



Carnival Corporation's AIDA Cruises Pioneering Cruise Industry's First-Ever Trial of Fuel Cell Technology

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Focused on supplying power with lower emissions, fuel cell research project is the latest in a series of major advances in corporation's innovative "green cruising" strategy

MIAMI, Oct. 14, 2019 /PRNewswire/ -- [Carnival Corporation & plc](#) (NYSE/LSE: CCL; NYSE: CUK), the world's largest leisure travel company, today announced its Germany-based brand, AIDA Cruises, has partnered with leaders from the maritime and engineering sectors to pilot the world's first fuel cell system designed to power large passenger vessels. As early as 2021, AIDA Cruises will trial this innovative fuel technology on AIDAnova, becoming the cruise industry's first brand to trial fuel cells on a large cruise ship.

The research project, named "Pa-X-ell2," is designed to develop fuel cells that are powered by hydrogen derived from methanol, with the potential to supply power to cruise ships at even lower emissions levels than liquefied natural gas (LNG), the world's cleanest burning fossil fuel. Designed by Freudenberg Sealing Technologies, the fuel cells are expected to have a longer lifecycle than those currently being developed for automobiles, with early trials on land showing a lifespan of over 35,000 operating hours.

Developed as a hybrid energy system for use in cruise ships, the fuel cells will be designed to enable benefits beyond significantly lower emissions, including operating with lower noise and vibration. In the future there is the potential for the required methanol to be produced from renewable energy sources.

Funded by Germany's Federal Ministry of Transport and Digital Infrastructure, the Pa-X-ell2 research project will include AIDA Cruises, represented by Carnival Corporation's Hamburg-based Carnival Maritime GmbH, Freudenberg Sealing Technologies, the Meyer Werft shipyard and other partners.

"With the first-time use of fuel cells onboard an oceangoing cruise ship, we will reach another important milestone on our journey to emission-neutral cruising," said Felix Eichhorn, president of AIDA Cruises. "Our goal is continue to show concrete solutions for achieving our climate targets."

As part of Carnival Corporation's innovative "green cruising" strategy, the fuel cell pilot is the most recent in an ongoing series of environmental initiatives and major technological advances for the company's AIDA Cruises brand. Last month, the brand signed an agreement to install a first-of-its-kind lithium-ion battery power system on its AIDAprima ship in 2020, which will be the world's largest battery storage system ever on a passenger ship, capable of generating a total output of 10-megawatt hours to help electrify the ship's propulsion and operation for periods of time.

In December 2018, AIDA Cruises made history with the introduction of the world's first cruise ship capable of being powered in port and at sea by liquefied natural gas (LNG), the world's cleanest burning fossil fuel. The introduction of LNG to power cruise ships is a major achievement in green cruising that supports the company's environmental goals with the virtual total elimination of sulfur dioxide emissions (zero emissions) and particulate matter (95% to 100% reduction). The use of LNG will also substantially reduce emissions of nitrogen oxides and carbon dioxide.

In total, Carnival Corporation has an additional 10 next-generation LNG cruise ships on order, including Costa Smeralda, which will be the second of the corporation's ships to be powered by LNG when it joins the Costa Cruises fleet this fall.

The company is also pioneering the use of Advanced Air Quality Systems, often referred to as exhaust gas cleaning systems, or "scrubbers." As of July 2019, Advanced Air Quality Systems have been installed on 77 of the more than 100 ships in the Carnival Corporation fleet. The systems remove almost all of sulfur oxide emissions, 75% of all particulate matter and reduce nitrogen oxide emissions.

AIDA Cruises' newest ship, AIDAnova, was recently named the first-ever cruise ship to be awarded the Blue Angel certification by Germany's Federal Ministry for the Environment for its environmentally friendly ship design. Since 2000, every ship built for AIDA Cruises has "cold ironing" or shore power capabilities, which allow for connecting directly into the land-based electrical grid while in port where the infrastructure is available. With "cold ironing," the air emissions are managed and regulated under the emission control requirements at the power plant supplying the port. By the end of 2020, at least 12 of AIDA's 14 ships will be able to use shore power wherever it is available. Since 2017, AIDAsol has been using the shore power plant in Hamburg-Altona, Germany, for its regular operations.

In addition, AIDA is also exploring the use of CO2-free production of liquefied natural gas (LNG) from renewable sources through its "Power to Gas" project or the use of fuel cells in cruise shipping. By the end of 2023, 94% of all AIDA guests will travel on ships that can be fully powered by low-emission LNG or shore power where possible.

AIDA Cruises was named "Germany's Most Trustworthy Cruise Company" in the 2019 Reader's Digest Trusted Brands Survey and received 2019 MedCruise awards for "greatest sustainability program" and "greatest investment and commitment to the environment and sustainability." The brand also received the 2018 Green-Controlling Award from the Péter-Horváth Foundation in recognition of its "Green Cruising" program.

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 102 ships with 241,000 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 the OceanMedallion™. A revolutionary wearable device that contains a proprietary blend of communication technologies, the 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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Carnival Corporation Media Contacts: Roger Frizzell, Carnival Corporation, rfrizzell@carnival.com, (305) 406-7862; Mike Flanagan, LDWW, mike@ldwwgroup.com, (727) 452-4538