

Upfront simulation improves vehicle quality and lowers automaker's costs

At Opel, 80 engineers use NX Scenario solutions as a routine part of the design process – a step toward totally virtual vehicle development

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► Issues:

Obtain performance data early in the development process to drive designs

Work toward goal of completely virtual car development

► Approach:

Implement NX®-based unified solution to give designers the ability to run their own simulations

Use NX to support Knowledge-Based Engineering

Rely on Teamcenter® to manage multiple design iterations

Initiate process changes and implement advanced training programs to support overall goals

► Results:

A design variation can be evaluated in less than a day

Faster development cycle

Fewer mistakes; higher design quality

Safer cars

ADAM OPEL AG

- Opel wanted hard and fast performance data to drive the design process. The traditional arrangement involving separate analysis specialists was too limited.

Working toward total virtual development

Opel is a brand with a long-standing tradition in Europe. Founded in 1862 to mass-produce sewing machines, the company now designs and manufactures trend-setting cars and vans that are sold around the world. Opel vehicles are driving the industry in a number of areas including comfort and environmental friendliness. For example, the Tigra TwinTop was crowned as the "Cabrio of the Year 2004." The Opel Signum 2.2 DIRECT was named the most environmentally friendly gasoline-



powered car and the new Opel Astra, which is in such high demand that additional manufacturing shifts have been added, is expected to have the lowest depreciation of any car in the compact class.

To achieve such outstanding accomplishments, Opel relies on virtual product development. This automaker is such a believer in working virtually that it has set a long-term goal of total virtual development. This would mean that just a single prototype would be made before the production startup. Opel has made considerable advances toward this goal in recent years, according to Dr. Markus Merkel and Roland Hierold of the Information Systems and Services Department at Adam Opel's International Technical Development Center. Opel previously integrated its design and manufacturing applications. Now, using NX and NX digital simulation solutions, Opel has linked design with analysis so that performance data can drive designs.

Letting simulation drive design

NX Scenario for Structures and NX Scenario for Motion are currently used by approximately 80 design engineers as a routine part of the design process. The design engineers were

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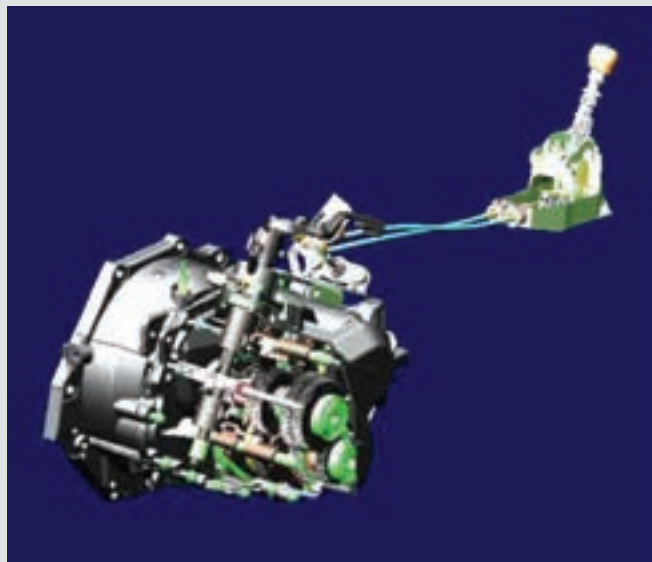
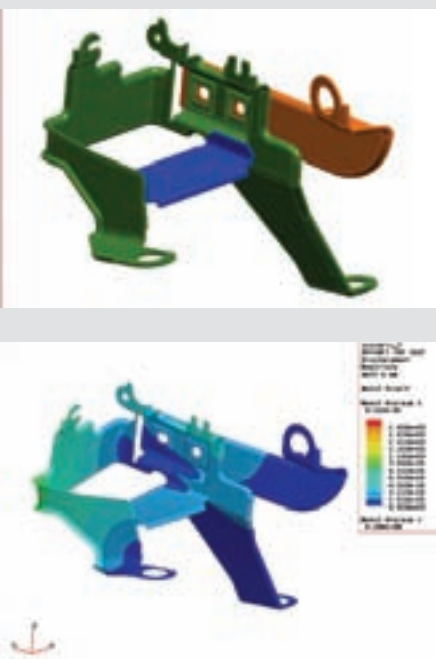
introduced to the power of the NX Scenario modules during professional training sessions, which proved extremely valuable in increasing overall productivity, breaking down barriers between the traditional roles of designers and analysts and helping to drive required process changes. The NX Scenario tools, combined with the NX design system, give engineers a unified solution that lets them evaluate the performance of designs in progress from their own workstations. Typically the complete effort for preprocessing, solving and postprocessing takes less than one day. Since this is much faster than the previous method of having specialists perform analyses, many more design alternatives can be evaluated to find the best solution. Teamcenter handles data management so that the multiple iterations are accurately tracked.

NX Scenario for Motion is primarily used to execute motion analysis, such as clearance tests for doors and sun-roofs as well as the testing of seat height adjustments. In addition, it is used to determine the pin joint forces which are then used in NX Scenario for Structures. This allows, for example, the determination of the force-displacement curve for the design of the pneumatic spring during opening and closing. In many cases, absolute values are not of primary interest. Rather the qualitative results are used to compare different design iterations and guide the engineer toward an optimal design.

The use of NX Scenario solutions doesn't eliminate traditional analysis. "An important side effect of the design-supporting analysis is the fact that the design and the traditional analysis grow closer together and a mutual understanding is fostered," explains Dr. Merkel. "From a purely technical view the input-decks can be used as common communication platforms."

Using upfront simulation for benefits downstream

Performing simulation as part of the design process does require some additional work, but Opel finds that it is more than compensated for through time savings during later phases. For example, the use of simulation means that fewer iteration cycles are needed, saving a great deal of time. In addition, design quality has improved. With fewer mistakes, there are fewer time-consuming engineering changes later in the process. The lean design approach made possible by NX is helping eliminate wasted time and



Solutions/Services

NX

Teamcenter

Client's primary business

Adam Opel AG, a member of the General Motors family since 1929, designs and manufactures cars and minivans. www.opel.de

Client location

Rüsselsheim
Germany

"NX solutions have allowed us to create a unified design environment in which design questions are answered as part of the design process."

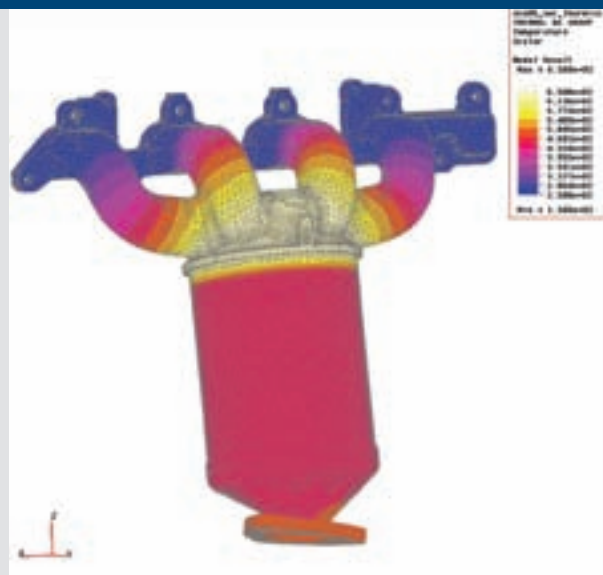
Dr. Markus Merkel
Adam Opel AG

effort. The NX-based development process has brought another benefit to Opel as well. The ability to evaluate multiple design options has increased vehicle safety, which is always one of Opel's major concerns.

In the near future design-supporting analysis at Opel will be expanded to include computational fluid dynamics analysis. This will permit flow simulation in the design environment. An initial application will be the design of ventilation ducts. Opel also plans to increase its use of Knowledge-Based Engineering, currently limited to the design of stamped metal parts. NX Knowledge Fusion will provide an even higher level of support to the design and development process.

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**Contact**

Siemens PLM Software

Americas 800 498 5351

Europe 44 (0) 1276 702000

Asia-Pacific 852 2230 3333

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