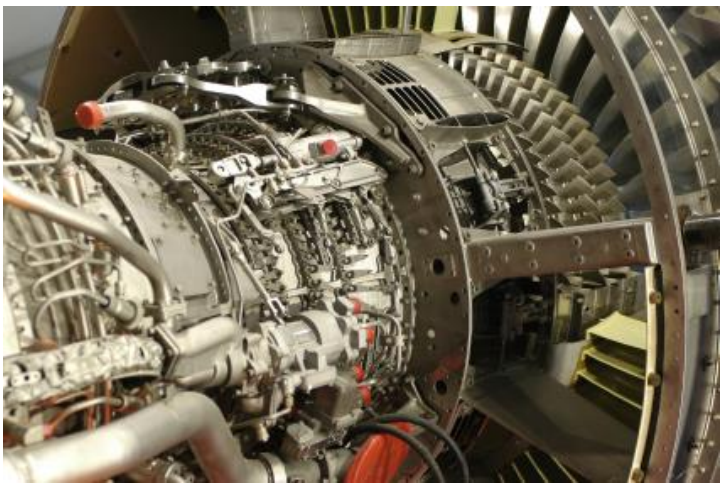
Use of cooled mirror hygrometers to create standardized conditions for aero engine acoustic testing

Application background

Aircraft noise emission has been the subject of much discussion, debate and government legislation in recent years. Aero engine manufacturers conduct very sophisticated test procedures to evaluate and minimise the noise generated by the engines. The tests are split into two specific areas:



1. Dynamic testing

Aero engines are mounted on fixed test stands and run at varying power levels to test performance criteria, combustion efficiency, noise level, etc. These tests are very expensive to conduct and data collection needs to be of the highest integrity. Rolls Royce spend more than 20,000 Euros per running hour on engine testing.

2. Passive testing

The noise generated by the spinning of the engine components, turbine blades, bearings, etc is tested in a passive mode by rotating the engine in an anechoic chamber. This is a totally sound insulated chamber which produces no internal reflection of sound and measures the pure sound generated by rotation of the engine. The rotation is effected by an external controlled motor.

Measurement technique

It is important in both the above tests to measure the humidity of the ambient air in the test zone. Attenuation of sound in air is dependent on, amongst other factors, the density of the air which is in turn affected by its temperature, pressure and its humidity. Accurate determination of the ambient dew point allows proper correction for the density of the air which in turn allows the noise level calculations to be calculated with a high degree of certainty. Typically, the Optidew 501 is used in engine testing and it provides the highest accuracy (0.2) and long term stability that this engine testing demands.

NOTE: The application can also be found in the automotive industry or potentially for any product or process where noise emission is an important commercial or legal aspect.

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