

# Analysis for Designers

Design for Real-World Performance



# A New Paradigm: Design-Integrated Realistic Simulation with Robust, Scalable, and Collaborative Solutions

In the race to get new and innovative products to market faster, manufacturing and product development companies face many challenges including globalization, cost reductions and shorter development schedules. In addition, the products must also meet safety, reliability, environmental and maintenance objectives.

The world's top manufacturing companies and leading industry research firms agree that performing realistic simulation earlier in the design process provides a positive impact on time, profitability and competitiveness.

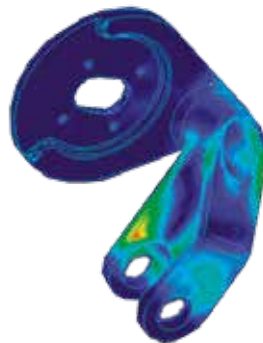
Integrating realistic simulation into the design process gives manufacturers the ability to evaluate the performance of multiple design alternatives prior to physical prototyping, making it possible to develop high-quality products in less time and at a lower cost.

SIMULIA provides complete design-integrated simulation capabilities within the CATIA V5 design environment. Designers can use the familiar CATIA user interface to perform analysis directly on their master reference model in CATIA. Data integrity issues are avoided since there is no transfer and translation of geometry.

**Design-Integrated analysis allows CATIA users to leverage the power of proven analysis technology to evaluate and improve their designs.**



*Original design*



*Structure analyzed and optimized for weight*



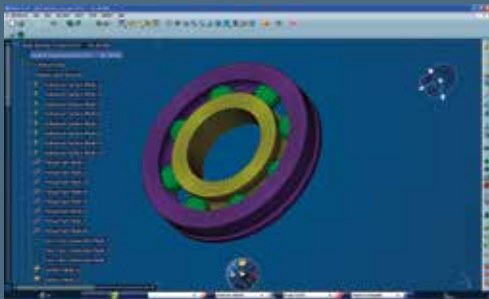
*Optimized design*

# Design-Integrated Analysis Portfolio

The design-integrated analysis solution from Dassault Systèmes includes the CATIA Analysis products as well as the SIMULIA Analysis products to fit the needs of all users. Partner products provide additional capabilities such as multibody dynamics, computational fluid dynamics, fatigue analysis, and others.

## CATIA V5 Analysis Capabilities

- Linear static stress analysis
- Transient and harmonic dynamic analysis
- Contact analysis
- Buckling analysis
- Assembly of multiple analysis models



*Advanced FE Modeling (AFE): Using the sweep tool, hexahedron meshes are generated on the ball bearing rings for maximum accuracy.*

## CATIA V5 Analysis Products

### Workbench—Generative Structural Analysis

#### Generative Part Structural Analysis (GPS)

*Generative stress and modal analysis on single parts*

#### Generative Assembly Structural Analysis (GAS)

*Generative stress and modal analysis on hybrid assemblies*

#### Generative Dynamic Analysis (GDY)

*Generative structural dynamic response analysis*

#### ELFINI Structural Analysis (EST)

*Complementary advanced options for preprocessing, solving, and postprocessing*

### Workbench—Advanced Meshing Tools

#### FEM Surface (FMS)

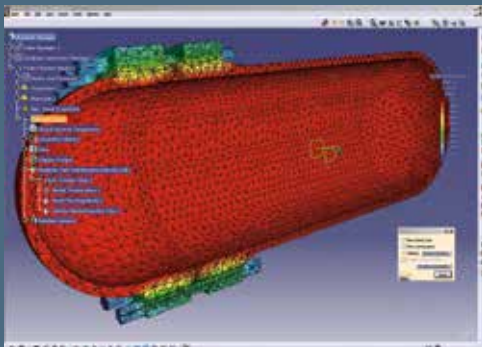
*Complementary advanced options to generate associative mesh from surface design*

#### FEM Solid (FMD)

*Complementary advanced options to generate associative mesh from solid design*

## SIMULIA V5 Analysis Capabilities

- Nonlinear static stress analysis
- Steady-state and transient thermal analysis
- Thermal-stress analysis
- Advanced contact analysis, including friction and large-sliding
- Rule-based, fully automatic meshing of complex surface geometry



*Thermal Analysis (ATH): Temperatures in the half section of the pressure vessel.*

## SIMULIA V5 Analysis Products

### Workbench—Thermal Analysis (ATH)

*Heat transfer analysis on hybrid assemblies*

### Workbench—Nonlinear Structural Analysis (ANL)

*Nonlinear stress and frequency analysis on hybrid assemblies*

### Workbench—Rule Based Meshing (RBM)

*Enable automatic meshing of complex surface geometry based on pre-defined meshing rules*

## Scalable Solutions

The combination of CATIA V5 Analysis and SIMULIA V5 Analysis products allows designers to understand design behavior enabling them to accurately calculate the displacements and stresses within the part subjected to a variety of loading conditions. Analyses can be performed on volume parts, surface parts and wireframe geometries to evaluate the realistic performance of individual components as well as complete assemblies.

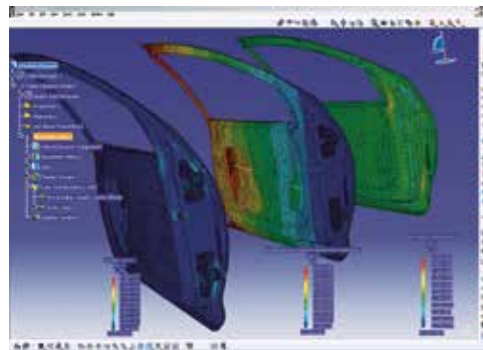
CATIA V5 Analysis and SIMULIA V5 Analysis enable users to analyze static, frequency, and buckling, in addition to providing solutions for performing nonlinear structural analysis to include effects, such as large displacements, material nonlinearity, and thermal analysis.

## Meshing Tools

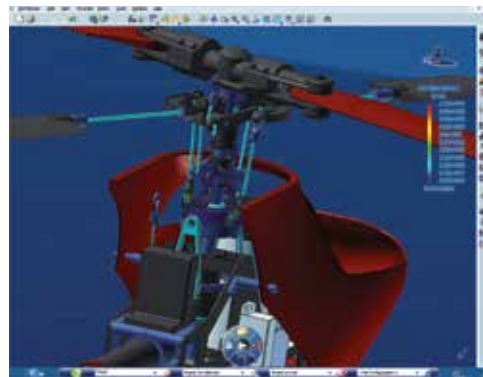
The CATIA meshing tools, FEM Solid (FMD) and FEM Surface (FMS), are intended for the user who wants to mesh complex solid, surface and wireframe geometry quickly and efficiently, while retaining control over the resulting element quality and the number of elements in the mesh.

Rule Based Meshing (RBM) is also available to help users automate the creation of high-quality surface meshes for all workflows that use CATIA meshing tools. RBM gives the user a means to globally specify the desired meshing treatment of entities such as holes, fillets, and beads. It also enables users to specify acceptable element quality criteria, such as minimum edge length, aspect ratio, and skewness.

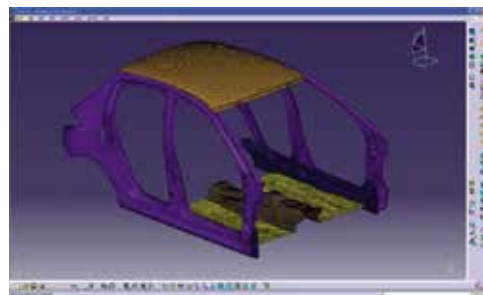
**Eliminate the problem of lost productivity associated with using multiple applications.**



**CATIA V5 Analysis** enables users to obtain a quick and accurate understanding of part behavior by reviewing its characteristics in a virtual design and analysis environment



**SIMULIA V5 Analysis** enables rapid performance of analysis iterations of products, from simple parts to complex assemblies



**Rule Based Meshing**-After specifying the meshing rules, no additional user involvement is necessary, as the mesh generation is completely automated

# Realistic Simulations provides confidence in making critical performance-based decisions...faster.

## Industry-proven Performance

The speed in which analyses can be performed in CATIA often surprises designers and simulation experts familiar with other applications. The time it takes to create the finite element model, solve it, and display results can be a matter of minutes. The robust, built-in finite element solver and mesh generators balance both accuracy and speed. The adaptive meshing capability automatically adjusts the mesh to obtain accurate results without time-consuming manual involvement.

## Benefits of Design-Integrated Analysis

### Design and analyze in a single environment

- Reduces the need to export models to a stand-alone simulation tool

### Scalable solutions

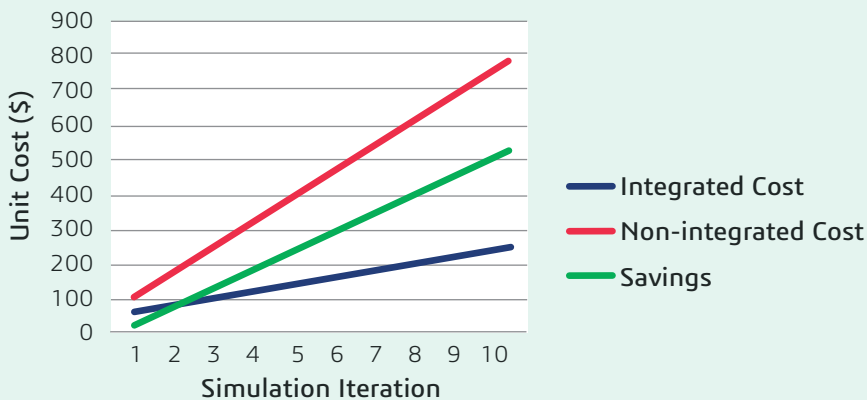
- Users perform linear, nonlinear, or thermal analysis to meet their design application need

### Design iterations can be evaluated rapidly

- More design options can be considered while staying on time and on budget given the same project timeline

### Improved product performance

- Meet performance and operating specifications



When simulation is integrated into the design process, as much as 30% time savings may be realized on the first design analysis iteration. This process scales to 73% total savings on subsequent iterations because of the removal of data translation and interpretation bottlenecks.

*“Using SIMULIA Analysis, a designer rather than an expert is now able to perform an analysis on an automobile transmission gear assembly. In the past, such an analysis would only take place if serious problems requiring design modification occurred... With today’s improved CAE tools, however, all analysis conditions for the gear assembly can be set within 30 minutes.”*

**Dr. Takanao Uchida**, leader of the CATIA V5 project at Honda Automotive R&D and one of the pioneers of “Designer CAE” in Japan



## Delivering Best-in-Class Products



Virtual Product Design



Virtual Planet



3D for Professionals



Information Intelligence



Realistic Simulation



Dashboard Intelligence



Virtual Production



Social Innovation



Global Collaborative Lifecycle Management



Online 3D Lifelike Experiences

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