

Mastering Complexity in Vehicle Engineering

Leverage Virtual Performance Testing for Enhanced
Design Efficiency



Virtual Performance Testing is Key to Today's Product Development

Virtual performance testing revolutionizes product development by enabling engineers to **simulate and analyze product behavior under real-world conditions in a virtual environment** before building physical prototypes. This digital approach minimizes the need for extensive physical testing, significantly **accelerating the product development lifecycle**. As a pioneer in this space, ESI empowers manufacturers to make informed decisions faster and fosters **seamless collaboration across design and engineering teams**.



The Future of Performance Testing is Digital

Navigating the complexity of modern automotive design requires manufacturers to **balance safety, performance, and cost across interconnected vehicle systems**, especially as they adopt lightweight materials and advanced technologies under evolving regulations. Traditional methods, such as Design of Experiments (DoE) and conventional CAE optimization, often prove impractical and costly, limiting scope and requiring specialized skills.

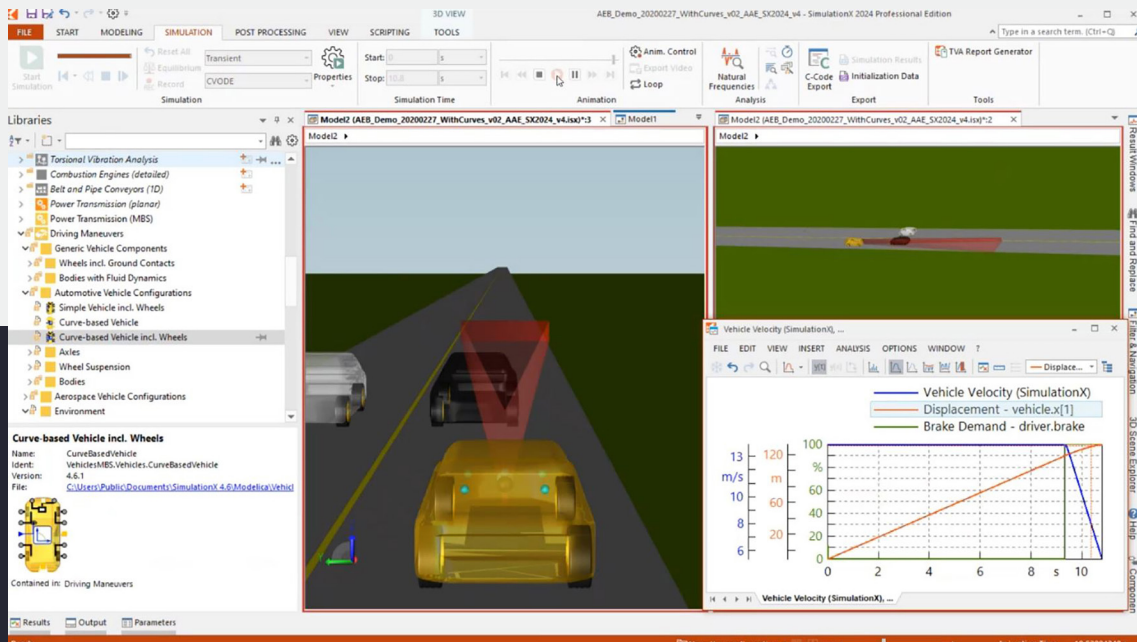
Virtual performance testing with virtual prototypes becomes essential in overcoming these challenges. By integrating ESI's virtual testing software into their digital thread, customers can **predict** not only **expected performance** but also real-world behavior, **including manufacturing intricacies**. Since our first crash simulation with Volkswagen in 1985, ESI has led the way in virtual testing, backed by 50 years of expertise in material science that ensures reliable results.

We understand the importance of speed alongside accuracy. By **combining our material physics knowledge with AI** and advanced machine learning, we significantly **accelerate simulation times, improve model explainability, and enhance error detection**—empowering manufacturers to make confident, data-driven decisions early in the development process.



Save Time and Costs by **Minimizing Prototypes and Physical Test Facilities**

ESI's virtual testing software provides unmatched capabilities for validating product performance across key engineering tasks. Our solutions enable manufacturers to effectively address critical areas, ensuring high-quality designs that meet the demands of today's and tomorrow's markets.

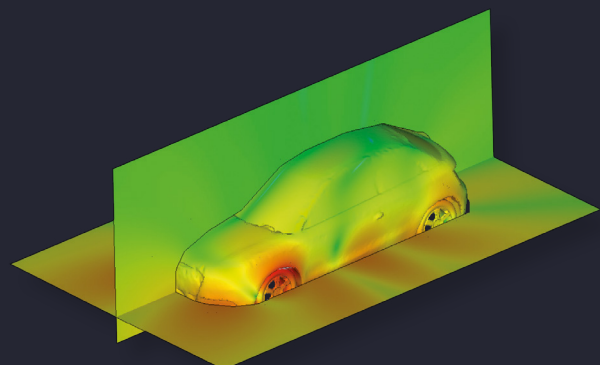
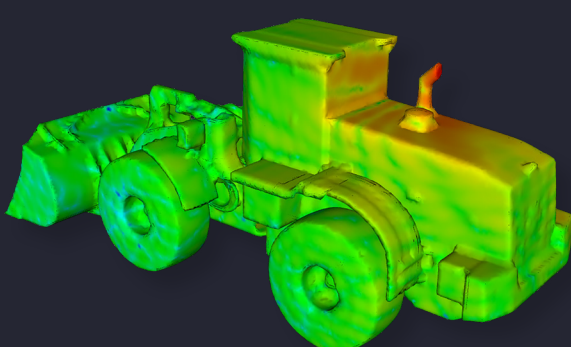


Crash, Safety, Strength, and Dynamics Testing: With advanced simulation tools, customers **conduct full vehicle crash and safety simulations, evaluate strength and dynamics, and assess seat and interior comfort.** This allows engineers to optimize the driving experience, ensuring maximum safety and performance from the start of the design process.

Vibro-Acoustic Performance Testing: Achieving optimal acoustic performance is crucial for enhancing vehicle comfort and safety. Our solutions deliver **detailed interior noise and vibration analysis, as well as exterior noise simulations.** Effectively managing noise, vibration, and harshness (NVH) enables engineers to create a superior driving experience that stands out in a competitive landscape.

Multi-Domain System Testing: Engineers utilize multi-physics system simulation to ensure **seamless integration between physical components (sensors, actuators, and mechanical systems) and digital controls.** This process allows them to model, test, and optimize interactions, identify design flaws early, and improve hardware-software integration for reliable, real-world performance.

The future of virtual performance testing is fully digital, driven by smart data and hybrid artificial intelligence. ESI equips engineers and designers with the **speed, precision, and confidence needed to find design sweet spots** and make informed decisions.



Transform Your Testing: Shift to Digital Test Tracks and Virtual Acoustic Chambers Now!

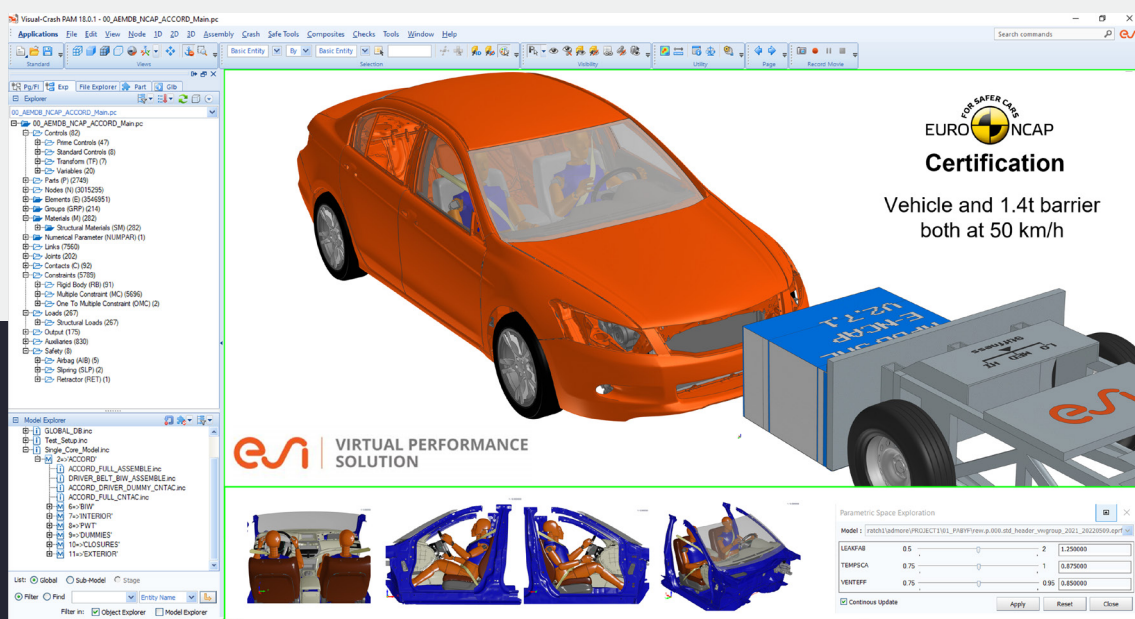
Virtual performance testing is reshaping product development, providing a smarter, more sustainable, and cost-effective alternative to traditional physical prototype testing.

Leading vehicle manufacturers are shifting to virtual prototyping, aiming to eliminate physical builds and relying solely on digital validation until final release.

The benefits are clear: **cutting development time by up to two years**, accelerating redesigns, and refining iterations earlier in the process.

For years, ESI has been at the forefront of this transformation, enabling manufacturers to validate designs in digital environments that replicate real-world conditions - without the environmental or financial burden of physical testing.

With our proven expertise in virtual prototyping, we have successfully guided organizations worldwide through this transition.



“We assume that we can save 1.5 to 2 years development time because the virtual proving ground will help accelerate engineering iterations and frontload the redesign process into the development phases.”

Paulo Marques
Chief Technology Officer,
CaetanoBus

We are ready to change your vehicle design and testing to virtual - are you?