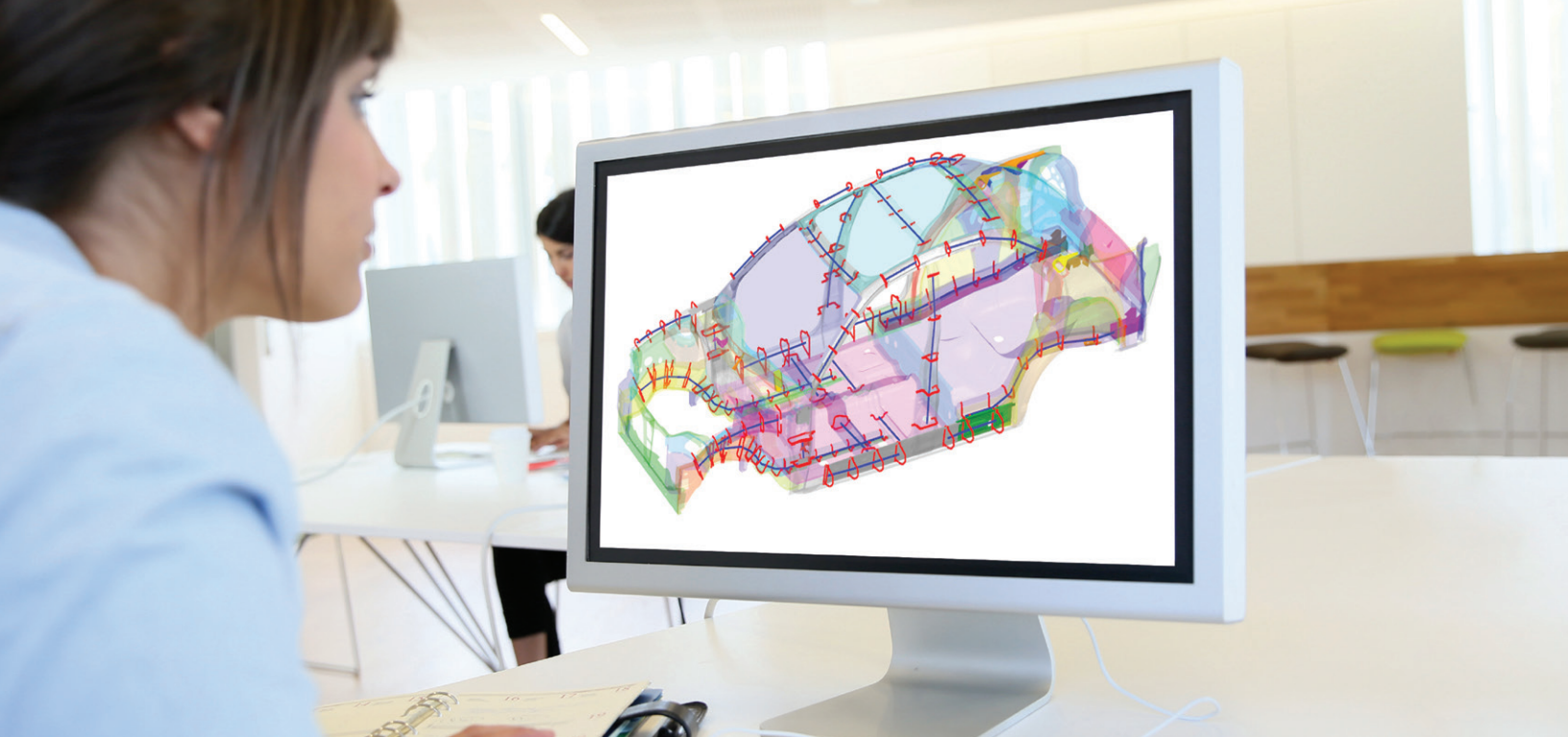




SIEMENS DIGITAL INDUSTRIES SOFTWARE

Body development process improvement

Simcenter Engineering services shorten the design cycle by evaluating stiffness changes during the concept phase

Benefits

- Improve the quality of the first design by giving feedback during the concept phase
- Build a model for both NVH and vehicle handling analysis
- Develop and analyze CAE models with proven simulation accuracy
- Bridge the gap between the NVH and vehicle handling departments by using multi-attribute CAE analysis
- Define body design targets in terms of joint and beam stiffness

Summary

Simcenter™ Engineering services improve and shorten the computer-aided engineering (CAE) body development process. By applying conceptual stiffness modifications on a preliminary finite element (FE) model, engineers are able to optimize critical performance aspects in earlier design phases.

Designing a new car presents complex engineering challenges. Vehicle handling and noise, vibration and harshness (NVH) performance depend on body stiffness, and even contradictory objectives in chassis design and bushing stiffness. To create a vehicle that meets all design criteria, engineers study how stiffness changes influence the overall behavior early in development, even before drawing the first computer-aided design (CAD). Using concept models for the body-in-white (BIW) and trimmed body (TB), modifications can be evaluated and an optimal balance between NVH and vehicle handling can be pursued.

An efficient CAE body development process allows you to optimize crucial performance aspects, such as NVH and vehicle handling, from the beginning. Using 3D simulation in Simcenter™ 3D software, engineers can improve existing body models and even design the next generation of body models. First, engineers convert an FE model of a current vehicle into a concept model that includes information on the stiffness of major beams and joints. This can be used to effectively evaluate the global performance. The most influential beams and joints can be identified in this concept model, and they can be modified as part of doing multi-attribute optimization. This process allows efficient target setting for a body that will meet all design criteria.

A typical CAE body development process using beam concept modeling is comprised of the following phases:

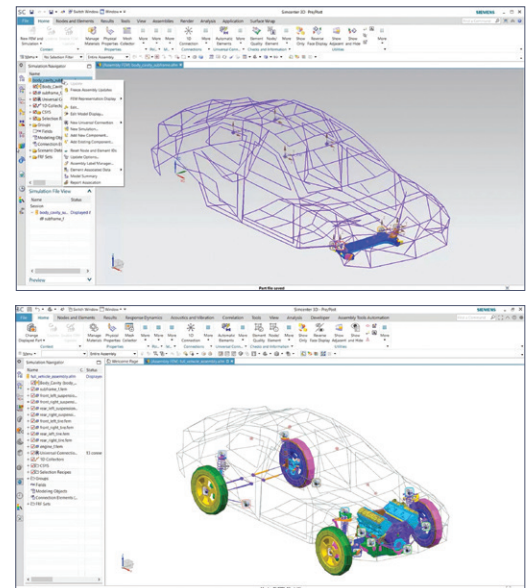
Body-in-white and trimmed body concept modeling

Simcenter Engineering experts start from an existing, detailed FE model, usually a Nastran® software model, and define a beam layout on the geometry in Simcenter 3D software. This tool automatically detects joints and replaces them with direct matrix on grid (DMIG)

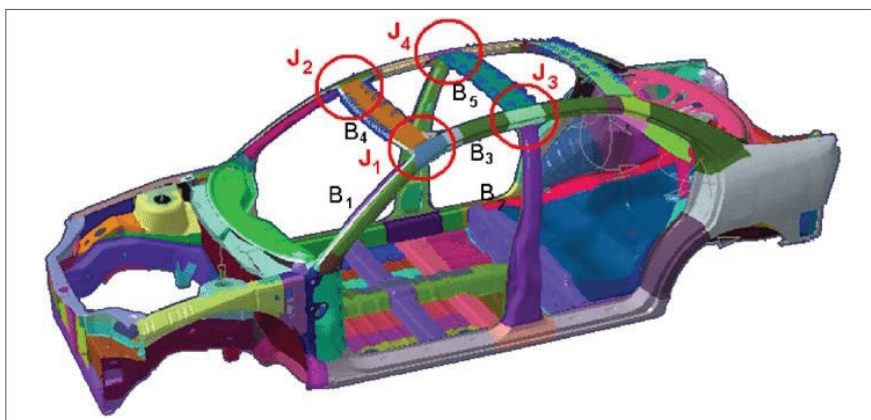
superelements. The beams and joints have equivalent stiffness values that later are subject to optimization. Using modal reduction in the full BIW and TB model, engineers can ensure that the beam concept model preserves full accuracy. As it has a limited number of degrees of freedom (DOFs), it runs quite fast in optimization loops.

Multi-attribute balancing

Simcenter Engineering experts vary the stiffness of joints and beams, and evaluate the impact on the global vehicle behavior. Important indicators are the BIW modes, static stiffness and the road noise in TB. This allows them to identify the most influential beams and joints in the body, as well as hard points in the chassis. Additionally, the engineers study the impact of body flexibility on vehicle dynamics. By balancing the different performance attributes, Simcenter Engineering experts define the body design targets related to joint and beam stiffness for a new vehicle model.



Balancing NVH and vehicle handling performance in Simcenter 3D.



Body-in-white beam concept joints in Simcenter 3D.

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