

## Automotive and transportation

# Fiat

Fiat delivers extraordinary NVH performance across product lines using LMS simulation and testing solutions

### Product

LMS

### Business challenges

Integrate NVH requirements of two distinct automotive giants

Utilize one NVH solution for all types of automobiles

Increase agility to meet rigorous development schedules

### Keys to success

Use LMS simulation and testing solutions to deliver a robust, virtual validation process and develop the best-in-class NVH performance

### Results

Achieved one NVH solution, utilizing the most advanced technologies from two companies

Optimized design validation with minimal errors

Achieved all NVH performance targets

Now delivering solutions to road noise problems in days instead of weeks



**Siemens PLM Software technology plays a key role in helping Fiat optimize NVH performance; company solves noise problems in days instead of weeks**

### Merging best-in-class competencies

In today's automotive market, excellent noise, vibration and harshness (NVH) performance is no longer just for the luxury sedan segment. Buyers of cars from Europe's A-segment (mini cars) to America's large sports utility vehicles (SUVs) expect as much comfort and performance, just in different-sized packages. But what happens to NVH

requirements when two seemingly different automotive giants like Fiat Group Automobiles SpA (Fiat) and Chrysler Group LLC (Chrysler) merge?

The past few years have been those of integration, with both the Italian and American teams combining competences, aligning processes and developing joint programs. Although they have distinct philosophies, the Fiat-Chrysler merger was a good match. The North American team's distinctive competence is iconic American cars like the 4-wheel-drive Jeep®, big pickup trucks and large, comfortable cars with rear-wheel drive and automatic gear-boxes, while the Europe, Middle East and Africa (EMEA) region is more focused on

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Roberto Mangiantini  
NVH Manager for Vehicle Concepts and Integration  
R&D  
EMEA Product Development  
Fiat Group Automobiles SpA

“We really had a unique opportunity to merge competencies like testing procedures, virtual and experimental tools, target-setting and deployment processes, as well as best practices and different NVH market requirements. We both brought our best-in-class competencies to the field and, now with LMS solutions, we are speaking one improved NVH language.”

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Italian beauties that inspire a passion for driving like the Alfa Romeo 4C and FIAT® 500 as well as other small, fuel-efficient cars and vehicles featuring manual transmissions and diesel engines.

“NVH performance is a different ball game with little cars. You have to optimize the use of space in different ways to reach high-performance levels and sustainable solutions,” explains Roberto Mangiantini, NVH manager for Vehicle Concepts and Integration in R&D (research and

development) – EMEA Product Development. Mangiantini’s team is responsible for all NVH performance development. “We really had a unique opportunity to merge competencies like testing procedures, virtual and experimental tools, target-setting and deployment processes, as well as best practices and different NVH market requirements. We both brought our best-in-class competencies to the field and, now with LMS solutions, we are speaking one improved NVH language.”



### Eliminating annoying road noise

One typical NVH performance target area is road noise. Clearly, road noise transfer path analysis is a well-known diagnostic technique. Although road noise performance is mostly managed on an architectural level, issues that arise on individual models are best handled using quick reliable tools, such as LMS™ solutions from product lifecycle management (PLM) specialist Siemens PLM Software, that solve the issue in days and not weeks.

In a very complex process with a huge number of variables, including common parts, subsystems, available options and various powertrains, the LMS simulation and testing solutions help design the best-possible NVH performance early in the process. Engineers can zoom in on specific ideas and can see how a small change can affect the overall NVH performance. They can also increase performance in a particular architecture to emphasize brand traits for certain market segments and sectors.

"All LMS solutions help us prove that our NVH performance is solid in regards to the chassis and underbody, and can be easily adapted even when you change car bodies – 'top hats' in auto industry slang," notes Mangiantini. "This is a clear benefit if you look at the number of variations we do."

### Competition creates the need for much shorter timeframes

Cutthroat competition means ever-shorter development times, which means engineers today need to really do their homework. That requires a good, integrated simulation method and robust, virtual validation process. Reinforcing the design validation process is a fundamental tool in supporting product competitiveness. The ideal solution should include total virtual analysis coverage (for design validation with zero loops) that incorporates new real-time experimental technologies for immediate diagnosis.

With extremely tough virtual design validation targets, achieving excellent NVH performance is essentially only possible if quite a number of factors are already in place. Among these factors, the virtual validation plan must be robust enough to optimize the design validation with minimal errors. The target-setting and deployment phases need to be complete, and the speed of the design validation process must be as fast as possible to diagnose and solve emerging issues quickly. With its seamless interaction and integration, LMS Test.Lab™ software provides the tools needed to meet all of Fiat's NVH performance targets.

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Guglielmo Caviasso  
Director of R&D  
Vehicle Concepts and  
Integration  
Fiat Group Automobiles SpA



When thinking about a new car or a new model, a comprehensive benchmark assessment must be completed and the experimental phase must be supported by fast, powerful systems. "I have worked with LMS testing solutions for more than 15 years," says Mangiantini. "Today, we use LMS Test.Lab and LMS SCADAS solutions for all types of work – from competitive analysis during new model development to our final validation milestones. We have all kinds of LMS SCADAS hardware, including 40-channel units for the proving ground and test benches and 72-channel units for more detailed work. We can also link up multiple units for even more channel access. The LMS SCADAS and LMS Test.Lab systems are fast and efficient. These are essential tools to help us reach our NVH performance targets and verify and validate our designs."

#### **Plans to cover all NVH performance aspects virtually**

"Together with Chrysler, we are working on improving our virtual analysis process," explains Guglielmo Caviasso, director of R&D, Vehicle Concepts and Integration. "As I said during one of the past LMS automotive conferences, we are simulating about 75 percent of the NVH performance of the car. We are seeing that we can do more via simulation. Our target over the next years is to cover all the NVH performance aspects virtually."

Mangiantini adds, "For many years, we have used LMS Test.Lab and LMS SCADAS data acquisition hardware and, more recently, we have integrated other LMS solutions, like LMS Virtual.Lab. We will continue to use them as important tools to support the development of excellent NVH performance."

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## Solutions/Services

LMS Test.Lab  
[www.siemens.com/plm/lms-test-lab](http://www.siemens.com/plm/lms-test-lab)

LMS SCADAS  
[www.siemens.com/plm/lms-scadas](http://www.siemens.com/plm/lms-scadas)

LMS Virtual.Lab  
[www.siemens.com/plm/lms-virtual-lab](http://www.siemens.com/plm/lms-virtual-lab)

## Customer's primary business

The Fiat Group designs, engineers, manufactures, distributes and sells vehicles globally. Fiat brands include Fiat, Alfa Romeo, Lancia, Abarth; Chrysler brands include Chrysler Jeep, Dodge, Ram, and Street and Racing Technology (SRT) vehicles. The Fiat Group also produces luxury cars under the Ferrari and Maserati brands.  
[www.fiatspa.com](http://www.fiatspa.com)

## Customer location

Turin  
Italy

An automotive engineer for more than 30 years at the Fiat Group, Mangiantini today finds himself playing more of a strategic role in the new global company. He explains, "I see my job more as an orchestra conductor. We need to harmonize all the different components and systems in a car to produce what our different audiences like. It requires the right balance

and the right trade-offs, adjusted according to segments and brands. It doesn't matter if you have a small quintet or a large symphony orchestra; it is the final NVH performance that matters, and LMS simulation and testing solutions play a pivotal role in this process."

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