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Tackling the scrubber choice

WASTEWATER Luxembourg-based APATEQ has launched what it calls a green and cost-efficient one-stop solution for the treatment of wastewater generated from the operation of scrubbers for exhaust gas cleaning (scrub water treatment). The company's MarinePaq enables shipowners to clean their vessels' scrub water for direct discharge into the sea by combining ultra-filtration with innovative process technologies. One system has been installed for the Danish shipping company Scandlines in Gedser, Denmark.

Scandlines ferry *Copenhagen* arriving in Gedser with APATEQ's containerised MarinePaq installed in the port

In preparation for the 0.5% sulphur cap agreed by the IMO (International Maritime Organization) for introduction through Marpol Annex VI in 2020, APATEQ has designed and manufactured a new system to treat wastewater from scrubber operation.

The MarinePaq is available as a centralised onshore system while an onboard version will be launched soon. Thus, shipping companies can treat scrub water from their vessels themselves, saving on expensive water disposal costs for hauling the scrub water to the nearest industrial wastewater treatment facility, reducing reliance on external water service providers, saving time, and gaining flexibility. When implementing APATEQ`s MarinePaq technology across a whole fleet, shipping companies are said to benefit from a fast return on investment of typically a few months. The combination of field-proven membrane technology and innovative process technologies ensures a reliable operation at a low cost, the company said. The performance of MarinePaq is in full compliance with present legislation and can be easily adapted to meet future, tighter regulations, as the modular design of the system allows an increase both in capacity and performance, it added.

Scrub water is typically highly contaminated with hydrocarbons and soot arising from the combustion of heavy bunker oil. Current treatment technologies available on the market such as hydro-cyclones and centrifuges are often overstrained with scrub water, especially in terms of eliminating the tiny lightweight soot particles that act as carriers for hydrocarbons. By using the MarinePaq unit, even the smallest particles are reliably removed, providing an effluent that can be discharged directly into the sea, even in coastal areas and harbours, depending on prevailing regional regulations.

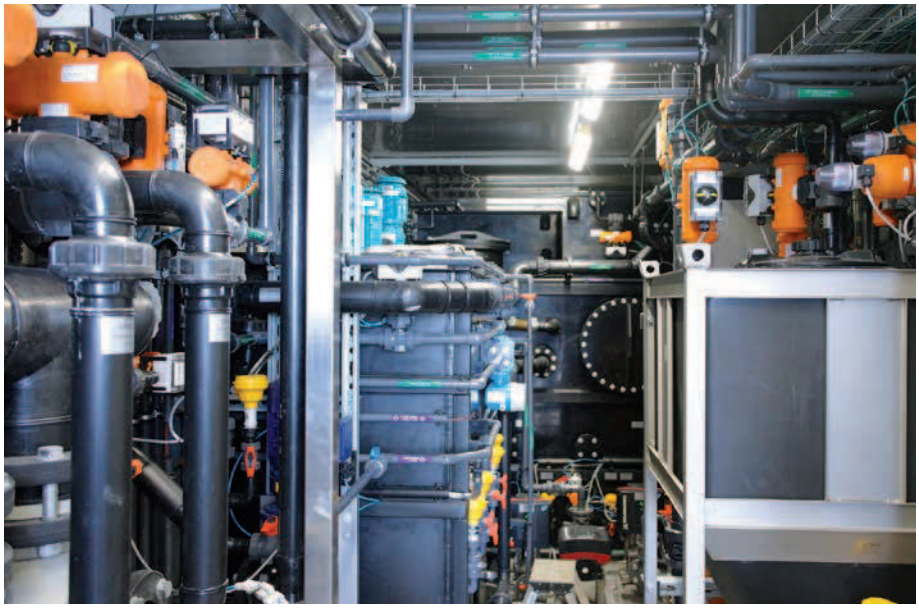
Installation in Denmark

A MarinePaq has been supplied for the Danish shipping company Scandlines in Gedser, Denmark. Installed at the port, the MarinePaq treats the scrub water ›

produced on board the two recently launched ferries on the Rostock - Gedser route, equipped with closed-loop scrubbers. When the scrub water cannot absorb more waste products, it is pumped into the shore-based MarinePaq. Equipped with scrubber technology and driven by a hybrid propulsion system, Scandlines sets up an infrastructure on a pioneering green level that is capable of facing toughening and constantly evolving regulations.

The onshore MarinePaq is based on a multi-stage treatment system designed to fit into several shipping containers, depending on the treatment capacity. By stacking the containers, the MarinePaq can be easily installed in an existing harbour with a minimum footprint. The MarinePaq for Scandlines is housed in two 40' containers, stacked one on top of the other. The effluent from the installation is directly discharged into the harbour of Gedser.

Pumps drive water from a storage tank to the first treatment stage, a chemical-physical pre-treatment. It removes nitrite, sulphite, partially heavy metals and hard (non-biodegradable) chemical oxygen demand (COD). By means of APATEQ's ultra-filtration system, soot and remaining suspended solids as well as free and emulsified oil are removed from the scrub water. Specially conditioned membranes reliably remove total suspended solids (TSS), including soot, to a level of below 1mg/l.



Interior view of MarinePaq module for Scandlines

Onsite control cabinet inside MarinePaq

The membranes used for the treatment usually last for more than five years before they have to be thoroughly cleaned or replaced. Optimised membrane performance combined with constant automatic backwash allows straightforward maintenance, with long intervals. Sludge arising from the treatment is compacted by an integrated filter press and safely disposed of at appropriate facilities ashore. Subsequently, a granulated activated carbon filtration further reduces COD from the water by absorbing the contaminants.

The post-treatment is carried out using selective ion exchangers that remove nitrate and heavy metals to the low concentration required for direct discharge. Sludge dewatering takes place by a fully automated chamber filter press. The sludge from the pre-treatment and the membrane concentrate are pumped into the sludge storage tank. A compact sludge dewatering device thickens the sludge to a level of 30-40% dry solids content. The sludge volume is thereby minimised, lowering the operating cost of the plant.

The MarinePaq is designed for 24/7 operation. Equipped with a programmable logic controller with touchscreen panel and remote control function, the system is highly automated and does not require a permanent onsite operator. An app displays the MarinePaq's graphic user interface, allowing the plant to be controlled and monitored from a desktop computer, a tablet or a smartphone. The control system constantly optimises the process for the best energy consumption and emissions reduction.

Through remote reporting and secure data storage of the system performance, the operational performance of the MarinePaq can be recorded. Sensors at various stages of the treatment process automatically measure pH value, temperature, turbidity and redox of the scrub water. Only regular quick tests concerning the levels of nitrite, nitrate and sulphite and, if required, COD in the raw water need to be carried out to determine the amount and composition of chemical additives and coagulants required for the prevailing water characteristics, APATEQ says. Constructed for a long service life and continuous operation in a highly corrosive environment, corrosion-resistant, weight saving piping is used for the entire installation, on board and onshore.