

Realize Your Product Promise™

The ANSYS logo is displayed in white and gold text on a dark rectangular background. The word "ANSYS" is in a bold, sans-serif font, with a registered trademark symbol (®) to its upper right. The background of the entire page is a teal gradient with a 3D architectural structure of dark, semi-transparent blocks on the left side.

ANSYS®

Systems & Multiphysics

Realize Your Product Promise Systems and Multiphysics Analysis



With a robust technology platform and industry-leading multiphysics, ANSYS moves your engineering team beyond localized areas of design – and simulates the system as a whole.

Your organization faces complex (and sometimes competing) pressures like never before. You need to create the next “must-have” product. That product must be first to market. It has to be affordable for your customers, yet priced so your organization turns a profit. And, of course, it has to work as advertised.

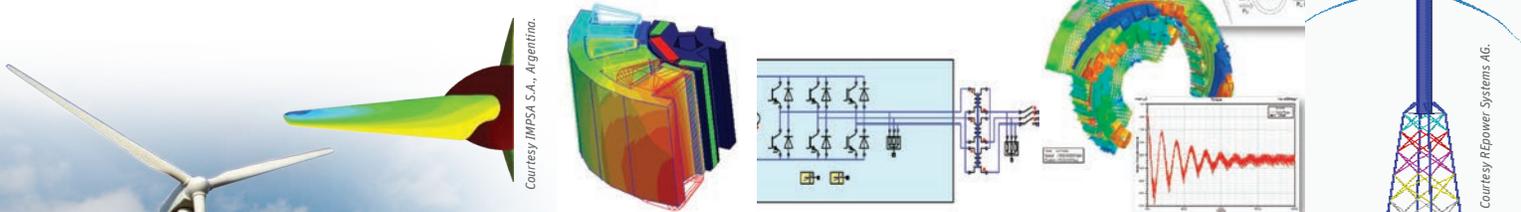
The challenges don't stop there: You have to meet all of these requirements in an environment in which product lifecycles are shrinking, global competition is increasing, and customer expectations are higher than ever.

Engineering products the way you have for the last 20 years is simply no longer an option if you expect to survive – much less thrive – in today's hyper-competitive marketplace. Simulation has revolutionized product development over the past decades by minimizing costly physical testing and accelerating time to market in every industry around the world. But for many companies, that simulation has largely focused on components or subsystems. Technology advancements in engineering simulation software now bring a total systems approach to product design and engineering.

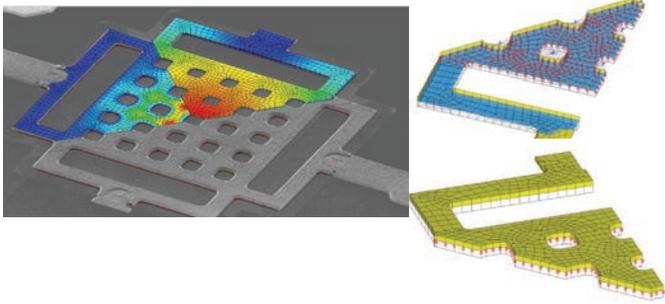


“Successful product development requires numerous things: talented systems-level thinkers, complex modeling, a robust simulation process, and enough computing power to handle it all. ANSYS allows us to try it before we build it. We can combine multiple scientific and engineering disciplines earlier in the process, creating an environment in which development can evolve creatively and economically.”

Scott Parent
Vice President, Technology
Baker Hughes



ANSYS delivers technology that enables you to study how products will behave in the real world, where multiple forces interact. Simulation-Driven Product Development™ in a wind power application considers many facets individually and as a system, from blade design to electronic components to site selection.



A perplexing problem for mobile phone users is dropped calls. EPCOS leveraged our suite to simulate the transient dynamic response of an innovative RF-MEMS switch for improving cell phone signal strength. The approach accounted for fluid, electrostatic and mechanical effects in a single model, providing fast turnaround for rapidly changing cell phone requirements.

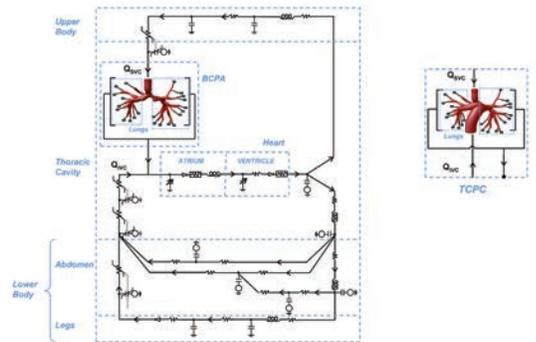
Product Complexity Drives Systems Approach

Many organizations have responded to increased competition by designing “smart” products. Such next-generation devices — ranging from cellular phones to automobiles to wind turbines — adapt to their environment or user. Since these products are relatively new, you can’t rely on historical real-world testing. So systems-level simulation plays a much larger — and important — role in product engineering.

Using ANSYS engineering simulation software throughout the entire development cycle enables you to predict with confidence how your products will behave and how manufacturing processes will operate in a real-world environment.

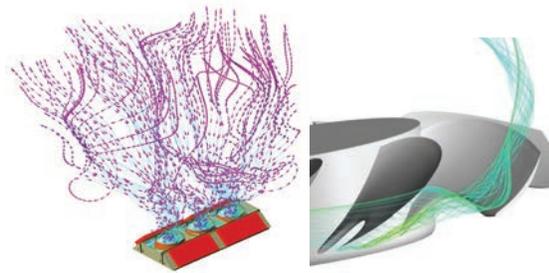
In the early development phase, our tools can help your cross-functional engineering organization predict system-level performance, then work on improvements in individual components or subsystems, as well as their interactions with one another, especially with multiple physics. You then continually and rapidly fine-tune the entire product system in a virtual environment until it is ready for physical assembly and testing. This accelerates the development process and increases performance success when products are launched.

Traditionally, simulation has been used only in the validation stages. But as products become increasingly complicated, leading companies are using ANSYS simulation earlier in the process to ensure that the products created live up to their promise.



A team from Politecnico di Milano is applying systems modeling to help doctors make surgical decisions for children born with a heart condition in which only one ventricle functions. Multidomain modeling becomes critical when considering biofluid dynamics in reconstructive pediatric cardiac surgery; a systems approach to predict the results of surgery is both appropriate and appealing. Because there is a wide spectrum of possible surgical treatments to repair a complex heart defect, patient-specific multidomain modeling can help considerably in choosing the best treatment to ensure optimal blood flow for the patient.





Voith Turbo reduces the cost of developing quiet train fans with ANSYS software, simulating a complete railcar cooling system. The 50-million-element mesh balanced the need for critical details with available resources.

Greater than the Sum of its Parts

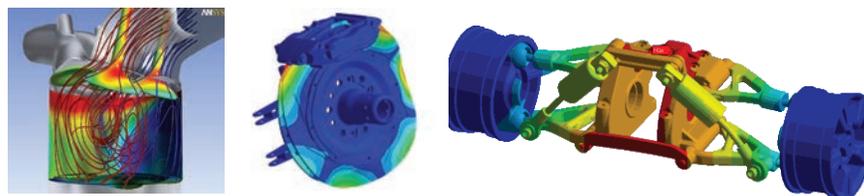
Component-level simulation has generated incredible returns. Imagine what your business can achieve by analyzing subsystems together in a virtual world.

Few product systems are affected by just one physical force. In the real world, products undergo a wide range of thermal, mechanical, electromagnetic and fluidic forces. Consequently, any system-level assessment must include multi-physics considerations to accurately predict performance. The implications to your business are enormous. Warranty expenses and brand reputation run parallel, in part, to how well you understand at a deep level the physical stresses that products will be subjected to — and how they will respond.

Many product recalls occur when individual components do not perform as expected when they are brought together. A tablet computer manufacturer may not plan for the significant thermal effects that occur when dozens of disparate electrical components are combined. The accuracy of a GPS device may be affected by electromagnetic interference from nearby communication systems, by the properties of the composite materials in its case, or even by the way consumers mount the device in their cars. If individual components are simulated as part of a system from the earliest design stage, these flaws can be identified and addressed before costly physical assembly and testing occurs — and well before product launch and recall.



As advanced medical devices become more complex, simulation can maintain functionality while addressing safety concerns. In an open MRI system, the details of the radio-frequency coils, a human body model, and the large volume of the exam room must all be included in sufficient fidelity in a simulation model to determine the resulting field accurately. Our software is ideally suited to this task.





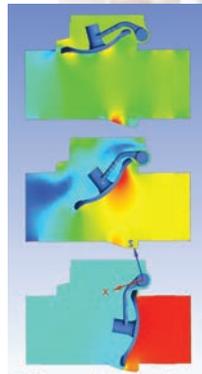
Isolated product failures can damage an organization in the form of reputation, sales, stock price, warranty claims, legal costs and credit rating. Product integrity is a critical issue in complex systems such as cars and airplanes, in which electronic and electromechanical components are developed by multiple vendors, increasing the opportunity for crosstalk and electromagnetic interference, or EMI.

A Single Resource for Technology Leadership

With the broadest and deepest multiphysics capabilities available today, ANSYS is uniquely qualified to support your business as it moves toward system-level simulation. Every day and in every industry, leading companies are applying software from ANSYS to solve their structural, thermal, electromagnetic and fluidic challenges — as well as to consider the effects of multiple physics on a single component or coupled system.

ANSYS brings industry-standard multiphysics capabilities — combined with our expertise in data and process management, reduced-order modeling and cosimulation, and application integration — for system-level analysis via a single, easy-to-use technology platform.

Engineers at critical component suppliers can also leverage ANSYS tools — the acknowledged industry standard for engineering simulation — to maximize the contribution of their own parts to overall system performance.



Cameron used ANSYS multiphysics technology to develop a new line of check valves for the petrochemical industry. The engineering team coupled fluid dynamics and mechanical analyses with optimization tools to reach record performance.

“What was acceptable yesterday was simulating one single component, but it becomes more important today to simulate the full assembly, because each part interacts.”

Christophe Avejian
Research and Development Manager
Valves & Measurement
Cameron Inc.



“ANSYS software plays a critical role, giving us the ability to run full-stage simulations while keeping pace with the design process. This provides insights that are not available when simulating individual components. Engineers can gain a much better understanding of the interaction between the compressor wheel and the diffuser when simulating the entire system.”

John Horsley
Engineer, Air Handling
Cummins Turbo Technologies



“As multiphysics and advanced modeling methods become more advanced, simulation-based engineering and science will be indispensable in meeting the technological challenges of the 21st century. The process will not be ‘simulation as usual’ for narrow studies of individual parts and assemblies, but it will be focused on complex, interrelated engineering systems and analysis results that meet specified standards of precision and reliability.”

Stefano Odorizzi
Founder and CEO
EnginSoft S.p.A.

Taming System-Approach Challenges through Real-Time Collaboration

ANSYS best-in-class technology, expertise and best practices make culture change a reachable goal.

By coupling physics and subsystems, advanced software from ANSYS uniquely enables iterative engineering analysis at the system level. In most cases, considering system-level deliverables from the beginning requires a very different engineering approach. Engineers across different disciplines and functions — and even based at supply chain partners — must work in a collaborative environment, asking not only “Will my part perform as expected in the real world?” but also “How will my component interact with every other part — and contribute to system performance — in the real world?”

It can be daunting to overcome functional silos and instill a new collaborative culture across your broad engineering organization. Through our software and services, ANSYS delivers the expertise and capabilities that make this difficult task achievable, by enabling multiple design partners to share information easily and in real time. ANSYS tools enable multiple engineering teams to automate their system-level simulations through iterative capabilities that minimize time investments as well as human resources and associated costs.

The ANSYS Workbench™ platform supports a collaborative environment for engineering teams to work together in developing multiphysics solutions. For the first time, multidisciplinary engineers can combine their components as they are being designed. This increases confidence and minimizes surprises during the physical assembly phase.

ANSYS Engineering Knowledge Manager™ (EKM) supports the seamless sharing of product specifications, performance metrics and other critical engineering insights — so that the entire team, even when dispersed across multiple time zones and geographies, is equipped with the same reliable, real-time information at both component and system levels.

All software from ANSYS is built for the high level of collaboration and cross-functional alignment that is needed to support new-generation, system-level product development teams. Our services team — a who’s who of engineering thought leaders from around the world — can provide your organization with best practices to fully take advantage of the benefits of system-level engineering.



“Any culture shift is difficult, requiring vision, leadership, planning and tangible benefits. The Analysis Led Design initiative — a Cummins corporate program to change the prevalent test-first culture — uses ANSYS software, has driven considerable change, and has proven to be of tremendous value.”

Bob Tickel
Director of Structural and Dynamic Analysis
Cummins Inc.



“We look at hundreds to thousands of individual components, analyzed together as a unit: aircraft hydraulic and fuel systems that have to fly for 30 to 50 years and meet certification requirements. We made a conscious decision to achieve greater value from our hardware and software investments. We have significantly increased our throughput, and we are using all the available technologies at Parker Aerospace to expedite design decisions using ANSYS.”

Bob Deragisch
Manager of Enterprise Systems
Parker Aerospace



“In the past, CAE methods struggled to be simultaneously fast and accurate, slowing the integration of these techniques into the development process of complex systems. I think that Workbench represents a milestone in overcoming these problems and allowing simulation to be perceived as a standard and required activity in complex product development.”

Riccardo Testi
CAE Analyst
Piaggio Group



Oil and gas industry giant Petrobras employs innovative ANSYS tools, including EKM, to solve its challenges. The organization receives simulation requests from refineries and production units, and most involve similar equipment configurations, such as pressure vessel nozzles or pipeline flanges. Re-using historical data via EKM shaves time and uncertainty from the simulation process.



Growing Applications for System-Level Simulation

Industry thought leaders are already assessing system-level performance in the virtual world.



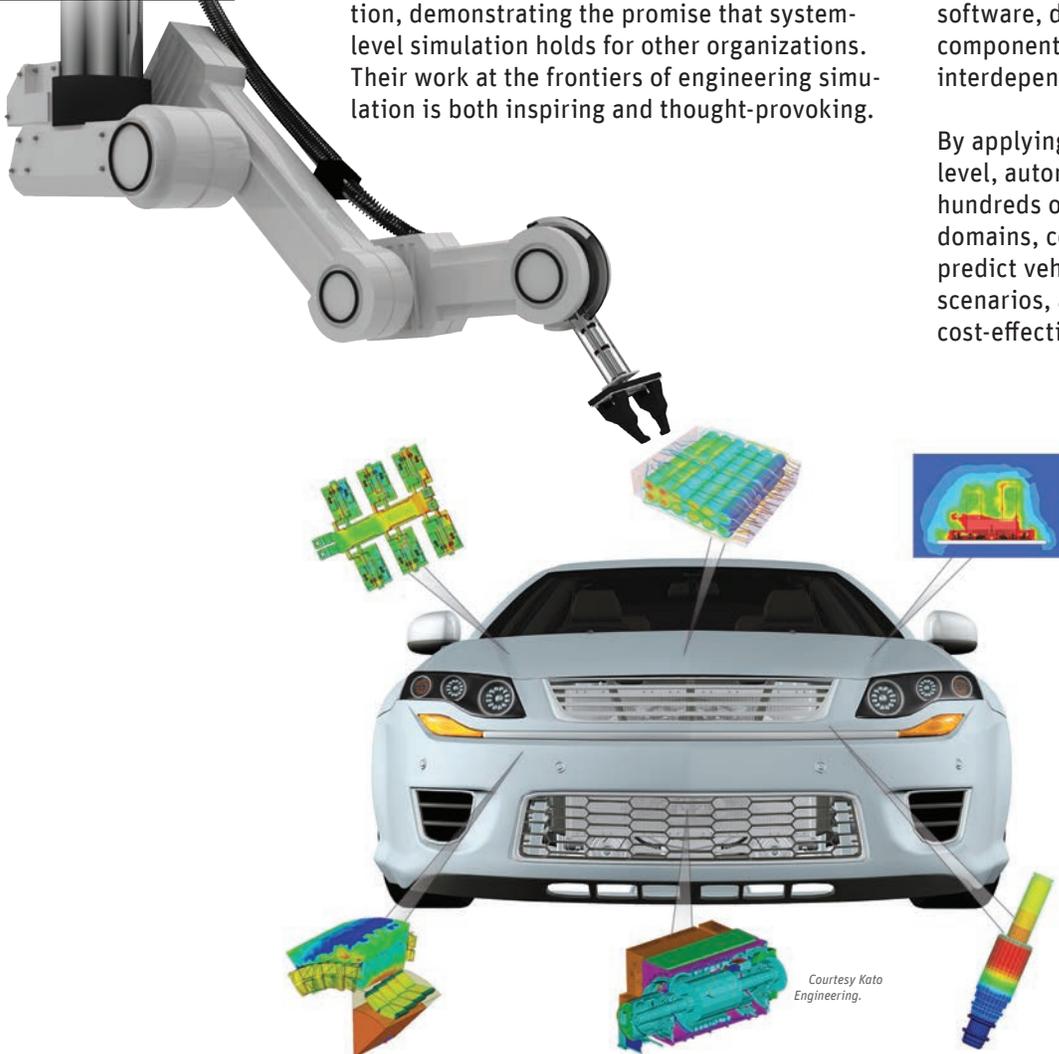
Around the world today, leading organizations apply our software and service offerings in a highly collaborative manner to realize the considerable promise of system-level simulation. By considering the performance of the entire system at the earliest design stages, these pioneers not only minimize the time and costs involved in component prototypes, they reduce the requirements for system assembly, testing, re-engineering and re-assembly. Working in diverse industries and applications, thought leaders are moving toward full-system simulation, demonstrating the promise that system-level simulation holds for other organizations. Their work at the frontiers of engineering simulation is both inspiring and thought-provoking.

Demonstrating the Promise: Real-World Applications

Automotive

Today, automotive engineers are at the forefront of applying system-level simulation, developing innovative powertrain systems for hybrid and electric vehicles. These systems bring together many advanced components — from batteries to power electronics to traction motors — each highly complex in its own right. Leveraging our software, developers optimize individual components along with the interactions and interdependencies of the isolated parts.

By applying ANSYS software at the system level, automotive engineers are able to evaluate hundreds of design alternatives within multiple domains, conduct numerous what-if studies, predict vehicle behavior in real-life driving scenarios, and optimize final designs in a rapid, cost-effective manner.



Automotive OEMs are engaged in a global contest to build and mass-market HEVs and EVs. Engineers must consider structural, thermal, aerodynamic and electromagnetic issues that play a crucial role in vehicle performance, reliability and cost. ANSYS integrated multiphysics simulation technology helps to address these challenges by enabling engineers to rapidly evaluate — prior to physical prototyping — functionality, performance and cost of a wide range of design alternatives.

Courtesy Kato Engineering.



In the consumer products sector, yoomi used our technology to develop a baby bottle/milk warmer. The multiphase simulation evaluated many design candidates, enabling yoomi to deliver its product two years ahead of schedule.

“Understanding how the whole system works was critical to developing an optimized design in minimal time. We performed a series of design studies using the simulation software and utilized the results to build a simpler analytical model to crunch through thousands of possible geometric alternatives.”

Jim Shaikh
Founder
yoomi

Energy

In the energy industry, designers of offshore wind turbines leverage ANSYS software to analyze the effects of wind, waves, ocean currents and other forces. They study complex soil–structure interactions at the seabed level. Understanding and addressing all load sources and their interactions is essential in verifying the reliability of these turbines and ensuring the safe, cost-effective operation of large-scale offshore wind farms. We provide accurate multiphysics modeling capabilities to support this advanced application.



“The coupled thermal and electro-magnetic tools provide us with insight into interactions between pacemakers and MRI scanners, which is a complex problem. Using simulation allows us to really understand the problem, so that we can mitigate the hazards.”

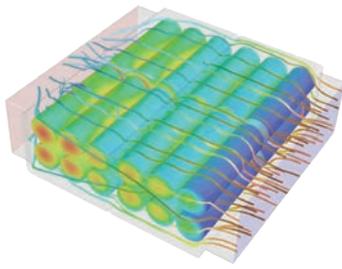
Mariya Lazebnik
Senior Scientist
Medtronic

Manufacturing

Industrial manufacturers also apply our solutions to understand and optimize complex interactions during multi-step production processes. For example, a steel manufacturer recently used ANSYS software to design innovative new refractory equipment, which meant modeling a complex process flow as liquid steel comes from the blast furnace, moves through a channel, and is continuously cast via molds. This sophisticated system-level simulation incorporated multiphase flows, liquid metal, entrapped air, and inclusions and other process irregularities. Only ANSYS software was able to manage the complexities of this system-level modeling challenge.



A residential high-rise in London is the first major building to incorporate wind turbines into its structure. Rambøll Denmark applied our tools in designing it because of the software’s ability to efficiently handle large differences in scale. The computational domain extended for several kilometers, as the simulation had to incorporate the effects of nearby buildings; at the same time, the mesh needed to resolve fine details in the area of the turbine.



General Motors, ANSYS and the University of South Carolina are working together to develop CAE design tools that accurately represent multiphysics phenomena across a wide range of scales for cells and packs, funded by an award from the U.S. Department of Energy's National Renewable Energy Laboratory. The project will contribute to making HEV/EV batteries more affordable, better performing and longer lasting.

ANSYS: Robust Technologies for the Only System-Level Perspective

No other software provider can match the multiphysics depth and breadth, the shared technology platform, and the knowledge management capabilities that ANSYS delivers.

System-level simulation requires exacting technology standards as well as incredible scale and speed. It calls for enormous breadth and depth in structural, fluidic, electromagnetic and thermal physics. Today, only ANSYS offers the complete capabilities your business needs to successfully simulate performance at the system level.

Clear Multiphysics Leadership

With a track record of 40-plus years, we deliver unmatched multiphysics capabilities. With our strength in structures, fluids and electromagnetics simulation capabilities, ANSYS software has emerged as the clear industry standard across every physics discipline. Whatever the product system — and whatever the forces brought to bear in real-world applications — our solutions enable your team to couple physics and accurately predict actual physical performance at the system level.

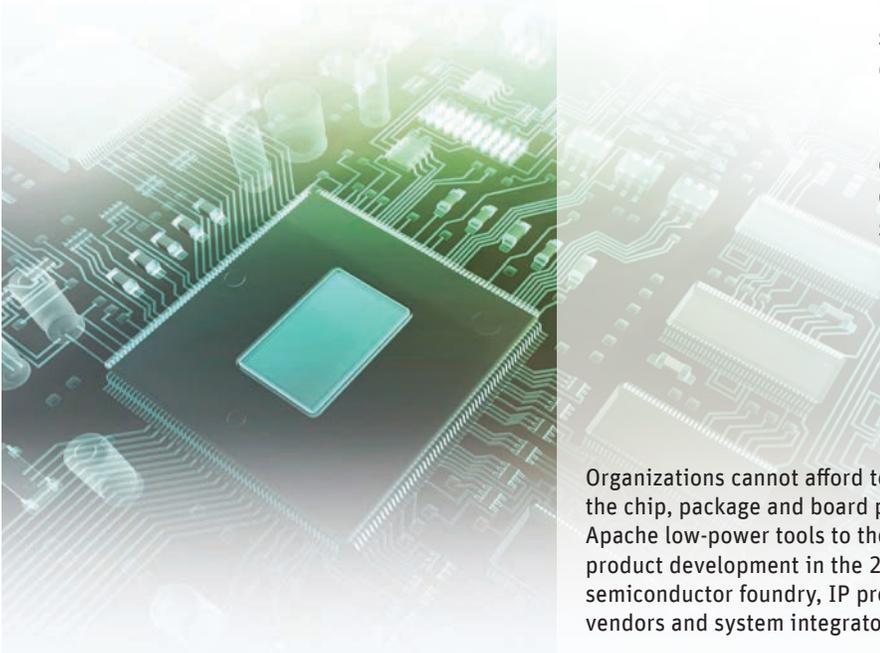
Unmatched Scale and Speed

Supported by advanced HPC capabilities, our solutions provide rapid modeling of individual components as well as large coupled systems. System-level simulation requires exceptional computing scale and speed, as it involves solving multiple numerically large problems.

Advanced low-power electronics solutions from Apache Design, an ANSYS subsidiary, mean that our portfolio can simulate system performance down to the individual chip level.

Flexible Fidelity for System-Level Analyses

Whether your goal is extreme high fidelity offered by 3-D models or the speed and broad view of 2-D, 1-D and 0-D models, we can answer your needs for assessing real-world system performance in a virtual environment. No other provider spans this same level of simulation fidelity, giving engineers a high degree of flexibility in their approach to system-level simulation. Your teams can shift their modeling approach and fidelity level in a customized manner, maximizing time and cost efficiency — while still ensuring the highest simulation accuracy.



Organizations cannot afford to view IC design with a silo-based approach, in which the chip, package and board process as independent projects. The addition of Apache low-power tools to the ANSYS suite is driving energy-efficient electronic product development in the 21st century. Apache tools help to bring together semiconductor foundry, IP providers, system-on-chip (SoC) design houses, package vendors and system integrators.



“Our customers don’t ask for components, they send us a system to design. And in these systems you have thermal, mechanical and electromagnetic concerns, the design needs to function reliably, you need to cut costs, and you have to design in all these parameters very early. We can investigate these with ANSYS tools. If you address all of your problems at the system level, you have the agility to choose the specific technology at the component level. It helps us to make an edgier design.”

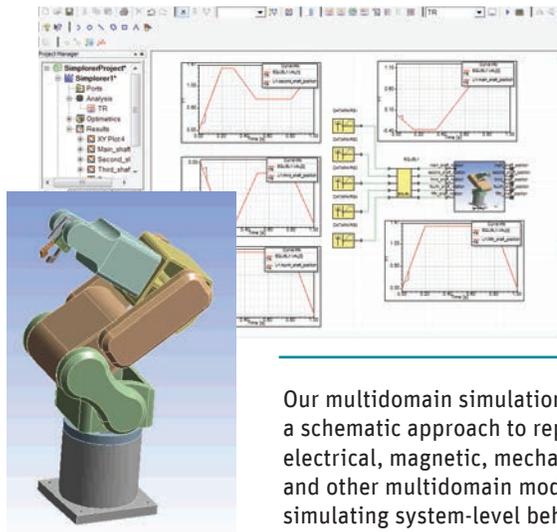
Pierre Solomalala
Power Electronics R&D Engineer
Alstom Transport

Tools for Unique Challenges

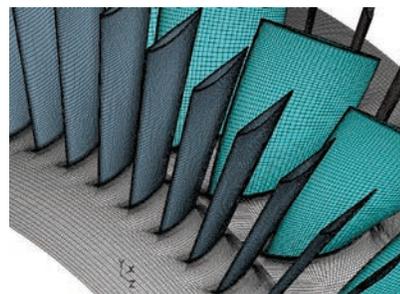
Beyond providing advanced multiphysics software, ANSYS has partnered with leading technology experts to develop specialized tools that consider especially complex physical interactions. For example, ANSYS TurboGrid™ provides turbomachinery designers and analysts with mesh creation tailored specifically to the needs of bladed geometries. The software creates high-quality hexahedral meshes tuned to the demands of rotating machinery fluid dynamics analysis.

Electromagnetic engineers use ANSYS Simplorer® to design mechatronic and other multidomain systems commonly found in the automotive, industrial automation, and aerospace and defense industries. ANSYS HFSS™ has emerged as the leading technology for 3-D full-wave electromagnetic field simulation.

Whatever your own unique challenge in simulating performance at the system level, ANSYS stands ready with the technology leadership and deep multidisciplinary expertise to help solve your most difficult and specialized problems.



Our multidomain simulation tool, Simplorer, uses a schematic approach to represent and couple electrical, magnetic, mechanical, hydraulic, thermal and other multidomain models, rapidly and accurately simulating system-level behavior. When modeling a system, critical components can exhibit physical effects, such as force, torque, motion and temperature, that strongly affect system results. In these cases, Simplorer incorporates a physics-based model produced by the ANSYS solvers within the system simulation. Using the complete ANSYS portfolio, system-level design no longer suffers from inaccurate model representations of critical components that can drastically affect the results.



High-performance computing can deliver results in a faster, more cost-effective manner with a greater degree of confidence. In studying noise generated by a complex turbomachine, EURO/CFD solved a 51-million-cell mesh unsteady simulation in just three weeks. Without HPC, the work would have taken three months.

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ANSYS is dedicated exclusively to developing engineering simulation software that fosters rapid and innovative product design. Our technology enables you to predict with confidence that your product will thrive in the real world. For more than 40 years, customers in the most demanding markets have trusted our solutions to help ensure the integrity of their products and drive business success through innovation.

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