

ENERGY  
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## CASE ROYAL CARIBBEAN CRUISES LTD: TEMPERATURE CONTROL IMPROVES FUEL ECONOMY IN CRUISE VESSELS

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Juha Vainio, Manager Power Plant Services,  
Royal Caribbean Cruises Ltd.

### Key components of the Wärtsilä RTDC system:

- control cabinet
- a humidity sensor
- a tri-way signal

The solution can be supplied as a basic delivery or a turnkey solution. The basic delivery includes hardware and commissioning.

For a luxury cruise operator such as Royal Caribbean Cruises Ltd. (RCL) it is of vital importance that a cruise ship is reliable and can keep to its schedules. Moreover, economy and environmental issues are also high on the agenda.

– Cruising in tropical conditions where humidity is high can generate tons of condensation in the engine charge air system. This is water which can cause severe corrosion problems if left unattended, resulting in an unwanted and unplanned maintenance stop, says **Juha Vainio**, Manager Power Plant Services, at Royal Caribbean Cruises Ltd.

This is one of the reasons why RCL decided to install Wärtsilä's Receiver Temperature Dew Point Control (RTDC) system in 10 of their biggest luxury cruisers including the vessels 'Oasis of the Seas' and 'Allure of the Seas'.

Royal Caribbean Cruises Ltd. is a global cruise vacation company that operates Royal Caribbean International, Celebrity Cruises, Pullmantur, Azamara Club Cruises and CDF Croisieres de France. The company has a combined total of 43 ships in service comprising more than 200 engines. RCL also offers unique land tour vacations in Alaska,

Asia, Australia, New Zealand, Canada, Europe and South America.

### INSTALLATION DURING VESSEL OPERATION

Vessels operating in variable ambient conditions tend to run their engines with an unnecessarily high charge air temperature in order to minimize the creation of condensation. This practical operation setup, however, increases specific fuel oil consumption (SFOC). Attempts to reach the designed air receiver temperature in tropical conditions always lead to condensation in the charge air system, which can cause corrosion and reduce the operating lifetime of the engine.



WÄRTSILÄ

“Overall, I would say a top class rating.”



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One clear advantage of the Wärtsilä RTDC system is that it can be installed while the ship is in operation, thus minimising engine downtime. The main challenge in retrofitting several cruise ships during the RCL project was in linking Wärtsilä’s hardware to the different existing control systems.

– There were components from different manufacturers to consider. But together with Wärtsilä, we first made a pilot installation on one of the newer ship engines and then copied the process to the other ships with similar configurations, says Juha Vainio.

Juha praises the installation work and Wärtsilä’s staff.

– The engineer certainly knew the product and was able to do both his own tasks and lead our people during the installation process. Overall, I would say a top class rating.

**LOWERING FUEL CONSUMPTION AND EMISSIONS**

A conventional control system keeps the charge air temperature constant without taking humidity into account. By comparison, the Wärtsilä RTDC is a fully automated solution that dynamically adjusts LT water flow for an optimal charge air temperature. This prevents condensation in the charge air receiver, thus preventing corrosion and reducing the risk of engine damage. It is designed with standard components to cover various Wärtsilä 46 engine configurations and water control systems.

Royal Caribbean Cruises Ltd. has ships sailing in tropical conditions such as the Caribbean with high humidity, as well as in dry conditions such as those found in Europe.

Challenges	Solution	Benefits
<ul style="list-style-type: none"> <li>– Improving energy efficiency and fuel economy</li> <li>– Preventing condensation and risk of corrosion</li> <li>– Connecting hardware to different existing control systems in 10 ships</li> <li>– Retrofitting without disturbing the ship operations</li> </ul>	<ul style="list-style-type: none"> <li>– Installation of the Receiver Temperature Dew Point Control that prevents condensation and the risk of corrosion, while improving the efficiency and reliability of engine operation and lowering fuel consumption and emissions.</li> </ul>	<ul style="list-style-type: none"> <li>– Reduced risk of corrosion in charge air system and inlet valves</li> <li>– Increased lifetime of equipment</li> <li>– Improved fuel economy by up to 1.0% in dry ambient conditions</li> </ul>

– The temperature rises when we charge the air in tropical conditions, and when we cool it down to be optimal for the engines we pass the dew point and hence create a lot of unnecessary waste water, says Juha.

– As the Wärtsilä RTDC system reacts quickly to humidity changes, it increases the receiver temperature set point whenever humidity starts to rise, so avoiding the creation of excessive amounts of condensation. As soon as the air gets drier, the system then lowers the air receiver set point for better fuel economy. According to the data that we have collected so far, it can be seen that whenever the air is dry, we have clear fuel savings, and whenever humidity rises, the engine is protected, making the return on the investment very good.

**IMPROVING EFFICIENCY AND RELIABILITY**

This project serves as a good example of the very good relationship between Wärtsilä and RCL. Juha estimates that during the last five years Wärtsilä and RCL have made more than

20 field tests for new components and new products.

– It all boils down to interpersonal trust between individuals in our respective companies. As we provide happy holidays for our customers, reliability and availability are important.

Like all other cruise companies, RCL wants to increase energy efficiency; according to Juha, the RTDC system does exactly that. Although the solution has only been in use for a short time, he is confident that it will extend maintenance intervals and hence lower maintenance costs.

– As a general investment for protecting the engines and increasing efficiency, I would certainly recommend other ship owners to install the receiver temperature dew point control. The payback time is good, concludes Juha Vainio.

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