



Carnival Corporation Releases Third-Party Study Confirming Advanced Air Quality Systems Are Positive for Environment

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Two-year independent study on composition of hundreds of "scrubber" wash-water samples provides hard scientific evidence that company's Advanced Air Quality Systems are well within compliance of IMO's most stringent wash-water quality guidelines

Report also finds favorable comparisons to major national and international water quality benchmark standards, including drinking water, further confirming safety and quality of wash water

MIAMI (March 6, 2019) – [Carnival Corporation & plc](#) (NYSE/LSE: CCL; NYSE: CUK), the world's largest leisure travel company, released the results of an independent, two-year scientific wash-water study that shows the company's Advanced Air Quality Systems are a safe and effective means for compliance with the International Maritime Organization's (IMO) 2020 requirements, which include regulations for cleaner air emissions and strict wash-water quality standards.

The study also concluded that the wash-water samples from the Advanced Air Quality Systems – known in the industry as exhaust gas cleaning systems (EGCS) or "scrubbers" – were below the limits set by several major national and international water quality and land-based water discharge standards to provide further proof of the quality and safety of the wash water, even when compared to criteria like drinking water.

Focused specifically on analyzing the composition and quality of wash water from Advanced Air Quality Systems, the two-year study included 281 wash-water samples from 53 Carnival Corporation ships equipped with the systems, creating the largest wash-water data set in the marine industry.

The samples were analyzed for 54 parameters by independent laboratories accredited by the International Organization for Standardization (ISO), using standardized EPA methods. Following the lab phase, DNV GL, a leading classification society and recognized advisor for the maritime industry, reviewed the laboratory test data, comparing the results to major point source discharge limits and water quality standards.

In February, the independent study results were presented publicly at a technical conference for Clean Shipping Alliance 2020 (CSA 2020), a group of leading companies from the commercial shipping and cruise industries committed to complying with 2020 fuel requirements through the development and use of exhaust gas cleaning systems.

Specific to IMO wash-water requirements, the study confirmed results from previous studies showing the quality of the water used in the Advanced Air Quality Systems process was always far below the IMO monitoring limits for polycyclic aromatic hydrocarbons (PAHs) and the annual limits for nitrates. In fact, when measured against IMO standards, the average wash-water test results in this study were over **90 percent** lower than maximum allowable levels. In many cases, the materials were completely undetectable in the laboratory testing process.

Additionally, the report compared the samples to selected national and international water quality benchmark standards, including the German Waste Water Ordinance, the EU Industrial Emissions Directive and the Surface Water Standards of the EU's Water Framework Directive. The World Health Organization's (WHO) drinking water guidelines were also evaluated. The Advanced Air Quality Systems test results compared favorably with all of these major benchmark standards, demonstrating that the composition of the water was not only consistently below, but in most cases, significantly below the most stringent limits.

"We are pleased to see the positive results of this multi-year study, which included in-depth analysis and review from respected independent experts, demonstrating the overall quality of our Advanced Air Quality Systems wash water and further confirming the IMO's acceptance of these systems for 2020 regulatory compliance," said Mike Kaczmarek, senior vice president for marine technology for Carnival Corporation. "Based on extensive emissions testing, we know that our Advanced Air Quality Systems in some ways outperform marine gasoil (MGO) in providing cleaner air emissions. And although we have known for a long time that the quality of water being returned to the sea is at a high level, based on our years of development of this data set, it was important to release the findings publicly as the latest scientific evidence showing the actual water quality. This is completely consistent with the commitments we have made to our sustainability goals, and to protecting the ocean environment and the destinations we visit around the world."

Kaczmarek added: "Comparing scrubber wash water to both existing IMO requirements and also various other major water standards is useful to provide an informed perspective and to illustrate wash-water quality in a way that is easy to understand. These comparisons also provide relatable criteria for a number of specific parameters for Advanced Air Quality Systems, such as PAH concentrations, that are included within these standards."

Carnival Corporation has installed Advanced Air Quality Systems on over 70 ships in its fleet, and combined with the industry-leading adoption of liquefied natural gas (LNG), shorepower and other sustainability initiatives, the company remains committed to leading the marine industry in meeting and exceeding all established standards for performance and environmental protections.

Kaczmarek concluded: "We are committed to consistently exceeding the expectations of our guests for great vacations, and at the same time, we are committed to operating responsibly, as our very existence is tied to protecting the oceans, local waters and communities in which we operate. With more than 120,000 employees, most of whom live and work at sea, our commitment to protecting and maintaining healthy oceans, seas and local communities is not just an operating necessity. For us, it is simply the right thing to do, and we take great pride in our commitment to environmental

leadership."

Building on much of the previous research on the use of Advanced Air Quality Systems that has come to similar conclusions about the quality of water that these systems return to the sea – the scope of the current study strongly confirms the suitability of these innovative systems to play an important, unrestricted role in compliance with upcoming IMO 2020 regulations.

Other recent major studies addressing the environmental performance of these systems in the marine environment include a June 2018 report by Japan's Ministry of Land, Infrastructure, Transport and Tourism on the "Impact of EGCS on the Marine Environment," which showed evidence strongly supporting scrubbers as a safe and effective option for IMO 2020 compliance.

EDITOR'S NOTE: Carnival Corporation Advanced Air Quality Systems study results and details are available upon request. Also note, additional details on the findings from Japan's EGCS report are publicly available and can also be sent upon request.

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About Carnival Corporation & plc

Carnival Corporation & plc is the world's largest leisure travel company and among the most profitable and financially strong in the cruise and vacation industries, with a portfolio of nine of the world's leading cruise lines. With operations in North America, Australia, Europe and Asia, its portfolio features Carnival Cruise Line, Princess Cruises, Holland America Line, Seabourn, P&O Cruises (Australia), Costa Cruises, AIDA Cruises, P&O Cruises (UK) and Cunard.

Together, the corporation's cruise lines operate 106 ships with 246,000 lower berths visiting over 700 ports around the world, with 19 new ships scheduled to be delivered through 2025. Carnival Corporation & plc also operates Holland America Princess Alaska Tours, the leading tour company in Alaska and the Canadian Yukon. Traded on both the New York and London Stock Exchanges, Carnival Corporation & plc is the only group in the world to be included in both the S&P 500 and the FTSE 100 indices.

With a long history of innovation and providing guests with extraordinary vacation experiences, Carnival Corporation has received thousands of industry awards – including recognition by the Consumer Technology Association™ as a CES® 2019 Innovation Awards Honoree for OceanMedallion™. A revolutionary wearable device that contains a proprietary blend of communication technologies, OceanMedallion enables the world's first interactive guest experience platform transforming vacation travel on a large scale into a highly personalized level of customized service. The prestigious CES Innovation Awards honor outstanding design and engineering in consumer technology products.

Additional information can be found on www.carnival.com, www.princess.com, www.hollandamerica.com, www.seabourn.com, www.pocruises.com.au, www.costacruise.com, www.aida.de, www.pocruises.com, and www.cunard.com.

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About CSA 2020

The Clean Shipping Alliance 2020 (CSA 2020) represents group of leading companies from the commercial shipping and passenger ship industries that have been leaders in emission control efforts through significant investments in research and analysis, funding and committing resources to comply with 2020 fuel requirements through the development and use of Exhaust Gas Cleaning Systems (EGCS).

The Alliance was formed on 27th September 2018 with a mission to provide information and research data to better inform industry and the wider public. In addition to serving as an advocate for companies working to reduce marine exhaust gas emissions, CSA 2020 will support the scheduled implementation and effective enforcement of the International Maritime Organization's (IMO) requirement for a 0.5 percent global sulphur cap on fuel content as of January 1, 2020.

CSA 2020 currently has 34 member shipowners representing 30 shipping sectors and operating, collectively, more than 2000 vessels. Visit: <https://www.cleanshippingalliance2020.org>.

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