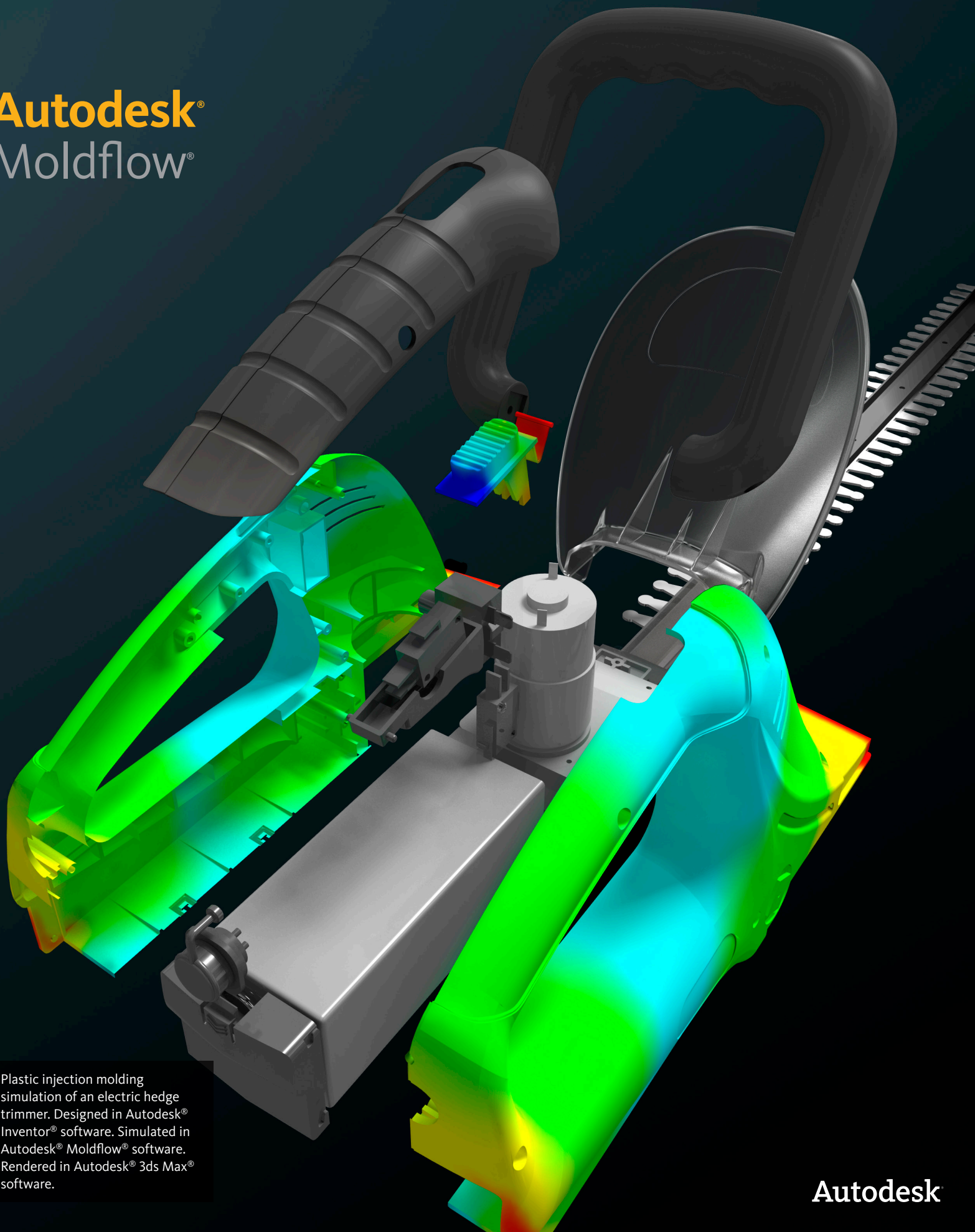# Technical What's New

Autodesk®
Moldflow®

Plastic injection molding
simulation of an electric hedge
trimmer. Designed in Autodesk®
Inventor® software. Simulated in
Autodesk® Moldflow® software.
Rendered in Autodesk® 3ds Max®
software.
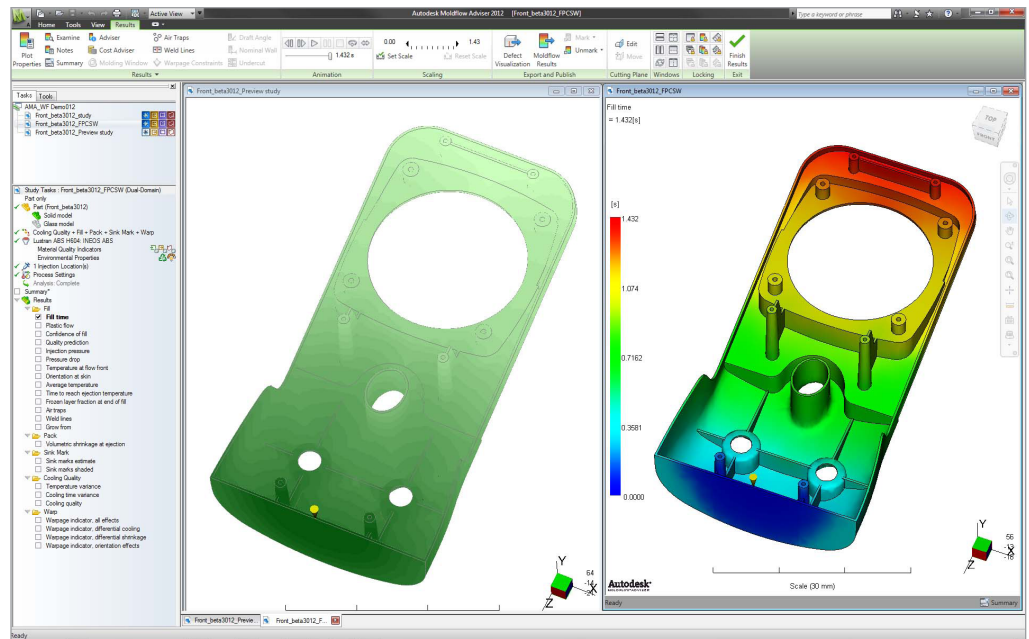
Autodesk

Technical What's New

Contents

What's New in Autodesk Moldflow 2012

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

Autodesk Moldflow 2012 offers the following new features:

- Fill preview technology
- Autodesk Moldflow Adviser plug-in for CAD
- Autodesk® Inventor® Fusion interoperability
- New short and long fiber solver options
- Transient mold cooling analysis
- Optimization using Design of Experiments (DOE)
- Venting analysis expanded to 3D thermoplastic processes
- Enhanced wire sweep analysis
- Accuracy and speed enhancements
- Enhanced CAD interoperability
- Material database updates

Technical What's New

Fill Preview Technology

Autodesk Moldflow 2012 is the first plastic injection molding simulation software with Fill Preview technology, a groundbreaking new feature that shows how a plastic part will fill and where weld lines will occur—in near real time. This new capability helps you make informed decisions about gating locations without the need to perform multiple, detailed simulations—resulting in a significant decrease in time to solution.

With Fill Preview technology, the filling pattern updates instantaneously as you move or add gates to a model. You can quickly assess the impact of potential gating scenarios on the filling pattern and resulting weld lines, helping to find the optimal gating configuration faster than ever before.

Fill Preview results can even be viewed before a part is meshed. If geometry changes are required to improve the filling pattern, you can save significant time by eliminating the need to generate a new mesh for each design iteration.

Fill Preview technology is available for both Autodesk Moldflow Adviser 2012 and Autodesk Moldflow Insight 2012 when performing Dual Domain™ or 3D thermoplastic analyses.

Autodesk Moldflow Adviser Plug-In for CAD

Ideally, you want to know how every decision made during the design process affects the quality, cost, and environmental impact of a manufactured product. Until now, this has been an unattainable ideal—simulation was simply unable to keep up with the pace of modeling. Not anymore.

Autodesk Moldflow Adviser 2012 software now includes a CAD plug-in that helps evaluate every design change you make, as you make it, directly within the modeling environment. Not only does the plug-in include Fill Preview technology for near real-time filling pattern prediction—it also provides instantaneous results to help you quickly react to potential manufacturability, cost, and environmental impact issues.
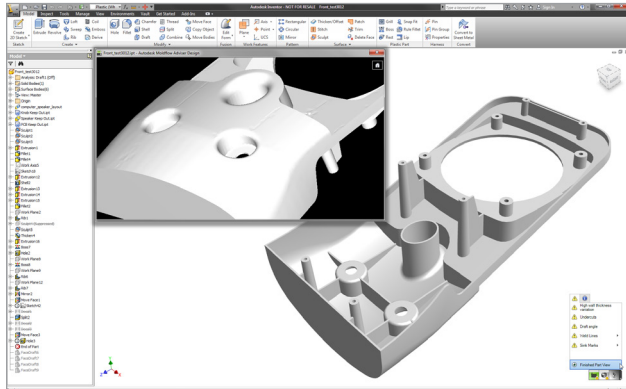
Beyond viewing the filling pattern, you can use the real-time results to view injection pressure, weld lines, and even sink marks. The Finished Part Preview displays these defects directly on the model; you can see how your finished plastic part will look, then make adjustments to the engineering features to make sure aesthetic requirements are met.

Indicators within the modeling environment display window provide additional information in the following areas:

Manufacturability. The manufacturability indicator immediately alerts you when a basic design rule such as wall thickness variation, adequate draft angle, or undercuts has been violated.

Cost effectiveness. This indicator provides insight into the causes of excessive material, mold, and processing costs for a plastic part under design—giving you the opportunity to optimize geometry early on in order to improve profitability.

Plastic material impact. The final indicator displays quantitative results designed to demonstrate the effects of manufacturing the part on the environment, including results for carbon footprint, embodied energy, recyclability, and embodied water.

The Autodesk Moldflow Adviser plug-in for CAD is provided as a benefit to Autodesk Moldflow Adviser customers with an active Autodesk® Subscription. It can be downloaded from the Autodesk Subscription Center.
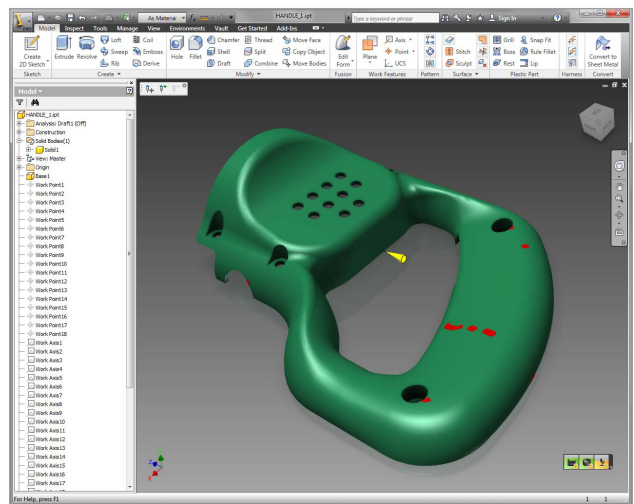
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Autodesk Inventor Fusion Interoperability

Optimizing a plastic part design typically means that, at some point, you will have to modify its geometry. This can be especially challenging if you lack access to the CAD system in which the plastic part was originally designed. Even if you do have such access, sorting through the history tree to modify or suppress features can be both time consuming and frustrating.

With the Autodesk Moldflow 2012 release, you can now use Autodesk Inventor Fusion software to modify geometry fast—so you can get straight to simulation, minus the irritation. Autodesk Inventor Fusion can open geometry from virtually any CAD system. You can then use Fusion's direct modeling capabilities to simplify the model; modify the size of critical features such as ribs, bosses, and wall thicknesses; or even add new features.

This interoperability is tightly integrated into both Autodesk Moldflow Insight and Autodesk Inventor Fusion. With a single click, you can easily push geometry to Autodesk Inventor Fusion for modification, then back to Autodesk Moldflow to perform another simulation.

Autodesk Inventor Fusion software can read CAD geometry in the following formats:

• Autodesk® Inventor® 2012

• Pro/ENGINEER® Wildfire® 5.0

• SolidWorks® 2011

• CATIA® V5R20

• ACIS® V4–V7

• Parasolid® V22

Autodesk Inventor Fusion software is included with the purchase of each license of Autodesk Moldflow 2012 software.

New Short and Long Fiber Solver Options

With short and long fiber composite materials being used in more and more applications, accurately predicting the alignment of fibers throughout a plastic part is critical—it can help you understand the exact physical properties of a manufactured product, how much it will shrink and warp, and how it will perform during use.

Over the past several years, Autodesk has partnered with leading researchers from the University of Illinois at Urbana-Champaign, Delphi Automotive Systems, LLC through its Delphi Packard Electrical/Electronic Architecture Division, and Pacific Northwest National Laboratory to develop new solvers for short and long fiber-filled materials. These solvers are now available exclusively in Autodesk Moldflow Insight 2012 software.

Short Fiber Prediction

The new Reduced Strain Closure (RSC) model, patented by Delphi Technologies, Inc. and licensed exclusively to Autodesk, has been developed to capture slow orientation dynamics when calculating fiber orientation. Prediction of fiber orientation distribution through the thickness of a plastic part is improved when using the RSC model.

Long Fiber Prediction

Fibers having an initial length longer than 1 mm are generally considered to be long fibers. In plastic injection molding applications, fiber alignment in the flow direction is usually weaker in long fiber-filled materials than in short fiber-filled materials. The Folgar-Tucker and RSC models assume isotropic fiber diffusion and cannot accurately predict fiber interactions for long fiber-filled materials. The ARD model, which assumes anisotropic fiber diffusion, more accurately predicts fiber orientation when using long fiber composites.
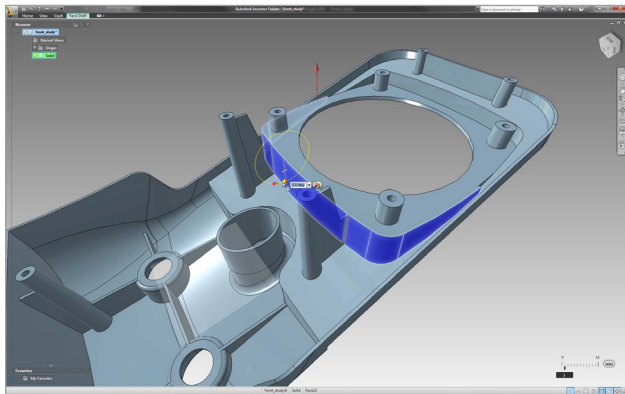
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Both of these models improve overall accuracy of fiber orientation and distribution in composite materials and, in turn, improve calculation of final mechanical properties—giving you better shrinkage, warpage, and structural predictions, so you can see how a product will perform during use.
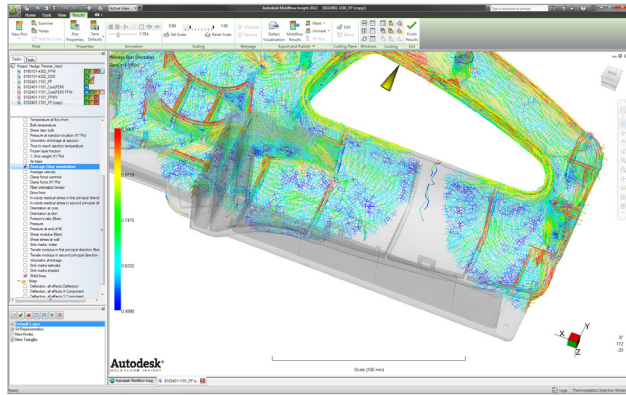

Transient Mold Cooling Analysis

With certain types of geometry, areas of an injection mold may heat up and cool down significantly during an injection molding cycle—which can extend cooling times, increase warpage, and ultimately affect profitability. The new transient mold cooling analysis feature in Autodesk Moldflow Insight 2012 software takes you "inside" the mold to identify potential cooling issues, helping provide proper justification for critical decisions made when designing a cooling system.

There are two options for running a transient cooling analysis in Autodesk Moldflow Insight 2012:

Transient within cycle. Transient within cycle analysis gives insight into how temperature variation in an injection mold that has been in production and reached equilibrium will affect the cycle time and quality of a plastic part.

Transient from production startup. Transient from production startup analysis shows how long it takes for an injection mold to reach stable production—especially critical for products with small production runs, where scrap produced during startup can have a large impact on profit margins.
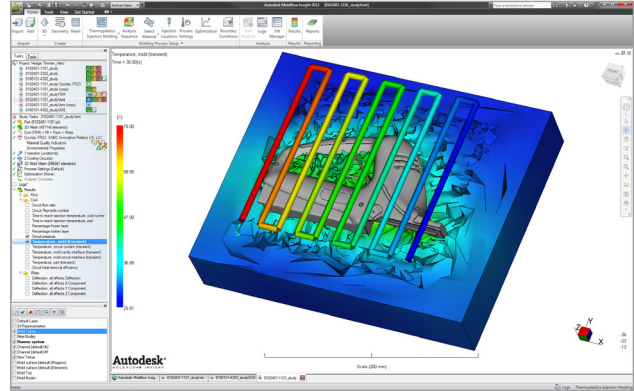

Optimization Using Design of Experiments (DOE)

What if you could run every logical configuration of the part, mold, and processing parameters at the same time? How much time would you save if you could fully use the massive computing power available on today's high-end workstations to test what-if scenarios in parallel, rather than in series?

The new optimization analysis in Autodesk Moldflow Insight 2012 does just that. Using the Design of Experiments (DOE) methodology, it automatically creates a set of simulations to test the limits of every possible configuration of input parameters that you describe by specifying your quality criteria. It then launches all of the simulations at once, taking advantage of every available processing core to get to the optimal solution faster than ever.

When viewing the results, you can quickly adjust the input variables to see how much impact each variable has on the quality of a plastic part. For instance, when viewing a warpage plot, you can adjust wall thickness, packing pressure, and even the cooling channel sizes; the plot will instantly update to show how each change contributes to the overall deflection.

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Best of all, using this feature requires no prior knowledge or understanding of statistical methods. You get a wealth of information to help you make key design decisions—plus confidence that small variations in real-life production will not result in large variations in product quality.
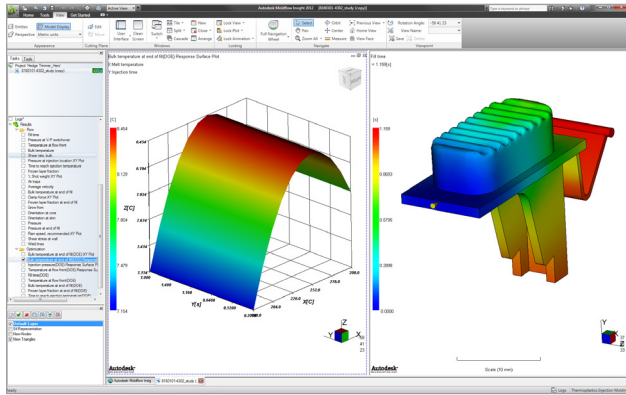
Venting Analysis Expanded to 3D Thermoplastic Processes

Entrapped air in the cavity can cause severe, production-halting defects such as burn marks and short shots. Understanding how the flow of plastic into an injection mold is affected by air pressure in the cavity is essential for avoiding these defects; it also helps designers place vents in the most effective locations.

New in Autodesk Moldflow Insight 2012 is the option to include air venting in 3D thermoplastic analyses to predict if, when, and where this type of issue will occur—helping ensure that your mold is properly vented.

Enhanced Wire Sweep Analysis

Autodesk Moldflow Insight 2012 introduces two new solver options and five new result plots for Wire Sweep analyses of microchip encapsulation processes using 3D analysis technology. These enhancements make it easier to model, simulate, and interpret results of microchip encapsulation applications, especially those that include a large number of wires.

New 3D Wire Sweep Solver Options

The Wire Sweep analysis now includes an option for considering the effects of a large number of wires on the flow of encapsulant, as well as the effects of adjacent wires on drag force. Wires can be modeled as 1D (beam) elements; no special modification of the part meshed with tetrahedral elements is required.

Also available is the ability to define the distance at which pairs of adjacent wires are considered too close together. The clearance distance is measured between the surfaces of adjacent wires after wire deformation.

New 3D Wire Sweep Result Plots

Five new result plots make data interpretation significantly easier. These plots are available by default after completing an analysis sequence that includes wire sweep.

Wire number. Animation controls make it easier to identify the locations of individual wires in the graphical display.

Maximum wire deflection magnitude. This helps identify the individual wires that undergo the most deflection.

Maximum wire sweep index. This helps identify the individual wires that undergo the greatest drag force during cavity filling.

Wire pairs within critical clearance. This helps identify pairs of wires that are too close together after wire deformation occurs during cavity filling.

Distance to closest wire. This helps identify wires too close to or far from adjacent wires.
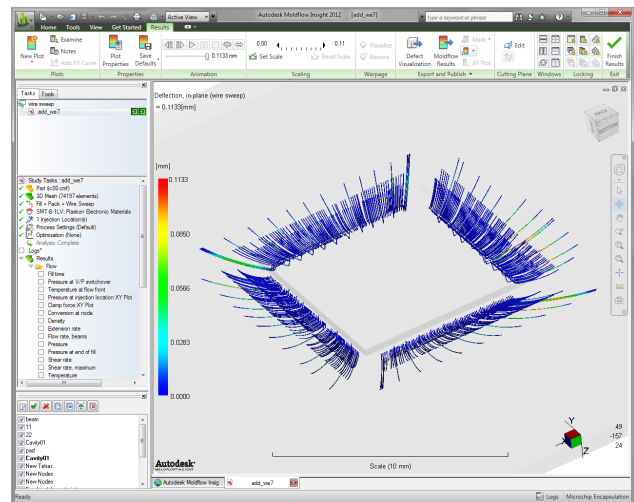
Technical What's New

Accuracy and Speed Enhancements

Multiple enhancements help improve the performance of Autodesk Moldflow 2012 simulations.

Improved Solution Time and Results for Gate Location Analysis

The Advanced Gate Locator algorithm now provides a more accurate prediction of the best gate location. In addition, the solver automatically takes advantage of parallel processing technology to speed up calculation of gate locations.
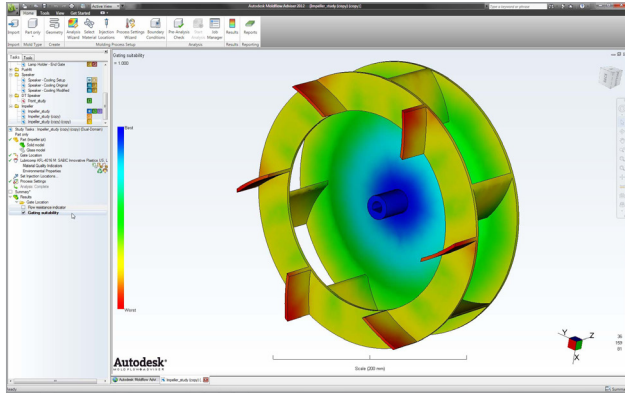
Improvement of Automatic Injection Time Prediction

Solver improvements help obtain a more accurate calculation of the automatic injection time prediction, improving flow and molding window results.

Improved Accuracy in Runner Balance Analysis

Improvements to the runner balance analysis make for better handling of complex models and runner layouts. In particular, family molds with drastically different cavity sizes, multicavity molds with major differences in runner length, and mold cavities where hesitation of the melt front is present can now be solved more accurately.

Displacement Boundary Conditions Available for Dual Domain and 3D Warp Analyses

Manual constraints can now be set for Dual Domain and 3D Warp analyses, to help predict how a plastic part will warp if used in particular conditions such as being fixed to another object in an assembly. This helps you see excessive stress levels or an undesirable shape when a product is assembled.

Elements Excluded from Warp Analysis

Exclude elements from warpage calculations to aid in isolating the cause of warpage in a plastic part, or simply to reduce analysis time by focusing on an area of interest. This applies to all midplane and 3D parts, cold runners, and inserts. When running a multicavity model, entire parts can be excluded to reduce memory usage and analysis time.

Increased Maximum Number of Elements for 3D Warp Analysis

With the continuous increase of computing power and the emergence of cloud computing, simulation models have become larger and more complex. To support 3D warpage analyses on these larger models, the default model mesh size limit—i.e., 6-layer option during tetrahedral meshing and mesh aggregation option for warpage—is extended to approximately 15 million tetrahedral elements.

Large Deflection Available for 3D Warp Analysis

The Large Deflection analysis option, already supported for midplane warp analysis, is now available for 3D warp analysis. This option increases accuracy when predicting the deformation of a 3D part—for example, with very thin parts where deflection is expected to be high or buckling is likely to occur.

Improved Volumetric Shrinkage Calculation at Rib Junctions for Midplane Models

The midplane flow solver has been improved to more accurately calculate temperature at the base of ribs, where they join the part wall. This improvement provides more accurate results at rib junctions when predicting volumetric shrinkage, sink marks, and time to reach ejection temperature. Warpage prediction may also be improved for parts that have ribs, especially where volumetric shrinkage is a significant contributor to a product's warpage.

Enhanced Support for GPU Technology

Support for GPU processing is now extended to 3D warp analyses. GPU technology allows numerically intensive calculations in a 3D warp analysis to be performed on the GPU card—resulting in a shorter analysis time.

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Enhanced CAD Interoperability

Autodesk® Moldflow® Design Link 2012 now provides direct import of Autodesk Inventor 2012 parts (*.ipt) and assemblies (*.iam), as well as ACIS V4–V7 (*.sat) models. If you are using Autodesk Inventor or Autodesk Inventor Fusion for CAD modeling, you can now take advantage of this expanded direct import capability simply by installing Autodesk Moldflow Design Link 2012 software.

Autodesk Moldflow Design Link is included with the purchase of each license of Autodesk Moldflow 2012 software.

Material Database Updates

The Autodesk Moldflow material database has been reviewed and modified; the updated database now contains 8,622 thermoplastic materials from 435 suppliers and 185 thermoset materials from 44 suppliers.

Learn More or Purchase

Access specialists worldwide who can provide product expertise, a deep understanding of your industry, and value that extends beyond your software. To license Autodesk Moldflow software, contact an Autodesk Authorized Reseller. Locate a reseller near you at **www.autodesk.com/reseller**.

To learn more about Autodesk Moldflow software, visit **www.autodesk.com/moldflow**.

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Feedback

Autodesk Moldflow customers can provide feedback to the Autodesk Moldflow development team through several avenues:

- Provide tips or join discussion groups at **forums.autodesk.com**.

- Engage with the SIM Squad, a team of world-class simulation experts at Autodesk who speak the language of CFD, FEA, and all things mechanical and plastic injection molding simulation, at **simulation.autodesk.com**.

- Keep up to date on what's happening in your industry, stay in touch with other industry professionals, and take advantage of a host of online resources at the Manufacturing Community Portal at **mfgcommunity.autodesk.com**.

- Talk with your Autodesk Authorized Reseller and support staff.

Your input is crucial to our success, and we look forward to receiving your suggestions.

Conclusion

We thank you for your continued support of the Autodesk Moldflow family of products, and hope you feel we are listening to your needs. We have added the new and enhanced functionality to Autodesk Moldflow 2012 software to help make you more productive, make your company more competitive, and return true value to your bottom line.

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