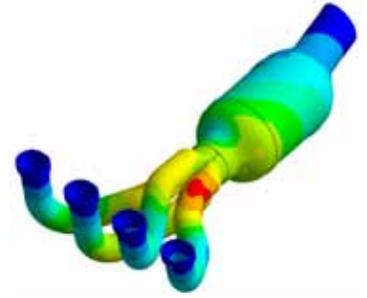


ANSYS[®]



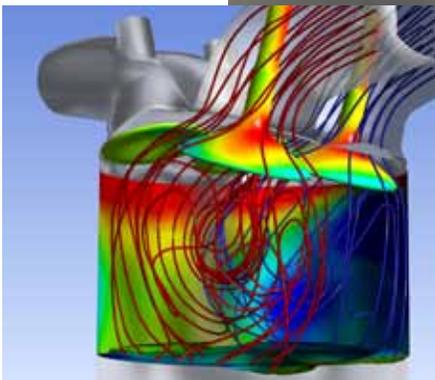
Realize Your Product Promise[™]

in Automotive



Driven to Innovate

As the demand for fuel-efficient, environmentally responsible vehicles intensifies, the global auto industry is transforming itself. Is your business ready to deliver category-changing innovations?



More than a century after the first car debuted, the global automotive industry is undergoing a period of dramatic transformation. As consumers and regulators demand more energy-efficient vehicles that minimize environmental impact, few technologies are exempt from scrutiny.

Automotive and transportation pioneers are looking to replace traditional internal combustion engines with fuel cells, batteries, opposed-piston technologies and electric traction motors — in an incredibly short time frame, and often from scratch. Novel composite materials impart strength while shaving weight, making it possible to reduce fuel consumption. Optimizing complex aerodynamics improves fuel economy even further. Smart electronics are adding new levels of automation, control, safety and comfort. Despite these technological leaps, consumers are demanding rock-bottom prices.

From cars and motorcycles to commercial trucks and construction equipment to rail vehicles, the worldwide transportation industry views innovation as a critical competency. Engineering simulation — in which R&D teams design and validate products in a virtual environment — provides pacesetters with a powerful platform for creating innovations that are truly category-changing.



"ANSYS software is vital to our business. It enables Red Bull Racing to reduce lead times rapidly, getting solutions to the circuit quicker and making us more competitive race by race. We try to get as much performance out of every small part of our car as possible, and ANSYS is essential in achieving that."

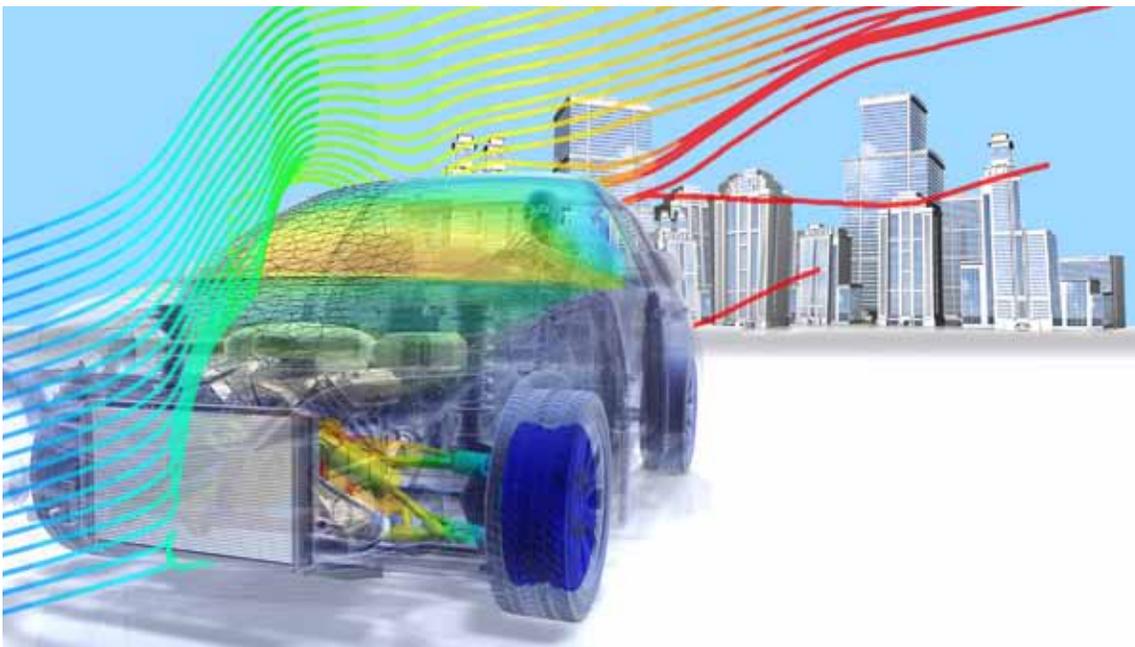
Steve Nevey
Business Development
Red Bull Racing

ANSYS: Accelerating New Products and Processes

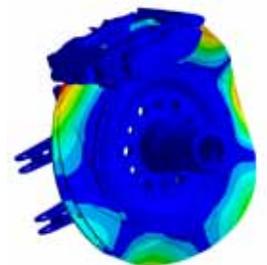
Advanced engineering simulation software from ANSYS supports development of revolutionary new products and processes at the heart of this transformation — and we stand ready to help your business emerge as an innovation leader.

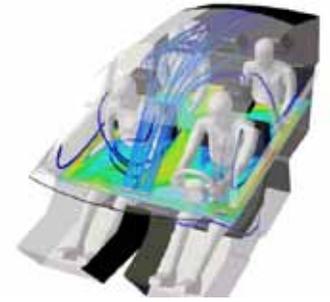
By driving time and costs out of the development cycle, our solutions help you bring innovations to market quickly, so you can gain a significant

edge on the competition. And because you apply ANSYS tools in a low-risk, virtual design environment where anything is possible — even within targeted time frames — your engineering teams are more likely to push boundaries and create outside-the-box innovations. At the same time, your business can benefit from a high degree of confidence that products will perform as predicted in the physical world, enabling you to realize your product promise to customers and other stakeholders.



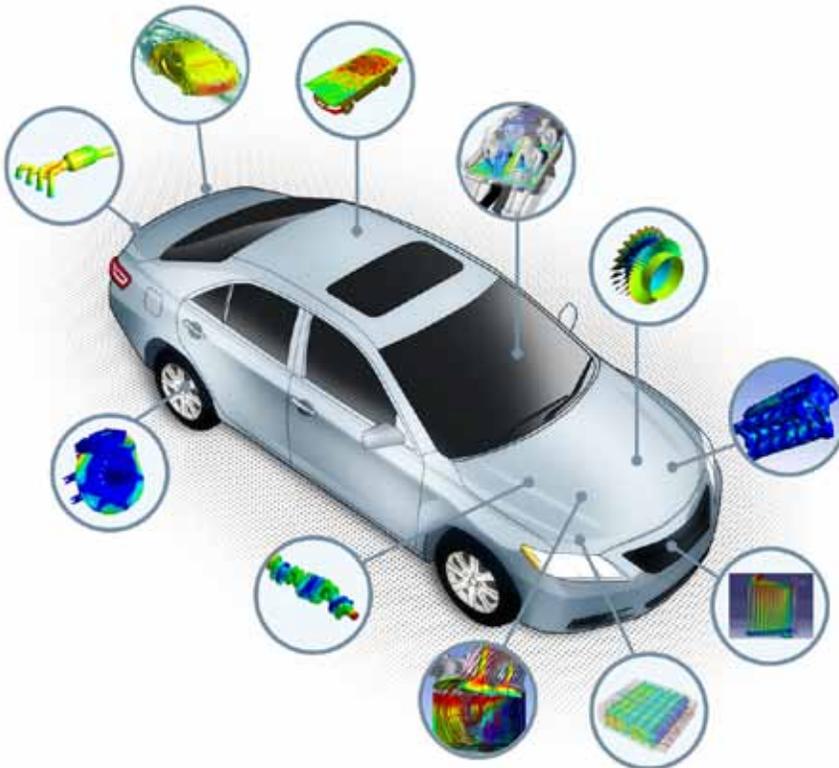
Electronic throttle controls offer benefits in automotive applications such as stability control, automatic braking, cruise and traction control, and pre-crash systems. KSR International designs inductance sensors that are part of such systems. The company initially used trial-and-error methods to develop custom inductance sensors, a process that took approximately three months. Using ANSYS tools to evaluate software prototypes — rather than building and testing hardware — has allowed the engineering team to reduce development time to only two weeks.





Steering Your Business Toward Success

In a range of applications, ANSYS helps automotive companies speed ahead of competitors with rapid product and process design.



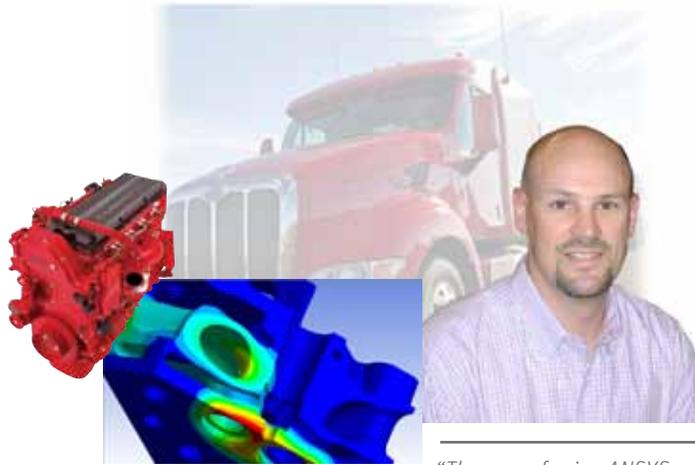
Being first to market is synonymous with success. Automotive companies that lead in anticipating and meeting market needs will emerge as winners, while others struggle to catch up. But you cannot afford to sacrifice product confidence for speed. In an industry characterized by well-known product recalls, your engineering team must combine speed with a strong commitment to deliver on your product promise.

Whether your organization is in an emerging or a mature market, an OEM or a supplier, ANSYS software provides the proven capabilities to help meet the challenges at hand. Our tools have already supported the rapid launch of countless innovative automotive products and processes.

ANSYS: Kick-Starting Innovation in Diverse Applications

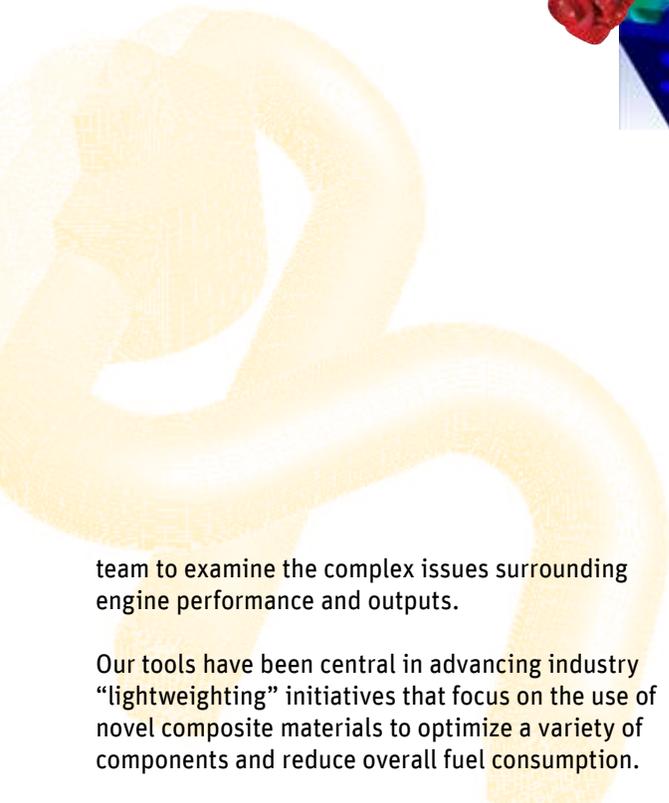
Consumer, regulatory and market pressures exist in diverse segments ranging from passenger cars to Formula 1® race cars, construction vehicles, commercial trucks, tractors, motorcycles and locomotives.

Auto developers use ANSYS solutions to develop engines that burn fuels more efficiently, rely on alternative energy sources or incorporate next-generation emissions control devices. By delivering multiphysics capabilities in a single platform, we make it easier for your engineering



"The ease of using ANSYS simulation tools has helped to transform our organization from a test-centric culture to an analysis-centric culture"

Bob Tickle
 Director of Structural and Dynamic Analysis
 Cummins, Inc.

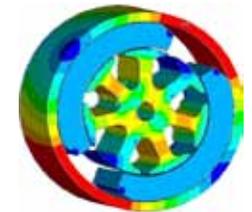


team to examine the complex issues surrounding engine performance and outputs.

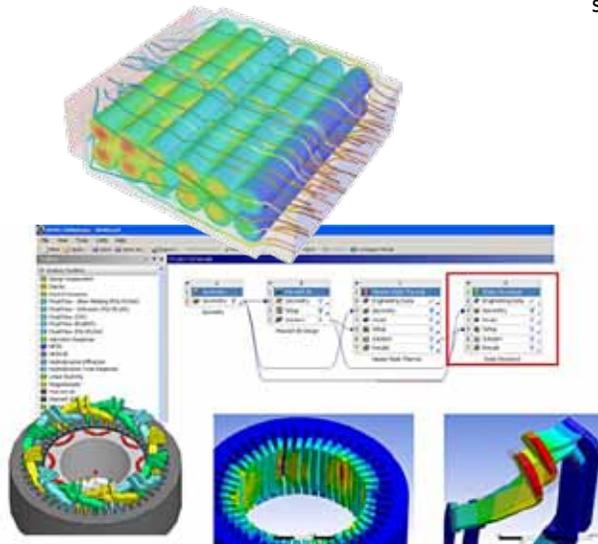
Our tools have been central in advancing industry "lightweighting" initiatives that focus on the use of novel composite materials to optimize a variety of components and reduce overall fuel consumption.

Innovators apply ANSYS to highly specialized problems such as brake squeal in passenger cars and noise, vibration and harshness. By illuminating the causal factors behind complex physical

phenomena, our solutions help engineering teams increase product reliability and minimize costly manufacturer recalls. Whatever the pressing competitive issue — from body to transmission to interior — ANSYS delivers broad simulation capabilities and deep automotive expertise to help your business emerge as the next industry success story.



Bühler Motor used ANSYS tools to develop mechatronic DC drives and gear motors, systematically analyzing and optimizing different components to reach the highest possible optimization level while also meeting safety standards.



"When you design innovation, you can't design in just one area — you have to couple everything at the early stage of the project. And we found that ANSYS enables us to do that."

Pierre Solomalala
 Power Electronics R&D Engineer
 Alstom Transport

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.



Road-Tested, Industry-Leading Technologies

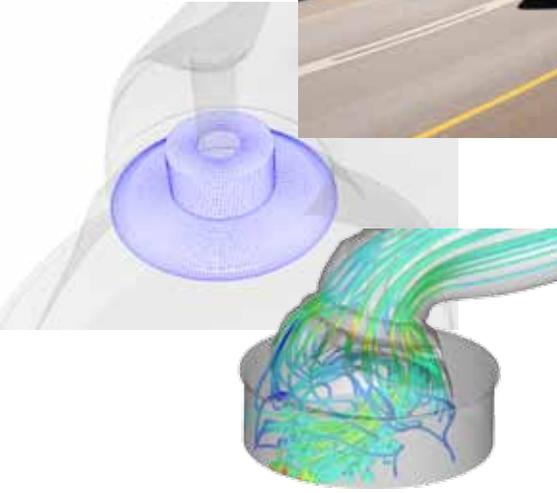
Proven solutions from ANSYS deliver the multiphysics and system-level perspective needed to drive innovation across the entire vehicle design cycle.



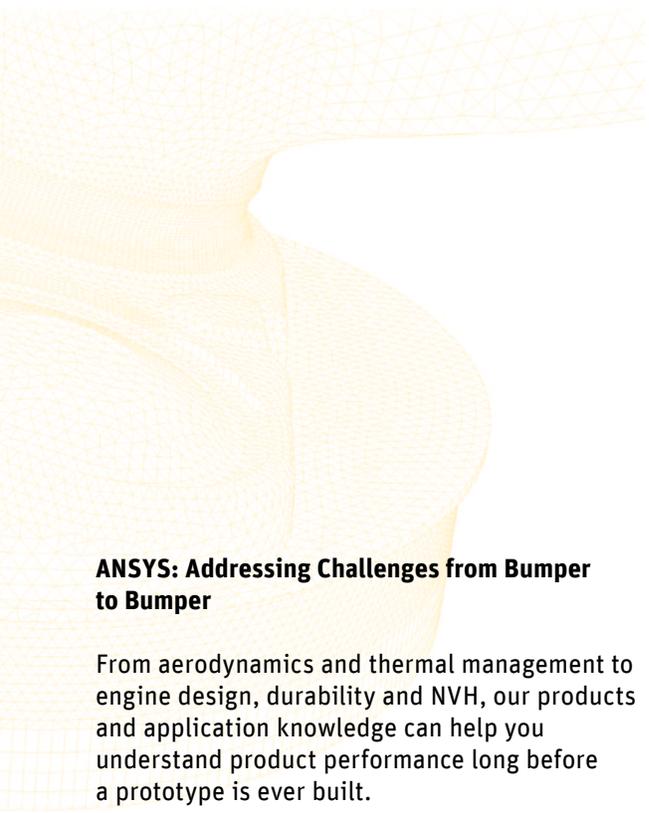
An early adopter of simulation technology, the automotive industry continues to look for ways to bring simulation as close to reality as possible. The engineering tool you choose should be reliable and accurate to reduce dependence on physical prototyping. The ANSYS suite goes far beyond, facilitating communication across various engineering disciplines. For the automotive industry, this is a key initiative for expediting the design cycle and reducing product recalls.

Only ANSYS offers a single, integrated technology platform built for this level of global collaboration. The ANSYS Workbench™ platform delivers unprecedented ease of use while integrating industry-leading structural, thermal, electromagnetics and fluids physics needed to solve complicated problems at both component and systems levels. To address the collaboration needs of all global supply chain participants, we offer engineering knowledge management capabilities that can be used across the enterprise.

ANSYS supports HPC environments required to manage large-scale simulations created by automotive engineers every day. Parallel processing capabilities combined with HPC tools, such as graphics processing units, enable you to speed and streamline even the most complex and numerically large simulations.



To better understand fuel injection technology, Delphi Automotive Systems ran simulations using a number of ANSYS fluid dynamics models, including discrete phase, drag, breakup, collision and coalescence, wall-impingement, and evaporation.



“By adopting a comprehensive approach for implementing FEA across the worldwide organization, Delphi has incorporated an extremely powerful technology into the product development process. The initiative to focus on upfront analysis in particular has resulted in outstanding value.”

Fereydoon Dadkhah
Senior Engineer
Delphi Electronics & Safety Systems

ANSYS: Addressing Challenges from Bumper to Bumper

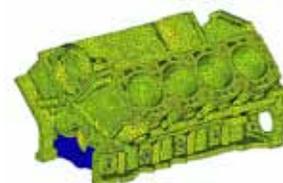
From aerodynamics and thermal management to engine design, durability and NVH, our products and application knowledge can help you understand product performance long before a prototype is ever built.

We have worked aggressively to assemble our technology suite so that you can address the wide range of complexities and transform your organization into an innovator. Our CFD products include advanced turbulence models to help optimize aerodynamic performance of vehicles. Our structural solutions incorporate nonlinear, fatigue and rigid-body dynamics tools to support development of composites and other

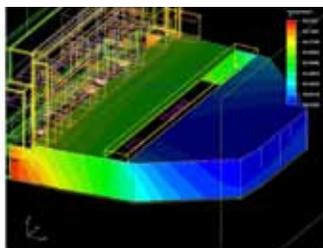
new materials. You can tightly couple a number of products to assess traditional engine technologies as well as fuel cells, hybrid-electric engines and other emerging technologies.

Passenger cars are on the verge of becoming more electric than mechanical in nature. We have the clear leadership in electromagnetics simulation to support revolutionary developments — as well as the multiphysics capabilities to optimize component interaction with other systems.

Automotive engineers consider complex real-world physics interactions and make value-added design trade-offs. Every day, and in every automotive segment, they use industry-leading multiphysics tools from ANSYS to position their companies for innovation leadership.



The Engine NVH Analysis Section at Ford Motor Company used ANSYS software to conduct design-of-experiments studies, gaining insight into modal and vibrational response, radiated noise, and crank/block dynamic interactions.



Courtesy Timoney Technology.

Almost half the value of next-generation automobiles will come from onboard electronics and electromechanical components. These devices must survive in harsh operating conditions, such as significant swings in humidity levels. Product developers can apply our tools to incorporate effects such as Joule heating phenomena in package or board substrates.

The automotive global supply chain is crowded with OEMs and multi-tier suppliers. ANSYS provides tools to address their varied design issues — and to manage the huge amount of data that simulation generates. The result: fewer surprises when components and systems are assembled into a finished vehicle.

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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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