

innovations

Focusing on innovation in the global cruise industry

Safe cruise ship resumptions - Finns step up to the plate



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A robot head was developed to measure the effectiveness of masks, ventilation and air filtration & purification systems on board ships and in terminals.

To help with the resumption of cruise ship operations, several Finnish-based businesses and organisations have developed new safety approaches, in response to updated post-pandemic measures.

These initiatives and research projects were aimed at restarting cruise ship operations, while ensuring a safer and successful experience for all those involved.

Whilst the safety and wellbeing of passengers and staff has always been a top priority for this particular industry, its recovery depends on taking health and safety measures to a new level, to drive stability and sustainability in the challenging years ahead, organiser Business Finland said.

One project highlighted by the organisation was the Health Travel initiative in which researchers collaborated with cruise operators, shipyards, and sub-contractors to find ways of improving health and safety on cruise ships and in terminal buildings.

Cell biology and industrial management researchers created models to analyse vessel passenger flows of different sizes and developed processes and procedures to minimise infection risks.

Another project was undertaken to understand the role of breathing, coughing, and sneezing in spreading COVID-19. Here, researchers from Tampere University, VTT Technology Research Centre of Finland, and the Finnish Institute for Health and Welfare, created a robot head prototype, as part of the AIRCO research project.

The robot was developed to support the design and planning of all types of indoor spaces, including ships and terminals, and to measure the effectiveness of masks, ventilation and air filtration and purification solutions in preventing the spread of viruses.

Another project was started to support the need for better air purification techniques. To achieve this, interior designer ALMACO partnered with Genano to provide the marine and offshore industry with advanced air de-contamination technology that removes airborne impurities of all sizes, including microbes and the novel coronavirus.

In addition to air quality, people and material flow can have a huge impact on the transmission of airborne viruses. KONE, a supplier of marine elevators and escalators, conducted intensive research in partnership with several cruise ship operators to develop new solutions for people and material flows on board ships.

This involved collecting data by using sensors installed on board, timing activities, and conducting interviews with passengers and crew members.

Looking at the same operation, Hypercell's IoT platform uses Bluetooth signal sensors to collect data on people volumes, dwell times, and flows in indoor and outdoor locations.

Accurate data, insight, and new techniques will play a key role in moving forward, as Timo Pakarinen, KONE's Marine Business Managing Director, explained: "Any changes on cruise ships must be fact-based and commercially viable solutions because the investments required are so large."



KONE's Timo Pakarinen

These collaborative research projects were initiated and funded by Business Finland, which will continue to help produce innovations and technologies to support the recovery and future viability of the cruise industry for years to come, the organisation stressed.

"Finland now offers leading technologies and solutions focusing on indoor air quality, passenger flows, safety protocols, and touchless solutions. The insights gained from this vital research are also contributing to the design of new cruise ships," said Ulla Lainio, Business

Finland's Head of Marine & Ports Global Industry Team.



Business Finland's head of Marine and Ports, Ulla Lainio

Case studies

A series of case studies was highlighted by Business Finland.

First under the spotlight was the Healthy Travel project.

This multi-disciplinary project, initiated by Business Finland in Autumn 2020, brought together cruise company researchers, shipyards and sub-contractors to improve health and safety on cruise ships and in terminal buildings.

“Our initial focus was on how to ensure a safe cruise experience in the middle of the pandemic. We then explored ways to attract more passengers to the ships,” said Project Manager, Jonas Spohr, a lecturer from the Laboratory of Industrial Management, Åbo Akademi University.

During the project, Åbo Akademi's researchers in cell biology and industrial management created models to analyse passenger flows on vessels of different sizes and developed processes and procedures to minimise infection risks.

Finnish diagnostics companies also developed different types of testing systems to cost-effectively prevent infected passengers from boarding the ships.

“We also produced a questionnaire to understand customers' experiences and opinions

regarding the safety measures implemented by the cruise lines in response to the pandemic, as well as their views on a range of other possible measures, including the use of technology to monitor passenger movements on a ship,” Spohr explained.



Åbo Akademi University's Jonas Spohr

The project also provided an opportunity to consider the long-term future of the whole cruise industry, including the diverse range of large and small businesses that serve the industry. In order to support the companies' strategic decision-making processes, data was collected on cruise industry developments and findings were shared taken from the customer questionnaires.

“Most people involved in the project share that view that the sector is likely to change, even without the impact of the coronavirus. The pandemic will pass at some point, and the ships will be much safer than before, so we also need to understand the bigger trends shaping the future of the industry,” he added.

As a result, companies involved with the industry, especially sub-contractors, now have a window of opportunity to help the cruise ships to adapt to the future. Creating new technical, digital, and sustainable solutions or ideas to improve passengers' cruise experience will likely generate more business.

“The big questions are concerned with: who are the customers of the future, and what will they value in the cruise experience? What is the impact of global trends like sustainability on the cruise industry, and how can all companies, including the sub-contractors, be part of

supporting these changes?” Spohr said.

In the case of the Finnish robot initiative, breathing, coughing and sneezing effects were examined with scientific consistency and precision. A new robot head produced small particles in the air, mimicking the aerosols and droplets that spread coronavirus when people interact.

“The droplets coughed by the robot can be supplemented with surrogate viruses to discover how the viruses travel in any given space,” explained Topi Rönkkö, Tampere University’s Associate Professor of Aerosol Physics. “Used with the right measuring technology, the robot can be a useful tool in the design and planning of all kinds of indoor spaces, including ships and terminals.”

The robot can also measure how effectively masks, ventilation and air filtration and purification solutions prevent the spread of SARS-CoV-2 and other viruses, and verify the accuracy of computer simulations.

In the next stage of the research, AIRCO’s project partners will combine their resources with two other projects funded by Business Finland involving about 50 Finnish companies and research institutions across a diverse range of industries and expertise.

“The robot will be used for further experimental research in the development and verification of the models that deepen our understanding of how aerosols spread in indoor environments,” Rönkkö added. “We will combine business-driven research with the best scientific information available to create solutions for the current challenges facing our societies and economies and to prepare for future pandemics.”

Air quality

As also mentioned above, interior designer ALMACO has partnered with Genano aimed at setting new standards for indoor air quality on cruise ships.

Scientific research showing that COVID-19 spreads mainly through aerosols and particles focused attention on indoor air quality as a crucial factor for minimising infections among passengers and crew on cruise ships and other vessels.

In response, ALMACO and Genano joined together to provide air de-contamination technology that removes airborne impurities of all sizes, including microbes and the novel coronavirus.



Genano’s electrical filtration system

“Finland is a forerunner in air purification and Genano is the most trusted actor in this field, with more than 20 years’ experience in the most demanding settings, such as hospital operating theatres. ALMACO’s extensive networks across the maritime industry enable Genano to bring its unique electric filtration technology to this market,” explained Erik Schobesberger, Almaco’s Vice President Modernisation & Newbuilding Support.

Genano’s patented electrical filtration technology is claimed to be able to remove even the smallest microbes. It effectively protects against the COVID-19 virus and also de-contaminates indoor air from bacteria, mould spores, ozone, pollen, odours and harmful gases.

“We recommend Genano’s proven technology to our customers because it is cost-effective, flexible and can be conveniently deployed on existing vessels. Compared to disposable HEPA filter systems, Genano’s air purification devices do not clog up and are easier to maintain.

“With health precautions now at the core of

the cruise experience, we are confident that Genano's solutions will set the standard for indoor air quality in the maritime industry of the future," he said.

In another case study highlighted, KONE conducted intensive research in partnership with several cruise companies during the past three years.

This research involved collecting data with sensors installed on the ships, timing activities, and interviews with passengers and crew members.

"We have collected a great deal of data that supports the companies' decision-making. Any changes on cruise ships must be fact-based and commercially viable solutions because the investments required are so large," KONE's Pakarinen, said.

Simulation modelling

The company used 3D simulation modelling of people's movements on a ship during embarkation/disembarkation and during the sea day. This enabled the running of different test scenarios on how elevators and escalators work, depending on the number and types of passengers.

Modelling included different distributions of various walking speed groups, as well as restricted mobility users, to match predicted passenger profiles. The end solution will help tackle challenges such as crowded elevator lobbies or other passenger flow bottlenecks, the company said.

"We have also carried out airflow research with VTT Technical Research Centre of Finland to make the elevator cars safer through cleaner air and better ventilation. The goal is peace of mind for the users by minimising the health risks in our elevators," Pakarinen explained.

"KONE's early involvement means that the shipowner gets the full value of our optimisation service, because that's when the big decisions about the ship are made. This ensures that the ship will have exactly the right number of elevators in the right places to ensure optimal passenger flow experiences with investments in elevator equipment," Pakarinen added. "We see each strategic partnership as a means to facilitate innovation and identify efficiencies."

Finally, in the case of Hypercell, its IoT platform uses Bluetooth signal sensors to collect data on people volumes, dwell times and flows in indoor and outdoor locations, which is anonymous and GDPR compliant.

"Our platform combines the hardware and software needed for a complete IoT solution that has proved its value across a range of industries. We see great potential in the maritime industry in terms of enhancing people flows and safety on board and in terminals, as well as helping to make shipyards safer," said Sami Vepsäläinen, the company's COO.

Once installed on a cruise ship, Hypercell's sensors can monitor passenger flows and trigger notifications to take action if areas become



Hypercell CEO Sami Vepsäläinen

over-crowded, thereby increasing infection risks during a pandemic. Safety concerns can be further alleviated by providing name tags for all passengers or employees.

"On a cruise ship, the tagging feature can be added to each cabin card, enabling the faster evacuation of passengers in an emergency. At a shipyard, named tags could save workers' lives in the case of a fire. Our technology could quickly locate the tagged employees working on the different decks of a large vessel and guide their evacuation via the safest routes.

"Big cruise companies and terminal operators could also utilise the data straight from our interface and bring it into their own systems. It is also possible to add a wide range of other sensors to the Hyperunit sensors to gather more information about the maritime environment under observation," Vepsäläinen concluded.