

CRUISE INDUSTRY INVESTS \$1 BILLION TO IMPROVE AIR EMISSIONS

As part of the global maritime industry, cruise ships contribute only a small amount of at-berth emissions in U.S. ports. However, the cruise lines continue to be innovative and industry leaders in developing new technology to reduce emissions.

National and international regulations strictly limit the amount of sulfur oxide (SOx) and nitrogen oxide (NOx) for ships that operate in the North American Emission Control Area (ECA), which includes the West Coast and Alaska. Within 200 miles of shore, vessels must comply with fuel requirements limiting total sulfur content to no more than 0.1%. This is much more restrictive than the 0.5% global limit due to take effect in 2020.

HOW EMISSION STANDARDS HAVE CHANGED

	2010	2018	REDUCTION
SOx RESTRICTIONS	3.5% max sulfur fuel content	0.1% max sulfur fuel content	99%
NOx RESTRICTIONS	Engine limited to 9.7 gNOx/kwh	Engine limited to 2.4 gNOx/kwh	75%

In addition to federal and international fuel requirements, Alaska monitors ship opacity/smoke density with shore-side observers.

REDUCING EMISSIONS THROUGH ENERGY-SAVING INITIATIVES



LED lighting lasts 25 times longer and uses 80% less energy

Energy-efficient engines consume less fuel and reduce emissions

Special hull paints reduce fuel consumption

Reuse engine waste heat

Optimized itinerary planning and navigation practices achieve maximum fuel efficiency

EGCS PROVE VERY EFFECTIVE IN REMOVING SULFUR

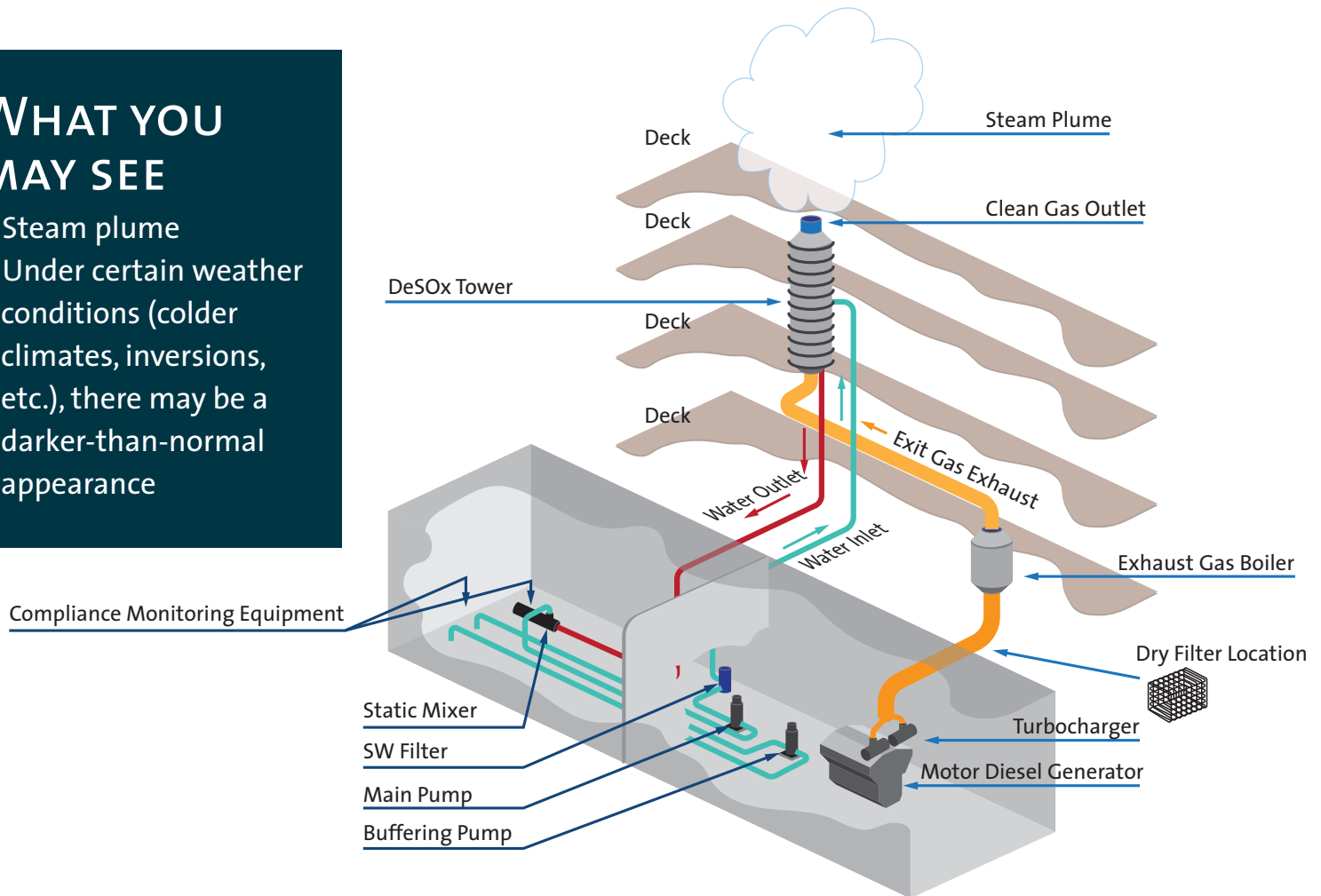
The Environmental Protection Agency has approved the use of exhaust-gas-cleaning systems (EGCS) as an environmentally equivalent technology to achieve the SOx limits. Currently, over 100 cruise ships have installed EGCS.

EGCS work by spraying engine exhaust with a fine water mist inside the ship's funnels/stacks. As the mist comes in contact with the emissions, it causes a chemical reaction that removes the sulfur. Any water not evaporated or turned into steam is drained and treated.

EGCS are amazingly efficient, removing 98 percent of SOx. EGCS have additional benefits, removing 40-60 percent of total particulate matter and up to 12 percent of NOx.

WHAT YOU MAY SEE

- Steam plume
- Under certain weather conditions (colder climates, inversions, etc.), there may be a darker-than-normal appearance



LNG: AN EVEN CLEANER FUEL

The first cruise ship to be powered by liquefied natural gas (LNG), a clean source of fuel, is expected to debut in 2019. LNG can reduce NOx by up to 80 percent and particulate matter by approximately 85 percent. As LNG contains no sulfur, these emissions are completely eliminated. As of 2018, CLIA member lines have committed more than \$8 billion to build 13 cruise vessels that can principally run on LNG.

Cruise lines are also implementing ship-energy management plans for route planning and maintenance to reduce fuel consumption and carbon emissions. Energy-efficient design standards will reduce CO2 emissions by 30 percent by 2025.