

ABB: MEASURING AND CONTROLLING SHIP EMISSIONS TO CHART A GREENER COURSE

Emissions from shipping are under the spotlight as awareness grows of the need to do more to protect the seas from pollution. Increasingly stringent regulations on the production and measurement of pollutants from ship propulsion systems are challenging shipowners to improve the efficiency and performance of their fleets. Here, Ben Goossens, Global Product Line Market Manager for ABB Measurement and Analytics, looks at these challenges and how innovative measurement and analytics solutions can help fleet operators meet them.

The need to address the pollution of the world's oceans is seeing the introduction of increasingly stringent legislation aimed at minimising carbon emissions from shipping. According to data produced by the International Maritime Organisation (IMO), emissions of greenhouse gases from all shipping increased by 9.6% from 977 million tonnes in 2012 to 1,076 million tonnes in 2018.

In 2017, the International Council on Clean Transportation found that, were shipping to be a country, it would be the sixth largest carbon emitter in the world.

Legislation to rein in these emissions includes the IMO's Greenhouse Gas Reduction Strategy, which aims to cut 40% of the carbon emissions of shipping by 2030, and 70% by 2050, compared with 2008 levels. These reductions will be achieved by improving energy efficiency, developing new technologies, and using low or zero-carbon fuels. The Carbon Intensity Indicator (CII) rating scheme also rates ships above 5,000 GT from A to E for how many grams of carbon dioxide they emit per cargo-carrying capacity and nautical mile, with limits that will become progressively more stringent.

A new rule to limit sulphur and nitrous oxide emissions, known as 'IMO 2020', limits the amount of sulfur in fuel oil to 0.50% m/m (mass by mass) – a big reduction from the previous limit

of 3.5%. Meanwhile, within the IMO's specially designated Emission Control Areas, the limit is a stricter 0.10%. There are presently four Emission Control Areas: the Baltic Sea area; the North Sea area; the North American area (covering designated coastal areas off the US and Canada); and the US Caribbean Sea area (around Puerto Rico and the US Virgin Islands).

A HOST OF CHALLENGES FOR SHIPOWNERS

Emissions compliance is just one of several headaches that face shipowners. Another is the predicted shortfall of skilled seafarers, estimated to be some 300,000 staff by 2050, while yet another is the inexorably rising cost of fuel.

The ageing merchant fleet is also a major challenge, with older ships being more inefficient and costly to run than newer ships. According to German database company Statista, 67% of general cargo ships are older than 15 years.



Compliance with maritime emissions regulations becomes easy with ABB's new analyser solution

"ABB offers a complete suite of measurement and analytic products"



However, given the cost of commissioning new ships, the only real answer to the question of how to make shipping greener is to retrofit new emissions-control systems and add smart measuring devices on to the existing fleet. The latest generation of measurement and analytical technologies can help transform the efficiency of ageing engines, monitor smokestack emissions and thereby extend a ship's working life and cut costs.

There are several options available to shipowners. One is to cut emissions by using exhaust gas cleaning systems, or "scrubbers". These allow ships fueled with heavy sulphur oil to cut their emissions to a level equivalent to that of ships that use cleaner fuels. The scrubber literally washes the ship's exhaust gases of sulphur.

The need to measure and prove the effectiveness of scrubbing is driving demand for emissions monitoring systems. It is now mandatory, if using a scrubber, to monitor the ratio of sulphur to carbon emissions. Measuring the emission of other greenhouse gases such as methane and nitrous oxides might also become mandatory when alternative fuels are used.

Yet scrubbing doesn't really solve the problem – it simply displaces it by turning a gaseous pollutant into a liquid pollutant. Instead of acid rain, you get acidified water. Alternative fuels and different propulsion methods, such as liquid natural gas, ammonia, hydrogen and nuclear, have all been suggested, although none provides the complete answer.

For example, liquefied natural gas (LNG) offers carbon dioxide emissions that are up to 25% lower than those of conventional bunker fuels. Unfortunately, the methane "slip" undermines LNG's usefulness – machines fueled by natural gas are generally designed to have at least 98% combustion efficiency, meaning that up to 2% of the gas is released unburned, hence methane "slip". Among greenhouse gases, methane is considered 80 times more damaging than carbon dioxide.

Likewise, ships fuelled on ammonia release nitrous oxides, which cause acid rain and can affect people with

respiratory conditions. Ships that use alternative sources of energy are likely to be subject to some form of requirement for measuring greenhouse gas capture.

MEETING MARINE MEASUREMENT NEEDS

Control and measurement of almost all aspects of a ship's operations is necessary if emissions are to be reduced. From fuel types, via fuel quality, engine control systems, combustion efficiency, emissions, ballast-water treatment, to cleaning systems, the list of things that can be measured on board a ship to make it greener is endless.

Building reliable, robust, and seaworthy emission measuring systems also poses several challenges. These include the corrosive effects of salt water, the movement of a ship at sea, extremes of humidity and temperature, the inherent remoteness of shipping operations and the need to minimise the costs of any kind of instrument failure.

However, thanks to advances in digital technologies, dynamic QR codes, remote assistance and Augmented Reality, manufacturers have overcome or minimised many of these challenges, allowing ships to remain compliant at all times even when thousands of miles from the nearest port.

Indeed, the latest generation of marine monitoring systems brings the control of maritime air pollution in line with large-scale shore-based emitters of greenhouse gases, such as power plants, cement works or waste-to-energy plants.

COMPREHENSIVE MONITORING AT SEA

ABB offers a complete suite of measurement and analytic products specifically designed to meet the needs of marine applications. Easy to configure, integrate, maintain and fix, these products include ABB's AZ10 Combustion Oxygen analyser. This helps optimise exhaust gas recirculation, a technique used in diesel engines to reduce nitrogen oxide emissions.

One of ABB's major solutions is CEMcaptain. Able to be retrofitted to existing vessels, this solution

simultaneously and continuously measures sulphur dioxide and carbon dioxide emissions and has achieved 98% "uptime". As well as requiring less maintenance effort, this high availability also eliminates the stress and workload caused by non-compliance.

As further ship emissions components are regulated, CEMcaptain can adapt by adding further analysers from ABB's range. CEMcaptain uses a dry extractive approach, which conforms with the requirements set out by MARPOL as proof of compliance.

ABB's CoriolisMaster flowmeter measures the density of the liquid by-products of scrubbing, helping determine the efficiency of the scrubbing process. Diesel engine performance can be assessed with ABB's Cylmate, a continuous engine pressure monitoring system that uses a mathematical model to assess engine performance, helping flag up potential problems.

Working in combination with Cylmate, ABB's Torductor 500 monitors the torque of propeller shafts, providing a comprehensive solution to engine performance and fuel optimisation. ABB even offers devices that measure the performance of their own measuring devices.

HEADING TOWARDS A CLEANER DESTINATION

By 2050, when the shipping industry must have cut its emissions by 70% compared with 2008, most ships in service will be far more advanced and far greener and cleaner than vessels being commissioned today. Despite this, regulators will continue to push for more emissions monitoring for shipping. Manufacturers such as ABB will be ready to respond with even more innovations designed to keep the oceans blue and the future green.

For more about ABB's measurement solutions for marine applications, visit: https://bit.ly/ABB_MeasuringMarine

