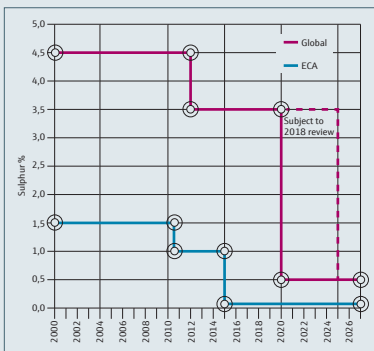


Right fit instrumentation for scrubbers

Keeping our oceans clean and complying with the new IMO regulations

The marine industry is currently living one of its biggest changes, as the IMO MARPOL Annex VI regulations impose stricter limits to the Sulphur content of exhaust gases coming into force on January 1st 2020. To comply, ships must either switch to low Sulphur fuel oil or install exhaust gas cleaning systems, also called scrubbers.



IMO timeline for reduction in fuel sulphur content

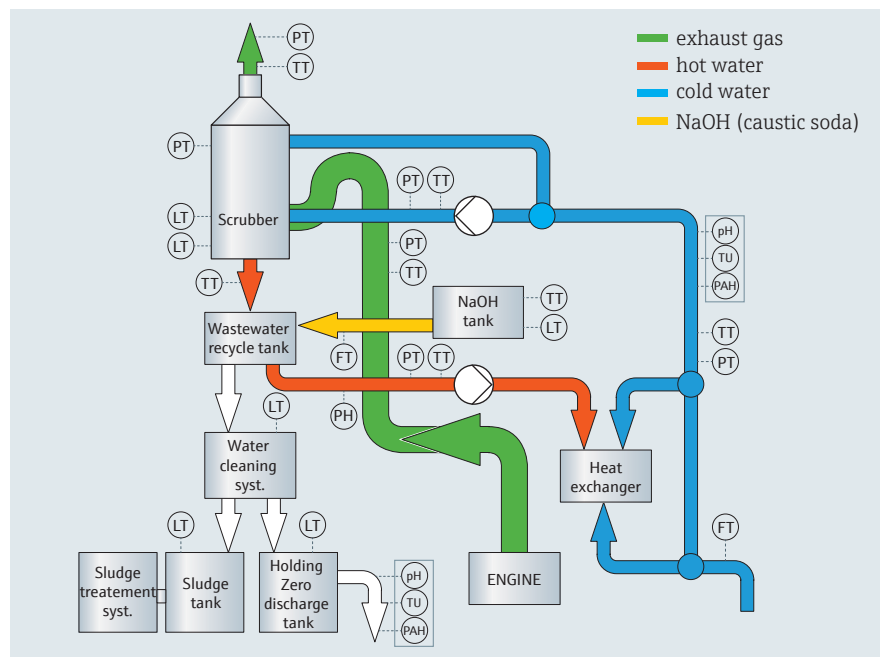


Diagram of a closed loop scrubber

SOx scrubbers spray the exhaust gases with seawater to remove the Sulphur oxides present in the fumes. Open loop configurations use only seawater to wash the Sulphur dioxide and then release this water back into the ocean. The closed loop system removes the sludge, cools the water down, adds caustic soda to maintain the water alkalinity and washing capacity and reuses it to wash the exhaust gas without releasing polluted water into the ocean. The hybrid system allows both configurations, it releases the used water directly into the ocean in areas where it is permitted, and changes to closed loop configuration in areas where this is restricted.

The scrubbing process must be well controlled to have optimized SO_x removal and to make sure that the water complies with the limits of the regulation.

- The pH, turbidity and polycyclic aromatic hydrocarbons (PAH), as well as the pressure, temperature and amount of feedwater, have to be measured.
- The pressures and temperatures of the scrubbing process must be measured since the water has to intimately mix with the exhaust gas to achieve the SO_x reduction and components have to be sized accordingly.
- The pressure and the temperature of the exhaust gas have to be measured to guarantee that the scrubbing doesn't create any back pressure that could reduce the performance of the engines.
- The differential pressure across the scrubber could be monitored as an indicator of soot deposits that require cleaning.
- A certain level of water in the bottom of the scrubber should be maintained to avoid that exhaust gas escapes through the pipes in undesired directions.
- The amount of caustic soda mixed with the water in the wash water tank should be measured, to avoid that water saturates and loses its washing power.
- The level of all the tanks in the process is also monitored.

The IMO norm determines the necessary technologies for water pollution measurement. It gives a strict limit for the value-delta between the water taken and released. For pH it requires a direct measurement and for turbidity the required measuring principle should be "single beam scattered light". For PAH the norm requires Fluorescence technology.

The measurements for the control of the process are up to the scrubber manufacturer and can help him differentiate. The process instruments should:

- Be robust to cope with the conditions in the ship (i.e. vibrations).
- Be made of Materials with the right chemical compatibility since the media is seawater, exhaust gas, soot, etc. Endress+Hauser offers different materials, i.e. alloys and pressure ceramic membranes, and different coatings, seals and liners to ensure the durability of the instruments.

- Be abrasion-resistant, like Endress+Hauser's pressure ceramic membranes that are extremely durable even when in contact with abrasive media.
- Have the mandatory Marine and EX approvals.

✓ Scrubber manufacturers are choosing Endress+Hauser because of its reliable and proven in use measuring instruments, its international presence and full portfolio of technologies and certifications.



Promag P300 magmeter



TH13 and TM131 RTD thermometer



Wash Water Monitoring System (pH, TU and PAH)



PMC51 transmitter and PMC21 transducer both with ceramic pressure measuring cell



FTL51C vibronic point level switch



PMP55 Pressure transmitter with welded diaphragm seal

www.addresses.endress.com

i References:

- www.egcsa.com
- „A practical guide to exhaust gas cleaning systems for the maritime industry. EGCSA Handbook 2012“ EGCSA
- "Understanding exhaust gas treatment systems. Guidance for shipowners and operators" Lloyd's Register