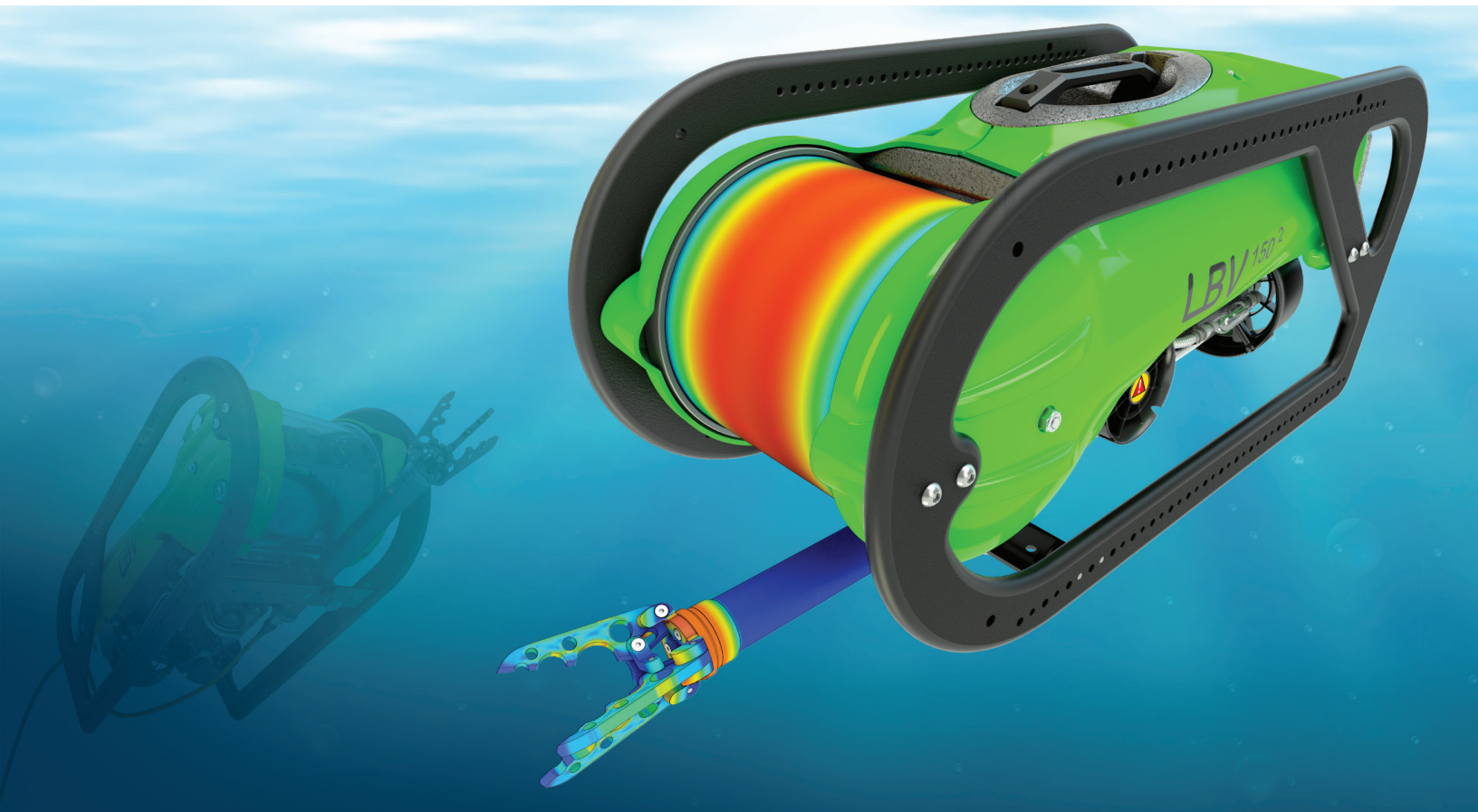# SOLIDWORKS SIMULATION
GET ENGINEERING INSIGHTS WITH VIRTUAL SIMULATION

SOPHISTICATED SIMULATION IS NO LONGER JUST FOR SPECIALISTS

Concurrent Engineering for more informed design

SOLIDWORKS® Simulation gives product engineers access to powerful FEA (Finite Element Analysis) capabilities that help enable them to speed up product innovation. Leveraging the familiar SOLIDWORKS 3D CAD environment, this extensive technology isn't just about making sure your product works, it's about understanding how your product will behave in the real world.

> "The advantage of SOLIDWORKS Simulation is that you don't have to transfer information back and forth between applications. SOLIDWORKS Simulation provides a much more cost-effective means for conducting analysis."
>
> — Caleb Fulks, Project Engineer, Diversified Product Development

SOLIDWORKS SIMULATION HELPS PRODUCT ENGINEERS ASK—AND ANSWER—COMPLEX AND IMPORTANT ENGINEERING QUESTIONS EARLIER

With SOLIDWORKS Simulation, you can reduce the risk involved in exploring new and innovative design solutions and help get products to market faster—and with less prototyping. By understanding product performance early in the design process, you avoid costly over-design and reduce the risk of warranty issues.

This powerful set of structural simulation tools is fully integrated within the SOLIDWORKS environment, with seamless operation for designers and simulation experts alike at every stage of product development. Through powerful results visualization you can study the forces affecting your design—displaying stresses, displacement, life time, and temperature. You can calculate measurements for any point, surface, or volume, and then graph and list results for all types of simulations.

SOLIDWORKS Simulation provides a complete range of tools for analyzing the structure with FEA, motion, and multi-physics for your parts and assemblies. As part of the SOLIDWORKS suite of 3D product development solutions—covering design, simulation, technical communication, and data management—SOLIDWORKS Simulation is powerful, accurate, and intuitive, enabling all product engineers to tackle the most complex engineering challenges.

Simulation-driven product development takes 3D design to another level so you can predict the performance of your product under real-world operating conditions to innovate, detect potential issues, and correct them before prototyping, tooling, and production.
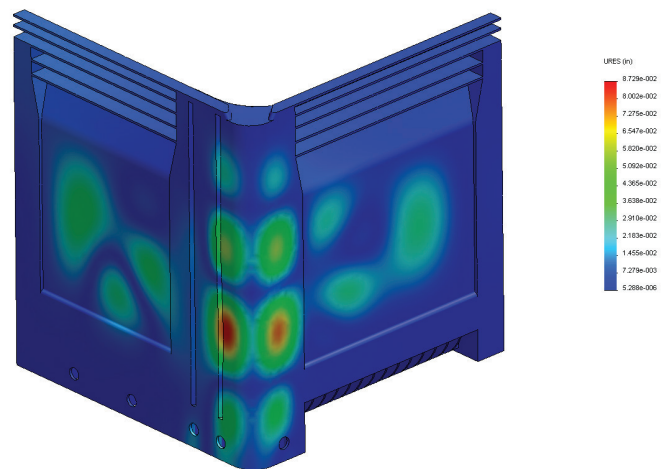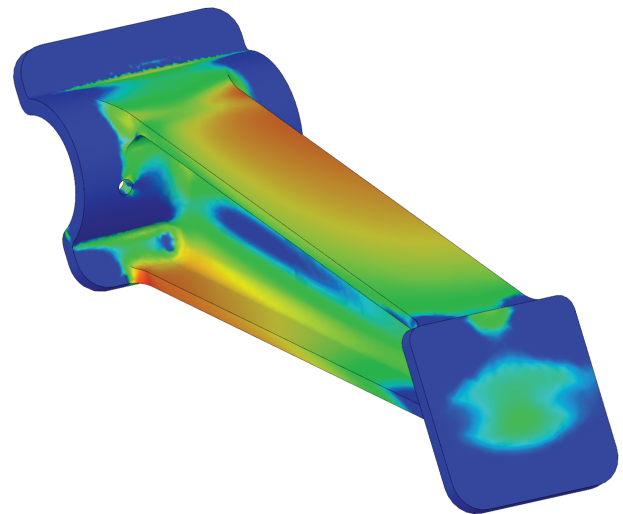
> "With SOLIDWORKS Simulation, I can identify and resolve potential issues during design, so that when we mold those initial pieces, they are right the first time.
> It's an incredible tool that has let us save 30 to 60 percent in capital costs in the development of new products."
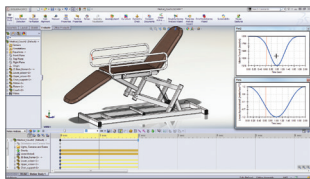>
> — Todd Turner, Senior Product Development Engineer, Macro Plastics, Inc.,
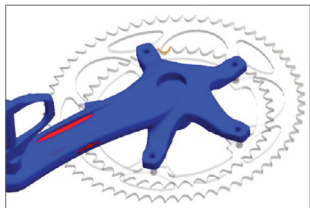
SOLIDWORKS SIMULATION STANDARD

PERFORM STRUCTURAL TESTING OF PARTS AND ASSEMBLIES FOR PRODUCT INNOVATION

Drive your design with intuitive simulation tools to improve product performance.

SOLIDWORKS Simulation Standard gives you an intuitive virtual testing environment for linear static, time-based motion, and fatigue simulation, so you can answer common engineering challenges with a SOLIDWORKS 3D CAD embedded solution

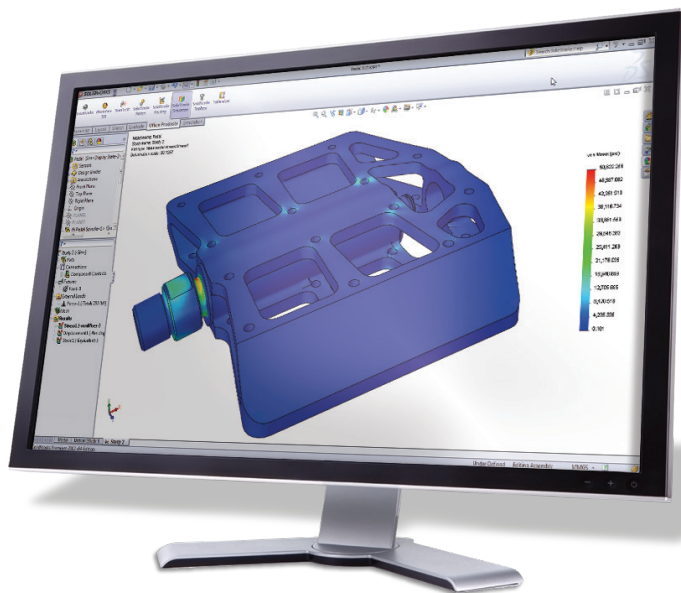**Verify your design with powerful linear static analysis**

- Test products made of weldments, sheet metal, and volume geometry with mixed mesh
- Evaluate strain and stresses between contacting parts, including friction
- Apply bearing loads, forces, pressures, and torques
- Improve designs based on structural, motion, or geometric criteria
- Use connectors or virtual fasteners to model bolts, pins, springs, and bearings, and dimension them under applied loads
- Activate the Trend Tracker and Design Insight plots to highlight optimal design changes while you work
- Intuitively manage your shell model with the Shell Manager

Evaluate your product performance throughout its operational cycle with motion analysis

- Define motion studies with time-based approach for rigid body kinematic and dynamic problems
- Leverage SOLIDWORKS assembly mates along with part properties for motion analysis
- Evaluate characteristics like actuator force and joint loads for motion optimization
- Gain greater control of model actuators with servomotors

Study the effects of cyclic loading on product life

- Check a system's expected life or accumulated damage after a specified number of cycles
- Import load history data from real physical tests to define loading events

Evaluate how your product will perform and move throughout its operational cycle with time-based motion simulation

Estimate component life based on calculated loads with fatigue simulation.

"With SOLIDWORKS Simulation tools, we can identify areas of high stress and potential failure before we cut metal, which allows us to improve design performance quickly and inexpensively."

— DJ Paulson, Co-Owner Straitline Precision

SOLIDWORKS SIMULATION PROFESSIONAL

INCREASE PRODUCT SUCCESS WITH POWERFUL AND INTUITIVE 3D VIRTUAL TESTING
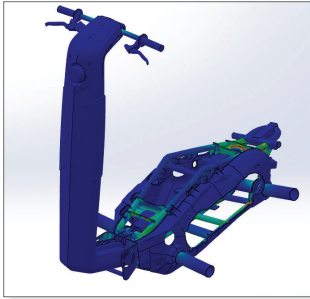
Solve complex simulations to enhance product quality and performance.

SOLIDWORKS Simulation Professional adds to SOLIDWORKS Simulation Standard more powerful and sophisticated simulation capabilities, to help you answer engineering challenges with complex load scenarios and multi-physics solutions

Test your design with extensive structural analysis

- Optimize designs based on structural, motion, or geometric criteria
- Have your CAD toolbox fasteners translated automatically into connectors for fast and accurate assembly analysis
- Combine load cases and test structural performance for multiple load combinations with the Load Case Manager
- Analyze how dropping a product will affect its structural integrity
- Assess large assembly behavior focusing on critical zones with submodelling
- Evaluate complex problems early in the design cycle with plane stress, plane strain, and axisymmetric linear static analysis
- Access an extensive materials database with metal properties and fatigue curves

Understand the effects of temperature on your design

- Study conduction, convection, and radiation heat transfer
- Utilize isotropic, orthotropic, and temperature-dependent material properties
- Determine the combined stresses and deformations due to structural and thermal loads
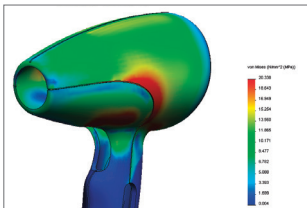
Determine the structural impact of thermal loads on your design.

Analyze assembly motion for process and task workflow with event–based simulation

- Define motion studies based on model event and assembly actions
- Trigger actions through new motion sensors, time, or the completion of a previous task
- Evaluate characteristics like actuator force and joint loads for motion optimization
- Gain greater control of model actuators with servomotors

Simulate frequency or buckling in your designs

- Examine how vibrating or unstable modes can shorten equipment life and cause unexpected failures
- Assess the effects of load stiffening on frequency and buckling response
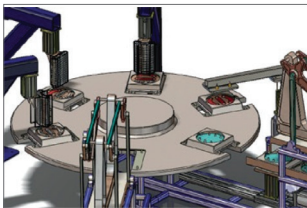
Virtually prototype the most challenging machines with event-based motion simulation.

"With SOLIDWORKS Simulation software, we eliminated more than two years of costs, saved $100,000 on prototyping, and produced a patented idea for enhancing heat transfer. That's the kind of advantage that helps us beat our competition."
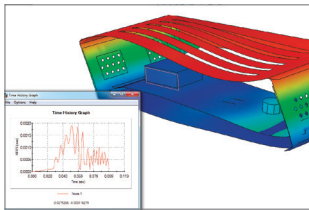
— Craig Tiras, P.E. Vice President of Engineering and Design, Gaumer Process

SOLIDWORKS SIMULATION PREMIUM
GET A DEEPER VIEW OF YOUR DESIGN PERFORMANCE WITH AN EXTENSIVE SIMULATION SOLUTION
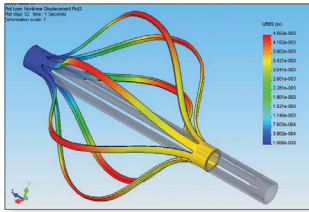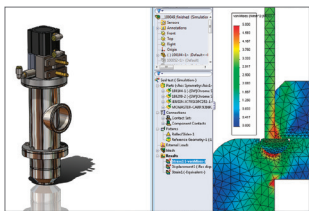

Study nonlinear problems that involve large displacement and complex material models.

SOLIDWORKS Simulation Premium includes all of the capabilities of SOLIDWORKS Simulation Professional, plus additional features like composite materials and powerful analysis tools for simulating nonlinear and dynamic response

Analyze your design in the nonlinear world

- Easily transition between linear and nonlinear simulations for comprehensive evaluation
- Examine deformations caused by overloads, contact (including self-contact), and flexible materials
- Determine residual stresses and permanent deformations in metals after material yield
- Study nonlinear buckling and snap-through events
- Investigate designs with hyperelastic materials, such as rubbers, silicones and other elastomers
- Conduct an elasto-plastic analysis to study plastic deformation and the onset of yield
- Examine creep effects and material changes with temperature
- Test the performance of your molded plastic part taking into account in-mold residual stresses and temperature with SOLIDWORKS Plastics

Plot product response versus dynamic loads.

Perform dynamic analyses of parts and assemblies

- Simulate time history, steady-state harmonic, response spectrum, and random vibration excitations
- Study stress, displacement, velocity, and acceleration variations with time, as well as RMS and PSD values
- Carry out impact analysis using nonlinear dynamic capabilities
- Determine the durability of a product submitted to vibrations with fatigue analysis

Simulate composite materials

- Study multilayer composite components to examine the effects of layer material, thickness, and orientation on product performance
- Use the revolutionary user interface to dynamically control and display ply orientation
- Determine the correct composite lay-up and orientation for operational loads

Validate the performance of composite materials, including stiffness and ply failure results.

Easily tackle complex problems with Cyclic Symmetry and 2D planar simplification tools

- Create plane stress, plane strain, axisymmetric, and cyclic symmetry nonlinear analysis
- Solve complex contact problems in a fraction of the time with no loss of accuracy
- Use 3D CAD models without modification to generate 2D sections for analysis
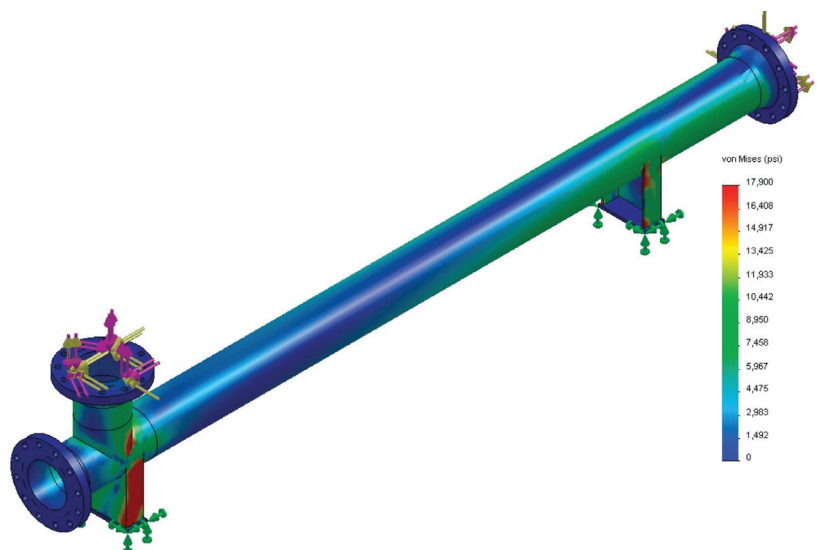
Study a whole class of nonlinear problems quickly and easily with the 2D planar simplification tool.

SOLIDWORKS SIMULATION MATRIX

	SOLIDWORKS SIMULATION PREMIUM	SOLIDWORKS SIMULATION PROFESSIONAL	SOLIDWORKS SIMULATION STANDARD
EASE OF USE/INTUITIVENESS			
Fully Embedded in SolidWorks 3D CAD	■	■	■
Learn Fast: Toolbar Menus, Context Sensitive Right-Mouse Menus, Built-In Tutorials, Searchable Help Documentation	■	■	■
Help Documentation	■	■	■
Get Help Fast: Local and Worldwide Support Services	■	■	■
Knowledge Base	■	■	■
CONCURRENT ENGINEERING			
Fully Embedded in SolidWorks 3D CAD	■	■	■
Full Associativity with 3D Design Changes	■	■	■
Support SolidWorks Configurations	■	■	■
SolidWorks Material Properties Support	■	■	■
Batch Run	■	■	■
FINITE ELEMENT ANALYSIS			
Solid, Shell and Beam modeling	■	■	■
h and p adaptive element type	■	■	■
Mesh control capabilities	■	■	■
Failure Mesh Diagnostic	■	■	■
Simplify model tool for meshing	■	■	■
Customizable Material Library	■	■	■
CONTACTS AND CONNECTORS			
Bonded contact condition	■	■	■
Node-to-node, surface-to-surface contact condition	■	■	■
Shrink Fit condition	■	■	■
Virtual Wall condition	■	■	■
Connectors: bolt, spring, pin, elastic support and bearing	■	■	■
Connectors Safety Check	■	■	■
Self-contact condition	■	■	■

SOLIDWORKS SIMULATION MATRIX

	SOLIDWORKS SIMULATION PREMIUM	SOLIDWORKS SIMULATION PROFESSIONAL	SOLIDWORKS SIMULATION STANDARD
POST PROCESSING			
Contour, Iso-Surface, Surface, Section Result Plot	■	■	■
Probe tool	■	■	■
Design Insight	■	■	■
Compare test data	■	■	■
List values on selected entities	■	■	■
Animation of Results	■	■	■
COMMUNICATION			
Customisable simulation report	■	■	■
eDrawings of Simulation results	■	■	■
LINEAR STATIC SIMULATION FOR ASSEMBLY			
Analyze the structural behavior or parts and assemblies under loading	■	■	■
Fixtures to prescribe zero or non-zero displacements	■	■	■
Structural loads	■	■	■
Temperature loading	■	■	■
Import Flow/Thermal Effects	■	■	■
Calculation of stress, strain, displacement and FOS	■	■	■
Calculation of reaction forces and moments	■	■	■
Load Case Manager	■	■	■
TIME BASED MECHANISM MOTION SIMULATION	■	■	■
DESIGN COMPARISON STUDIES			
What-if scenarios based on defined variables (dimensions, mass properties, simulation data)	■	■	■
TREND TRACKER			
Detect trends in results from different iterations of a static study	■	■	■

SOLIDWORKS SIMULATION MATRIX

	SOLIDWORKS SIMULATION PREMIUM	SOLIDWORKS SIMULATION PROFESSIONAL	SOLIDWORKS SIMULATION STANDARD
FATIGUE SIMULATION			
Analyse the life expectancy of structure under repeated loading	■	■	■
Theory of Cumulative Damage	■	■	■
Outputs: life, damage and factor of safety plots	■	■	■
DESIGN OPTIMISATION (based on Simulation data)	■	■	
ADVANCED CONTACTS AND CONNECTORS			
Thermal contact resistance condition	■	■	
Insulated condition	■	■	
Edge and spot weld connector	■	■	
EVENT-BASED MOTION SIMULATION	■	■	
FREQUENCY SIMULATION			
Analyze the natural frequencies and mode shape of parts and assemblies	■	■	
Import Flow/Thermal Effects	■	■	
Load Stiffening	■	■	
BUCKLING OR COLLAPSE SIMULATION			
Analyze slender structure for critical buckling factors and the associated buckling mode shapes	■	■	
Import Flow/Thermal Effects	■	■	
STRUCTURAL THERMAL SIMULATION	■	■	
DROP TEST SIMULATION			
Analyse the effect of the impact of a part or an assembly on a target surface	■	■	
Inputs: drop height, gravity, velocity at impact	■	■	
Outputs: stress, displacement, and strains	■	■	

SOLIDWORKS SIMULATION MATRIX	SOLIDWORKS SIMULATION PREMIUM	SOLIDWORKS SIMULATION PROFESSIONAL	SOLIDWORKS SIMULATION STANDARD
PRESSURE VESSEL DESIGN SIMULATION			
Analyze the structural behavior or parts and assemblies under loading	■	■	
Linear combination and square root of the sum of the squares (SRSS)	■	■	
SUBMODELLING SIMULATION			
Analyze the structural resistance of a sub model from a main assembly	■	■	
2D SIMPLIFICATION			
Plane Stress	■	■	
Plane Strain	■	■	
Axisymmetric	■	■	
LOAD CASE MANAGER			
Evaluate the effects of various load combinations on your model	■	■	
NON LINEAR SIMULATION			
Transient (time dependent) loads	■		
Large component deformation	■		
Nonlinear materials	■		
Self-contact for nonlinear analysis	■		
Real-time visual updates while solving	■		
DYNAMIC SIMULATION			
Modal Time History Analysis	■		
Harmonic Analysis	■		
Random Vibration Analysis	■		
Response Spectrum Analysis	■		
Estimate component life based on dynamic loading	■		
COMPOSITES COMPONENTS SIMULATION	■		

SOLIDWORKS PRODUCT DEVELOPMENT SOLUTION

SOLIDWORKS software provides users with an intuitive 3D development environment that helps maximize the productivity of your design and engineering resources to create better products faster and more cost-effectively. See the full range of SOLIDWORKS software for design, simulation, technical communication, and data management at **www.solidworks.com/products2015**.

SYSTEM REQUIREMENTS

- Windows 7 (preferably x64) or Windows 8
- 2 GB RAM minimum (8 to 16 GB RAM recommended)
- 50 GB disk space free (minimum)
- SOLIDWORKS-Certified graphics card
- Intel® or AMD® processor (4 to 8 cores recommended)
- Broadband Internet connection
- Microsoft® Excel® and Word (for reporting and exporting)

LEARN MORE

Visit www.solidworks.com/simulation or contact your local authorized SOLIDWORKS reseller to learn more.

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