

# Moldflow Plastics Advisers



# Challenges in Plastic Part Production — Manufacturing Driven Part and Mold Design

Production of injection molded plastic parts is integral to many of today's mainstream manufacturing processes. Industries such as automotive, electronic equipment, consumer goods, medical equipment and telecommunications all have great demands for plastic parts in their products. While part design geometry is becoming increasingly complex, at the same time, market pressure to produce lighter, less expensive products faster is leading manufacturers to push for thinner parts.

Constraints inherent to the injection molding process may cause unexpected delays and incur costs. Part designs often require modification late in the mold design phase to support the injection molding process, and part quality or cosmetic appearance problems may not be discovered until parts are actually manufactured. This can lead to expensive tool modifications and lengthy mold commissioning trials. Also, cycle time and machine size are not always considered during the part design stage, which can lead to design modifications during the production cycle — another costly delay.

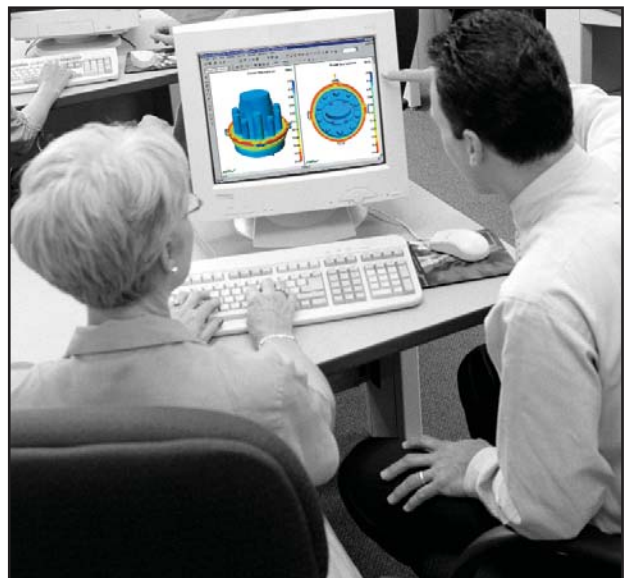
## The Costs Associated with Change — or Not Changing

The cost of a design change is extremely low in the early stages of product design, but increases substantially the later the change is introduced into the process. Not only do costs spiral, but the impact on time-to-market can be devastating on bottom-line profits. Companies that do not consider manufacturing constraints early in the design process consistently encounter additional downstream costs and time delays. While the cost of change is apparent, doing nothing often costs a company more. Not optimizing a design for manufacturing means missing a valuable opportunity to reduce production expenses — something that companies in competitive industries simply cannot afford.

Simulation solutions that enable part and mold designers to optimize their designs for manufacturing and eliminate downstream problems are an essential investment in today's competitive environment.

“We like to incorporate Moldflow analyses early in the product stage because we know that we will end up with a part and mold as desired. We also know that we will not be making expensive modifications later.”

Gary Deaton  
Manager of Marketing and Manufacturing  
The Minco Group



# Moldflow Plastics Advisers Solutions — Design-for- Manufacture Tools for the Plastics Injection Molding Industry

Moldflow Plastics Advisers® (MPA®) solutions bring the benefits of injection molding simulation directly to the desktops of part and mold designers, enabling users to predict and solve injection molding manufacturing problems in the earliest stages of product development. Manufacturing constraints can be considered at the same time as form, fit and function.

## Test Every Part and Mold Concept

MPA products are easy to learn and use and do not require extensive training or plastics expertise. With the power of Moldflow's patented Dual Domain™ technology, users can work directly from 3D solid CAD models without the need to manually create or even view a finite-element mesh, saving hours to days to weeks of model preparation time. Plus, MPA modules are integrated with the world's leading 3D CAD systems, allowing users to work directly from within their familiar CAD environment.

## Get Answers, Communicate Results

Intuitive result displays and detailed design advice help users to quickly optimize part and mold designs. An automatic, Web-based report generator facilitates communication of results among all members of the design-to-manufacturing team. An innovative, e-mail based Connect to Consultants tool facilitates collaboration between a user and a designated plastics simulation expert to assist with results interpretation, problem troubleshooting and identifying design alternatives.

## Entry-level Solution for Part Designers

Moldflow Part Adviser is a plastics flow simulation tool that has been developed with the specific needs of part designers in mind. Users do not need to be dedicated analysts to benefit — even occasional users can quickly assess the manufacturability and quality of plastic part designs for injection molding applications early in the design process.

## Mid-range Solution for Mold Designers

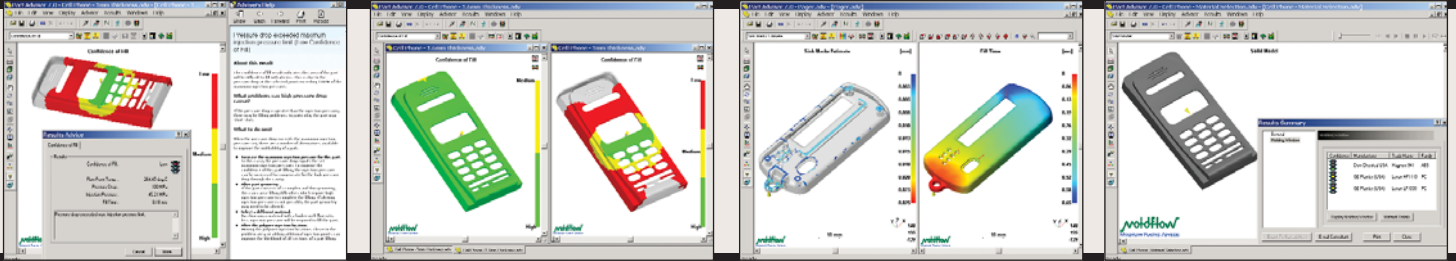
Moldflow Mold Adviser extends simulation capabilities beyond the part cavity to allow mold designers to create and optimize gate and runner systems for single cavity, multi-cavity and family molds. Optional extension modules also allow users to evaluate molded part performance and cooling circuit design. Moldflow Mold Adviser is targeted at the mid-range market to provide the optimal balance of functionality to address critical mold design parameters, before the mold construction begins.

“ Using Moldflow's products, we save 10% to 30% by volume on materials. Even though every project is different, the technology helps save CACO Pacific and our customers money. Any company that has anything to do with building molds should take a look at Moldflow to enhance their capability.”

Bruce Jetseck  
Mold Designer  
CACO Pacific

# Moldflow Part Adviser

The Moldflow Part Adviser module is the ideal tool to quickly check the manufacturability and quality of plastic part designs when the cost of change is least — early in the design process. Users can get rapid feedback on how modifications to wall thickness, gate locations, material choice or part geometry can affect the filling pattern and pressure and temperature distributions in the part cavity. The analysis results and detailed design advice can be used to determine the optimum part thickness and gate locations as well as to identify and eliminate quality issues such as weld lines, air traps and sink marks.



## Benefits:

- Assess Manufacturing Feasibility** — Part designers can obtain the answer to the most fundamental question — can the part be manufactured? Additionally, users can drill down and interrogate specific areas of the model that pose a concern to learn the cause of and potential solution to the problem.
- Identify Part Quality Issues** — Sink marks, weld lines and air traps can negatively impact part quality and aesthetics. Users can obtain information on sink-mark locations and their severity as well as weld-line locations and a qualitative measure of their strength.
- Optimize Part Thickness** — Knowing how thin a part can be manufactured is extremely valuable at the design stage. Part designers can optimize the overall part thickness and ensure that variations in part thickness will not pose manufacturing problems.
- Choose the Most Suitable Material** — Material selection is a principal function in the part design process. Users can evaluate materials and determine the best material candidates.

# Moldflow Mold Adviser Extension Modules

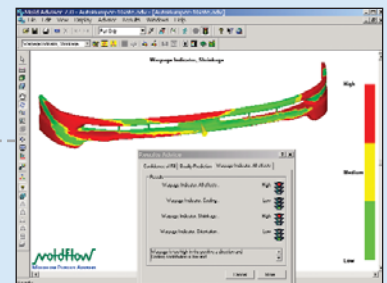
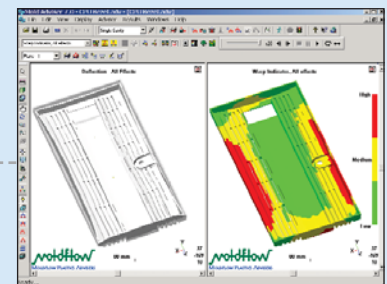
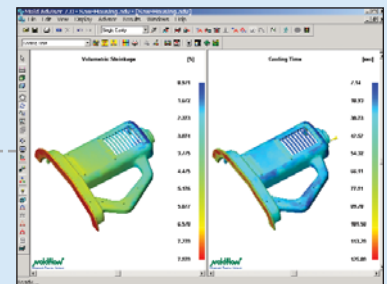
Two optional, add-on modules to Moldflow Mold Adviser are available to extend its capabilities to quickly evaluate and optimize part performance and cooling circuit design for low-to-medium complexity part and mold designs. The result is faster mold commissioning, minimal mold rework, a more robust manufacturing process and faster time to market.

## Moldflow Performance Adviser

Moldflow Performance Adviser extends the capabilities of Moldflow Mold Adviser to simulate the packing phase of the injection molding process to minimize undesirable part shrinkage as well as provide a warpage indicator that indicates if a part is likely to warp or deform beyond acceptable levels.

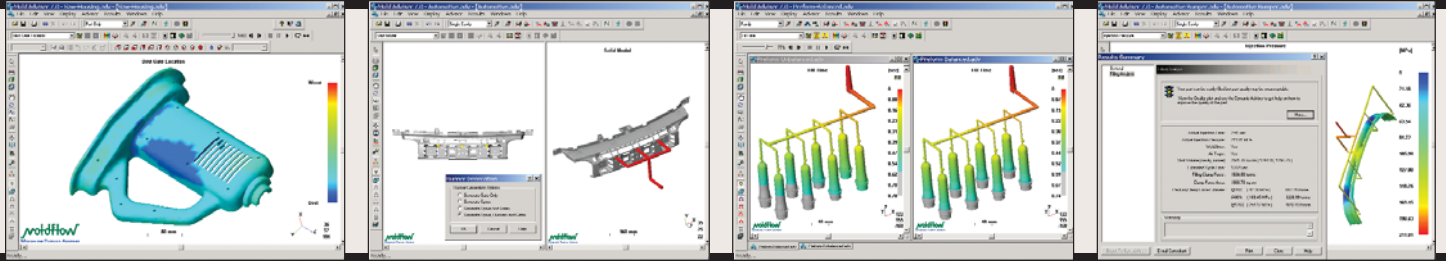
## Benefits:

- Optimize Packing Phase** — The packing phase is the key to achieving the right balance between part quality, part cost and cycle time. Mold designers can set up and evaluate packing profiles to determine the optimum packing pressure and time.
- View Deflected Part Shape** — Users can predict and display the deflected shape of the part to help visualize part shrinkage and warpage.
- Warpage Indicator** — This intuitive result helps identify regions on the part that deflect beyond a threshold value. Mold designers can evaluate changes to processing conditions, material or the part design to reduce or eliminate warpage.



# Moldflow Mold Adviser

The Moldflow Mold Adviser module extends the capabilities of Moldflow Part Adviser to allow mold designers to create and simulate plastic flow through single cavity, multi-cavity and family molds. Users can optimize gate type, size and location as well as runner layout, size and cross-sectional shape. Analysis results include cycle time, clamp tonnage, and shot size, all of which help the design-to-manufacturing team size the injection molding machine, minimize cycle times and reduce manufacturing waste. Optional Moldflow Mold Adviser add-on modules allow users to simulate more phases of the injection molding process and evaluate molded part performance and cooling circuit design.



## Benefits:

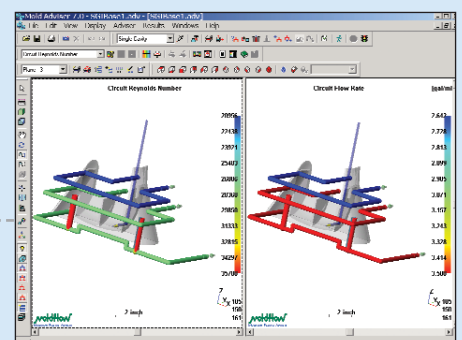
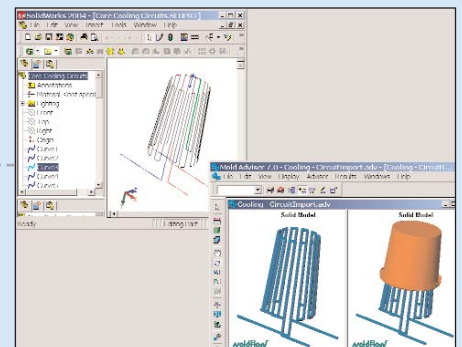
- ❑ **Optimize Gate Location** — Identifying the appropriate number of gates and the most suitable gate locations are two key mold design functions that users can accomplish effectively and efficiently.
- ❑ **Automated Design of Feed Systems** — Automated methods, developed exclusively by Moldflow, allow users to quickly and easily create sprues, runners and gates for single-cavity, multi-cavity and family molds constructed in two- or three-plate mold configurations.
- ❑ **Optimize and Balance Feed Systems** — Powerful capabilities allow users to automatically determine the best sprue, runner and gate dimensions and size runners to balance flow in multi-cavity and family mold layouts. An optimized runner system helps to reduce scrap, improve productivity and lower production costs.
- ❑ **Predict Cycle Time, Shot Size and Clamp Tonnage** — Mold designers can confidently quote tooling projects using cycle time, shot size and clamp tonnage estimates.

## Moldflow Cooling Circuit Adviser

Moldflow Cooling Circuit Adviser extends the capabilities of Moldflow Mold Adviser to simulate the cooling phase of the injection molding process so that users can optimize their mold designs for uniform cooling and minimum cycle times.

## Benefits:

- ❑ **Cooling Circuit Design** — Mold designers can leverage several options to design their cooling circuits, including importing from a CAD system, using an automatic wizard or using highly efficient modeling tools that are integral to Cooling Circuit Adviser. The cooling circuits can incorporate regular channels, hoses, baffles and bubble...
- ❑ **Cooling Channel Optimization** — Mold designers can evaluate their cooling circuit designs to achieve uniform cooling and minimize cycle time. Pressure drop, Reynolds number, flow rate and coolant temperature results can be used to help identify inefficient circuits. A part surface temperature result is useful in spotting non-uniform cooling patterns that can lead to undesirable part warpage.



# Moldflow is the leading global provider of automation and optimization software solutions for the plastics injection molding industry.

Companies use Moldflow's complete suite of products to address plastic part design issues at the earliest possible stage as well as to maximize productivity and profitability on the manufacturing floor. Moldflow products bring the consideration of manufacturing constraints into the earliest stages of plastic part design where the cost of change is minimal, as well as move the knowledge gained from design simulation downstream to the manufacturing floor to optimize injection molding process parameters. Moldflow's collaboration with academia, industry, and customers around the world has led to a reputation for constant innovation in the complete design-to-manufacture process. Headquartered in Wayland, Massachusetts, Moldflow has offices and R&D centers in the United States, Europe, Australia and the Asia Pacific region.

## Moldflow Design Optimization Solutions

For companies that design injection molded parts or molds and need to get products to market faster and less expensively, Moldflow Plastics Advisers (MPA) products provide injection molding design-for-manufacturability tools that predict and eliminate potential manufacturing problems during the preliminary part and mold design stages. Moldflow Plastics Insight® (MPI®) advanced process simulation tools account for the complex interrelationships among part and mold design, material choice, and processing conditions to optimize the thermoplastic injection molding process as well as gas-assisted, co-injection, injection compression, and reactive molding processes.

## Moldflow Manufacturing Solutions

Moldflow Manufacturing Solutions™ (MMS™) products deliver a complete manufacturing execution system, which provides production and process data for use in critical decision making and real-time business performance management and automates the setup, optimization, and control of manufacturing processes. The complementary technologies that comprise the MMS system may be used separately or together to achieve particular manufacturing goals.



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