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Revolutionizing Product Development: The Power of Simulation-Driven Design

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WHAT IS SIMULATION-DRIVEN DESIGN?

Simulation software has been around for decades, but its full potential has often been confined to analysts with massive computing power. Traditionally, simulations are conducted late in the design process, just before final physical prototyping, when most of the product costs are already fixed. These simulations, often lasting weeks, present a critical point; if a major flaw is detected, the entire product development process may need to start over.

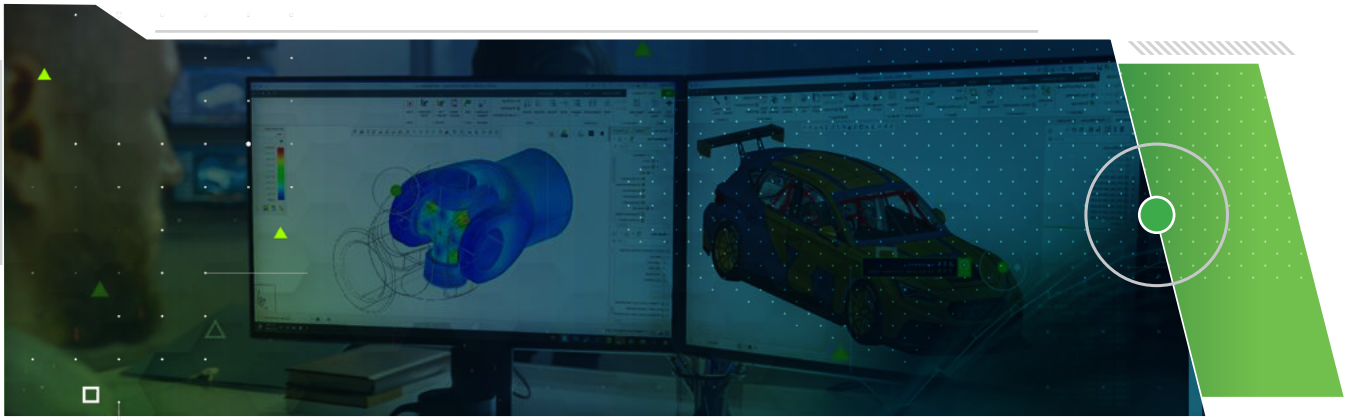
Simulation-driven design (SDD) is a transformative approach to product development that uses simulation tools throughout the entire design lifecycle. Ansys and PTC have over a century of combined experience with finite-element analysis and CAD. Their combined experience has made it very clear that there are significant benefits to this, including lower costs, enhanced quality, and faster time-to-market.

This iterative process allows design engineers to assess various design alternatives, predict real-world performance, and mitigate risks early in the development process. The real value of SDD lies in democratizing simulation, empowering design engineers with the tools and insights needed to drive innovation and efficiency. One of the tools used to optimize design is AI-driven generative design technology, which allows design engineers to efficiently explore a large design space. Generative design takes SDD to the next level, using algorithms to generate many design variations based on specified constraints and goals. This approach often results in creative solutions that a designer may not have envisioned.

Embedding simulation directly into CAD tools from the beginning enables design engineers to seamlessly go through their design process, testing multiple scenarios, iterating rapidly, and even refining models automatically. This shift allows dedicated simulation experts to concentrate their expertise on addressing complex challenges, thereby optimizing resource allocation, driving product insight, and fostering innovation throughout the product development journey.

THE EVOLUTION OF THE PTC AND ANSYS PARTNERSHIP

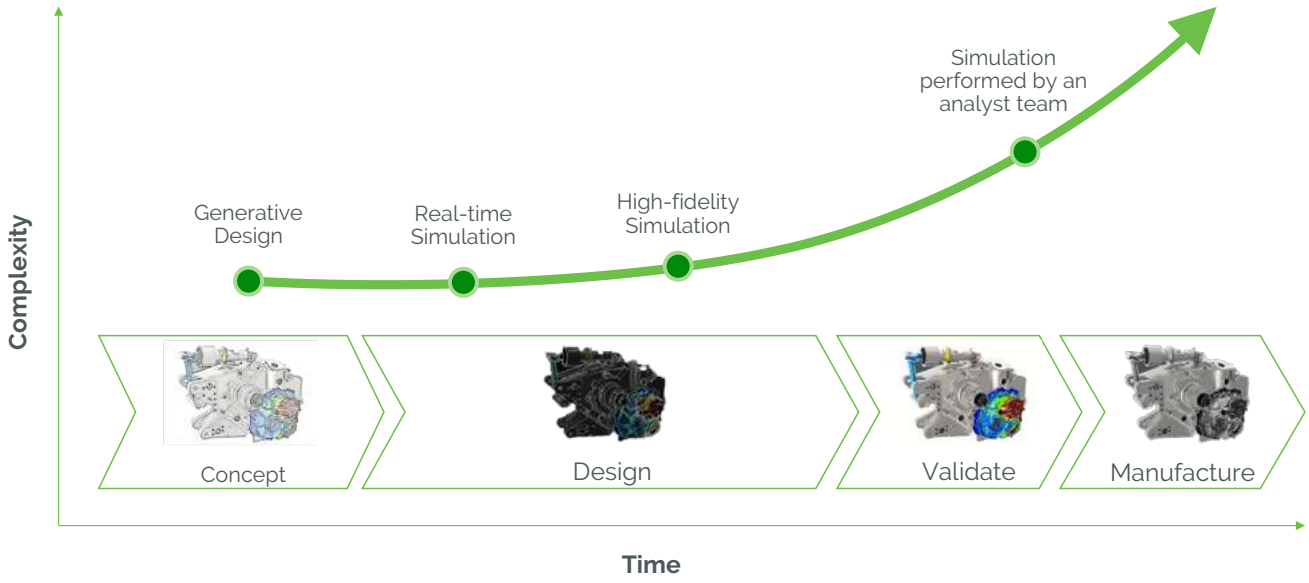
PTC and Ansys have a common vision of helping organizations improve product design with real-time and high-fidelity simulation tools. These advanced technologies combine Ansys technology with Creo, giving design engineers unparalleled capabilities. They can access instant design guidance, disrupting traditionally time-consuming design-simulation feedback processes. They can also build on those capabilities with easy-to-use, high-fidelity simulation that is directly integrated into Creo.



In addition to these simulation tools, the partnership extends to broader toolsets integrated within Creo, fostering collaboration between design engineers and analysts across the workflow. By facilitating integrations among PLM (Product Lifecycle Management), materials management systems, and Ansys and PTC platforms, organizations can improve data exchange and simplify processes. This ensures smooth collaboration and empowers stakeholders to make well-informed decisions throughout the product lifecycle.

SIMULATION THROUGHOUT THE DEVELOPMENT CYCLE

Traditionally, the product development cycle has faced many challenges. By moving simulation to the left and not relying solely on physical testing for validation, more engineers can now spend more time exploring different designs, resulting in improved performance, reduced costs, and accelerated time-to-market.



During the conceptual phase, engineers use generative design to automatically optimize part designs based on different constraints and objectives. Generative design serves as a strategic tool in refining designs for improved performance and efficiency, by considering various factors. These include design constraints around weight, material selection, manufacturing process and even “keep-out” regions.

As demand increases for products that are lighter, faster, and more durable at lower costs, engineers need to quickly iterate their designs. Real-time simulation tools give immediate feedback on design choices within the Creo environment. This saves time and effort as engineers can explore different design options and be confident about their decisions. Each design change is analyzed right away, without having to switch between different software platforms and convert files manually. Engineers can use real-time simulation to easily test structural strength, thermal effects, modal frequencies, and fluid dynamics. Real-time simulation tools help avoid potential problems in the early stage of the design process, making it faster and easier to validate design options and reduce time-to-market. This design guidance can help reduce delays, optimize analyst resources, and lower product development costs.

Design engineers working in Creo can perform higher fidelity simulations, streamlining final product qualification and production readiness; even correlating the simulation results with functional testing. The correlation between functional testing and final simulation results is often a final product release requirement. Offering linear static structural analysis, modal structural analysis, and steady-state thermal analysis, Creo predicts deformation, temperature distribution, strain, stress, vibration modes, and resonance frequencies accurately. Automated analysis setup and mesh creation expedite the process, while Ansys simulation solvers ensure reliability across scenarios. Furthermore, advanced features like non-linear contact and combined structural and thermal analysis add more value and enhance flexibility to the tool.

TRANSFORMING ORGANIZATIONAL PROCESSES FOR INNOVATION

Effective implementation of simulation tools entails more than just acquiring the technology; it requires a fundamental shift in organizational processes. Simulation reviews need to be integrated earlier in the design process, empowering design engineers to utilize these tools effectively. This necessitates bringing the analysts onboard, who can transition into coaches to facilitate the adoption of simulation technologies and establish best practices within the organization. Analyst-designer collaboration leads to more product insight, with designers using generative design and real-time design guidance, and analysts being able to focus on more complex validation studies. Analysts can become more productive and valuable contributors, enhancing product quality. In addition, it is essential to recognize that successful adoption of these tools relies on more than just their capabilities; it necessitates a cultural shift towards embracing innovation and continuous improvement. As with the adoption of AI, while these tools will not replace engineers, they can significantly augment their skills and productivity, enabling them to excel in their roles and drive innovation within the organization.

Simulation in Action: LIXIL and TEN TECH LLC Case Studies

LIXIL's American Standard Brand Drives Faster Time-To-Market with Creo Ansys Simulation

American Standard is a leading manufacturer of kitchen and bath products including fittings, ceramics, and bathing fixtures.

By quickly being able to make design modifications that drive time-to-market with Creo Ansys Simulation, there's less time wasted taking the file out of Creo and placing it into the separate Ansys solution. As a result, LIXIL was able to design and test complex and innovative products with a confidence level in the 75-85% range, reducing iterations of prototyping and testing.

TEN TECH LLC Saves Time and Improves Efficiency with ANSYS Discovery

TEN TECH LLC is a mechanical engineering consulting company that provides services to the Aerospace & Defense, Hi-Tech Electronics, Automotive, Medical, and Renewable Energy industries.

By leveraging ANSYS Discovery's instantaneous design feedback, TEN TECH LLC was able to address critical design challenges faster. Simulations that would require days, or even weeks, were done in just three simple clicks.

THE FUTURE OF SIMULATION AND SUSTAINABILITY

Design engineers and simulation analysts are key players in making their organizations more sustainable. Their role is evolving, thanks to the strategic integration of simulation and generative design technologies. Now, engineers can assess material choices not just for structural integrity but also for their environmental impact, such as energy consumption and emissions.

However, as sustainability considerations become increasingly complex, design teams require better digital tools to make informed choices and navigate trade-offs effectively. Recognizing this need, companies like PTC and Ansys are proactively enhancing their tools to handle the evolving array of engineering problems. By embracing flexible workflows and solutions, engineers can go beyond minimum sustainability requirements.

"We are excited to pursue more integrated materials management and sustainability workflows with PTC, building on the existing Ansys Granta connections to Creo and Windchill," said Mark Hindsbo, Vice President and General Manager of Product, Ansys. "These workflows help engineers balance performance and environmental footprint priorities as they design products by providing predictively accurate, traceable, and reliable materials information across enterprises."

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>
> **MARK HINDSBO**

CONCLUSION

The adoption of simulation tools has transitioned from being on the leading edge to becoming a staple of forward-thinking companies. While these tools have matured significantly, they continue to evolve rapidly, ushering in a new era of innovation. Looking ahead, we anticipate a continued expansion of the scope of digital analysis, driven by advancements in AI algorithms, physics simulations, and optimization technologies. As witnessed by case studies, these tools are already enhancing engineering teams' productivity and innovation. Embracing this evolution not only ensures competitiveness but also positions organizations at the forefront of engineering excellence in the ever-changing landscape of product development.

Discover PTC's Simulation offerings **Learn More**

455626 Creo/Ansys Simulation White Paper