



AN AUTOMOTIVE RENAISSANCE

In its 125-year history, the auto industry has never seen such a period of rapid, exponential change. Virtual engineering is the answer to staying apace.

By Josh Fredberg, Vice President of Marketing, ANSYS, Inc.

It's rare when everyone agrees that the time is right to re-invent foundational products and technologies in a given industry. But today, that's the challenge the global automotive sector faces. The race is on to develop a new generation of fuels, power technologies and vehicle designs that will reduce lifetime costs, safeguard the environment and meet stringent regulations. The prize is financial success, but the winners may rise to the status of industry pioneers like Henry Ford and Karl Benz, who radically transformed transportation.

Today's renaissance pioneers are grappling with greater technical complexity than early engineers ever could have imagined. As vehicles become increasingly electronic, engineers must take a systems-level approach that considers not only how a specific component — such as a new powertrain — will perform, but also its impact on other components. For example, will thermal heat transfer from the powertrain negatively impact the electronics that control mission-critical airbags and collision-avoidance systems?

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These are sophisticated questions that can be addressed only via engineering simulation. In the race to innovate, simulation enables engineers to road-test their designs in a risk-free virtual environment where anything is possible — and every real-world condition can be safely considered.

As the leader in engineering simulation, ANSYS has anticipated the evolving needs of automotive engineers, assembling the world's most robust toolkit to support these visionaries. We have added to our family of engineering simulation technologies with acquisitions of Apache, with expertise in power optimization, and Esterel, a provider of embedded software simulation solutions. In fact, it is this ability to virtually study how components, systems and processes behave under different conditions — without first committing to a final design — that is driving the exponential growth of automotive onboard electronics. Already, Apache products are being applied in multiphysics settings to optimize chips that run electronic sensors, for example, for both power consumption and high heat exposure. And because today's high-end cars can have over 10 million lines of embedded code in components ranging from engine control units to AC systems, Esterel tools can have a significant impact on overall product integrity.

As a result, ANSYS is the only company that can help engineers design and integrate the complex, multiscale mechatronics systems that characterize vehicles today — from the fluid dynamics involved in hydraulics, gear mechanisms and aerodynamics to the electrical

physics and software code that underlie the performance of the entire vehicle.

Furthermore, ANSYS is working on solving specific next-generation engineering problems with a wide range of industry leaders. For example, ANSYS is collaborating with General Motors and the U.S. Department of Energy to optimize electric-vehicle batteries for increased performance, safety and life span. Using real-world examples from TRW Automotive, ANSYS addressed the complex problem of brake squeal, developing a groundbreaking method to compute sliding contacts between brake pads and discs. And ANSYS developed a new aerodynamics design method called 50:50:50, in which 50 shape variants of a nonidealized vehicle geometry supplied by Volvo can be simulated via a 50-million cell mesh in as little as 50 hours.

In the academic arena, we are working with the Society of Automotive Engineers (SAE) to teach the next generation of automotive engineers to think outside the box. Students are challenged to seek out the absolute best performance of race cars via simulation in Formula SAE and Formula Student competitions. Universities around the world use our solutions in developing technology breakthroughs that support the goals of the automotive industry.

While these efforts — and others that are ongoing at ANSYS — focus on targeted problems, the resulting improvements will ultimately benefit every ANSYS user. Just as automotive engineers are challenged to re-invent their most basic product systems, software engineers at ANSYS are challenged to keep our tools several steps ahead of industry needs, and that's a responsibility we take very seriously. ▲