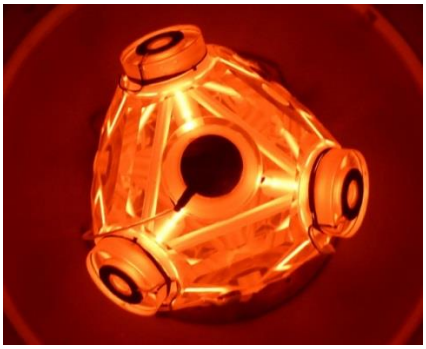
Bruker alicona
That's metrology!

Optimization of manufacturing of "gyrolasers" with Focus Variation

After evaluating the various technologies available, Thales selected Bruker Alicona as the only company capable of offering a solution that is both efficient and quick to implement. By measuring shape, size, position and roughness with a single system, Focus-Variation bridges the gap between 3D coordinate Measurement Systems (CMMs) and conventional profilers.

World-renowned for its industrial electronic solutions, Thales has an entity in the Avionics division that specializes in Navigation, located on several industrial sites, including La Brelandière in Châtellerault (France - Vienne 86). This site produces inertial systems for the aeronautics industry, a true Thales trademark. These systems, based on glass ceramic sensors called "gyrolasers", allow the position of the aircraft to be known without the help of GPS satellites.



Glass-ceramic sensor called "gyrolaser"

The "gyrolaser" components are manufactured by high-precision machining in a glass ceramic material block. This high-quality glass ceramic (identical to that used to make the mirrors of large telescopes) is not very sensitive to thermal variations and makes it possible to reach roughness levels of < 1 nm rms after super polishing.

In order to reach these roughness levels, many refinement steps are necessary after machining the "gyrolaser". One of the key steps of the process consists in eliminating the SSD* resulting from the machining process by chemical etching on the parts [*SSD: Sub-Surface Damage, are micro cracks present on the surface and invisible to the contact profiler. These micro cracks are generated by the friction of the diamond tools on the glass ceramic].

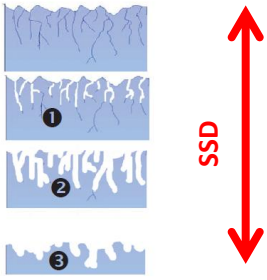


Figure 2: Operating principle of chemical etching in 3 steps.

Measure shape, size, position & roughness with one single system

In order to correctly control the chemical etching process and the amount of material removed, it is necessary to precisely know the roughness of the workpieces after machining and before chemical etching.

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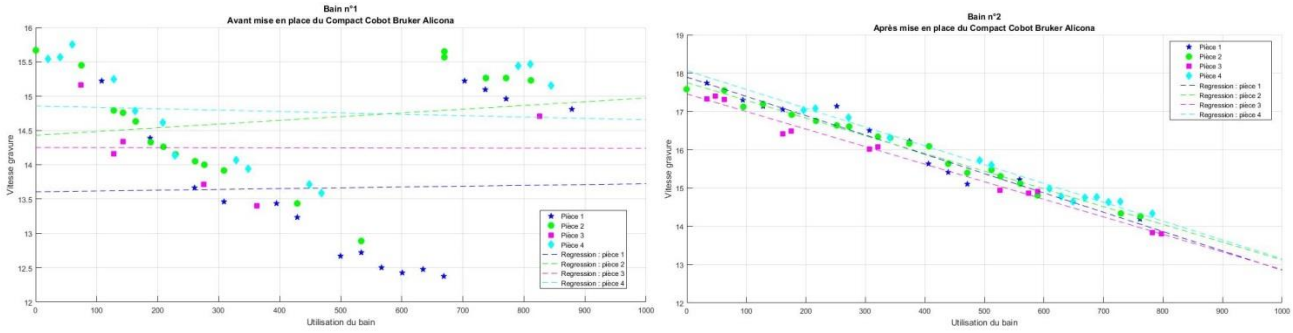
Efficiency and implementation speed

Based on precise technical specifications, the choice was quickly made for a 6-axis collaborative robot equipped with an R25 (Compact Cobot) measuring head. "The main difficulty consisted in structuring the control programs, bypassing access problems and meeting cycle times", says François Cuvillier, Gyrolaser Product Line Indrustrialization Manager at Thales AVS. Thanks to the joint work of the Thales AVS and Bruker Alicona teams, the equipment was quickly validated and put into production.



Etching speed vs. bath use before and after setting up the Compact Cobot by Bruker Alicona

Compact Cobot, by Bruker Alicona, located in the metrology room at Thales AVS Châtellerault la Brelandière and equipped by the company Rhonax (Thyez 74 France /www.rhonax.fr).

Towards a fully automated production

Thales is participating with many other manufacturers in the Aerospace Factory of the Future project, a French collaborative research platform aimed at imagining and implementing all the technologies that will make aerospace factories more competitive over the next fifteen years. Current developments thus seek to make autonomous production cells, by connecting all the production elements together,

from machine tools, through washing and robotics, to metrology equipment, in order to create an intelligent and self-adaptive production unit.