



## THREE SCRUBBER SOLUTIONS

AEC Maritime offers closed loop, open loop and hybrid scrubber solutions. In each solution the PH, turbidity and concentration of PAH are measured in accordance with MARPOL Annex VI resolution MEPC.184 (59).

### OPEN LOOP

In an open loop system, outgoing exhaust gases are washed with seawater in the scrubber. The seawater is discharged directly into the sea through a process water treatment system. An open loop requires the least investment and has lower operating costs.

### CLOSED LOOP

In a closed loop system, outgoing exhaust gases are washed with process water in the scrubber.

The process water is continuously re-circulated. A closed loop can operate anywhere but has higher operating costs.

### HYBRID

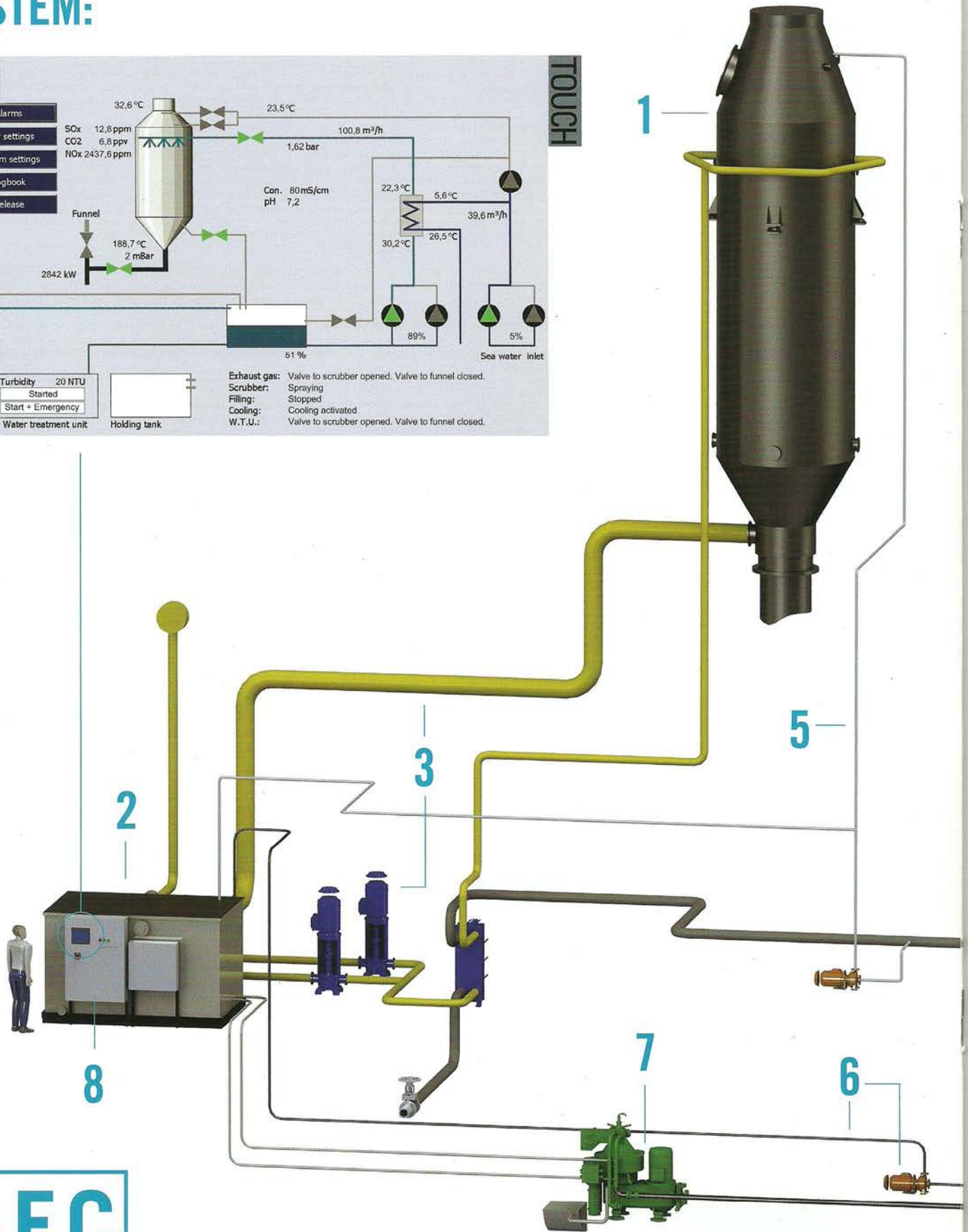
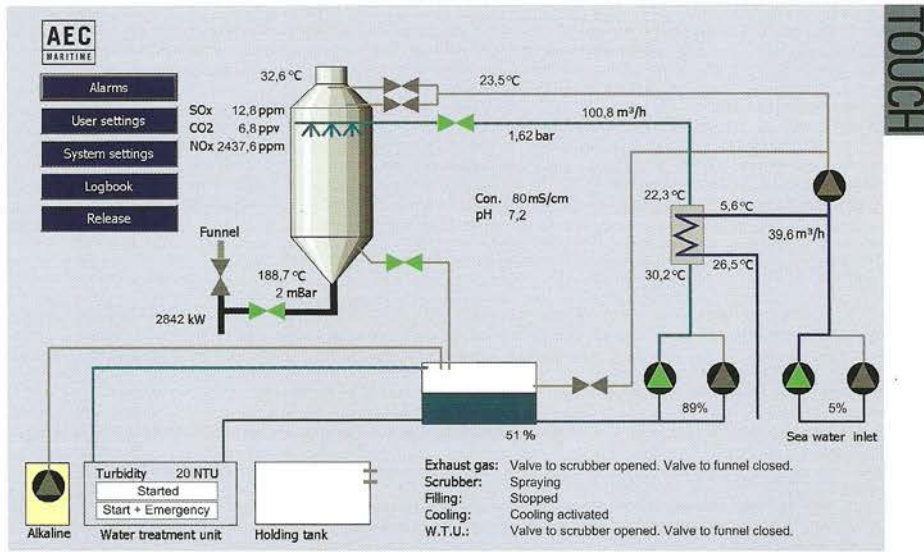
In a hybrid system, you can switch between an open loop and closed loop system. The process water can be discharged directly into the sea or continuously re-circulated. A hybrid can run open loop when allowed and closed loop when required.

#### ***Satisfied customer***

*"We are impressed with the AEC approach and the simplicity of their system. Their technology works without filters so there is no polluting packed bed. AEC Maritime has made clever use of their 20 years' experience within scrubber technology."*

*- Fini Alsted Hansen, Technical Superintendent  
Fleet Management-Scandlines.*

# OUR CLOSED LOOP SYSTEM:



## 1. SCRUBBER

The scrubber has an open tower structure without any filters. There are no moving parts and there is no need for a bypass. If needed, the scrubber can run dry.

## 2. CIRCULATION TANK

In the circulation tank the process water is mixed and prepared for the scrubber. The circulation tank is made of lightweight polypropylene, which is corrosion free.

## 3. WASH WATER CIRCULATION

The supply lines and return lines are made from certified Glassfiber Reinforced Epoxy. This material is lightweight and also corrosion free. The redundant executed pumps are equipped with frequency converters.

## 4. COOLING SYSTEM

A heat exchanger is installed to cool down the process water to optimize the process. Seawater is taken from the ship's main supply. The redundant executed pumps are equipped with frequency converters.

## 5. FILLING AND DEMISTER CLEANING

To start up the closed loop system, seawater is pumped into the circulation tank. The same pump is used to clean the top of the demister. This process is automatically controlled without interference of personnel.

## 6. NaOH

To keep the PH level neutral, caustic soda is added just before the entrance of the circulation tank for an optimal mixture. This process is automatically controlled without interference of personnel.

## 7. WATER CLEANING SYSTEM

The process water constantly runs through a wash water treatment unit. This is where the particles are separated from the process water. The remaining sludge can be stored and discharged in port.

## 8. AUTOMATION AND CONTROL SYSTEM

The whole scrubber system is constantly measured and controlled. Once switched on, the scrubber runs automatically. The scrubber is constantly adjusted to keep energy consumption level low and the process water in balance with respect to SO<sub>x</sub>, PH, concentration of PAH and turbidity.

