



courtesy of

**IVECO**



Success story

# IVECO S-WAY truck: perfecting cab design to maximize driving comfort

Employing ESTECO optimization-driven design approach to reduce truck cab vibration.

*IVECO relies on ESTECO technology to innovate its simulation-driven product development process. IVECO engineers combine the use of CAD and CAE solvers within modeFRONTIER workflow to automatically execute parametric simulations across a wide spectrum of disciplines: structural calculation (crash, durability, strength), fluid dynamics, NVH (Noise, Vibration, Harshness) and vehicle dynamics. On top of the automated simulation process, they apply optimization algorithms to achieve better vehicle designs with increased performance at reduced production costs.*

## Challenge

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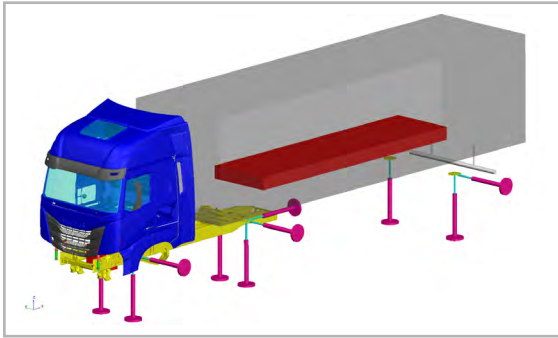
**The optimization process led us to achieve up to 10% reduction in cab vibration.**

The IVECO S-WAY is a complete transport solution which provides excellent life on board conditions to drivers. With a brand-new cab designed to enhance aerodynamic performance and increase fuel efficiency, engineers at IVECO had to completely rethink the suspension system to improve the comfort standard level.

In fact, one of the main challenges of the project was to evaluate the cab comfort before the construction of any prototype. Consequently, they made use of **multi-body simulation and optimization techniques to verify the overall behavior of the cab** by defining the correct set of stiffness and damping parameters for the suspension elastic components.

## Solution

A 3D truck model was generated in MSC Adams/Car to simulate the behavior of mechanical components (cab body, suspension, actuator, tractor and trailer frame) on different proving grounds as pave, patched asphalt and speed bump.

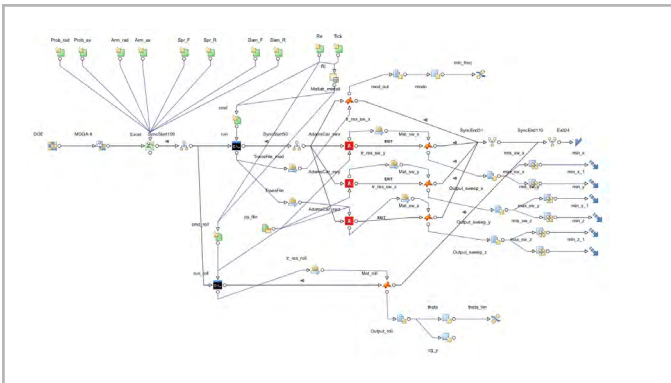


3D truck model generated in MSC Adams/Car

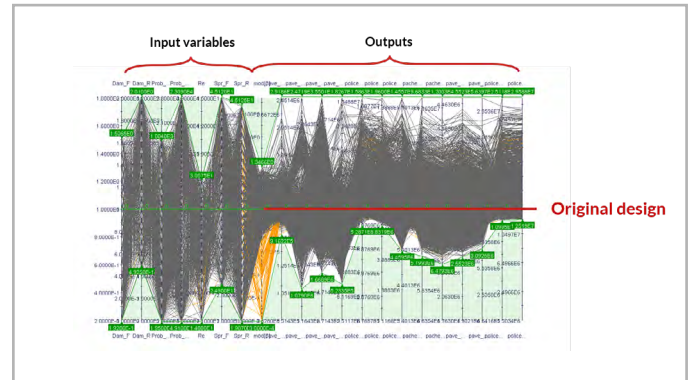
The simulation model was directly integrated in **modeFRONTIER workflow to automatically tune the suspension properties**, with the aim of optimizing output parameters related to vibration, cab movements and comfort. An initial Design of Experiments (DOE) analysis allowed to identify the correlation between design variables and system responses, with the aim of simplifying the multi-body simulation model to be further validated in the optimization process. Finally, the **MOGA-II algorithm, available in modeFRONTIER**, enabled engineers to pick the right designs with minimized cab vibration on different paths.

## Benefits

“We took advantage of modeFRONTIER software solution to **automatically execute a huge number of simulations** and evaluate thousands suspension system designs within few weeks. The Parallel Coordinate Chart enabled us to easily plot several variables and visualize the distribution of the designs in an effective manner. The optimization process **led us to achieve up to 10% reduction in cab vibration** compared to the baseline. Moreover, the results achieved with modeFRONTIER allowed us to identify specific properties of dampers, springs and bushes that have been considered during the prototype phase of the IVECO S-WAY truck development” said **Andrea Morello**, Performance Engineer and CAE Senior Analyst, **IVECO - CNH Industrial**.



modeFRONTIER workflow automatically tunes the suspension properties to optimize vibration, cab movements and comfort



Parallel Coordinate Chart shows up to 10% reduction in cab vibration

## About IVECO

As a major player in the global transport world, Iveco is an international leader in the development, manufacture, marketing and servicing of a vast range of light, medium and heavy commercial vehicles. It also manufactures passenger transport vehicles and special vehicles for defence, civil protection and specific missions like fire-fighting. The vehicles adopt the latest engineering technologies, applied to a comprehensive range of engines running on diesel and alternative fuels. [iveco.com](http://iveco.com)



ESTECO is an independent software company, specialized in numerical optimization and simulation process and data management. With a 20-year experience, ESTECO supports over 300 international organizations (such as Ford Motor Company, Honda, Lockheed Martin, Toyota and Whirlpool), accelerating the decision-making process and reducing development time. [esteco.com](http://esteco.com)