

下部に自重によるたわみ

Performing Analysis in the Design Phase

By **Dr. Takanao Uchida**

Editor's Note: Honda is one of the world's most advanced users of Dassault Systèmes PLM solutions. Dr. Takanao Uchida of Honda R&D, one of the pioneers of "Designer CAE" in Japan and the leader in charge of the CATIA V5 project at Honda Automotive R&D, has more than a decade of experience in using design analysis software with CATIA. The following is an excerpt from an article published by the Japanese Society of Automotive Engineering.

ADVANTAGES OF CAE ANALYSIS IN THE DESIGN ENVIRONMENT

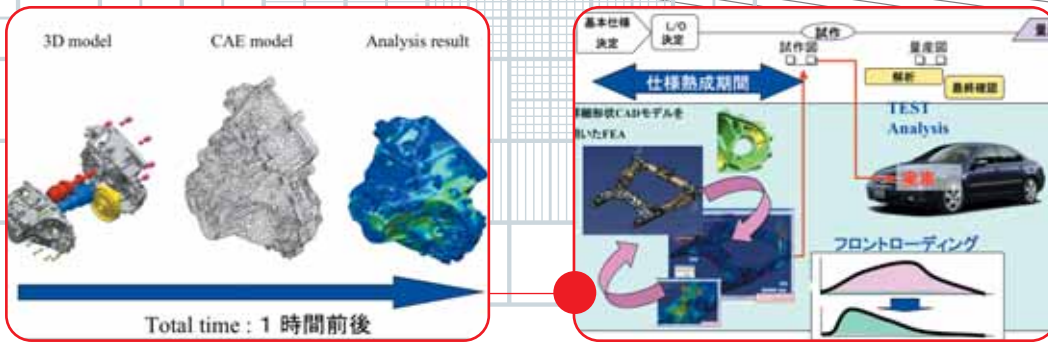
Computer-Aided Engineering (CAE) model preparation for finite element analysis (FEA) is no longer the sole property of CAE specialists. Thanks to dramatic improvements in CAD integration, automatic meshing and computer speed, design engineers can now perform preliminary FEA analysis directly on their detailed 3D CAD models.

In the early days of 3D CAD, expert modelers created 3D models from 2D drawings. It could then take as long as a month for FEA experts to build a separate CAE model with simplified geometries.

Today, however, 3D has replaced 2D as the standard for design capture, and FEA is now embedded within 3D CAD systems such as CATIA. The result has been to make analysis more readily available to designers in their everyday modeling environment.

Automatic meshing, for example, reduces the need to create complex mesh settings and manual simplification of the model, reducing the technical burden on designers. Automatic meshing enables designers to carry out their analyses at a parts level and to work at the assembly level with high accuracy. Another capability that has been improved for designers is Contact





3D has replaced 2D as the standard for design capture, and FEA is now embedded within 3D CAD systems such as CATIA. The result has been to make analysis more readily available to designers in their everyday modeling environment.

Definition. Defining contacts no longer requires multiple manual steps; it is now accomplished simply by indicating the faces to be contacted in a model.

The result of improved usability features in analysis software is that designers can review many valuable and fundamental ideas based on physical behavior. They then can make important geometry-based decisions to optimize their designs quickly.

DESIGNER ANALYSIS EXAMPLE

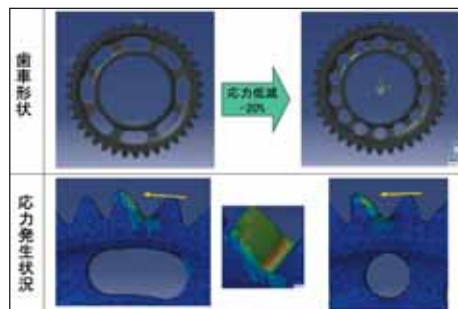
An automobile transmission gear assembly is an example of an analysis that can now be carried out by a designer rather than an expert using CAD-integrated FEA. The gear assembly must be evaluated for strength and stiffness of individual parts, including gears, gear axes and bearings, at the time of torque transmission.



A gear assembly analysis performed by designers directly in the design environment.

improved CAE tools, however, all analysis conditions for this gear assembly can be set within 30 minutes. This enables a designer to look at the assembly and see that Axis A has the highest stress and that stress on the gear support of Axis D is high. He can then reduce the weights of the axes and gears, taking stiffness/strength into account, and even studying gear-tooth fitting based on inclination.

These insightful analysis capabilities have been available to CAE specialists for some time. But with today's CAD-integrated analysis tools, they are now accessible to designers as well, giving them much greater knowledge and decision capability in the design-specification process.



Using CAD-integrated analysis tools, designers can make performance-based decisions.

For example, designers can use analysis to determine how to create jigs for efficient spot-welding of assemblies. New tools have also been developed to study the effects of air flow inside air conditioning ducts to investigate optimum design layout.

CAD-integrated analysis also benefits the management of simulation data and processes. The conditions used to set up the analysis, and the CAE model itself, are now saved with the 3D CAD model. The organization's need for traceability or data reuse can then determine which simulation data to save.

Over the past several years, Honda has supported the development of simplified analysis operations and promoted analysis as part of the training of its designers. Honda is now focusing attention on training highly skilled designers to perform design analysis as well as evaluate manufacturing technology. Future key decisions about new car model development may now lie in the hands of these 'super designers,' empowered to make a wide range of design decisions based on deep technical knowledge and fast, accurate analysis results from 3D CAD.

THE FUTURE OF DESIGN ANALYSIS
CAD-integrated analysis allows other types of analysis to be performed by designers.

For more information:
www.simulia.com/products/cad_fea.html

In the past, such an analysis would only be undertaken if serious problems requiring design modifications occurred. With today's