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MANUFACTURING TECHNOLOGY

Manufacturing Case Study

Tricool chillers aid research by BRE into air quality on board aircraft

Concern about the impact of flying on health, fuelled by extensive media coverage and DVT (deep vein thrombosis) issues, prompted the European Commission to take action.

As a result, a full-scale aircraft cabin test rig built by BRE is being used for two EC-funded projects to research exactly what the ideal environment inside an aircraft cabin should be for both passengers and crew.

Live trials on board the rig

The Aircraft Cabin Environment (ACE) test rig consists of a 17-metre long section of the forward fuselage of a wide-bodied passenger jet, fitted-out with equipment to measure a wide range of environmental conditions including noise, vibration, humidity and temperature control, all under simulated flight conditions.

BRE brief was to focus on cabin air quality, noise and vibration, with the aim of creating a benchmark for the airline industry.

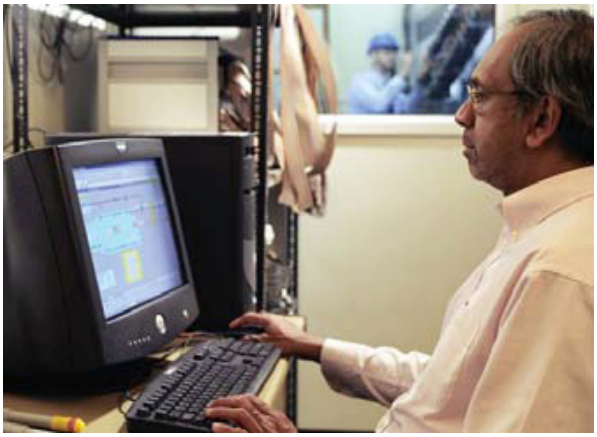
As a unique facility, the ACE rig required extensive planning before any testing could take place. David Butler, principal consultant at BRE, was responsible for overseeing the environmental conditioning systems. Recreating realistic conditions meant designing a system that was capable of supplying air at a very low RH. Aircraft cruise at around 38,000 ft, and with temperatures outside the aircraft touching -57 °C, air drawn into the cabin has very little moisture content. “Simulating those conditions at sealevel is very difficult,” says David.

The specification

“Tricool Thermal is well used to designing systems to provide solutions for a wide range of applications, but the ACE test rig is a unique application,” comments Dave Palmer, Director at Tricool Thermal. “The Compac uses the latest advances in refrigeration technology, is reliable and can provide the range of cooling required by BRE.”

“The chillers are our main source of cooling,” says David. “They run continuously throughout each test and play a pivotal role in creating variable environments within the aircraft”.

Regular ‘flights’ took place at Garston over a period of several months, with cabin crew, pilots and co-pilots, plus 20-35 volunteer passengers. The duration of each flight was 3hrs 40mins.



Scientific research with BRE

The environment within the building containing the aircraft was cooled down 5-10° before each test to simulate reduced thermal loads. The surfaces of the walls and windows in the main cabin are cooled by a water glycol solution circulating through pipework at a temperature of 0 °C. Temperatures inside the aircraft ranged between 21-27 °C. BRE’s air-conditioning system has the same high levels of filtration as normal commercial aircraft, which includes a HEPA filter. However, the system had to provide a very high level of dehumidification to match conditions on real aircraft. Air is therefore precooled and dehumidified with a low temperature coil before being passed through a desiccant dehumidifier, which has the effect of heating the air so it needs re-cooling. The

ICS House, Stephenson Road, Calmore Industrial Estate, Totton, Southampton, SO40 3RY
t: 023 8052 7300 f: 023 8042 8366 e: info@coolenergy.co.uk

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temperature is then trimmed to the desired levels prior to the air being supplied to the cabin ventilation system.

At the same time, the air supply to the flight deck passes through the dehumidifier and cooling coils before being circulated in the cockpit.

The results

Total flexibility of the conditioning system enables the airflow into the aircraft and the re-circulated air to be altered as required for each test. The RH in the cockpit has been taken down to 6% during tests and as low as 10% in the main cabin.

The results of the research will take many months to collate. But the goal is to scientifically establish what constitutes the ideal environment onboard commercial aircraft so that passengers and crew can work and travel in a safe and healthy environment.

Visit our website **www.tricool.com** for more information, or contact us on **0800 977 5709** or at **info@icstemp.com**.

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