

VIBES.technology

SUCCESS STORY

VIBES.TECHNOLOGY AND MERCEDES-BENZ COOPERATION IN NVH DEVELOPMENT

AT A GLANCE

CLIENT
Mercedes-Benz, automotive OEM

APPLICATION
Airborne sound characterization for electric vehicles, using an artificial engine on a test bench

PRODUCTS USED
DIRAC, SOURCE, COUPLE

KEY RESULT
A standardized source characterization method shared with Magna Powertrain, with less reliance on physical prototypes

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In the automotive industry, optimizing vehicle performance and passenger comfort is a primary focus. Noise, Vibration, and Harshness (NVH) development plays a functional role in ensuring vehicles meet consumer expectations, particularly as the industry shifts toward electric mobility. VIBES.technology, a provider of NVH testing and simulation solutions, partnered with Mercedes-Benz to update NVH development methodologies using their software tools. This collaboration streamlined processes, improved testing accuracy, and facilitated standardized cooperation with suppliers like Magna Powertrain.

THE CHALLENGE: PIONEERING NVH FOR ELECTRIC VEHICLES

Mercedes-Benz faced the practical challenge of characterizing NVH for its electric vehicles (EVs). Unlike internal combustion engine vehicles, EVs lack engine noise, which makes other sound sources, such as electric motors and auxiliary systems, more noticeable in the cabin. To manage acoustic quality, Mercedes-Benz needed a systematic method to evaluate airborne sound and measure transfer functions within the vehicle.



Traditional NVH testing relies heavily on physical prototypes and measurements, which require significant time and resources. Mercedes-Benz sought a solution for source characterization and testing that also allowed for consistent data sharing with Magna Powertrain, a partner in powertrain component development. VIBES.technology's software tools were selected to address these testing requirements.

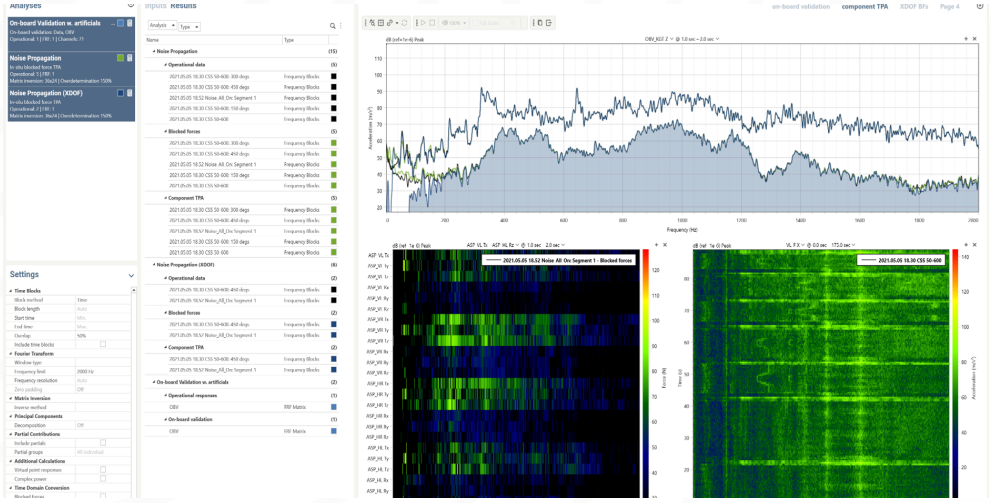
THE SOLUTION: VIBES.TECHNOLOGY'S INNOVATIVE APPROACH

VIBES.technology provides modular NVH testing solutions, offering software tools designed to analyze sound and vibration performance. Their flagship software suite includes specific tools for source characterization and transfer path analysis (TPA), which allow manufacturers to model NVH behavior during the development process. Mercedes-Benz integrated VIBES' tools to manage airborne sound characterization in EVs, using an approach that combined physical test bench data with virtual simulation.

Central to this process was the use of an artificial engine methodology: utilizing a compact box with embedded speakers, roughly the size of an electric motor. This artificial engine enabled engineers to simulate airborne sound sources in a controlled, repeatable environment. By integrating this hardware setup with VIBES' software, the engineering team measured source characteristics on a test bench and calculated the airborne transfer functions inside the vehicle cabin.

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THE IMPLEMENTATION: PROCESS INTEGRATION AND RESULTS

VIBES' software tools (DIRAC, SOURCE and COUPLE) were integrated into Mercedes-Benz's development workflow to conduct source characterization and transfer path analysis (TPA). The artificial engine setup provided a functional alternative to relying solely on full-vehicle testing methods. By simulating the acoustic output of electric motors, the team evaluated various scenarios without needing physical prototypes for every iteration, reducing testing time and resource expenditure.

A primary outcome of this workflow was the derivation of accurate airborne transfer functions inside the vehicle cabin. These functions mapped how sound from the electric motor and auxiliary systems travels through the vehicle structure. VIBES' software allowed Mercedes-Benz to visualize these transfer paths to target specific areas for acoustic damping and optimization.

The methodology was also extended to Magna Powertrain. Using VIBES' tools, Mercedes-Benz and Magna Powertrain established a standardized method for source characterization on their respective test benches. This standardization enabled the sharing of consistent data, ensuring powertrain components met NVH requirements prior to final vehicle integration.

THE IMPACT: OUTCOMES IN NVH DEVELOPMENT

By utilizing VIBES' software tools and the artificial engine approach, Mercedes-Benz recorded the following measurable outcomes:

- **Targeted Accuracy:** Using VIBES' software for source characterization and transfer path analysis provided precise data for acoustic optimizations.

- **Efficient Development:** The artificial engine setup decreased reliance on physical prototypes, enabling faster testing and iteration cycles.

VIBES.TECHNOLOGY AND MERCEDES-BENZ COOPERATION IN NVH DEVELOPMENT

• **Standardized Collaboration:** Shared testing methods facilitated consistent data exchange with Magna Powertrain, ensuring component compatibility and reducing development friction.

• **Acoustic Control:** The NVH optimization contributed to a quieter cabin environment for the final vehicle design.

LOOKING AHEAD: A PARTNERSHIP FOR THE FUTURE

By pairing VIBES' software tools with Mercedes-Benz's engineering processes, the partnership established a highly functional NVH testing workflow for electric vehicles. This methodology provides a systematic framework for addressing acoustic engineering requirements as electric mobility continues to expand. For Mercedes-Benz, implementing this testing standard helps ensure that their EVs meet required NVH specifications efficiently, supporting their broader vehicle development goals.