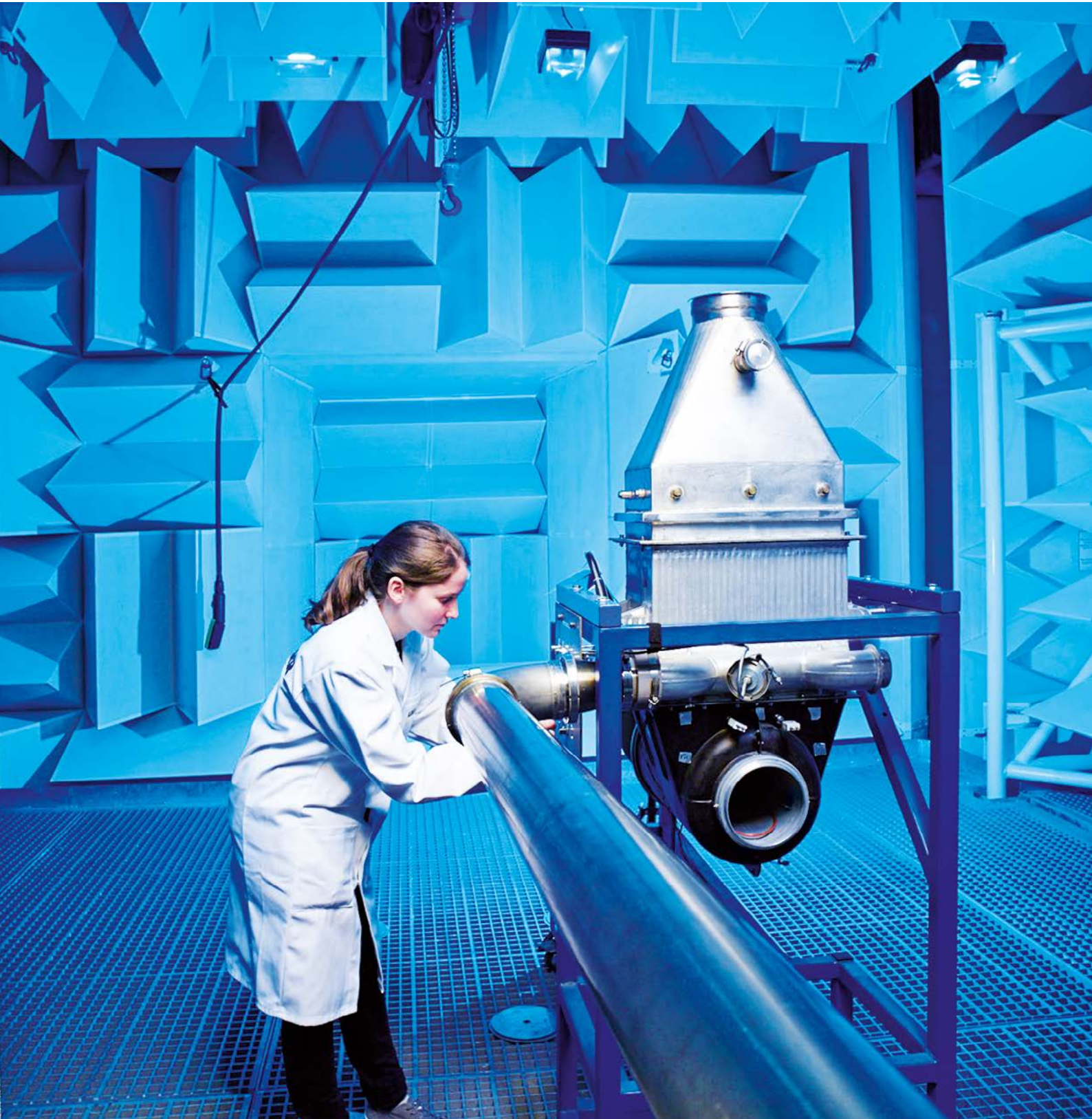


Acoustic Analyzing in Anechoic Chamber



LIEBHERR

Anechoic chamber

In 2011, Liebherr-Aerospace has built in Toulouse (France) a facility which is unique in Europe for acoustic analyzing: an anechoic chamber with air capabilities.

In this room, Liebherr is able to measure the noise emission of its aerospace air management systems equipment under real conditions. The goal is to minimize the noise in order to improve the comfort of the passengers on board the aircraft and also to meet the noise emission standards at airports.

Liebherr-Aerospace is offering its anechoic chamber and its skill to other companies to perform acoustic tests with any kind of equipment with or without air supply.

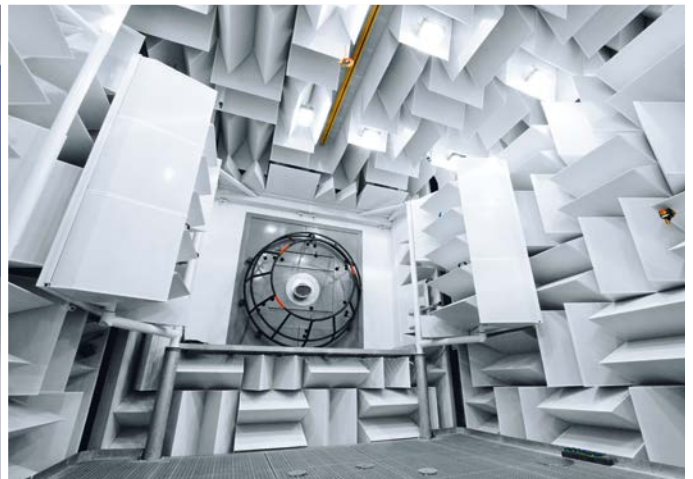
Capabilities:

- Acoustic power (according to ISO 3945/ISO 9614)
- Free field measurement
- Directivity of noise emissions
- Spectral analysis
- Localization (intensity method)

Anechoic chamber monitoring and control system



Acoustic power measurement



The chamber's characteristics, the many possible configurations as well as the expertise of Liebherr-Aerospace in acoustics, allow system analyzes in optimal conditions.

General

- Chamber 7.5 x 7.5 x 8.0 m
- Lifting floor
- Full and semi anechoic configuration
- Front door 2.8 x 2.9 m

Technical

- Structure uncoupled from the building
- Air conditioning
- Acceptable ambient temperature: between -40 °C and +85 °C
- Air extraction capability: 9 kg/s at 160 °C

Test examples on aerospace air systems:

- Development test: Outlet and radiated noise characterization of a jet pump used on helicopter (air system mixer with supersonic flow speed).
- Research program: Valve outlet noise measurement to identify critical operating conditions and to improve acoustic predictions of valves installed within air systems.
- European research program in partnership with Airbus: Inlet and outlet noise measurements of classical air conditioning system (air supply coming from aircraft engines) and innovative electrical system (without air supply of engines) in order to compare acoustic emission. The tests allow Liebherr-Aerospace to generate acoustic reduction concepts as early as from the first phase of system development.

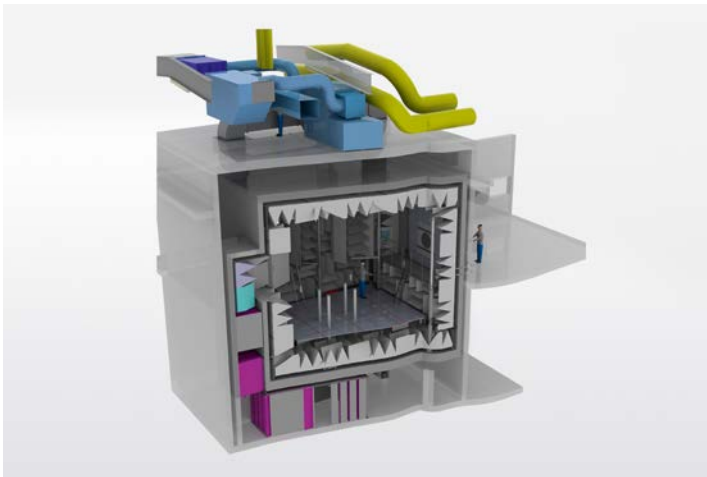
Acoustic

- Cut off frequency: 90 Hz
- Background noise
 - 20 dB (A)
 - 50 dB (A) with air handling unit

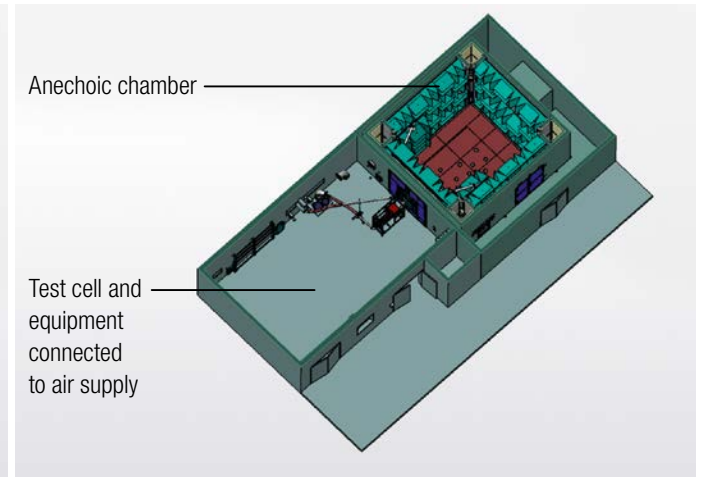
Coupling with a test cell

- Air supply 7 bar / 1000kw (3 kg/s and + 300 °C)

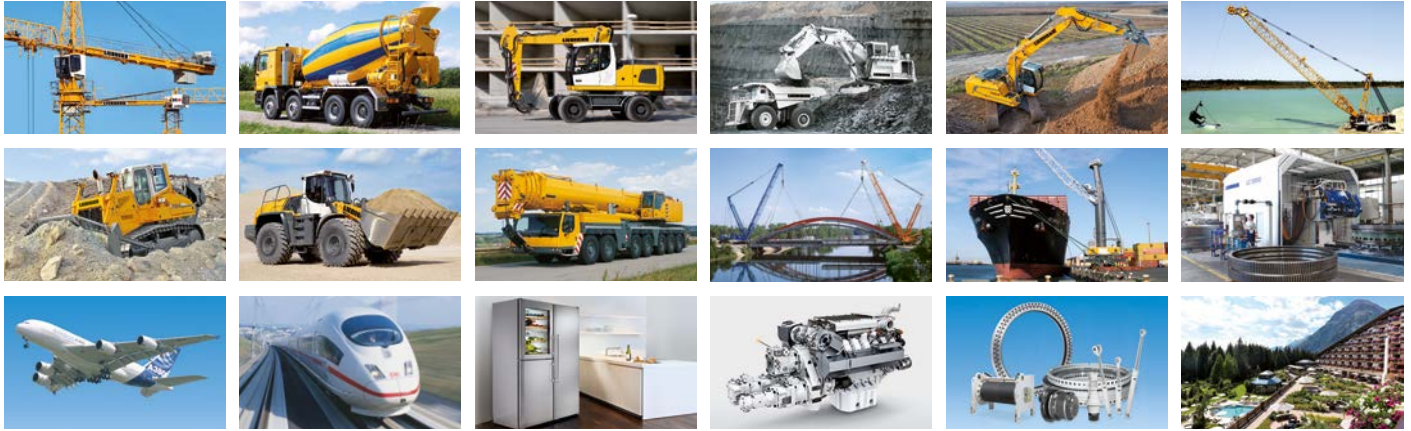
Cutaway model of the anechoic chamber



Chamber layout



The Liebherr Group of Companies



Wide Product Range

The Liebherr Group is one of the largest construction equipment manufacturers in the world. Liebherr's high-value products and services enjoy a high reputation in many other fields. The wide range includes domestic appliances, aerospace and transportation systems, machine tools and maritime cranes.

Exceptional Customer Benefit

Every product line provides a complete range of models in many different versions. With both their technical excellence and acknowledged quality, Liebherr products offer a maximum of customer benefits in practical application.

State-of-the-art Technology

To provide consistent, top quality products, Liebherr attaches great importance to each product area, its components and core technologies. Important modules and components are developed and manufactured in-house, for instance the entire drive and control technology for construction equipment.

Worldwide and Independent

Hans Liebherr founded the Liebherr family company in 1949. Since that time, the enterprise has steadily grown to a group of more than 130 companies with over 41,000 employees located on all continents. The corporate headquarters of the Group is Liebherr-International AG in Bulle, Switzerland. The Liebherr family is the sole owner of the company.

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