

FIAT

Predicting and Eliminating Squeak & Rattle Noise

For car makers, squeak and rattle phenomena represent a significant problem as many customers will interpret the noise as a general lack of quality in the product. FIAT has studied the potential for squeak and rattle noise in its vehicles for many years but previously this was only achieved by testing physical components that were produced using near final designs. If any noise issues were discovered, the team could only apply quick fixes to solve them which could be a very costly exercise. Utilizing a simulation approach, where interior noise is analyzed ahead of physical testing, can reduce the need for fixes late in the development process.



solution

FIAT chose Altair ProductDesign as a partner to perform a pilot project to investigate squeak and rattle. The project focused on studying issues on the FIAT UNO, a vehicle made exclusively for the South American market. Altair ProductDesign suggested that FIAT implement Altair's 'Squeak & Rattle Director' (SNRD), a comprehensive set of services and software automations that rapidly identify and analyze design alternatives to eliminate the root causes of squeak and rattle in assemblies. With customization from the Altair ProductDesign team, the solution provides a semi-automated approach to determine relative component displacements in the time domain that can lead to undesired noise. A dedicated four day workshop facilitated a fast ramp-up of the NVH team's knowledge of the SNRD and helped Altair to identify FIAT's specific design process that the solution could be tailored to.

SNRD enabled FIAT's NVH specialists to import linear models for their pre-existing vehicle range and correlate the simulation results with the known physical test data. FIAT's test engineers were then able to assist the CAE analysts and design teams by performing A2B comparisons between the existing models and those evaluated with the SNRD. By understanding the performance of the new concepts and quantitatively comparing those to correlated models and/or to different variants, the engineers could be more confident in their design decisions.

result

FIAT's NVH team is now routinely using the SNRD in its simulation loops. The solution allows the team to identify the risk areas for squeak and rattle, and understand the effect of various deviations that could result from the manufactured parts through sensitivity studies. For example, the effect of different material properties, tolerance chains, and different road loads.

FIAT's NVH experts are now able to quickly and accurately study the potential for squeak and rattle phenomena to occur in their vehicles earlier in the development process. Once identified, these issues can be addressed and removed from the final design before physical hardware is produced. This in turn leads to significant cost and time savings.