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Emissions monitoring in shipping

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The emission monitoring is structured like land-based applications and is based on the scope of the exhaust systems to be monitored.

Using a heated gas sampling probe, the measurement gas is taken from a suitable point and, in order to avoid the formation of disruptive condensate, is fed to the analysis system via a heated measurement gas line. This system is divided into two functional levels:

The first stage is the processing system. A sample gas pump is located here, which continuously conveys the gas sample from the sampling probe into the analysis system. A fine filter then removes any particles that may be present from the gas flow. In the following two-stage sample gas cooler, the sample gas is 'dried', i.e. the moisture contained in the gas is precipitated by falling below the dew point and removed by means of condensate pumps. Behind the cooler, a humidity sensor monitors the correct degree of dryness of the measuring gas, for which the correct flow rate for the analyzer located in the second stage is now regulated in an electrically monitored flow meter.

All components listed in this analysis system and / or the entire system must be tested and certified according to MEPC.259 (68) and MARPOL Annex VI.

In drive systems with several exhaust gas sources, the analysis system can also be equipped to monitor these individual sources. For this purpose, a measuring point switch is integrated in the first stage behind the measuring gas cooler. Up to three additional sample gas lines can be laid on this. For metrological and economic reasons, these sample gas lines are only partially equipped with heated lines. These lines each have their own sample gas cooler near the extraction point and only a heated line between the extraction probe and the cooler. From the cooler to the measuring point switchover, only simple gas lines are required.

There is a connection upstream of the sample gas cooler for flushing the preparation system with instrument air. The connection for applying test gas or zero gas to calibrate the analyzer is located between the two cooling stages of sample gas line one.

As part of the IAPP (International Air Pollution Prevention) efforts to reduce the emissions of CO_2 and other pollutants, the international type of maritime shipping is also increasingly regulated. The reason for this is that the fuel for large ocean-going ships is predominantly high sulfur fuel oil (HSFO), which contributes significantly to global air pollution.

To eliminate these sources of pollution, the IMO (International Maritime Organization) began a long time ago to set binding limit values for air pollutants, like those for power plants on land. In addition, some coastal regions in America, Europe and Asia have issued even stricter emission limit values and prohibit ships that do not comply with these limit values from entering their coastal waters and ports. National authorities use so-called sniffers to monitor emissions from the air and / or at stationary points such as bridges and port facilities.

Since January first, in the year of 2020, a limit value of 0.50% applies to SO_2 emissons in international waters and alimit value of 0.10% in coastal waters (ECAs = Emission Control Areas). The ECAs include e.g. also North and Baltic Sea.

In order to comply with the new limit values, the regulations provide shipping companies with different options. This includes the fundamental change in the type of fuel, e.g. from HSFO to MGO (Marine Gas Oil) or LNG (Liquid Natural Gas) as well as equipping or retrofitting ships with desulphurization systems, so-called SOx scrubbers.

For the shipping companies, these scrubbers have the advantage that they can continue to burn the HSFO, which is considerably cheaper in relation to MGO

Build your emissions monitoring system with these certified components.

or LNG, in the existing drive machines with manageable investment and operating costs.

Similar to the desulphurization systems in the stationary power plant area, the scrubbers work as air washers. In the so-called open-loop process, the alkalinity of the sea water is used to neutralize the sulfur from the engine exhaust gases. The closed-loop and the dry porcess, as well as a combination of the two, are less common. These are closed circuits in which the exhaust gas is desulfurized using chemicals and minerals. In order to comply with the regulations and obtain the required certificates, all systems without exception must be equipped with suitable, also certified emission monitoring systems. These constantly measure compliance with the limit values for SO_2 and CO_2 and also provide the relevant documentation. This must be proven when entering ECAs and ports. The documentation also includes the proper disposal of the residues resulting from the desulfurization process.

As is common in almost all areas of the maritime shipping for insurance reasons, all components and devices involved in the scrubber system must be certified by an internationally recognized classification society. The acceptance tests are based on the special operating conditions on ships and the climatic ambient conditions. For example, the components must withstand vibrations of up to 4g, depending on the location, and their electromagnetic radiation must not interfere with any on-board systems or sensors.