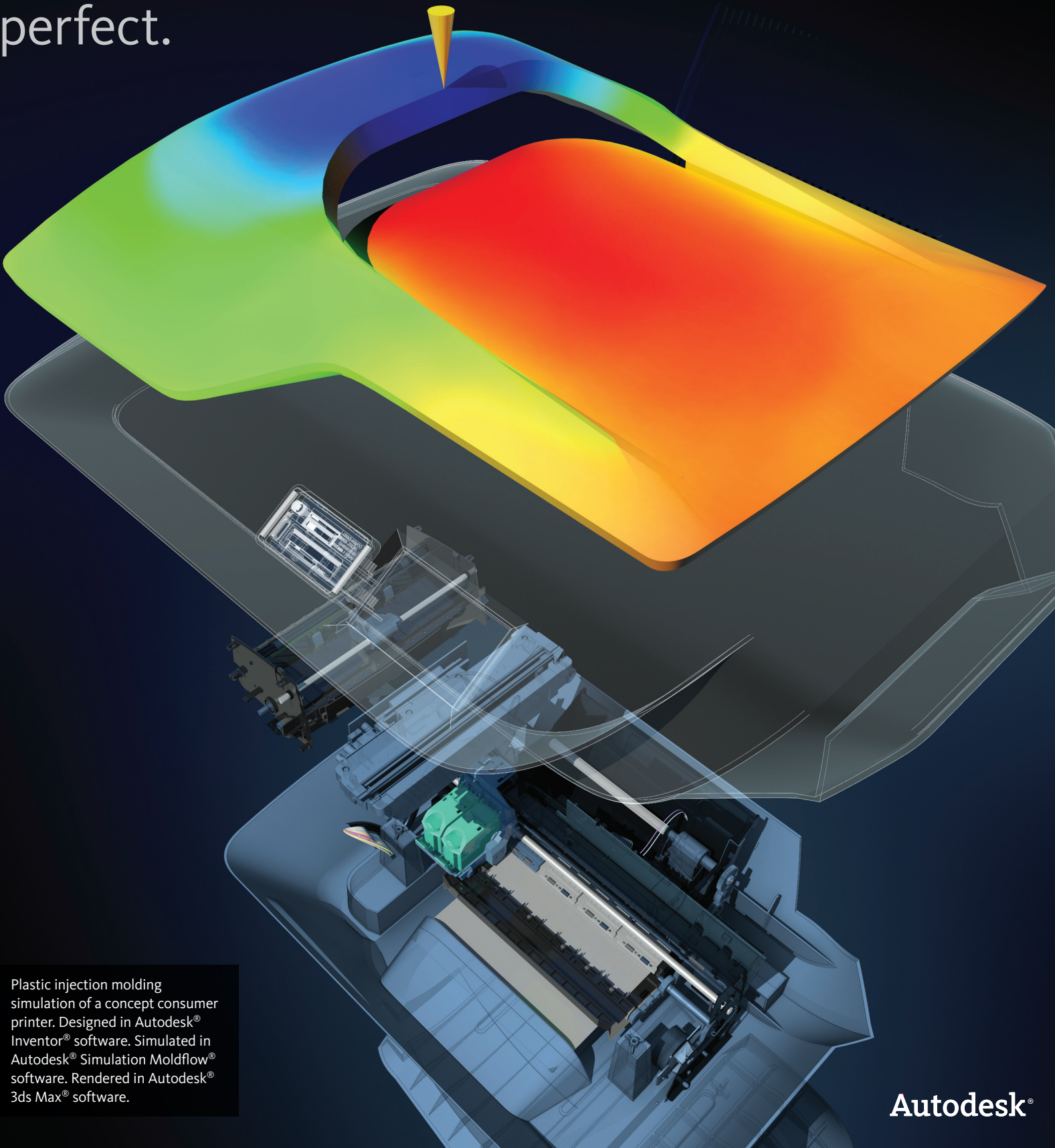# Autodesk®
Simulation Moldflow®

Plastics made perfect.

Plastic injection molding simulation of a concept consumer printer. Designed in Autodesk® Inventor® software. Simulated in Autodesk® Simulation Moldflow® software. Rendered in Autodesk® 3ds Max® software.

Autodesk®

Validation and Optimization of Plastic Parts

Innovative plastic resins and functional plastic part designs are on the rise in almost every industry. Plastics and fiber-filled composites answer growing pressures to reduce costs and cut time to market. The need for simulation tools that provide deep insight into the plastic injection molding process has never been greater.

Contents

Autodesk® Simulation Moldflow® plastic injection molding software, part of the Autodesk Simulation solution for Digital Prototyping, provides tools that help manufacturers predict, optimize, and validate the design of plastic parts, injection molds, and extrusion dies. Companies worldwide use Autodesk® Simulation Moldflow® Adviser and Autodesk® Simulation Moldflow® Insight software to help reduce the need for costly physical proto-types, reduce potential manufacturing defects, and get innovative products to market faster.

Autodesk Simulation Moldflow Product Line

Autodesk is dedicated to providing a wide range of injection molding simulation tools to help CAE analysts, designers, engineers, mold makers, and molding professionals create more accurate digital prototypes and bring better products to market at less cost.
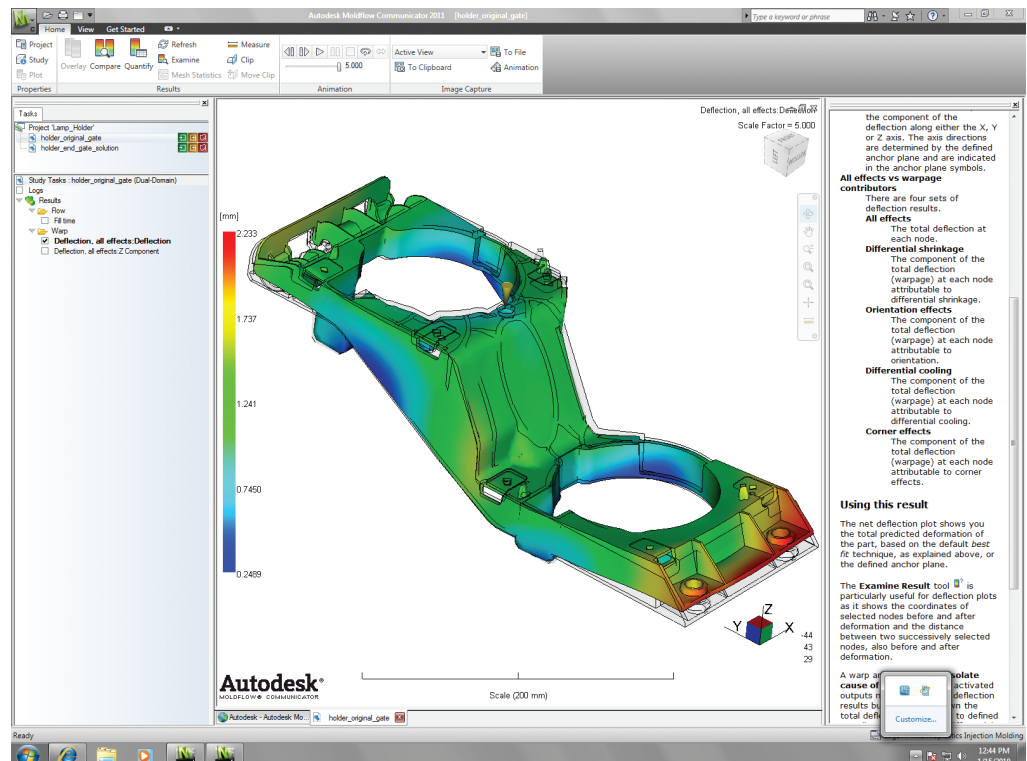
Part Layout Simulation

Validate and optimize plastic parts, injection molds, resin selection, and the injection molding process.
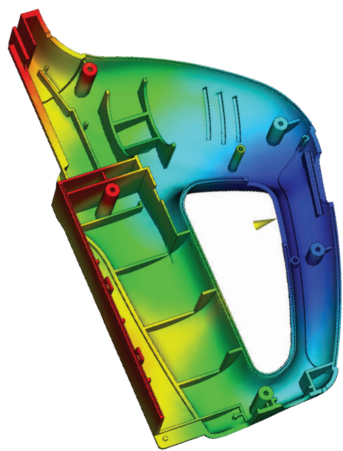
Plastic Flow Simulation
Simulate the flow of melted plastic to help optimize plastic part and injection mold designs, reduce potential part defects, and improve the molding process.

Part Defects
Determine potential part defects such as weld lines, air traps, and sink marks, then rework designs to help avoid these problems.

Thermoplastic Filling
Simulate the filling phase of the thermoplastic injection molding process to help predict the flow of melted plastic and fill mold cavities uniformly; avoid short shots; and eliminate, minimize, or reposition weld lines and air traps.

Thermoplastic Packing
Optimize packing profiles and visualize magnitude and distribution of volumetric shrinkage to help minimize plastic part warpage and reduce defects such as sink marks.
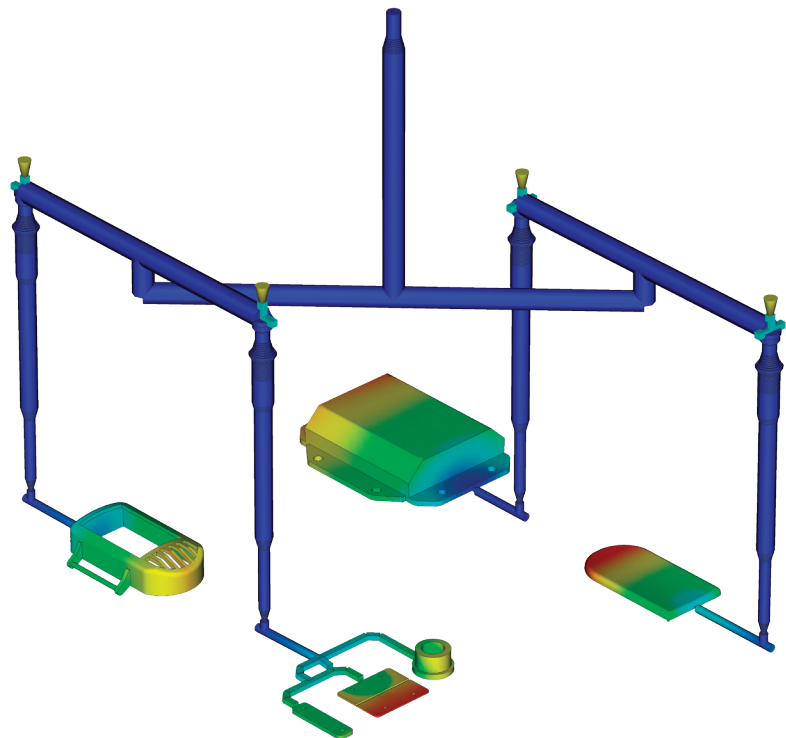
Feed System Simulation
Model and optimize hot and cold runner systems and gating configurations. Improve part surfaces, minimize part warpage, and reduce cycle times.

Gate Location
Identify up to 10 gate locations simultaneously. Minimize injection pressure and exclude specific areas when determining gate location.

Runner Design Wizard
Create feed systems based on inputs for layout, size, and type of components, such as sprues, runners, and gates.

Balancing Runners
Balance runner systems of single-cavity, multicavity, and family mold layouts so parts fill simultaneously, reducing stress levels and volume of material.

Hot Runner Systems
Model hot runner system components and set up sequential valve gates to help eliminate weld lines and control the packing phase.
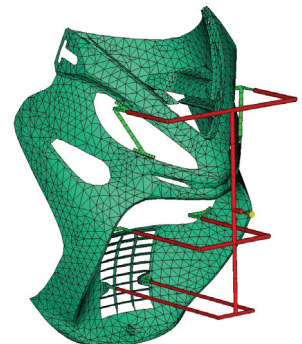
Injection Molding Process Simulation

Mold Cooling Simulation
Improve cooling system efficiency, minimize part warpage, achieve smooth surfaces, and reduce cycle times.

Cooling Component Modeling
Analyze a mold's cooling system efficiency. Model cooling circuits, baffles, bubblers, and mold inserts and bases.

Cooling System Analysis
Optimize mold and cooling circuit designs to help achieve uniform part cooling, minimize cycle times, reduce part warpage, and decrease manufacturing costs.

Rapid Heat Cycle Molding
Set up variable mold surface temperature profiles to maintain warmer temperatures during filling to achieve smooth surfaces; reduce temperatures in the packing and cooling phases to help freeze parts and decrease cycle times.

Shrinkage and Warpage Simulation
Evaluate plastic part and injection mold designs to help control shrinkage and warpage.

Shrinkage
Meet part tolerances by predicting part shrinkage based on processing parameters and grade-specific material data.

Warpage
Predict warpage resulting from process-induced stresses. Identify where warpage might occur and optimize part and mold design, material choice, and processing parameters to help control part deformation.
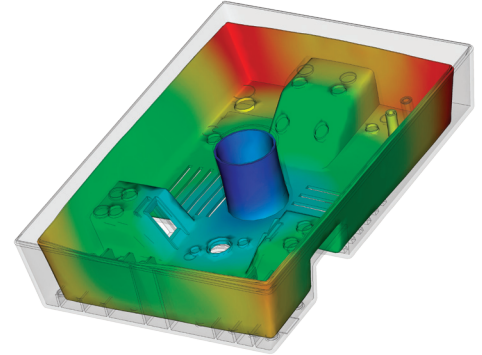
Core Shift Control
Minimize the movement of mold cores by determining ideal processing conditions for injection pressure, packing profile, and gate locations.

Fiber Orientation and Breakage
Control fiber orientation within plastics to help reduce part shrinkage and warpage across the molded part.

CAE Data Exchange
Validate and optimize plastic part designs using tools to exchange data with mechanical simulation software. CAE data exchange is available with Autodesk® Simulation, ANSYS®, and Abaqus® software to predict the real-life behavior of plastic parts by using as-manufactured material properties.
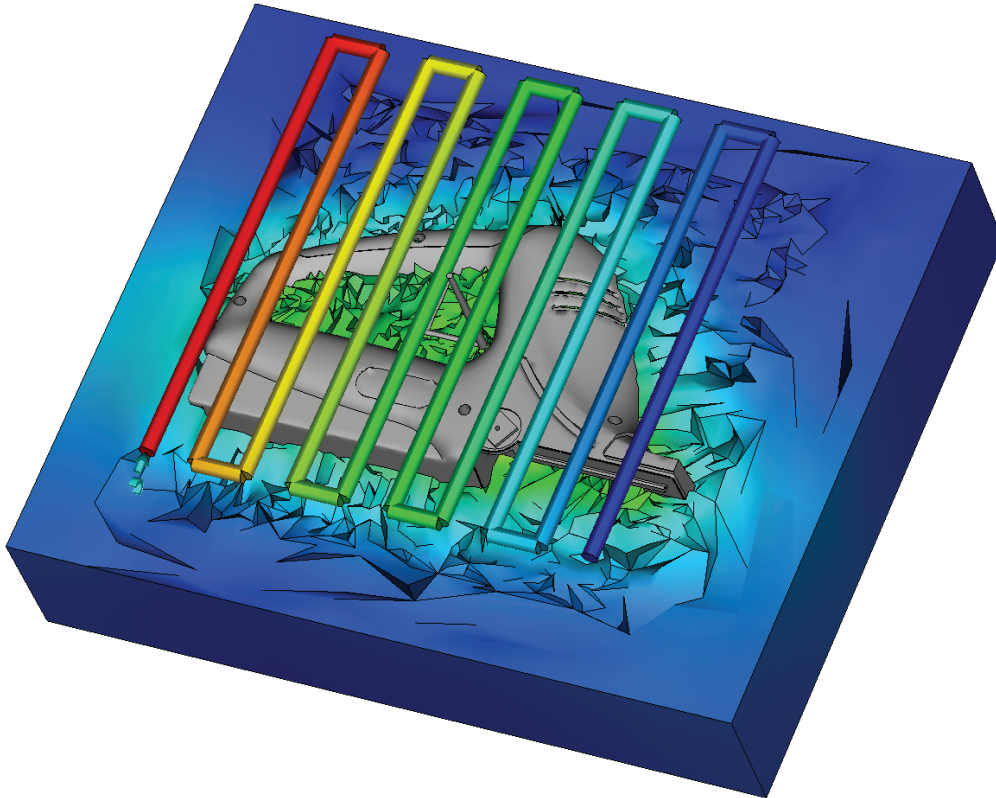
Injection Molding Process Simulation

Thermoset Flow Simulation

Simulate thermoset injection molding, RIM/SRIM, resin transfer molding, and rubber compound injection molding.

Reactive Injection Molding

Predict how molds will fill with or without fiber-reinforced preforms. Help avoid short shots due to pregelation of resin, and identify air traps and problematic weld lines. Balance runner systems, select molding machine size, and evaluate thermoset materials.

Microchip Encapsulation

Simulate encapsulation of semiconductor chips with reactive resins and the interconnectivity of electrical chips. Predict bonding wire deformation within the cavity and shifting of the lead frame due to pressure imbalances.

Underfill Encapsulation

Simulate flip-chip encapsulation to predict material flow in the cavity between the chip and the substrate.
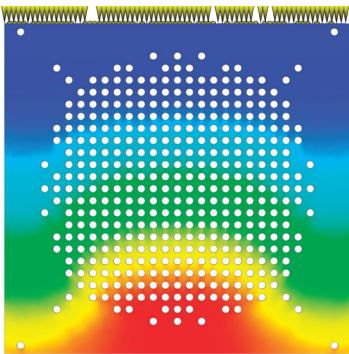
Specialized Simulation Tools

Solve design challenges with simulation.

Insert Overmolding

Run an insert overmolding simulation to help determine the impact of mold inserts on melt flow, cooling rate, and part warpage.
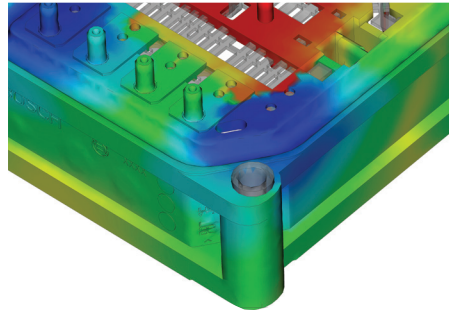
Two-Shot Sequential Overmolding

Simulate the two-shot sequential overmolding process: one part is filled; the tool opens and indexes to a new position; and a second part is molded over the first.

Birefringence

Predict optical performance of an injection-molded plastic part by evaluating refractive index changes that result from process-induced stresses. Evaluate multiple materials, processing conditions, and gate and runner designs to help control birefringence in the part.

MuCell®

MuCell® (from Trexel, Inc.) simulation results include filling pattern, injection pressure, and cell size. These are all critical factors in optimizing a given part for the process, as well as the process itself.

## Specialized Molding Processes

Simulate a wide range of plastic injection molding processes and specialized process applications.

Gas-Assisted Injection Molding

Determine where to position polymer and gas entrances, how much plastic to inject prior to gas injection, and how to optimize size and placement of gas channels.

Co-Injection Molding

Visualize the advancement of skin and core materials in the cavity and view the dynamic relationship between the two materials as filling progresses. Optimize material combinations while maximizing the product's cost-performance ratio.
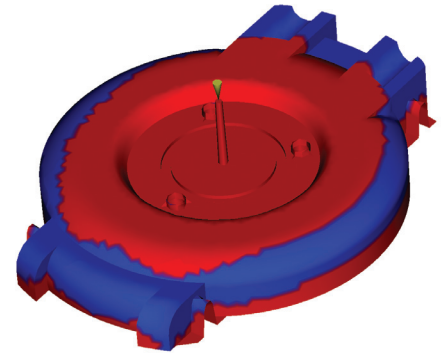
Injection-Compression Molding

Simulate simultaneous or sequential polymer injection and mold compression. Evaluate material candidates, part and mold design, and processing conditions.

CAD Interoperability and Meshing

Use tools for native CAD model translation and optimization. Autodesk Simulation Moldflow provides geometry support for thin-walled parts and thick and solid applications. Select mesh type based on desired simulation accuracy and solution time.

CAD Solid Models
Import and mesh solid geometry from Parasolid®-based CAD systems, Autodesk® Inventor® software, CATIA® V%, Pro/ENGINEER®, Creo® Elements/Pro, Autodesk® Alias®, Siemens® NX®, Rhino®, and SolidWorks®, as well as ACIS®, IGES, and STEP universal files.

Error Checking and Repair
Scan imported geometry and automatically fix defects that can occur when translating a model from CAD software.

Centerline Import/Export
Import and export feed system and cooling channel centerlines from and to CAD software, to help decrease modeling time and avoid runner and cooling channel modeling errors.

Autodesk Simulation Moldflow CAD Doctor
Check, correct, heal, and simplify solid models imported from 3D CAD systems to prepare for simulation.

3D Simulations
Perform 3D simulations on complex geometry using a solid, tetrahedral, finite element mesh technique. This approach is ideal for electrical connectors, thick structural components, and geometries with thickness variations.

Dual Domain Technology
Simulate solid models of thin-walled parts using Dual Domain™ technology. Work directly from 3D solid CAD models, leading to easier simulation of design iterations.
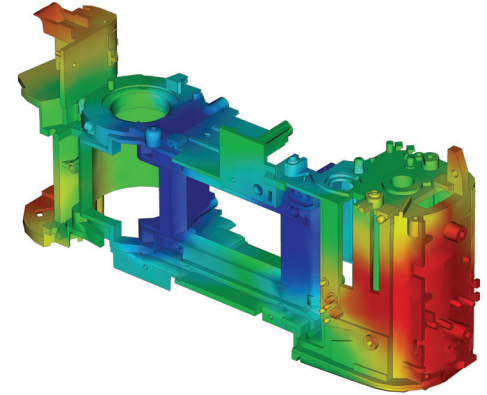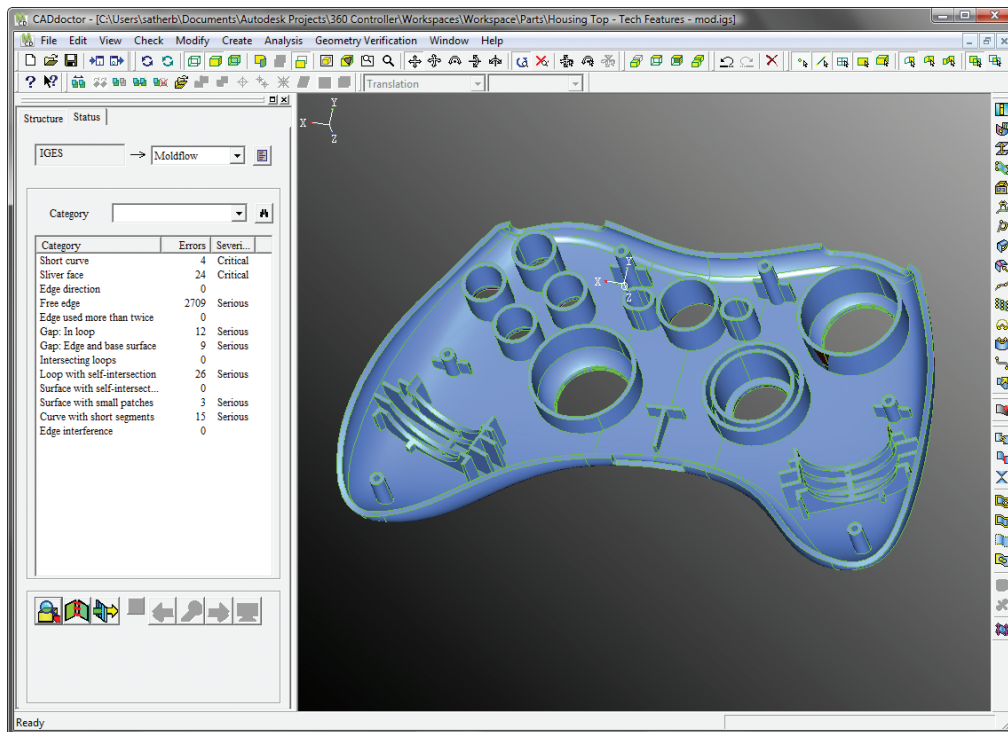
Midplane Meshes
Generate 2D planar surface meshes with assigned thicknesses for thin-walled parts.
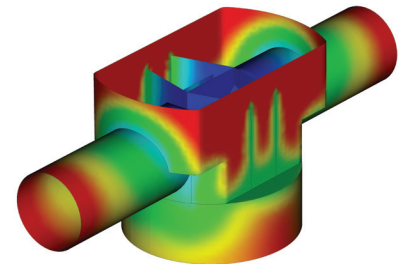
Results Evaluation and Productivity Tools

Visualize and evaluate simulation results, and use automatic reporting tools to share the results with stakeholders. Take advantage of features such as a material database and advisers to further boost productivity.

Results Interpretation and Presentation
Use a wide range of tools for model visualization, results evaluation, and presentation.

Results Adviser
Query regions of a model to identify primary causes of short shots and poor part or cooling quality. Get suggestions on how to correct the part, mold, or process.

Photorealistic Defect Visualization
Integration with Autodesk® Showcase® software enhances quality assessments of plastic parts by examining near-photorealistic renderings of digital prototypes.

Automatic Reporting Tools
Use the Report Generation wizard to create web-based reports. Prepare and share simulation results more quickly and easily with customers, vendors, and team members.

Microsoft Office Export Capability
Export results and images for use in Microsoft® Word reports and PowerPoint® presentations.

Autodesk Simulation Moldflow Communicator
Collaborate with manufacturing personnel, procurement engineers, suppliers, and external customers using Autodesk® Simulation Moldflow® Communicator software. Use the Autodesk Simulation Moldflow Communicator results viewer to export results from Autodesk Simulation Moldflow software so stakeholders can more easily visualize, quantify, and compare simulation results.
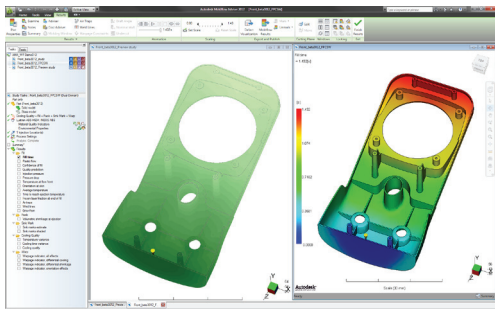
Material Data
Improve simulation accuracy with precise material data.

Material Database
Use the built-in material database of grade-specific information on more than 8,500 plastic materials characterized for use in plastic injection molding simulation.

Autodesk Simulation Moldflow Plastics Labs
Get plastic material testing services, expert data-fitting services, and extensive material databases with the Autodesk® Simulation Moldflow® Plastics Labs.

Productivity Tools
Use advisers and extensive help to boost productivity.

Cost Adviser
Learn what drives part costs to help minimize those costs. Estimate product costs based on material choice, cycle time, post-molding operations, and fixed costs.

Design Adviser
Quickly identify areas of plastic parts that violate design guidelines related to the injection molding process.
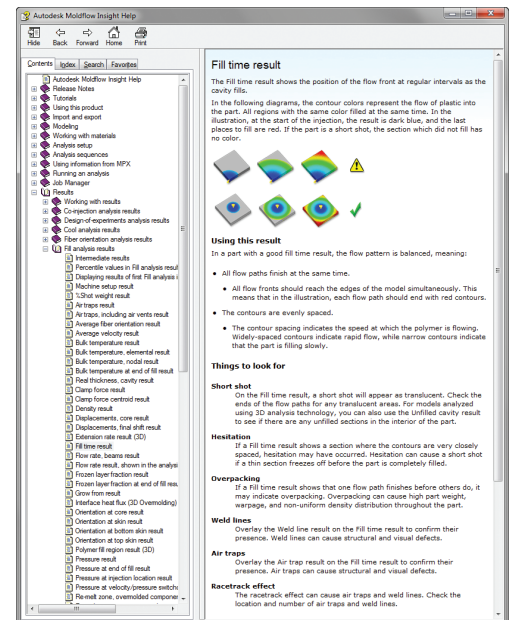
Help
Get help on a results plot, including information on what to look for and how to correct typical problems. Learn more about solver theory, interpreting simulation results, and designing better plastic parts and injection molds.

Automation and Customization
Automate common tasks and customize Autodesk Simulation Moldflow software for your organization.

API Tools
Application programming interface (API) tools enable you to automate common tasks, customize the user interface, work with third-party applications, and help implement corporate standards and best practices.
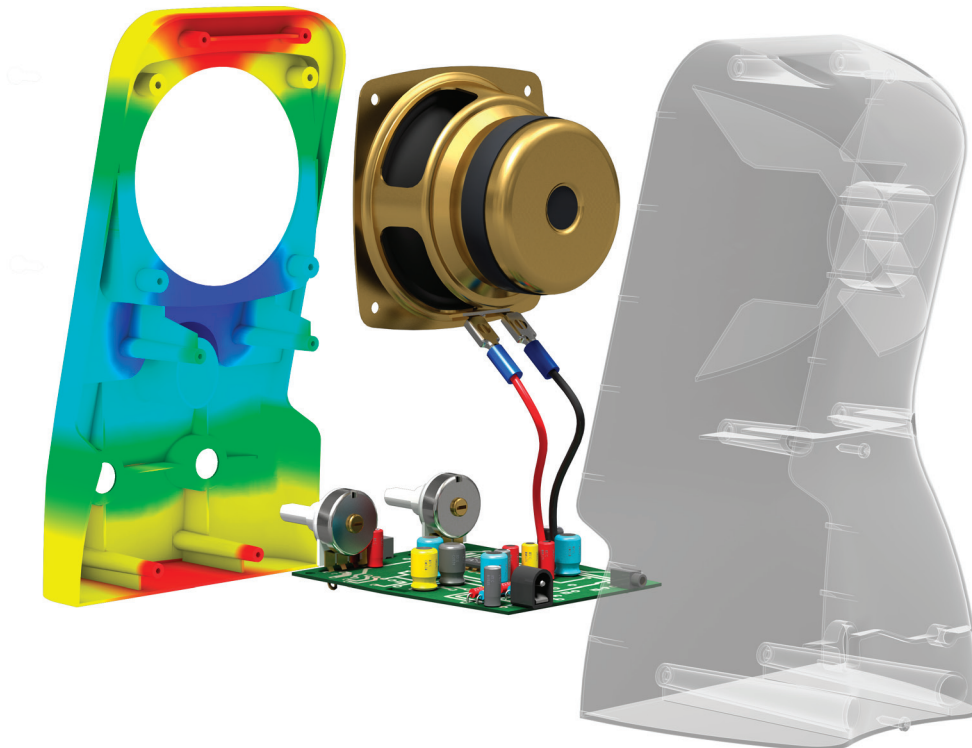
Feature Comparison

Compare the features of Autodesk Simulation Moldflow products to learn how Autodesk Simulation Moldflow Adviser and Autodesk Simulation Moldflow Insight software can help meet the needs of your organization.

	Autodesk Simulation Moldflow Adviser Standard	Autodesk Simulation Moldflow Adviser Premium	Autodesk Simulation Moldflow Adviser Ultimate	Autodesk Simulation Moldflow Insight Standard	Autodesk Simulation Moldflow Insight Premium	Autodesk Simulation Moldflow Insight Ultimate
MESHING TECHNOLOGY						
Dual Domain	✓	✓	✓	✓	✓	✓
3D		✓	✓	✓	✓	✓
Midplane				✓	✓	✓
CAD INTEROPERABILITY						
CAD Solid Models	✓	✓	✓	✓	✓	✓
Parts	✓	✓	✓	✓	✓	✓
Assemblies				✓	✓	✓
SIMULATION CAPABILITIES						
Thermoplastic Filling	✓	✓	✓	✓	✓	✓
Part Defects	✓	✓	✓	✓	✓	✓
Gate Location	✓	✓	✓	✓	✓	✓
Molding Window	✓	✓	✓	✓	✓	✓
Thermoplastic Packing			✓	✓	✓	✓
Runner Balancing		✓	✓	✓	✓	✓
Cooling			✓		✓	✓
Warpage			✓		✓	✓
Fiber Orientation			✓		✓	✓
Insert Overmolding				✓	✓	✓
Two-Shot Sequential Overmolding				✓	✓	✓
Core Shift Control					✓	✓
MOLDING PROCESSES						
Thermoplastic Injection Molding	✓	✓	✓	✓	✓	✓
Reactive Injection Molding				✓	✓	✓
Microchip Encapsulation					✓	✓
Underfill Encapsulation					✓	✓
Gas-Assisted Injection Molding						✓
Injection-Compression Molding						✓
Co-Injection Molding						✓
MuCell®						✓
Birefringence						✓
DATABASES						
Thermoplastics Materials	✓	✓	✓	✓	✓	✓
Thermoset Materials				✓	✓	✓
Molding Machines				✓	✓	✓
Coolant Materials					✓	✓
Mold Materials					✓	✓

	Autodesk Simulation Moldflow Adviser Standard	Autodesk Simulation Moldflow Adviser Premium	Autodesk Simulation Moldflow Adviser Ultimate	Autodesk Simulation Moldflow Insight Standard	Autodesk Simulation Moldflow Insight Premium	Autodesk Simulation Moldflow Insight Ultimate
CAE DATA EXCHANGE						
Autodesk Simulation			✓		✓	✓
Abaqus			✓		✓	✓
ANSYS			✓		✓	✓
LS-DYNA®					✓	✓
NEi Nastran					✓	✓
SUPPORTED LANGUAGES						
English	✓	✓	✓	✓	✓	✓
Chinese (Simplified)	✓	✓	✓	✓	✓	✓
Chinese (Traditional)	✓	✓	✓	✓	✓	✓
French	✓	✓	✓	✓	✓	✓
German	✓	✓	✓	✓	✓	✓
Italian	✓	✓	✓	✓	✓	✓
Korean	✓	✓	✓			
Japanese	✓	✓	✓	✓	✓	✓
Portuguese	✓	✓	✓	✓	✓	✓
Spanish	✓	✓	✓	✓	✓	✓

Digital Prototyping for the Manufacturing Market

Autodesk is a world-leading supplier of engineering software, providing companies with tools to design, visualize, and simulate their ideas. By putting powerful Digital Prototyping technology within the reach of mainstream manufacturers, Autodesk is changing the way manufacturers think about their design processes, and helping them to create more productive workflows. The Autodesk approach to Digital Prototyping is unique in that it is scalable, attainable, and cost-effective, which allows a broader group of manufacturers to realize the benefits with minimal disruption to existing workflows, and provides the most straightforward path to creating and maintaining a single digital model in a multidisciplinary engineering environment.

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