TIME IS MONEY

The old adage couldn't be more appropriate for product development. Releasing a product at the right time is key to market share and success. To achieve time-to-market objectives, industry leaders are using simulation technology to compress every aspect of the development process while improving quality and creating opportunities for innovation.

By Todd McDevitt, Director, Corporate Marketing, ANSYS

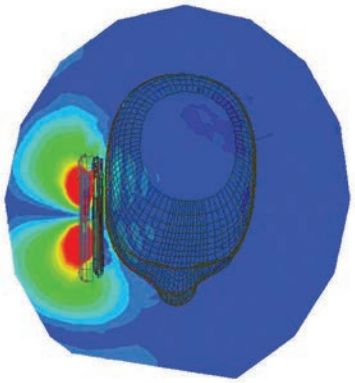
While there are many factors that drive the success of a product, a key factor is time to market. Whether you are an innovator beating the competition to a new market or a rapid follower responding to customer demand, seizing that window of opportunity when customers are most receptive to your product is critical.

Fifty years ago, Caterpillar Inc. decided to redesign their signature line of D9 crawler tractors to meet the worldwide rise in large building and mining projects. After almost 10 years of design and testing, the company debuted the D10 crawler tractor. Its groundbreaking elevated drive sprocket design guaranteed its market leadership for at least another decade while its competitors conducted their own lengthy design efforts. [1] Today, technological advantages are short-lived at best.

In this age of constant innovation, companies can no longer take a decade to develop a product — or assume they can maintain market leadership for the indefinite future. Compare, for example, the story of the D10 crawler to the current race among construction equipment manufacturers to introduce market-leading hybrid construction equipment. Komatsu introduced its first hybrid excavator in 2011. Within just three years, at least four of its worldwide competitors had released their own hybrid equipment. [2] The race to dominate the hybrid construction machinery market is only beginning.

BREAKING FREE FROM THE CYCLE

Releasing a product at the right time requires engineering and process efficiency, from first concept through final



▲ Using simulation, cell phone antenna designer Vortis can create a customized antenna design for a specific cell phone in one-tenth the time and cost required with the build-and-test method. Vortis engineers compressed the design process to a single step by adding all of the elements that need to be considered at the beginning of the simulation process and then using the ANSYS Optimetrics parametric analysis tool to generate a designed experiment consisting of a series of iterations to explore the complete design space.

"The only way we're going to optimize for the last 10 or 20 percent, which is the most important part of getting to market, is with a really high level of precision and a really quick iteration cycle. We started doing simulations with ANSYS and what we had been doing in nine months we could do in four or five weeks."

— Philip Winter, Co-founder and CEO, Nebia

▲ Nebia has created a showerhead that redefines the shower by atomizing the water. ANSYS simulation helped to realize this design that saves water and creates a better shower experience.

manufacturing. At the center is the product development process. For decades, manufacturers have focused on developing processes that cut production time while ensuring that products still meet the high quality customers demand. These companies have long recognized that the trial-and-error process of designing, building a physical prototype, testing, re-designing, then building a new prototype is an expensive and time-consuming bottleneck. Not only are physical mockups expensive, testing them tends to find isolated problems rather than address systemic design issues.

Leading companies across the world have adopted virtual prototyping to overcome these limitations and reduce reliance on physical testing. They use simulation solutions to create virtual models that more effectively test their designs against real-world conditions in a fraction of the time and cost it takes to build a single physical prototype. Digital models also allow engineers to analyze product designs as systems, rather than as isolated parts.

At the same time, products have become smarter and more complex. Software-controlled mechatronic systems are routinely used to deliver advanced features, improve safety, and reduce power consumption. Testing the mechanical, electrical and embedded systems that comprise these products is more complicated than ever. Manufacturers now need to know how the various components in complex systems interact long before they can fabricate physical prototypes and test their performance.

MODEL-BASED SYSTEMS ENGINEERING: BUSINESS OPPORTUNITIES AND OVERCOMING IMPLEMENTATION CHALLENGES
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Volvo is one company that has recognized this challenge. It has incorporated simulation and other tactics, reducing product lead time to 30 months from 42 months. [3] But, like its competitors, the company knows it just can't stop there. Volvo's goal is to cut lead time down to 20 months by 2020. To achieve this, it must reconsider and compress every phase of the design process.

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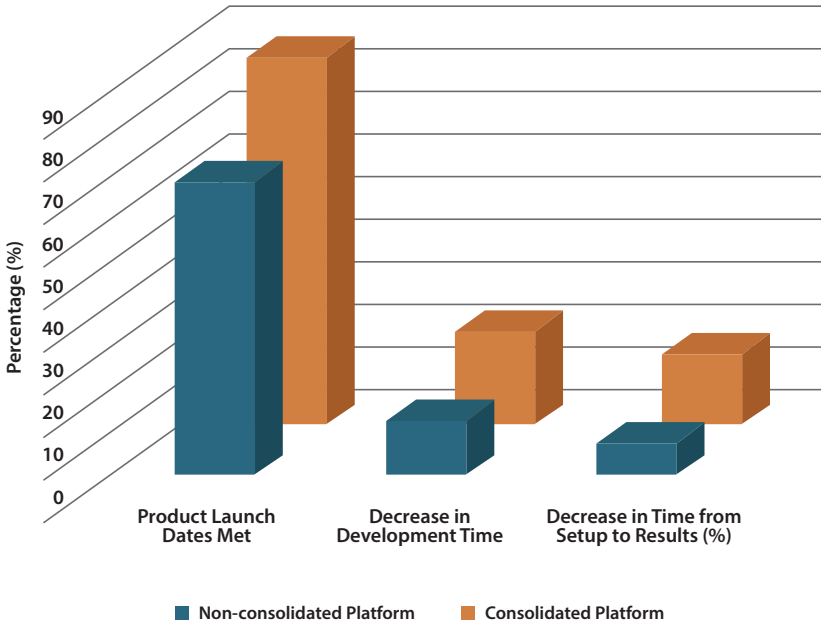


▲ Using a consolidated platform, companies are able to decrease development time.

Leading companies across the world have adopted virtual prototyping to overcome limitations and reduce reliance on physical testing.

PROCESS COMPRESSION

While companies typically have used simulation tools to verify designs before building a prototype, ANSYS has been looking to the future and investing in technologies and practices to further compress the development process. Process compression centers around three main strategies: compressing each design cycle, reducing the number of cycles, and performing parallel — or concurrent — engineering.

Compressing Each Design Cycle

Faster does not always mean better. But there are ways to accelerate the design process without jeopardizing innovation or risking late-stage design failures

At most companies, engineers, designers and analysts spend considerable time performing routine, repetitive tasks and procedures. Often, these procedures differ between teams, are undocumented or are inconsistent. To alleviate these issues, simulation governance groups within the enterprise seek to codify simulation best practices, thereby automating routine operations, reducing errors, and enabling faster design decisions. This requires a consolidated simulation platform that can be deployed across the enterprise in which the workflow and analysis software are integrated in an open and adaptable architecture. ANSYS Workbench delivers this consolidation with best-in-class solver technology, along with wizards and automated processes. Engineers can spend less time setting up and running simulations and focus on analyzing results and making engineering decisions.

Whirlpool Brazil enhanced its design process by using ANSYS SpaceClaim Direct Modeler within ANSYS Workbench. This enabled engineers to investigate and perform design modifications while dramatically shortening the design cycle. This story is on page 18.

While designing marine renewable energy technology, DCNS put ANSYS CFD in the hands of product development and design engineering instead of restricting its use to researchers. The result was a reduction in size and cost of future heat-engine power plant installations and ship propulsion systems. See page 28 in this issue for the full story.

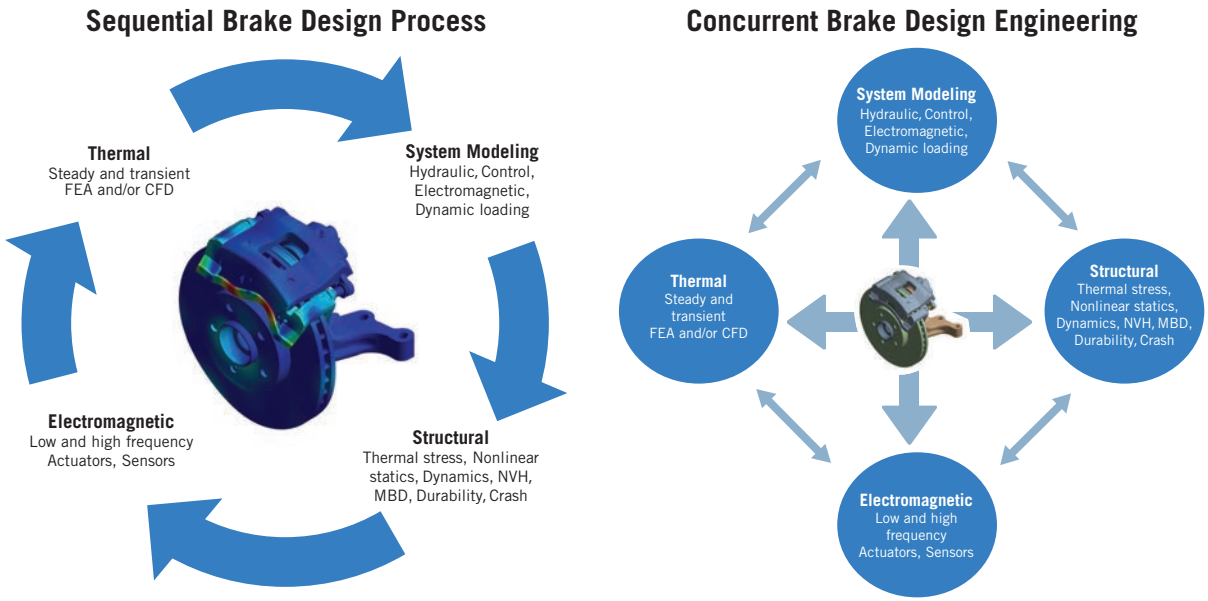
High-performance computing (HPC) is paramount for faster design cycles. The growing complexity and size of simulations can bring a well-equipped desktop computer to its knees for hours and even days. Engineering teams require solutions that will help them solve larger models accurately and quickly. ANSYS HPC enables engineers to create large, high-fidelity models that yield accurate and detailed insight into the performance of a design. Not only can engineers solve larger models faster, they can perform more simulations using different design parameters to explore a larger design space.

When Daikin Industries, Ltd. turned to ANSYS structural mechanics solutions to analyze the effects of aging and adverse conditions on the life of its battery gaskets, the company saved enough time to iterate many more design options and develop a new, more durable battery gasket. See page 38 for details.

Eliminating Cycles

Compressing the time spent on each cycle is important, but you can attain even greater results by finding the best design initially and cutting the number of cycles. For example, an automotive supplier might need to maximize the heat transfer coefficient of its disk brakes while meeting braking performance, durability and noise requirements. Finding the design that satisfies all requirements involves a variety of engineering disciplines.

Many companies today address this situation by using siloed design teams that deploy multiple tools from separate vendors, creating data format and transfer issues. This approach is hardly efficient; the Aberdeen Research Group found in a study of 550 companies that reconciling data formats over multiple platforms alone cost an average of 3.6 hours per analysis, with some companies reporting a loss of eight hours — an entire workday — per analysis. [4]



▲ Using concurrent design in which several teams work simultaneously to develop a product reduces the number of design cycles and, therefore, time to market.

BREAKTHROUGH FOR BRAKE DESIGN
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This issue profiles ANSYS AIM, an integrated environment for simulation by designers and the latest manifestation of the ANSYS multiphysics vision. This vision also includes the ANSYS Workbench platform for coupling physics between ANSYS point solutions. Designers can deploy both solutions across the enterprise to effectively execute efficient multiphysics simulations to enable earlier design decisions. Not only do these ANSYS platforms support multi-objective optimization, but they make it possible to analyze and evaluate trade-offs in complex architectures, requiring fewer iterations per cycle.

The Aberdeen Group's study further underscores the importance of a consolidated platform in product development efforts. In the study, 87 percent of companies using a consolidated platform met their product launch dates versus 70 percent of companies that used a multi-platform approach. Consolidated platform users were also 37 percent more likely to decrease their development time.

Pump manufacturer Grundfos is an ANSYS customer that created an automated design loop that incorporated multiple ANSYS products. By optimizing its processes, Grundfos reduced overall design time and saved $400,000, while significantly improving the hydraulic efficiency of its new pump, as described on page 13.

Parallelize Everywhere

More traditional product development programs employ a linear, sequential model to design and manufacture products. In this approach, requirements — such as structural, thermal, electrical, control systems and manufacturing — are considered separately, and one design team cannot begin until the previous team has finished.

Concurrent engineering is a method in which several teams work simultaneously to develop a product. Both product design and manufacturing planning run in parallel. Decision-making involves multi-team participation and involvement. A common platform for simulation process and data management is vital for any concurrent engineering process. To this end, we provide our customers with ANSYS Engineering Knowledge Manager (EKM) on the desktop or in the cloud so the entire development team can look at the same models, data and results.

ANSYS has also made investments in model-based systems engineering (MBSE) tools that allow systems, software and hardware engineers to look at a common functional or architectural model of the product. A fundamental tenet of MBSE is that authoritative product design is a living and executable model, rather than a static, text-based design document. A model provides a thorough understanding of the dependencies, data and interfaces between the various subsystems, so that engineering teams can work effectively in parallel.

As the articles in this issue of *ANSYS Advantage* attest, our customers in virtually every industry are seizing opportunities, improving their products and expanding into new markets. To ensure that they will be ready for new market opportunities, they are leveraging ANSYS simulation software to compress their development process and get to market faster.

References

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[4] Paquin, R., Prouty, K. Achieving Product Development Success Through a Consolidated Simulation Platform; Aberdeen Group: 2015.