

Agenda
Bar Harbor Cruise Ship Committee
Meeting of Thursday September 12, 2019; 1:00 PM
Bar Harbor Municipal Building — Council Chambers

- I. CALL TO ORDER**
- II. APPROVAL OF MINUTES (August 15, 2019)**
- III. PUBLIC COMMENT PERIOD**
- IV. ADOPTION OF AGENDA**
- V. STAFF REPORTS**
- VI. REGULAR BUSINESS**
 - a. Cruise Ship Committee review of CLIA report**
 - b. Air emission monitoring at the harbor**
 - c. Finding from Professor Gabe's Study**
 - d. Review citizen comment regarding cruise ship loud speaker announcement in harbor**
- VII. PUBLIC COMMENT PERIOD**
- VIII. ITEMS FOR NEXT AGENDA**
- IX. SET MEETING DATE AND TIME**
- X. ADJOURNMENT**

From: Ric Quesada [mailto:[\[REDACTED\]](mailto:)]
Sent: Monday, July 15, 2019 6:19 PM
To: manager@barharbormaine.gov
Subject: Cruise ship noise

Cornell;

It's me again. This time I am very concerned about cruise ship noise. It is unnecessary and a major annoyance to those of us within range. For us, that means about a mile. Their happy cruise director just welcomed everyone back on board " after a lovely day in Bar Harbor with fantastic weather." If my neighbors were that noisy I would let them know in no uncertain terms and then I would call the Police. The other day there was a commotion that sounded like a reggae band entertaining the masses. Ships at sea are subject to a different standard of behavior and noise. But to come to Bar Harbor, they need your permit. I suggest that you put strict noise conditions on the permit or not issue permits.

Respectfully

Ric Quesada
370 Lower Main St
Bar Harbor ME 04609

(207) 288-5405

MINUTES

Bar Harbor Cruise Ship Committee

Meeting of Thursday, August 15, 2019 at 1:00 PM

Bar Harbor Municipal Building — Council Chambers

Attendance:

Chairperson, Eben Salvatore and committee members Martha Searchfield, Stephen Coston (Town Councilor), Ken Smith, Skip (Prentice) Strong, Jeff Dobbs (Town Councilor), Katy DeGrass, Sandy McFarland, Greg Gordon, Jim Will, Sarah Flink, Amy Powers, and Michele Gagnon.

Charlie Phippen was excused.

Presently, there are three vacancies on the committee.

As of August 1, 2019, Skip Strong and Sarah Powers are non-voting members

Ms. Gagnon did not vote.

Therefore, the voting membership for the meeting was 10.

City staff present — Manager Knight.

I. CALL TO ORDER

Chairman Salvatore called the meeting to order at 1:00 PM.

II. APPROVAL OF MINUTES (July 18, 2019)

Mr. Smith made a motion to adopt the minutes from the July 18, 2019 meeting, as amended. Mr. Dobbs seconded the motion. The motion carried unanimously (10-0).

III. PUBLIC COMMENT PERIOD

Mr. O'Connell provided a handout, which he expanded upon, dated 7/15/19 (see Attachment A) that Chairman Salvatore corrected the date to 8/15/19. The handout was titled Cruise Tourism & Traffic Congestion in Bar Harbor: Improving the Visitor and Residential Experience.

IV. ADOPTION OF AGENDA

Mr. Dobbs made a motion to adopt the agenda as prepared. Mr. Smith seconded the motion. The motion carried unanimously (10-0).

V. STAFF REPORTS

None

VI. REGULAR BUSINESS

- a. **Council directive to review CLIA Report** – Chairman Salvatore explained that he had met the previous day to review the Cruise Tourism & Traffic Congestion in Bar Harbor: Improving the Visitor and Resident Experience report with Councilors Dobbs and Coston, Manager Knight, Ms. Powers, and CLIA officials. The Committee reviewed the report and prioritized the recommendations as shown in the table below.

SHORT TERM	LONG TERM	NO FURTHER DISCUSSION AT THIS TIME
Safety/Chief Willis 5.1; 5.2; 5.4A; 5.5; 5.11	Comprehensive Transportation Planning 5.11, 5.4B; 5.5; 5.7; 5.7.1; 5.9; 5.10.1; 5.14; 5.15; 5.16; 4.1.7; 4.2; 4.4	Town Pier Redesign 5.8
Signage 5.6; Better Wayfinding		Port Authority 5.12
Minor "Pierscaping" 4		Tendering Arrival Location 5.3
Bus Logistics 5.9; 5.10		
Ferry Terminal Parking 5.13		
School Parking 5.14		
Delivery Trucks 5.16		
Research of Possible Grant Funding pages 3 and 38		
Tender Departure/Timing: 4.1.7		
Acadia Transportation Plan 4.4; Establish communication/workshop		

- b. **Discussion on next steps regarding Council directive to conduct air emission monitoring** - Manager Knight explained that he had spoken to Andy Johnson from the MDEP Bureau of Air Quality. That the town is looking to have an air quality station near the pier such as the one located on McFarland Hill. The idea would be for the town to contract with the MDEP to monitor the ambient air but have it paid by Carnival Cruise Line. Ms. Powers explained that having Carnival Cruise Line pay would be punitive and the cost should be shared amongst all users. Manager Knight replied that Carnival Cruise Line is the cruise line that has had major violations. He added that the directive from the Town Council is that Carnival Cruise Line should pay. Ms. Powers passed information from the Cruise Industry (see attachment B) titled Sustaining the Seas We Sail for committee members to review. Ms. Flink's earlier email regarding a study in Victoria, British Columbia, was also referred to as good information for the members to review.

- c. **Finding from Professor Gabe's Study** – There was no study to review.
- d. **Other** – No comments.

IX. PUBLIC COMMENT PERIOD

O'Connell commented further.

X. ITEMS FOR NEXT AGENDA

- a. **Cruise Tourism & Traffic Congestion in Bar Harbor: Improving the Visitor and Resident Experience report**
- b. **Air emission monitoring at the harbor**
- c. **Finding from Professor Gabe's Study**

XI. SET MEETING DATE AND TIME

Thursda, September 12 at 1:00 PM

XII. ADJOURNMENT

Mr. Smith made a motion that the committee adjourn the meeting. Mr. Dobbs seconded the motion. The motion carried unanimously (10-0).

Minutes approved by the Cruise Ship Committee on September 12, 2019

Michele Gagnon, Secretary

Date

AUGUST 12, 2019

Submitted to Bar Harbor on [§]7/15/19 by Cruise Lines International Associates.
Titled: Cruise Tourism & Traffic Congestion in Bar Harbor: Improving the Visitor and Residential experience.

To whom this may concern,

In response to CLIA's plans for BH 's town pier and adjacent areas the following letter is an argument against dedicating any portion of our town pier to the cruise industry.

In this report, CLIA makes the claims, "very clean air" "extremely clean air", yet provides no numbers to back these claims. No science or math. However the truth of the mathematical and the proven science of engineering technology gives a very different view. Using the frequent visitor The Anthem of the Seas as an example of the amount of air pollution that comes with their ten hour visit, the following data analysis shows we have invited the dirtiest tourist industry on the planet to our town.

A ship this size, hoteling at anchor, for ten hours, ¼ mile off Bar Harbor, while emitting the legal non-road 1000ppm sulfur dioxide emissions is putting out the same equivalent sulfur fumes as 39,600 idling semi trucks would put out for ten hours. The 2015 law that mandates 1000 ppm within the 200 mile ECA zone is not scheduled to change out past 2035 according to the Paris Accord. So we are stuck with this reality.

Sometimes the pollution from these 40,000 semi trucks is blown directly into Bar Harbor on a sea breeze from Anchorage A, sometimes from a NW breeze from Anchorages B and C. Also of grave concern but not included in this letter is the tenders belching the same fumes right next to the town pier constantly for ten hours which maybe as bad as the ship because they are parked right downtown. We have an anti idling code under Operation of Vehicles, Article 5, 194-38 that was put on the books to prohibit air pollution. No vehicle is allowed to idle for more than 5 minutes anywhere downtown from May 1st to Indigenous Peoples Day. If one vehicle which is allowed to emit a maximum of 15 ppm and is subject to a fine after five minutes, a cruise ship at 1000 ppm for ten hours would be violating the code by 40,000 times every 5 minutes. There are 120 5 minute periods in ten hours. So the $120 \times 40,000 = 4.8$ Million times over. Now in Mass. the fine is 500 dollars for each subsequent violation of their idling law. So if we were to fine CLIA for emitting such pollution right next to our town then their Anthem of the Sea would be fined 2.4 billion dollars for their one visit.

Following is the math that validates this report. I have tried to make this understandable but it is math and it's not everybody's favorite subject. I know some of it will appear confusing, but if you take a moment and read it through you will get enough out of it to realize that we are indeed putting the communities health at risk. It is all basically grade school math and scientific facts.

The potential energy of a gallon of diesel is 40 kw. A diesel engine can capture 50% of that turning it into kinetic energy. 20kw a gallon. The Anthem of the Seas needs 12,000 kw hoteling at anchor. It needs 600 gallons of diesel every hour. As of 2015 that diesel cannot emit more than 1000ppm of sulfur dioxide when burnt. There is the new Marine Gas Oli, MGO with a max of 1000ppm on the market and some ships are burning this more expensive blend but most make money by scrubbing the sulfur out of the cheap Heavy Fuel Oil, HFO and flushing it into the ocean out of a pipe under the smokestack.

Now to make a comparison to a legally governed use of diesel, I chose ULSD 15 ppm diesel that semi trucks and large buses and some cars burn. There are 5 minute idling rules in much of the country on 15ppm diesel. All of California and Mass for example and many places in between. These are called On-Road diesel laws with exceptions for farm equipment. Out on the ocean or most bodies of water the rules are called Non-Road. Next year a drastic

reduction from 35,000 ppm to 5,000ppm for ships out past 200 miles will be implemented causing a large increase in the cost of goods shipped. 1000ppm will remain as law inside 200 miles into the foreseeable future. Most ships are installing scrubbers so they can continue buying the HFO. But the scrubber is simply taking some of the sulfur out of the air and the rest of the carcinogens and heavy metals are flushed into the ocean diluted by 2.5 million gallons a day of saltwater.

1000ppm is 66 times 15 ppm. 66 times more sulfur dioxide. One semi truck burns one gallon per hour while idling. The cruise ship burns 600 gallons per hour. that is 600 x66 times more than is allowed on land. Compared to idling semi trucks that is 39,600 trucks. If you were to ticket them for every 5 minute On-Road violation and charged them the same as the 500.00 fine that Mass charges than it would cost CLIA 2.4 billion dollars for their ten hour visit.

Explained: 120 (5min. periods of time in ten hours) x 40,000 semis x \$500.00 = \$2.4 billion.

The Zaandam (24visits)does not scrub in port nor does it scrub anywhere. It switches fuel tanks 3 miles outside of Bar Harbor from 25,000 ppm HFO to 800 ppm MGO on it's way into BH. Mike Caczmarek, Carnivals Senior Vice President of Marine Technology told me this during a 1 hour question and answer period I had with him in the Harbor Masters office after he had given a tour on the Zaandam. Obviously if the Zaandam was not scrubbing the inexpensive 1.00 + / gal 25,000ppm HFO down to 1000ppm within the 200 mile ECA, Emissions Control Area or they would have simply continued to save thousands on fuel by continuing to burn it in port. I have previously read that some of the older ships do not have the room in their ships for scrubbers. If the Zaandam does not have such a deal than they are in serious violation of the ECA.

At cruising speed out past 3 miles burning 25,000ppm the Zaandam is putting out approximately 1 million idling semi trucks worth of sulfur dioxide. At anchor, burning 800ppm, about 20,000 idling semi trucks worth of sulfur dioxide.

One other thing that did not sound good was when Mike claimed 70 Carnival ships were outfitted with a scrubber and the oily scrubber waste was not considered hazardous waste and he said they dispose of it in port. However it's not the soot that has been removed that is considered as unhealthy. It is the PAH's and heavy metals flushed out into the ocean that cannot be filtered out. The Norwegians have banned scrubbers in their fjords because of the unhealthy levels of the two things. Scrubber waste has been found to be hazardous to humans mainly because of the heavy metals and carcinogenic PAH's. It's been proven. The EPA has determined they are emitted exceeding safe limits.

By the way we have not been given a clean bill of health by Jane Disney as far as heavy metals or PAH's. She did not test for heavy metals and only once or twice for PAH's because of the high cost. Her testing was mainly on biologics like ecoli, nitrates, oxygen levels, stuff related to sewage discharge.

I hope you took time to read this
Thank You
Jim O'Connell

SUSTAINING THE SEAS WE SAIL

The Cruise Industry's Commitment to Protecting and Preserving the Environment



Sustainability lies at the heart of all we do. Every day, the global cruise industry is hard at work protecting and sustaining the environment through bold leadership, innovative stewardship, and strong strategic partnerships.

The global cruise industry has committed to reduce the rate of carbon emissions across the industry fleet 40 percent by 2030 over a 2008 baseline.

We embrace the International Maritime Organization (IMO)'s ambition for carbon-free shipping as soon as possible this century. Our commitment to reduce the rate of carbon emissions is the first step toward that goal.

CLIA Cruise Lines are pursuing emissions reductions through a host of ambitious goals and new innovations.

- Carnival Corporation & plc achieved its 25% carbon intensity reduction goal in 2017, three years ahead of its 2020 target date. Carnival Corp. & plc encompasses major brands including Carnival Cruise Line, Princess Cruises, Holland America Line, Seabourn, Cunard, AIDA Cruises, Costa Cruises, P&O Cruises and P&O Australia.
- Royal Caribbean Cruises Ltd. has committed to reduce the rate of carbon emissions by 35% by 2020. RCL encompasses major brands: Royal Caribbean International, Celebrity Cruises, Silversea, TUI Cruises, Pullmantur, and Azamara Club Cruises.
- Royal Caribbean Cruises Ltd is also working with the Swiss-Swedish leading power technology company ABB to develop and deploy the world's first fuel cell system, an emissions-free approach to electricity, on a luxury cruise ship.
- AIDA Cruises launched the first cruise ship to be fully powered by liquefied natural gas (LNG) in December 2018. It is the first of 25 LNG ships on order industry-wide.
- When possible, CLIA Cruise Lines use electric shore power when in port – significantly reducing ship emissions. The Port of Montreal recently invested more than \$11 million dollars to install shore power capabilities for wintering vessels and cruise ships with an expected reduction of 2,800 tonnes of greenhouse gas emissions per year.

What other industries do on land, we must do at sea – a challenge that requires constant innovation.

- CLIA Cruise Lines use advanced water treatment systems and never discharge untreated sewage at sea – a policy which exceeds international maritime regulations.
- Cruise ships recycle 60 percent more waste per person than the average person does on land. In fact, CLIA Cruise Lines recycle 80,000 tons of paper, plastic, aluminum and glass each year.
- Many cruise lines conserve water by capturing condensation and recycling it for uses such as deck washing, machine operations and laundry. Water-reduction technology, including sink aerators, reduced-flow dishwashers and low-consumption laundry also help conserve water.

- 93% of the cruise industry has eliminated plastic straws or provides them only on demand.**
- Many CLIA Cruise Lines have made a commitment to reducing or eliminating single use plastics.
 - MSC Cruises replaced plastic straws with 100% compostable or biodegradable alternatives and has committed to replacing all single-use plastics with available alternatives by March 2019.
 - Silversea and Oceania produce water on board, eliminating the need for plastic water bottles
 - Many CLIA Cruise Lines have moved away from single-use toiletries in staterooms.
- Waste cooking oil is typically strained to remove debris and then collected and brought ashore for recycling in the bio-diesel market where feasible.

No industry has a stronger interest in protecting the oceans we sail and the destinations we visit than the cruise industry. It is not simply our responsibility: operating sustainably is a business imperative.

To advance environmental sustainability, the global cruise industry has forged significant partnerships with global conservation groups and NGOs.

- Carnival Corporation has supported The Nature Conservancy's Mapping Ocean Wealth program since 2014. The program measures the benefits of ocean habitats, like coral reefs and mangroves, to local economies and promotes environmental conservation of these valuable resources.
- Seabourn's partnership with UNESCO promotes sustainable tourism at World Heritage sites. Seabourn provides guests with onboard educational talks by experts, offers guided tours of these sites, and coordinates financial support from the tours to UNESCO's World Heritage Fund.
- MSC Cruises has partnered with Marevivo, an Italian marine conservation association that works worldwide to advance sustainable development, biodiversity conservation and marine protected areas.
- Norwegian Cruise Line partnered with relief organization All Hands and Hearts to raise over \$2.5 million for hurricane recovery in the Caribbean.

supporting community relief efforts such as the rebuilding of pre and primary schools in Morne Prosper Village, Dominica.

- As part of their five-year partnership, Royal Caribbean Cruises Ltd. and the World Wildlife Fund are collaborating on campaigns to build greater passenger awareness about ocean conservation.
- CLIA is a member of United for Wildlife and the U.S. Wildlife Trafficking Alliance to help travelers recognize and avoid purchasing illegal wildlife products.

The cruise industry is committed to the health of the world's oceans, marine life, and marine environments.

CLIA Cruise Lines lead a range of efforts to sustain and improve ocean health, marine life, and marine environments.

- Norwegian Cruise Line is helping restore severely degraded coral reefs in the Great Stirrup Bay, Cayman Islands. Norwegian supports local efforts to grow reef fragments in nurseries which will help renew local reefs, and is working with researchers to collect crucial data and implement proven restoration techniques.
- In 2018, Silversea launched a partnership with ORCA, one of the UK's leading marine conservation charities. Silversea is assisting ORCA by helping them collect critical sightings data of whales, dolphins, and porpoises.
- Holland America Line teamed up with NOAA and the University of Alaska Southeast to offer guests a unique experience to view humpback whales and other wildlife aboard small research vessels. While guests gain an understanding of the local wildlife from guides, plankton samples, feeding patterns, and other data is collected and used to further the organizations' understanding of the species and habitat.
- Royal Caribbean, in partnership with WWF, conducted Fishery Improvement Projects in Peru and Ecuador, establishing better standards for mahi-mahi fishing in the region, and helping these communities achieve Marine Stewardship Council certification.

* In the U.S.
** By capacity for fleets with greater than 2,000 cabins



CARNIVAL
Corporation & PLC

Scrubbers – A Clean Solution for Air and Water

Advanced Air Quality Systems (AAQS), commonly referred to as exhaust gas cleaning systems or “scrubbers,” are a significant technological innovation designed to improve air emissions, meet and exceed environmental regulatory standards and support sustainable operations in the global shipping industry.

Advanced Air Quality Systems are an important part of Carnival Corporation’s strategy to improve air quality in port and at sea, a strategy that also includes the use of liquefied natural gas (LNG), shore power and marine gasoil (MGO). By enabling ships to use heavy fuel oil (HFO) and treat it in a way that significantly improves air emissions, Advanced Air Quality Systems provide a safe and effective solution for compliance with International Maritime Organization (IMO) 2020 regulations, while meeting international air and water quality standards.

Carnival Corporation weighed many factors before choosing to pioneer the use of Advanced Air Quality Systems in the small confines of a cruise ship to comply with the upcoming IMO 2020 global sulfur regulations. Under these new regulations, as of January 2020, all ships must utilize fuel oil with a sulfur content of 0.50% mass by mass (m/m), except in Sulfur Emission Control Areas, or SECAs, where the limit is 0.1%, or use approved equivalent methods like Advanced Air Quality Systems to meet the sulfur oxide (SOx) emission requirements. As part of its overall environmental compliance strategy, Carnival Corporation chose to utilize Advanced Air Quality Systems as the most practical method for its existing fleet based on the ability to significantly improve air quality at least to the level of MGO – and in some ways outperform MGO – while continuing its commitment to meet and often exceed all applicable international environmental regulatory standards.

As of the second quarter 2019, Carnival Corporation has invested over \$500 million in the development, testing and deployment of Advanced Air Quality Systems. To date, the company has installed over 220 Advanced Air Quality Systems on more than 75 of the more than 100 ships in its fleet, with a goal of installing nearly 400 scrubbers over time in these multi-engine ships. By 2020, the company expects 85% of its global fleet to be fitted with Advanced Air Quality Systems.

To learn more about Carnival Corporation’s Advanced Air Quality Systems, [click here](#).

**A PROVEN & EFFECTIVE SOLUTION
FOR CLEANER EMISSIONS**

HFO+AAQS

15%

**Less sulfur emissions
than MGO**



Advanced Air Quality Systems have the proven capability to outperform low-sulfur fuel alternatives such as MGO, providing overall cleaner air emissions in a way that is safe for ocean environments. Results of extensive testing show that ships using Advanced Air Quality Systems produce emissions lower in sulfur and particulate matter (PM) than those running on low-sulfur MGO, a fuel consisting exclusively of distillates that is considered the benchmark for the IMO 2020 0.5% sulfur cap restriction.

In keeping with even the highest international standards, Advanced Air Quality Systems remove 99% of sulfur and 60-90% of PM from engine emissions, including black carbon, elemental and organic carbon. It also reduces nitrogen oxides by at least 5%. Research shows Advanced Air Quality Systems may be especially effective in capturing small-size PM (10 and 2.5 microns and ultrafine), while removing most of the soot from airborne distribution, including black carbon.

In late 2018, Carnival Corporation received the results of the latest rounds of extensive exhaust emissions tests of the company's Advanced Air Quality Systems. The results are consistent with the major published research on this subject, such as a 2014 study by researchers in Sweden, Kent Salo and Erik Fridell, which concluded that scrubbers on ships using HFO can lower PM to a level below that of MGO.

HFO requires less refining than highly-refined MGO, which means less greenhouse gas created during production. HFO also has a lower combustion temperature than MGO, resulting in less nitrous oxides (NOx) produced by a ship's engines.

Ships operating with Advanced Air Quality Systems are able to remove almost all the sulfur from engine exhaust – keeping it from being released into the air – and returns it in form of sulfate (SO₄), the natural form in which it exists in abundance in the sea, which is the world's natural reservoir for sulfur.

To learn more about the environmental performance of Carnival Corporation's Advanced Air Quality Systems, [click here](#).

PERFORMANCE RESULTS

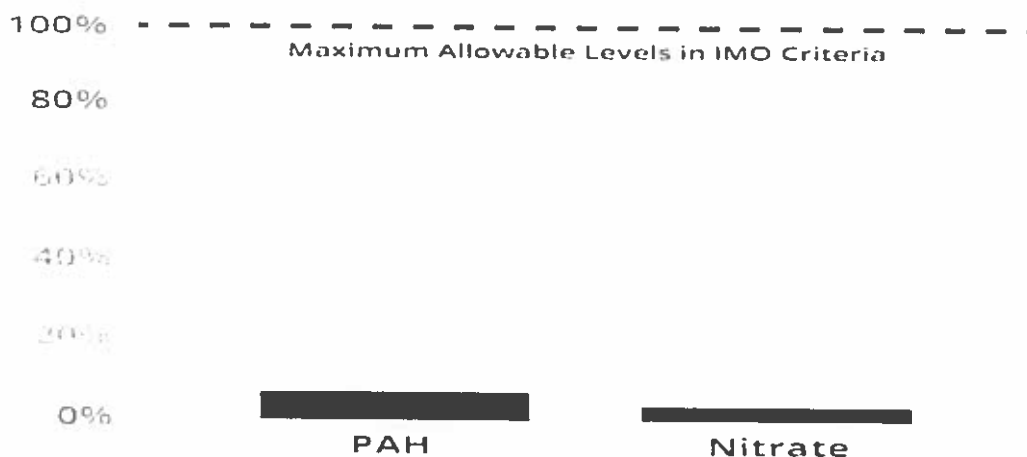
All Advanced Air Quality Systems comply with international regulations and are inspected by a classification society and certified by the ship's flag administration. In addition, all systems utilize continuous monitoring equipment to automatically record all required parameters.

Advanced Air Quality Systems ensure that Carnival Corporation ships are in compliance with all relevant environmental regulations, including the upcoming IMO 2020 requirements.

The IMO, via strict guidelines from its Marine Environmental Protection Committee (MEPC), requires ships to monitor air and water emissions to safeguard against air and water environmental impacts:

- To measure and record SO₂ levels in the engine exhaust, a gas analyzer is installed above each Advanced Air Quality Systems tower to ensure 24/7 monitoring. Performance of the Advanced Air Quality Systems is constantly adjusted by automation to remain well within the regulatory SO₂ limits.
- IMO MEPC guidelines require that Advanced Air Quality Systems wash water be continuously measured and recorded for three parameters: pH, turbidity and polycyclic aromatic hydrocarbons (PAH). This data is collected in three locations – the inlet, after the AAQS tower and before discharge – and is required to be kept onboard for no less than 18 months.
- IMO and, for ships operating in US waters, the U.S. EPA also require periodic monitoring in the form of annual sampling and laboratory analysis of wash water from Advanced Air Quality Systems to test for additional parameters, using measurement techniques that are more advanced than those possible to achieve during continuous monitoring.

AAQS Wash Water Over 90% Below IMO Requirements



Not to scale. Actual performance is significantly better than shown.

Meeting Strict Water Quality Standards

An independently reviewed four-year scientific study of Advanced Air Quality Systems wash-water samples concluded that Carnival Corporation ships operating with Advanced Air Quality Systems consistently meet and, in some cases, outperform the industry benchmarks established by the IMO, European Union (EU) and the U.S. Environmental Protection Agency (EPA). The wash water from these systems is also well below the limits set by several major national and international water quality and land-based water discharge standards, even when compared to criteria like drinking water, including the WHO Drinking Water Guidelines.

Specific to the study regarding IMO wash-water requirements, DNV GL, one of the world's leading classification societies and recognized advisor for the maritime industry, analyzed the laboratory test data and 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. To read the full study, [click here](#).

To date, every significant and scientifically valid primary research known on the use of Advanced Air Quality Systems has come to the same conclusion – these innovative systems play an important role in compliance with upcoming IMO regulations and other standards for ship operations.

In fact, Japan's Ministry of Land, Infrastructure, Transport and Tourism released a report in February 2019 strongly supporting scrubbers as a safe and effective option for IMO 2020 compliance. The report found that the ability of scrubber systems to remove airborne PAH and particulate matter (PM) makes them preferable to ships burning LSFO (or marine gas oil). Looking at 21 different PAHs and eight heavy metals, the study also found the impacts on water quality and marine life to be negligible. The report is available [here](#).

To learn more about the environmental performance of Carnival Corporation's Advanced Air Quality Systems, [click here](#).

CARNIVAL CORPORATION'S AAQS ADOPTION

Exhaust gas cleaning systems (EGCS) like Carnival Corporation's Advanced Air Quality Systems have been used for decades on land in power plants as a proven and effective way to significantly reduce sulfur oxide (SOx) and particulate matter produced by an engine's operation. Carnival Corporation is a forerunner in adapting this technology for maritime use within the confined space of a cruise ship, beginning to test, measure and modify Advanced Air Quality Systems prototypes beginning in 2006.

To further enhance its emissions profile, Carnival Corporation developed a catalytic filter for its engine exhaust to further reduce particulate matter before exhaust reaches the Advanced Air Quality Systems. Its standard Advanced Air Quality System then removes more than 98% of

sulfur and between 60-90% of the particulate matter, including organic, elemental and black carbon. The combination of Advanced Air Quality Systems, catalytic filter and other systems all contribute to reduction of particulate matter, including the very fine PM 10- and 2.5-micron particles, with some reduction also of nitrogen oxides (NO_x).

Given that a cruise ship operates on several engines, multiple scrubbers are installed on each ship. As of July 2019, Carnival Corporation has installed over 220 Advanced Air Quality Systems on 77 of the 100-plus ships in its fleet, with a goal of installing nearly 400 scrubbers over time – eventually covering 85 percent of the fleet.

Today

As of July 2019



9 Carnival Corporation Brands Utilizing AAQS



77 Number of Carnival Corporation Ships Utilizing AAQS



220+ Number of AAQS Systems Installed Across the Fleet
By 2020



9 Carnival Corporation Brands Utilizing AAQS



85 Percentage of Carnival Corporation Fleet Utilizing AAQS



330+ Number of AAQS Systems Installed Across the Fleet

CARNIVAL CORPORATION & ITS COMMITMENT TO SUSTAINABILITY

As the world's largest leisure travel company and world's largest cruise company, Carnival Corporation recognizes the importance of sustainability as a critical part of how the company and its nine global cruise line brands conduct business. With more than 120,000 employees from over 150 nations around the world – most of whom live and work at sea – Carnival Corporation has a deep commitment to protecting and maintaining clean air and healthy oceans and communities in the over 700 destinations its ships visit each year.

Carnival Corporation's portfolio includes more than 100 ships sailing for nine of the world's leading cruise lines: Carnival Cruise Line, Princess Cruises, Holland America Line, Seabourn, P&O Cruises (Australia), Costa Cruises, AIDA Cruises, P&O Cruises (UK) and Cunard.