, the flue gases are passed through seawater, whose natural alkalinity serves to “wash” them clean. Afterwards, the process water is channeled back into the ocean, subject to the relevant requirements stipulated by the IMO. The “closed loop” process, on the other hand, is a closed cycle in which sodium hydroxide or magnesium hydroxide are added to the mixture so as to neutralize the sulfuric acid. The process water is then treated and stored in a tank. There are also “hybrid” scrubbers, which combine the closed-loop and open-loop systems. These are particularly suited for areas in which the use of open loop systems is prohibited.

Scrubber systems are inexpensive to operate, environmentally friendly, and offer a high degree of operational readiness. The costs of such systems normally are recouped within a period of one year to two and a half years. As an industrial services provider, Bilfinger has an impressive track record in the field of flue-gas desulfurization, its experience reaching as far back as 1980. The company has now carried its expertise over to high-seas shipping, having adapted the technology to maritime conditions and to the specific types of flue gas to be scrubbed. Depending on the customer’s needs, Bilfinger offers open-loop systems as well as hybrid systems that can be installed on the vessel either as part of its original equipment or as a retrofit.

### **A range of customized solutions available from a single source**

Bilfinger’s North America’s business model is based on the turn-key concept. Thus, the company handles all of the various project phases, from development to manufacturing all the way to maintenance. This allows us to reduce those interfaces entailing the highest costs for the customer, particularly when it comes to the engineering services required to integrate the scrubbers into a vessel’s existing operating equipment. It is a range of services that only a few players on the market are capable of providing. Bilfinger’s size as a corporate group and the personnel resources the company consequently has available mean that even large series of scrubbers can be delivered to the customer and placed into service in timely fashion.

Bilfinger North America will be offering complete service packages for the local market, comprising 3-D scanning, scrubber design and installation planning, along with the supervision of the scrubber’s installation at a US yard and its commissioning. U.S.-manufactured scrubbers

will be used for vessels operating under the Jones Act in US waters. This local manufacturing and local engineering will make the scrubber a truly “American” product.

US owners who operate their vessels worldwide stand to benefit from Bilfinger’s expertise, too. The Bilfinger Group has extensive experience in retrofitting scrubbers in all types of vessels, be they bulk carriers, tankers or containers, at any location across the globe, from the Baltic Sea to the Far East. In addition, Bilfinger collaborates on retrofit projects with the owners’ preferred ship designers or shipyards.

When it comes to executing retrofits – a service increasingly in demand – a particular challenge is making optimal use of the vessel’s existing free space. The areas available for new construction on the ship generally will be limited, so that the preferred space-saving solution will be to install the scrubber system inside the vessel’s stack. This is also where the flue-gas lines, noise mufflers, and boilers are located. Given that installation costs make up a considerable portion of the total investment required for a retrofit (sometimes up to 50%), a scrubber with a space-saving design will be highly advantageous. Bilfinger has developed a solution in constructing its washer system that can be custom-tailored to the vessel’s particular circumstances and that also happens to be outstandingly cost effective. In many cases, it is possible to dispense with the so-called “backpack solution,” which is more cost-intensive.

#### **A high level of operating safety is a top priority**

A particularly critical feature of any scrubber is its safe operability. Also, it must comply with the required sulfur-emission limits. In addition, the water needed to wash out the sulfur must not be allowed to penetrate into the closed piping. To allow for these requirements, Bilfinger’s design provides for two-phase systems that feature the required emissions performance and reliably prevent any backflow thanks to their design and structural geometry.

Since the use of seawater coupled with high flue-gas temperatures entails the high risk of corrosion, Bilfinger employs premium-grade stainless steels in its washer systems, whereby the exact type of steel used will vary depending on its installed location. In selecting these materials, the company draws upon its long experience with land-based scrubber applications (e.g. in power plants). Bilfinger also places great store by ensuring that its plant engineering solutions are fit for the future. Take the wastewater-cleaning system used in the hybrid scrubber, for example: Here, Bilfinger employs a membrane technology that can be adjusted, at reasonable expense, to comply with the additional emission limits currently being debated.

### **Bilfinger's scrubbers are more cost efficient**

Besides corrosion resistance, another feature that helps keep the operating costs of scrubbers down is their resistance to pressure loss: The less pressure they lose, the less fuel they consume. Just one of the customers won over by this comprehensive range of services is Carl Büttner Shipmanagement, a shipping company based in Bremen, Germany. They had Bilfinger install a multi-stream scrubber with a hybrid system onboard its ocean-going tanker M/T Aurelia in 2016. After a test phase of only three months, the scrubber's effectiveness was certified by the "International Air Pollution Prevention Certificate." The system has been in trouble-free operation for two and a half years now and continues to deliver the desired scrubbing performance. While the success story validates the technology as such, it also confirms Bilfinger's own predictions of market growth: The company's order book for maritime flue-gas scrubbing is already worth more than 100 million euros, whereby a total of 71 tankers, bulk carriers, and container vessels are to be retrofitted. In order to meet this expected demand, Bilfinger is entering into partner arrangements with manufacturers in Asia.

### **Images**



Desulfurization systems (scrubbers) are able to reduce the concentration of sulfur oxide in flue gas just as markedly as the use of more expensive fuels that are lower in sulfur, such as marine diesel or low-sulfur heavy fuel oil (LSHFO).

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Scrubbers systems are inexpensive to operate and environmentally friendly while offering a high degree of operational readiness. Their amortization period ranges from 1 year to 2 ½ years.


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Bilfinger is a leading international industrial services provider. The Group enhances the efficiency of assets, ensures a high level of availability and reduces maintenance costs. The portfolio covers the entire value chain from consulting, engineering, manufacturing, assembly, maintenance, plant expansion as well as turnarounds and also includes environmental technologies and digital applications.

The company delivers its services in two business segments: Engineering and Technologies and Maintenance, Modifications & Operations. Bilfinger is primarily active in the regions Continental Europe, Northwest Europe, North America and the Middle East. Process industry customers come from sectors that include chemicals & petrochem, energy & utilities, oil & gas, pharma & biopharma, metallurgy and cement. With its 36,000 employees, Bilfinger upholds the highest standards of safety and quality and generated revenue of €4.153 billion in financial year 2018.



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