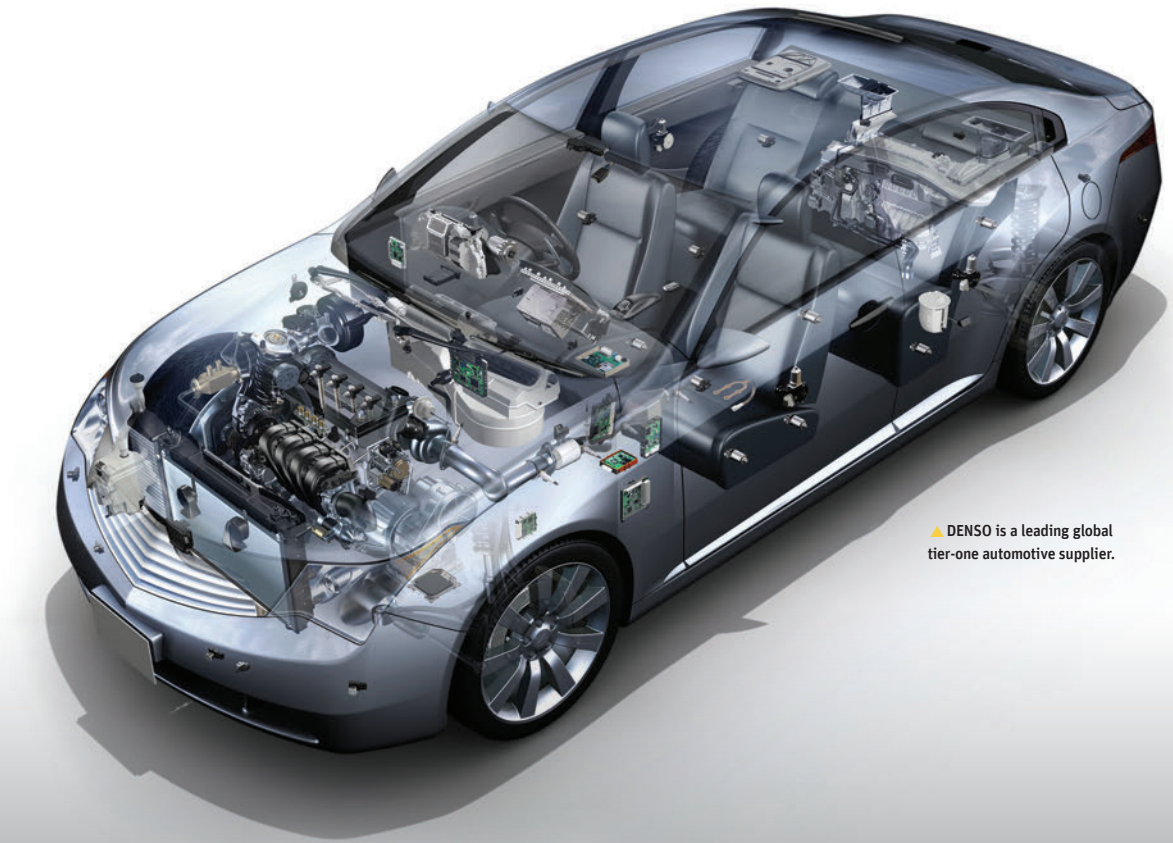
ON TOP OF THE WORLD



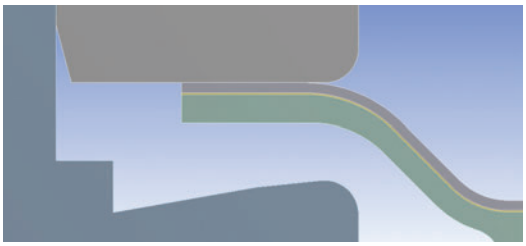
▲ DENSO is a leading global tier-one automotive supplier.

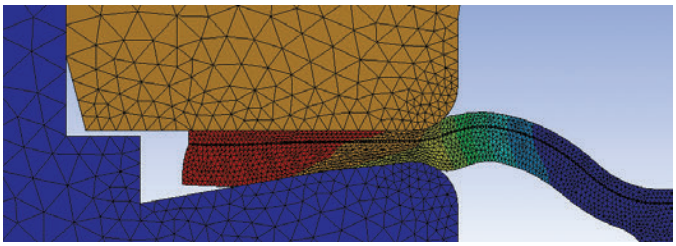
DENSO Corporation standardizes on ANSYS structural software to expedite global product development.

By Shigeru Akaike, Project Director, CAE Design Promotion, DENSO Corporation, Kariya, Japan

Competition is intense in the automotive systems and components business. Best-in-class simulation capabilities are necessary to thrive amid global competition. DENSO Corporation — a leading supplier of advanced automotive technology, systems and components for all the world's major automakers — faced the need to reduce software licensing expenses to remain cost-competitive and to develop world-class products. DENSO performed a rigorous benchmarking process and selected ANSYS simulation software as its standard tool to expedite product development, cut costs

DENSO has developed a strategy to embed CAE fully into all phases of the global product development process.





▲ Using large deformation analysis allows the DENSO team to predict strength and the shape profile. With some compressions at more than 50 percent of the original thickness, structural simulation helps the company to ensure product reliability.

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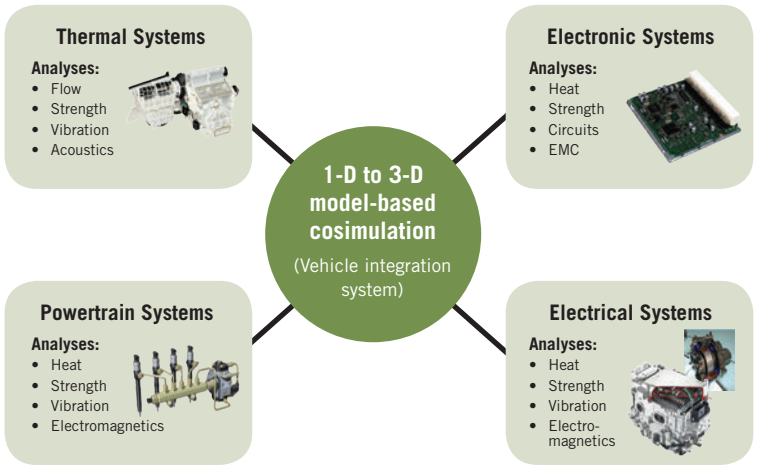
and boost competitiveness across its product portfolio, which includes automotive powertrains, advanced electronics, heating and cooling systems, and many other products.

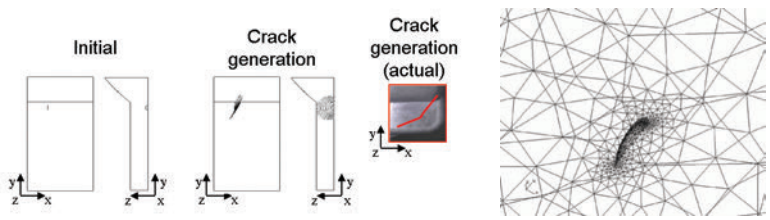
DENSO BACKGROUND

With sales of $39.8 billion U.S. in the latest fiscal year, DENSO is organized into business groups focusing on powertrain controls, electronic systems, thermal systems, and information and safety systems. A small group of DENSO analysts began using computer-aided engineering (CAE) about 30 years ago to diagnose problems that had been revealed during the prototyping process. In the ensuing years, new applications for CAE have been employed, including its use as a presentation tool during the sales process, as an engineering tool to develop new ideas, and as a partial alternative to physical prototyping for evaluating proposed designs. To take full advantage of this technology, the company has added many new CAE professionals over the years: experts responsible for customizing CAE tools for a single physics, specialists who customize tools for multiple physics, and CAE engineers who develop new tools for single and multiple physics.

Over the years, DENSO accumulated licenses for nearly 70 commercial CAE codes and customized many of these codes to meet its special needs. But in 2011, corporate budget cuts made it necessary to reduce software costs. The company made the decision to benchmark its portfolio of CAE codes, comparing codes employed for similar purposes, identifying the best one in each category and standardizing on the best code company-wide. In the analysis code category, DENSO identified 69 capabilities that were needed for structural simulation and asked the two leading code vendors in this category what capabilities they could provide now and in the future.



▲ DENSO continues to embed CAE more deeply within its global product development process, and the company maintains its strong strategic partnership with ANSYS by sharing visions and goals, as well as through ongoing and future joint projects.

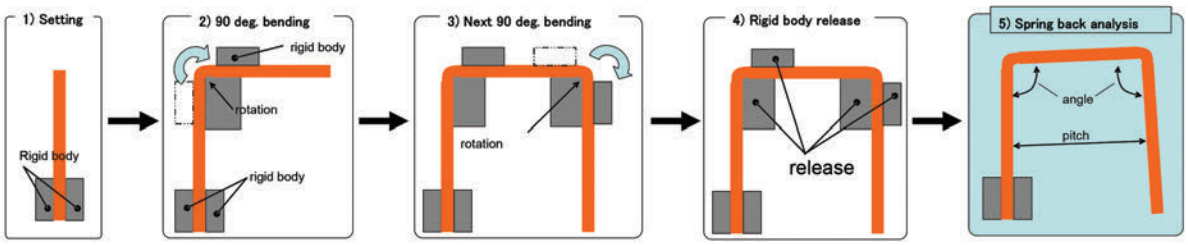


▲ Crack growth analysis allows DENSO to predict when failure might occur. This helps to ensure product reliability by visualizing the stress distribution based on crack profile changes.

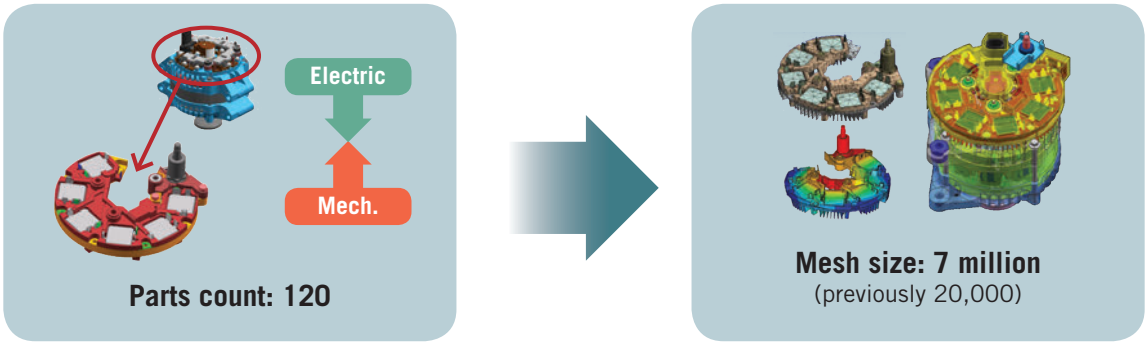
BENCHMARK STUDY IDENTIFIES ANSYS AS TECHNOLOGY LEADER

ANSYS delivered 38 of these capabilities directly and provided another 19 with workarounds. ANSYS also provided a timetable for delivering another three functions and promised to develop the remaining nine in the near future. The other vendor could offer only eight of the 69 capabilities outright and provide a workaround for 12 more. That vendor also promised to develop 42 more functions at some unspecified point in the future and could make no promises for the final seven. DENSO also surveyed its user community and found that 80 percent favored adopting ANSYS Mechanical as the company standard while only 20 percent favored the other vendor's software.

The benchmark study focused on finite element analysis software, which was the primary analysis used at DENSO at the time of the study. DENSO selected



▲ By using simulation to predict profiles after the forming process, geometric accuracy can be improved.



▲ By simulating the entire assembly, DENSO can predict strength and fatigue to ensure product dependability.

ANSYS software largely because of ANSYS Mechanical's advanced analytical abilities for structural linear, nonlinear and dynamics analysis; its ability to model with elements; its library of material models and equation solvers; and its scalability in efficiently solving a range of engineering problems and scenarios. DENSO also found the support provided by long-term ANSYS channel partner Cybernet Systems to be especially valuable. After the study was completed, DENSO increased its usage of additional ANSYS multiphysics capabilities including CFD and electromagnetic simulation.

EMBEDDING CAE INTO THE PRODUCT DEVELOPMENT PROCESS

DENSO has developed a strategy to embed CAE fully into all phases of the global product development process. The mission of the Digital Engineering Department is to enhance CAE technology in each of the company's business groups by developing methods to solve typical product development problems. Each business group has a CAE team responsible for developing product-specific CAE tools for use in the design process. Engineers from overseas business units are trained at headquarters to enable joint development of CAE technology in the future.

DENSO has determined that its need for multiphysics analysis will increase greatly in the future. For example, research and development teams working on hybrid vehicle/electric vehicle motor generator design must address structural and thermal considerations along with electromagnetic design constraints. Kinematics–vibration–noise analysis is required to address environmental problems in the design of turbomachinery, compressors and belt drives. Because of the risk of supply cutoffs, multiphysics analysis is vital in developing alternative materials that frequently need to be considered.

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Collaboration with academia helps DENSO develop basic theories that can be embedded into the software. The company is working with universities on the flow-by-particle method, high-precision electromagnetic fields, polymeric heat transfer characteristics, metal-to-metal joints and magnetic particle compression.

As a result of these efforts, DENSO has improved product quality by considering more alternatives upfront and has compressed the product development process. DENSO intends to continue to embed CAE more deeply within its global product development process and maintain its strong strategic partnership with ANSYS through sharing visions and goals, as well as ongoing and future joint projects.