CUSTOMER STORY

ACCURATE CABIN PREDICTIONS

MODELING REAL AUTOMOTIVE PARTS REPLACES COST- AND TIME-CONSUMING PHYSICAL TESTING

About the Customer

With a turnover of €580 million in 2021, Trèves Products Services & Innovation in France is one of the leading Tier-1 suppliers of noise, vibration, and harshness (NVH) reduction parts. Trèves provides full sound packages for the trunk, body, interior, and powertrain. Among the 4,900 employees, 300 are R&D engineers located across 9 technical centers, with 26 plants in 17 countries all working to meet the requirements of their 15+ OEM customers. Their numerous specialists in the characterization and modeling of poro-elastic sound packages have been successfully using AlphaCell for over 5 years.

> “Accounting for the thickness distribution gives a significantly more accurate estimation of the absorption area. The proposed approach allows a numerical optimization of the thickness distribution without manufacturing or characterizing flat samples at several thicknesses.
>
> Lei LEI, PhD, Mechanical and Acoustical Engineer at Trèves Products Services & Innovation, France

Learn More:
Watch Video Now

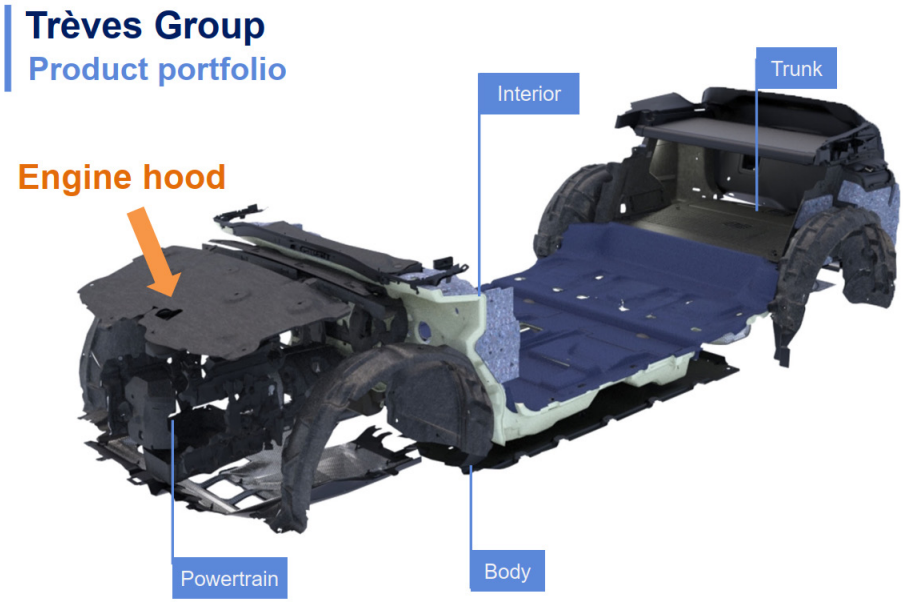

Figure 1

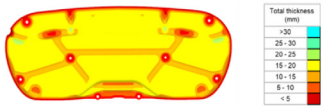

Figure 2

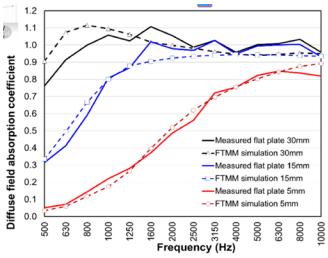

Figure 3

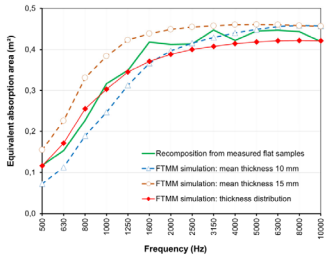

Figure 4

Figure 1: The engine hood solution optimized using AlphaCell. **Figure 2:** The engine hood solution requires a complex thickness profile. **Figure 3:** AlphaCell offers accurate predictions of complex real-world parts. **Figure 4:** Improved simulation accuracy by accounting for varying part thicknesses.

Their Challenge

To best meet their customer expectations, where possible Trèves is reducing part design and lead time by replacing expensive and time-consuming physical testing with numerical modeling. Traditionally, such models need real parts to account for their multi-layer arrangement and varying thickness. Their input parameters must also be readily available. Finally, the models should be comprehensive in scope and easy to implement. Given upcoming reduction in pass-by noise emission limits from 70 to 68 dB, expected in 2024, this ability is becoming essential.

Our Solution

Available via the Altair Partner Alliance (APA), AlphaCell from Matelys-Research Lab offers several features that met Trèves' needs. In addition to structure-borne sound (random force, rain-on-the-roof, rolling noise) and turbulent boundary layer excitation, AlphaCell can predict within seconds the response of multi-layer configurations in diffuse sound field conditions, such as those encountered in an alpha-cabin test. The effect of varying thicknesses is accounted for in a fast, user-friendly manner with any compressed part predicted from the initial material properties (e.g. thermocompression). Although not part of this project, the sound package could be integrated in AlphaCell's auralization module to estimate the perceived sound difference.

The model's acoustic input parameters were determined via a dedicated characterization process mastered at Trèves using the Matelys software suite and equipment. Simulation results were easily compared with measured data using the model's intuitive drag and drop interface. In this project, data for flat samples produced in several thicknesses were compared with real engine hood parts, including the support structure shown in Figure 1 and 2.

Results

Implemented in less than a day, the model delivered a major time reduction compared with manufacturing real parts. The satisfactory acoustic predictions provided using AlphaCell enabled Trèves to numerically optimize the engine hood solution. As seen in Figure 3 and 4, with just a few seconds to calculate results for the full frequency spectrum, the low computation time led to the modeling process being applied to the entire sound package, including the engine bay, underbody, and wheel arch area. The capabilities of AlphaCell have helped position Trèves to provide even more robust solutions to OEMs in order to achieve the next generation of pass-by noise limits.

To learn more, please visit altair.com/alphacell