7 Real Benefits of Virtual Prototyping.

How ESI Helps Deliver **Safe, Clean and Productive** Machinery & Equipment

Contents

7 Real Benefits of Virtual Prototyping.

When developing next-generation heavy machinery for sectors like construction, mining, agriculture, and infrastructure, you are expected to blend art, science, and engineering cost-effectively. You aim to create machines that deliver **constant uptime, safety, and environmental compliance** while meeting the **highest quality standards** for lifetime durability in the toughest terrains. This holds true not only for the products but also for manufacturing and maintenance processes. Even in an industry as tough as “Heavy Machinery,” that’s a big ask!

Let’s make sense of how Virtual Prototyping - as delivered by ESI - makes it easy.

What is Virtual Prototyping and how does it work?

The freedom to displace physical tests and prototypes by virtually replicating product development, testing, and manufacturing with simulations. At ESI, we call this **Virtual Prototyping.**

Virtual Prototypes are based on **predictive, real-time, immersive,** and physics-powered simulation models and capture ESI's unique treasure of material physics.

How Virtual Prototyping Can Help You?

1. Secure Machine Uptime

Virtual prototyping allows OEMs to simulate various operational conditions and scenarios before the actual production. This helps identify potential issues that could lead to product and production downtime. By resolving these issues upfront, **OEMs gain early confidence that they are designing and manufacturing machines that are reliable and robust throughout the entire product lifecycle.**

Experience up to

60%

fewer maintenance issues by detecting and solving potential problems in advance.

Source - ESI Live for Heavy Machinery: Towards an Enhanced Digital Twin for Predictive and Prescriptive Maintenance of KONE Elevators & Escalators

2. Ensure Safety

Through virtual simulations, OEMs can assess the ergonomic aspects of assembly line, service and product operations. This enables the early identification of potential safety hazards or inefficiencies in the design. By **optimizing workflows and ensuring ergonomic designs,** health, safety, and comfort for workers and operators are enhanced, while operational productivity is improved.

3. Prove Compliance

Virtual prototyping enables rigorous testing of heavy machinery in different terrains and load scenarios. This helps OEMs design machines and equipment that **meet stringent environmental regulations** by predicting and optimizing their performance in a controlled virtual environment.

Reduce vehicle development time by

1.5 Years

by using a virtual proving ground to accelerate engineering iterations.

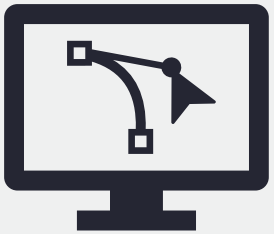
Source - ESI Website Customer Stories: ESI SimulationX Provides CaetanoBus with a “Virtual Proving Ground” to Master Vehicle Dynamics.

4. Accelerate Time to Market

OEMs need to speed up the introduction of cutting-edge technologies like electrification. Through a virtual prototyping approach, **cost-effective testing of electrified designs becomes possible, catching and resolving potential issues with informed decisions upfront in the development cycle.** Working with fully operational digital prototypes of different product variants in real-world virtual scenarios offers insights into machine performance and process efficiency. This reduces the necessity for late-stage changes and the cost and time needed to construct physical master builds.

5. Manage Complexity

Virtual prototyping assists heavy machinery manufacturers in effectively managing the increasing complexity of product lines and the challenges of globalized development and production. It enables manufacturers to **efficiently assess different options and make informed decisions about which variants to proceed with.** Global teams can collaborate seamlessly within a virtual prototyping environment, regardless of their geographical locations. This facilitates **real-time communication, sharing of ideas, and collaborative problem-solving,** thus overcoming the challenges posed by dispersed teams.



Increase productivity by

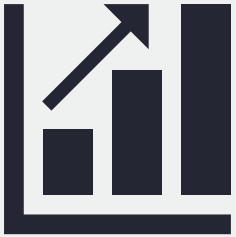
33%

by using virtual prototyping to optimize component manufacturing.

Source - ESI Blog: Empowering foundries to achieve "rightweight" parts while reducing material costs.

6. Optimize Efficiency & Cost

Virtual prototyping enables heavy machinery OEMs to **efficiently address time and cost pressures** by streamlining design, testing, and validation processes, leading to faster time-to-production and **improved return on investment for products.**



7. Demonstrable Sustainability

By minimizing physical prototypes and detecting design flaws or process inefficiencies before they become a reality, virtual prototyping **significantly reduces material waste,** making the end-to-end design and manufacturing process far more sustainable. Being able to validate more innovative designs faster ultimately helps deliver a greener, cleaner product.

Reduce scrap by

98%

by virtually simulating component casting.

Source - ESI Website Customer Stories: Patriot Foundry & Castings Reduces their Scrap Rate by 98% with ESI ProCAST.

So, why ESI?

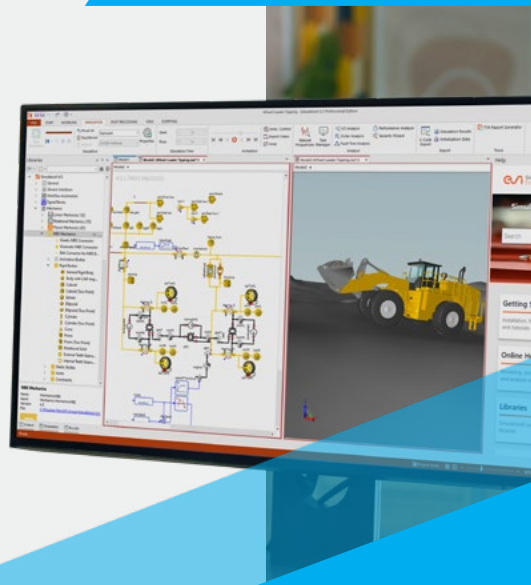
See how ESI helps heavy machinery designers, engineers and manufacturers innovate without compromise.

ESI Group stands at the forefront of advancing the heavy industry sector with **over 50 years of experience providing innovative virtual prototyping solutions that transform design and manufacturing processes.**

With a robust portfolio of technologies and a proven track record, ESI empowers leading automotive, aerospace, and heavy equipment manufacturers – and their supply chains - to navigate complex challenges, enhance efficiency, and deliver superior products.

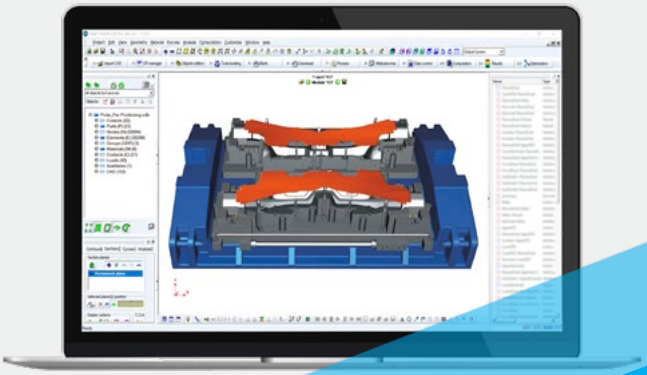
Virtual Proving Ground

Efficiently verify the safety and acoustic performance of new machines by constructing fully operational digital prototypes and subjecting them to rigorous virtual testing on an environmentally-friendly virtual proving ground. This cutting-edge approach **minimizes testing mileage, reduces costs associated with processes, tooling, and materials, all while maintaining compliance with emissions regulations.**



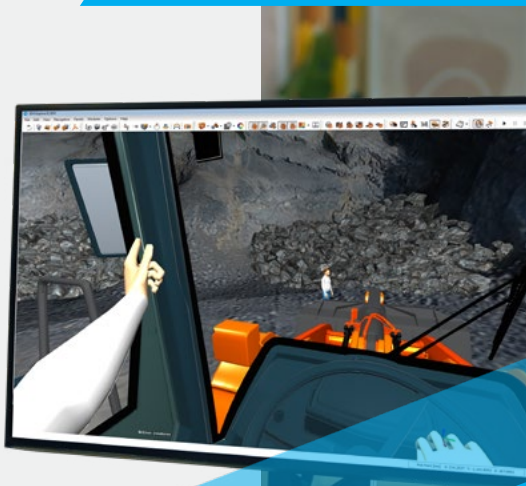
Virtual Part Manufacturing

Deliver defect-free machine parts and ensure consistent adherence to tolerances for reliable, high-quality products. Enhance your understanding of material physics with simulation-based testing and unlimited virtual validations. **Make confident decisions in selecting optimal production processes, ensuring manufacturability and dimensional quality early in the development process.**

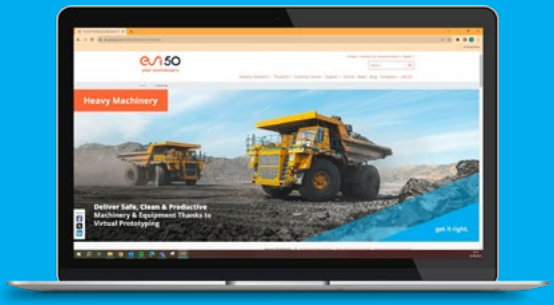


Collaboration and Validation

Validate tomorrow's products and processes today. **Push engineering workflows months ahead of production by immersively exploring new machine concepts** from a worker and operator perspective and gain a hands-on experience of the processes required to make and maintain them. **Power collaborative virtual workflows** without waiting for construction or required traveling to a common site.



Recommended Next Steps



Dig Deeper!

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