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FALL 2005

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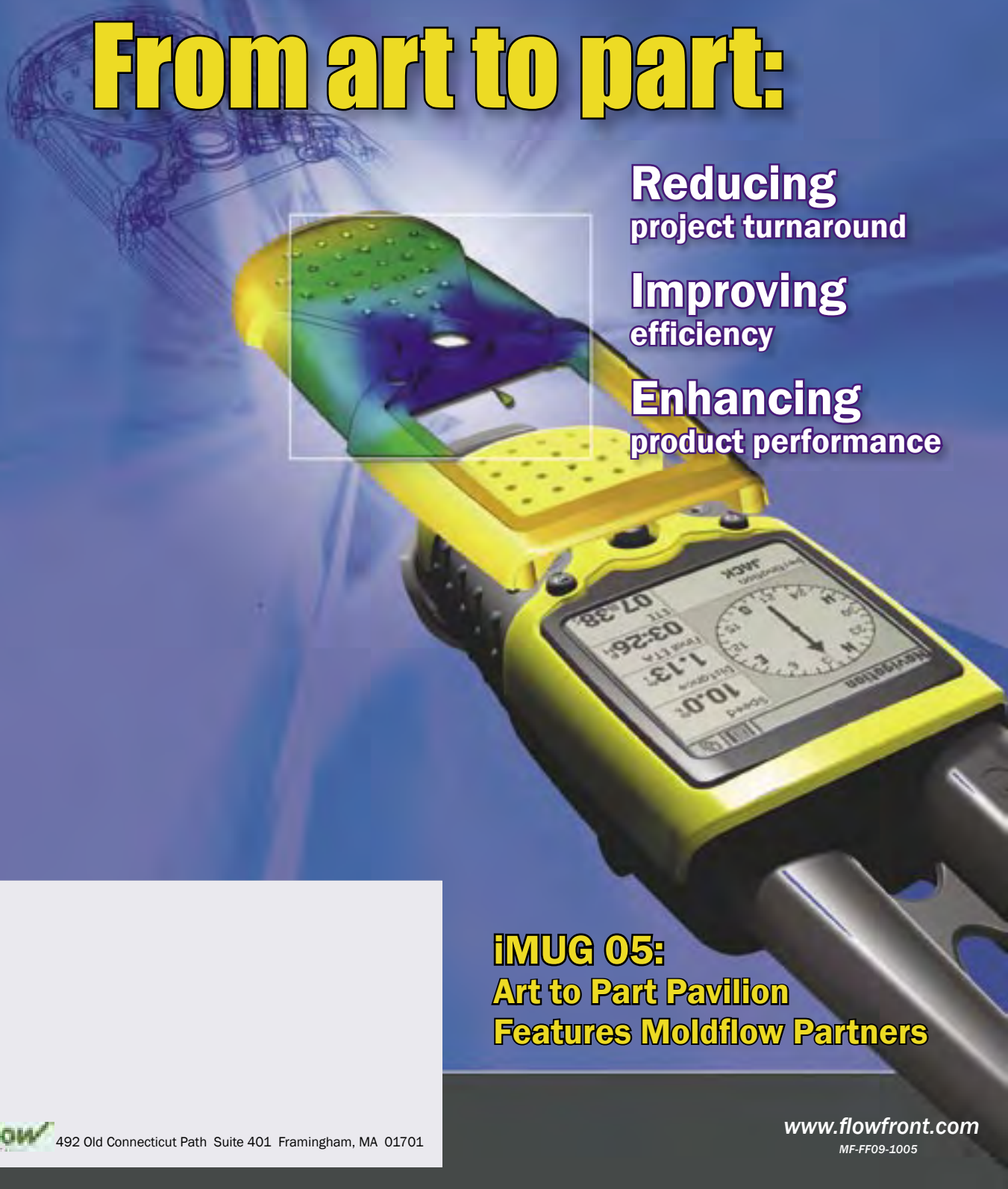
From art to part:

Reducing
project turnaround

Improving
efficiency

Enhancing
product performance



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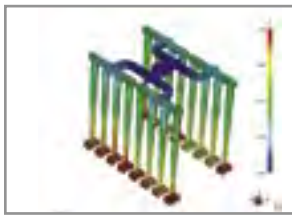
MPI 6.0 user interface enhancements eliminate workflow bottlenecks. Now you can more easily analyze complex parts, compare more alternatives and ultimately, complete more projects.



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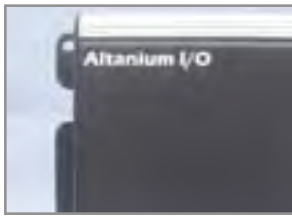

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Make the most of Altanium hot runner process controllers. Learn how available options can help you detect and avoid common molding problems.

Cover shot illustrates the stages involved in the design of a GPS device.

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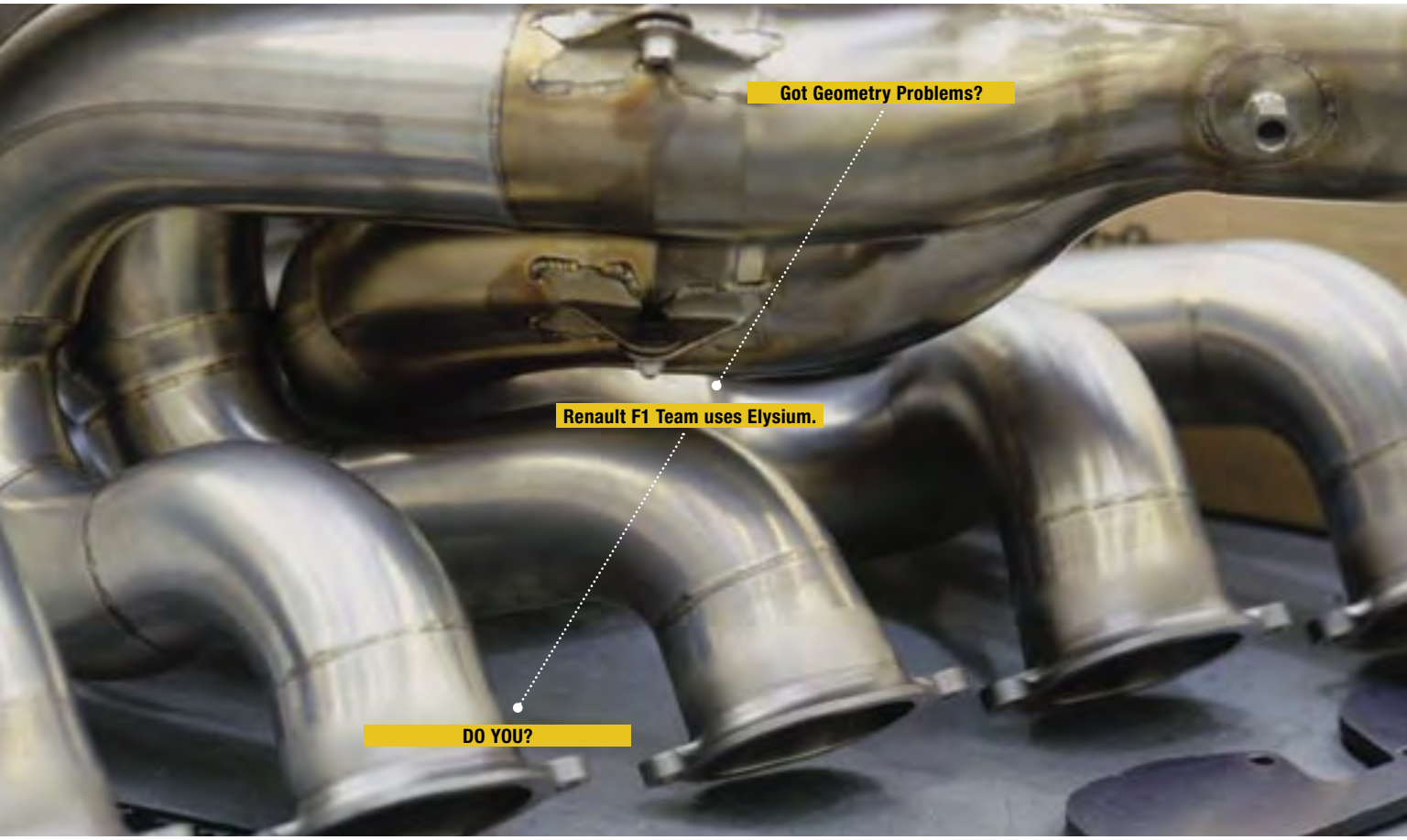

Why did Moldflow select Elysium to OEM a customized version of our product CAD•doctor?

Elysium's CAD•doctor is a standalone translator and automated healing tool which performs interactive analysis and quick repair of 3D CAD data. Specifically, Moldflow CAD Doctor addresses problems encountered when importing solid surface-based models to the Moldflow design analysis environment.

About Elysium Inc.
Founded in 1984, Elysium bridges the gap between CAD systems and enables PDM and product structure synchronization with its industry-leading technologies. Elysium's CAD•porter™, CAD•doctor™, CAD•feature™, and CAD•portal™ software products enable the translation of all geometry from one CAD system to another with the industry's highest success rate. Other products include CAD•pdm™, a tool which enables CAD integration within a PDM environment. Platforms supported include, ABAQUS/CAE, ACIS, CATIA, Inventor, NX (I-deas and Unigraphics), JT, ParaSolid, Pro/Engineer, SolidWorks and Wildfire. Elysium has successful partnerships with several major software companies including ABAQUS, Autodesk, Moldflow, MSC.Software, PTC, SmarTeam, SolidWorks, Spatial and UGS. Elysium is a member of the AIAG and an Official Supplier of Renault F1 Team.

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letter from the editor

Art to Part

This issue of Flowfront is our "show piece," coinciding with the International Moldflow User Group Conference (iMUG05), held this year in Orlando, Florida, October 25-27. In these pages as well as at iMUG05, customers, industry experts and Moldflow staff share success stories, business philosophies and product innovations that impact plastic products from art to part.

Our focus in this issue is on the next release of our flagship product, Moldflow Plastics Insight® (MPI®) design analysis software. MPI 6.0 delivers a host of technology advancements reduce total project turnaround, improve efficiency and enhance product performance. Preview of new technologies and key enhancements to analytical solvers that dramatically reduce solution time for true 3D analysis applications, provide new result displays in answer to specific user requests, and deliver new interface capabilities to popular structural analysis applications. Learn about user interface enhancements, which allow users to more easily analyze complex parts, compare more alternatives and ultimately, complete more projects.

Meet Moldflow Communicator, a utility developed to address the needs of distributed product teams. With Communicator, the assumptions, quality and applicability of CAE analyses can be better understood and accounted for, and the knowledge gained from performing analyses can be shared more effectively among all participants in the design-to-manufacturing process. Communicator will be rolled out for other Moldflow software products in the coming months.

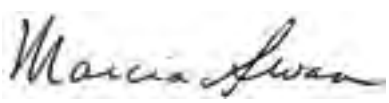
Among our customer contributions in this issue, you'll find a molder's perspective on the challenges facing manufacturers today as Gene Wells, senior process engineer at DJ/Nypro Plastics, discusses rigorous mold tryout. You'll also find out how ITT Industries (Dole, France) successfully uses Moldflow technology to validate part designs for thin-wall molding applications.

Significant developments to the full line of Moldflow Manufacturing Solutions products are highlighted. Find out what's new in the latest Celltrack™, MPX® and Shotscope® releases, and learn how to use available options for Altanium® hot runner process controllers to detect and avoid common molding problems.

Finally, Oren Harari, a highly regarded professor of business management and iMUG05 keynote speaker, gives us his views on the "Business Intelligence Quotient" and why it's critical for competitive success in today's economy.

Whatever role you fill in taking plastic products from art to part, you will find information here about technology innovations, product applications and business practices that benefit every stage of product development through manufacturing.

I hope we will see you in Orlando and at future iMUGs, and I welcome your feedback on Flowfront and Moldflow products throughout the year to flowfront@moldflow.com.



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For more information about Moldflow,its community of over 10,000 users in the design and manufacturing industries, and its local offices in your area, please visit:
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Celltrack Goes Wi-Fi: Improve Your Productivity and Profitability

By Nick Smith

Moldflow's Celltrack™ real-time production management system is now available with Wi-Fi (wireless fidelity) enabled machine interface units (MIUs). The Celltrack system tracks and reports production and machine efficiencies. It can be attached to virtually any piece of cyclic equipment used for discrete manufacturing and also provides capabilities for work order management, job scheduling, mold and machine maintenance tracking, labeling and SPC/SQC functions.

Many studies have verified that wireless Ethernet technology can offer significant benefits versus traditional networking protocols, and the greatest benefits will likely materialize in environments where collaboration is a priority and easy access to information and rapid decision making are important.

Celltrack customers operate daily in such environments and can now utilize Wi-Fi to benefit from the increased access, flexibility and lower cost that wireless technology can bring. Specifically, we have found the following significant benefits of Wi-Fi enabled MIUs:

- Access production data and connect to the shop floor from anywhere in the plant—improve your productivity through multitasking.
- Installing a wireless network is cheaper that installing connections—improve your profitability and gain more flexibility simultaneously.
- The latest MIUs use wireless technology for data transmission to the file server—you can benefit from the latest information management technologies.
- Wireless technology is proven and low risk to implement—Celltrack customers in Europe are already using the wireless MIUs.
- Existing wired MIUs can be upgraded to wireless—keep your existing equipment and maximize your return on investment.
- All network technologies are supported to offer you the best choice for your operations—MIU01 and MIU02 continue to be available with serial, wired Ethernet or the new Wi-Fi networking options.
- A single Celltrack installation will support a network of MIUs utilizing a mix of all three communication protocols—you can mix existing with new technologies and choose the best time to upgrade your equipment to wireless.

Celltrack customers can now choose a Wi-Fi option to benefit from the increased access, flexibility and lower cost that wireless technology can bring.

Our experience shows that implementing a wireless Ethernet network increases the flexibility and mobility of equipment placement on the factory floor and reduces the cost of installation significantly when compared to a hardwired Ethernet or serial network.

With this new capability, Celltrack delivers yet another tool for manufacturing managers to gather the critical necessary to maximize the efficiency of shop floor operations. ▮

For more information about Moldflow Celltrack Production Management, visit www.moldflow.com.

Moldflow Plastics Xpert: Tools Every Molder Should Have

By David Duarte

In today's increasingly competitive global environment, manufacturers must use every tool at their disposal to reduce costs, increase efficiencies and improve process yields. The Moldflow Plastics Xpert® (MPX®) system delivers a unique set of tools to support these important initiatives specifically for injection molding manufacturers.

The patented MPX expert system provides a systematic methodology for the setup and optimization of the injection molding process. It delivers significant improvements in productivity and quality, thereby directly improving profitability. It is a process control tool kit that systematically fixes molded part defects through an automated DOE (design of experiments) which determines a robust "good parts" processing window. Once good parts are produced, MPX maintains the optimal processing conditions to produce the best quality part at the lowest possible cost.

With the recent release of MPX 4.0, Moldflow has added two significant enhancements to this powerful set of tools, viscosity control and a new velocity optimization routine.

Viscosity Control

In injection molding manufacturing, a consistent material response is desired to ensure

a repeatable process. However, several factors, such as regrind usage, humidity level, factory temperature, plastication variations and material batch-to-batch variations, often lead to a fluctuation in material viscosity. Such variation can affect the repeatability of the process and, on some occasions, the quality of the parts produced.

The viscosity control method implemented in the MPX Process Control module takes advantage of the strong relationship that melt temperature has upon material viscosity, calculating a viscosity index that can maintain the material viscosity at a consistent level.

Depending on the magnitude of the melt temperature change, the density of the part may change due to the pvT relationship and any changes in flow dynamics. If this resultant change in density is undesirable, the viscosity control method includes an optiional melt density compensation function, configured by the user. Compensation for the change in melt temperature is achieved by adjustment of the packing pressure; the new packing pressure is automatically downloaded to the controller, assuring consistent part weights are maintained.

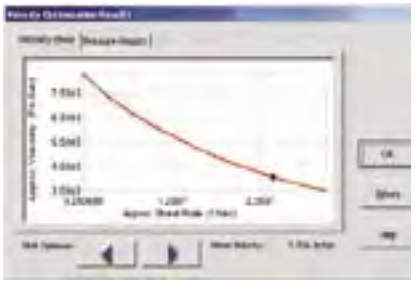
The viscosity control feature in MPX 4.0 detects when the viscosity index is out of control and adjusts temperatures to regain statistical control of the molding process.

Velocity Optimization

One of the challenges to setting up any new tool is determining the optimum injection velocity. The velocity optimization routine in the MPX Process Setup module directly addresses this need. Velocity optimization is an automated routine based on the widely accepted method to derive an optimum velocity from the relative viscosity vs. shear rate relationship. The plastics industry has adopted the inverse of fill time (1/fill time) as an indicator of shear rate. Use of this relationship is considered by most to be an accurate method to determine a starting velocity.

The MPX velocity optimization routine accomplishes this by running two series of samples at varying velocities. The first series is run starting from an initial velocity (starting point), then increasing velocity until a molding defect occurs or the upper machine velocity limit is reached. The second series is then run starting from this upper velocity, and decreasing velocity until a molding defect occurs. The relative viscosity is determined for each velocity used and a plot is presented which displays relative viscosity as a function of the inverse of fill time. The routine then determines the most stable region for processing based on this relationship.

A logical question at this point is, "Where do I determine the starting velocity for this routine?" One of the most powerful tools available in MPX is the ability to determine an initial velocity for the velocity optimization routine. This can be accomplished in one of three ways: 1) use the MPX velocity wizard as a guide; 2) download machine profiles from a machine controller, if the part has been previously run; or 3) download the velocity and pressure profile results from



MPX Process Setup determines the relationship between relative viscosity and shear rate, and recommends an optimum velocity.

Moldflow's industry-leading Design Analysis Solutions, Moldflow Plastics Insight® (MPI®) or Moldflow Plastics Advisers® (MPA®) products.

Using result files generated by MPI or MPA plastics flow simulations in MPX directly links design to manufacturing, leveraging the value of these design analysis products on the manufacturing floor.

With these new enhancements, MPX 4.0 continues to deliver the tools injection molders need to do the job right the first time. ▮

For more information about Moldflow Plastics Xpert, go to www.moldflow.com.

Groundbreaking: Common Hardware for Moldflow's Shop Floor Solutions

By David Rotondo

Many injection molders have made sizable capital investments to become more competitive and improve quality and efficiency. Despite these investments, molders often incur significant cost due to differing hardware platforms used in their plants. Simplifying the tasks of running an injection molding cell, for example, or adding another process monitoring system, often meant integrating various different hardware platforms—a challenging task for any organization.

Moldflow's new common hardware solution helps molders overcome these challenges, save integration cost and improve quality and efficiency. The common hardware is currently available for Moldflow Plastics Xpert® (MPX®) and Shotscope® systems and the Matrix™ operator interface for Altanium® hot runner process controllers. The common hardware has been successfully utilized by many molders since its introduction in July 2005—a clear sign of the platform's proven capabilities.

Simplify the Complex

These capabilities help to simplify the tasks of running a complex injection molding cell, comprised of the injection molding machine, the mold and all of the various auxiliary equipment necessary to produce high-quality parts. The auxiliary equipment often comes from different manufacturers employing their own unique display to manage their equipment. A typical injection molding cell may have five to 10 different displays, all of which an operator must be able to handle. Quite often, these displays are not even at the same location, so that an operator may also have to go to five or 10 different places to adjust process parameters—an inefficient and time-consuming task.

Consequently, many molders attempt to consolidate the number of interfaces in an injection molding cell to a more manageable number, ideally to just one. Moldflow's new, proven common hardware platform allows molders to reduce the number of interfaces significantly and approach the ideal case of just one interface.

Savings Impact Your Bottom Line

Maximizing manufacturing process control is important measure to improve quality and reduce cost. With the introduction of the common hardware for Moldflow Manufacturing Solutions products, current Altanium Matrix users, for example, can add Shotscope or MPX technology, which will run on the same screen as the Matrix operator interface. Similarly, current Shotscope or MPX users can easily add Altanium Matrix technology to their tool set, without having to purchase additional computers or interfaces. This can result in savings of several thousand dollars on every system.

Another advantage of Moldflow's common hardware solution is increased flexibility for the future. For example, if a molder has future interest in hot runner process control capabilities, but initially focuses on implementing Shotscope or MPX technology, the hardware can be configured as "Altanium Matrix-Ready" when it is initially installed. This configuration enables molders to add hot runner process control capability later by purchasing only the Altanium Matrix software, the Altanium mainframe and the number of required control zones. There is no need to purchase another operator interface, which again results in saving of several thousand dollars per system.

Moldflow's new common hardware solution helps molders reduce cost, improve efficiency and deliver high-quality parts to their customers. ▮

Moldflow's common hardware solution for Altanium Matrix, MPX and Shotscope systems helps molders save integration cost and improve quality and efficiency in their operations.

Next issue, Flowfront would like to feature your new releases.

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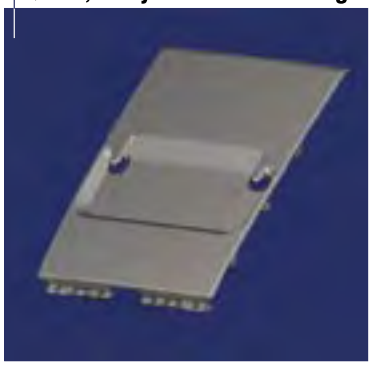
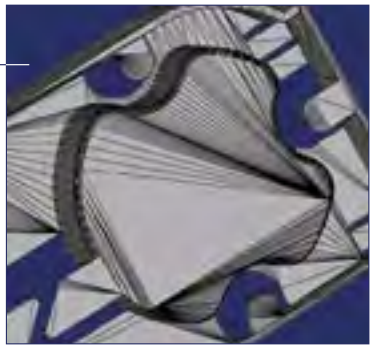


Automated surface mesh optimisation for optimal flow simulation includes triangle reduction



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MPI 6.0 Release Highlights Range of 3D Solutions with New Solvers and Technology Enhancements

By Murali Annareddy

Succeeding in today's global market depends on continuously increasing efficiency and performance. This is especially true in the plastics industry, where the past 10 years have seen a widespread shift to using 3D CAD systems for integrated part and tool design and a corresponding shift to relying on CAE analysis technologies that run directly on those 3D models. Moldflow has always been the technology leader in this area, consistently delivering the broadest range of true 3D analysis capabilities, introducing patented Dual Domain™ technology and focusing development efforts to support our customers' evolving needs for faster, more accurate CAE solutions.

With the release of Moldflow Plastics Insight (MPI) 6.0, Moldflow will deliver several major solver enhancements that support the overarching goal set for this release: to reduce total project turnaround times by improving user efficiency and productivity and enhancing product performance. MPI/3D users, in particular, will be able to realize substantial performance improvements as well as benefit from new capabilities.

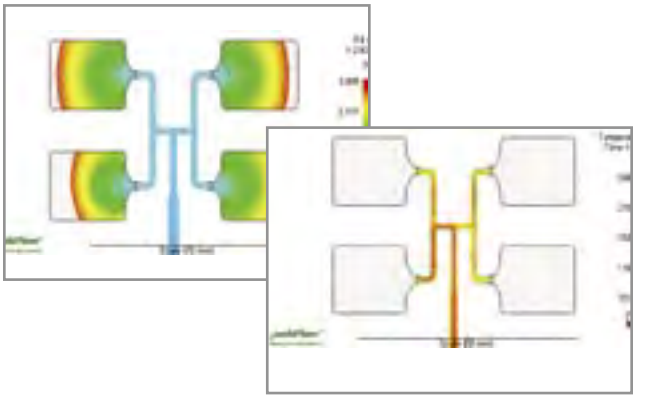
Next-Generation, Coupled 3D Flow Solver

MPI 6.0 introduces a new, coupled 3D Flow solver. The new solver replaces the current, segregated 3D Flow solver available in MPI 5.1 and earlier releases. The coupled 3D Flow solver combines pressure and three velocity components into a single matrix, which is then solved. In contrast, the old, segregated 3D Flow solver solves for pressure first and then solves for the three velocity components. This fundamental difference in the solution method translates into dramatic speed improvement, although there is a premium on memory required.

The release of the coupled 3D Flow solver is the culmination of a major research and development undertaking which aimed to develop a next-generation solver platform that could be extended easily to support multiple mesh domains and multiple injection molding processes. Although in its initial application the new solver will support 3D tetrahedral elements and beams, it can be easily extended to Midplane and Fusion meshes as well as the yet-to-be-commercialized hybrid mesh which will combine Dual Domain elements in thin sections and tetrahedral elements in thick and solid sections of a single model.

The coupled 3D Flow solver was newly developed to take advantage of the latest numerical simulation techniques. Several methods to improve speed and accuracy are featured in this new solver:

- Improved algorithms for calculating flow-front advancement now allow larger time-steps to be used to achieve greater speed without sacrificing accuracy.
- Improved algorithms that determine the rate of solution convergence in each time step contribute to the speed increase.
- A more accurate upwinding calculation improves the temperature solution, especially around corners. (Upwinding is a numerical scheme whereby the result at a downstream location in the flow path is calculated based on the conditions at a selected upstream—or upwind—location.)
- The shear heating calculation is improved to achieve greater accuracy, especially where shear heating changes rapidly along the flow path, such as near a gate.



Shear heating flow imbalance predicted by the MPI 6.0 coupled 3D Flow solver highlights the effect of rapid changes in shear heating along the flow path.

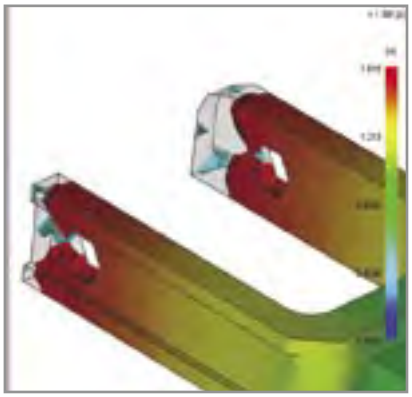
Unlike the segregated 3D solver, which allowed users to choose between Fast and Navier-Stokes options, the new, coupled 3D Flow solver is of just one type. Despite solving the full Navier-Stokes equations, this coupled 3D Flow solver is remarkably faster than the segregated solver used in MPI 5.x. On average, the coupled solver speed was found to increase by a factor of about 134 percent compared to the speed of the segregated 3D Fast solver option. Compared to the segregated 3D Navier-Stokes solver option, the new, coupled 3D Flow solver delivers a performance improvement of better than 800 percent.

Model Size (Number of Elements)	MPI 5.1 Segregated 3D Flow, Fast Option Solution Time (Seconds)	MPI 5.1 / MPI 6.0 Speed Increase Factor (Seconds)	Solution Speed Improvement (Percent)
23,936	290	238	122%
86,083	806	638	126%
74,279	1,331	938	142%
82,401	1,556	1,220	128%
90,767	696	512	136%
240,846	4,135	2,551	162%
522,656	4,231	3,307	128%
897,293	18,084	13,766	131%

Comparison of Segregated 3D Flow, Fast Option and Coupled 3D Flow Solver Performance.

Other new features available with the coupled 3D Flow solver in MPI 6.0 include:

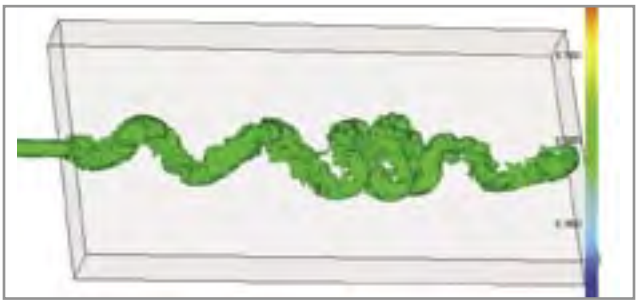
- New 3D analysis capabilities to predict air traps and to simulate gas penetration in 1D beam elements.
- Unique, first-of-its-kind capability to simulate the phenomenon of jetting. This innovative technology gives MPI users a powerful tool for designing gates in automotive lenses, where the initial flow of melt through the gate can lead to visible defects.
- Support for 3D meshes created in previous versions of MPI.
- Can be used with both thermoplastic and thermoset materials, including for microchip encapsulation and underfill encapsulation applications.
- Supports all capabilities of the segregated 3D solver used in MPI 5.x, including gas-assist, fiber, core shift, insert overmolding and two-shot overmolding applications, as well as inertia and gravity effects.



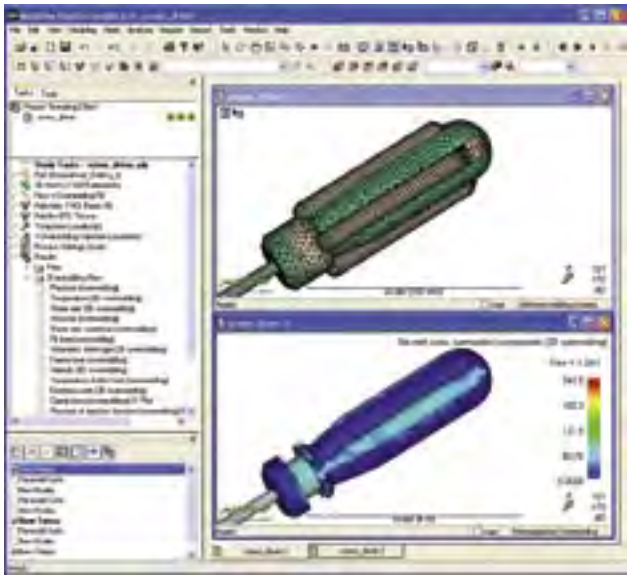
New air traps result overlaid with fill pattern now gives MPI/3D users more explicit information to better predict effects of air traps and determine appropriate venting locations.

New Re-melt Zone Result in 3D Overmolding Analysis

With part insert overmolding and two-shot, sequential overmolding processes, there is a potential for re-melting to occur at the interface of the two components. A new result is provided in MPI 6.0 to highlight areas of the first shot or plastic part insert which have been reheated to above the material's transition temperature. The objective of this result is to alert the user to the potential for smearing of the first material into the second material.



New jetting prediction allows users to test gate design changes to eliminate this phenomenon, which is particularly useful in applications where it is important to avoid visible defects, such as automotive lenses.



New re-melt zone result alerts users to the potential for smearing to occur at the material interface in overmolding applications.

3D Warp Solver Speed Increase

MPI 6.0 features two new methods to increase the speed of the 3D Warp solver.

New AMG Matrix Solver

A typical 3D Warp solution involves two steps: assembling a solution matrix followed by the actual iterative solution of that matrix. The latter step represents approximately 70 percent of the total analysis time, depending on model complexity. MPI 6.0 introduces an Algebraic Multigrid (AMG) matrix solver that delivers a substantial reduction in the time spent in the second step, at the cost of an increased memory requirement. As shown in the table below,

the overall solution speed increased on average by a factor of about 693 percent (see table below).

Model Size (Number of Elements)	MPI 5.1 3D Warp Solution Time (Seconds)	MPI 6.0 3D Warp, AMG Matrix Solver Solution Time (Seconds)	MPI 5.1 / MPI 6.0 Speed Increase Factor (Percent)
102,050	12,956	2,227	582%
120,027	17,654	1,593	1108%
301,081	22,615	6,952	334%
305,859	42,259	6,761	625%
237,952	59,713	6,147	971%
244,036	69,635	7,210	966%
569,359	72,219	27,419	263%

3D Warp Solution Speed Increase Using the AMG Matrix Solver.

Mesh Aggregation

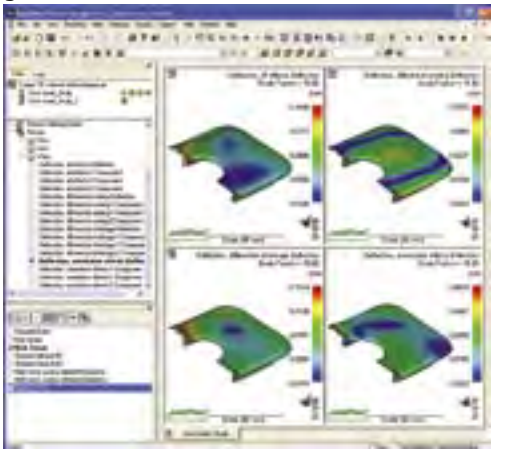
The 3D Warp solver in MPI 6.0 includes a new option to use coarse-through-thickness (aggregated) mesh, which reduces analysis time and memory requirement in most cases. It is important to note that the 3D Flow, 3D Cool and 3D Fiber solvers continue to use the regular 3D mesh comprising six or more layers of tetrahedral elements.

The memory and solution time problems with the 3D Warp solver stem from having to upgrade first-order (4-node) tetrahedral elements to second-order (10-node) elements to ensure accuracy of the structural solution in thin geometries. This results in a larger solution matrix, and thereby a longer analysis time. The problem compounds when a model has a higher number of elements to begin with.

The 3D Flow, 3D Cool and 3D Fiber analyses require sufficient layers through the thickness to capture the changes in temperature, shear rates, viscosity, shear stresses, orientation, etc. However, the 3D Warp analysis may be run on a mesh with fewer layers of elements without compromising solution accuracy. Using the aggregated (two-layer) mesh, the 3D Warp analysis typically runs three to eight times faster and uses only 30 to 50 percent of the memory required to complete the analysis on a standard mesh. The mesh aggregation is done automatically and requires no user input. At the end of the 3D Warp analysis, the results are mapped back to the original mesh.

Calculate 3D Warp Components

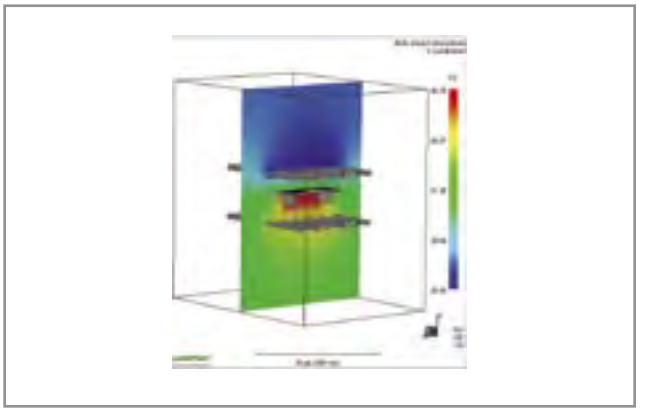
A much-requested user enhancement has been implemented in MPI 6.0 to allow the 3D Warp solver to isolate the causes of warpage. Through this enhancement, deflections due to unbalanced cooling, non-uniform shrinkage and fiber orientation are calculated in addition to the total deflection. The insight gained through studying this additional data is important in trying to diagnose and correct part warpage.



MPI 6.0 delivers a much-requested enhancement to calculate deflection due to the three components of warpage, as well as the total deflection, for 3D Warp analyses.

New Internal Mold Temperature Result

Users performing cooling analyses on 3D models will now be able to view the mold temperature distributions through the mold interior. Sectional cutting planes can be set up to view these temperatures. This result can be helpful in optimizing cooling channel placement to achieve effective heat extraction from the plastic material and efficient heat dissipation through the mold.



New internal mold temperature result allows users to view temperature distributions through the mold interior, thus providing better data for optimizing cooling channel placement.

continued on page 32

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Rigorous Mold Tryout: A Molder's Perspective on Manufacturing Quality Parts

By Gene Wells, Senior Process Engineer, DJ/Nypro Plastics

In today's competitive environment, customers are placing increasingly stringent demands on third-party molders. Specifically, they require zero defects in manufactured parts, and low-cost molds and materials. However, it's often difficult to meet these demands because of problems associated with the mold's design and build—a direct result of cutting corners for cost. My experience has taught me that when mold designers, mold builders and molders work together in certain ways they can build capable low-cost tools that meet customers' demand for zero rejects.

Collaboration Is Key

The mold designers and builders are responsible for building a capable tool that can absorb variations in the production process. Nonetheless, the mold designers and builders often don't consider important variations in process conditions when proofing a tool. As a result, even simple requirements—such as getting a part out the first time it's ejected—may not be met. Further, making changes and performing additional tests can cost a lot of money and time and create unnecessary wear and tear on the mold.

Rigorous mold tryout is about building a mold so that the molder does not have to "break the rules" to get the mold up and running. Rigorous mold tryout can identify problem molds that have narrow process windows before full-scale manufacturing begins and bad parts are produced. Ideally, molders would be involved in the mold design and building process early on.

In many organizations, there is one person who makes the process work. Is there a "go-to" person in your organization who stands by a machine "processing" a mold for flash, shorts, dimension, etc.? What do you do when that "go-to" person is not available?

Getting Started

Have you noticed that a particular mold seems to need attention every time it runs and no one thing seems to work in every situation? Have you ever wondered why you can be running merrily along and all of a sudden parts go from good to bad? Are parts from certain molds frequently rejected internally and externally? What is going on?

There are a variety of causes for run degradation. One of the most important reasons, however, is a large viscosity shift followed by large static and dynamic pressure losses. Injection molding is more sensitive to these variations in process conditions than most types of molding processes.

Therefore, the mold should be designed to withstand large variations in process conditions and still produce good parts without "breaking the rules." Having such a capable tool also means that any molder can start and run production with it. So, in addition to collaboration in designing and building the mold, rigorous mold tryout is required.

Establish Flow Rate

First, flow rate must be established. How is this usually done? Is it even studied at all? I haven't met too many molders who know how important flow rate is, much less try to optimize it. The sad fact is that it's so easy to do.

Think of an injection molding machine as the best rheometer there is and begin evaluating the process with at least 90 percent of the machine injection rate. Then, decrease the fill speed and document the viscosity change, noting where viscosity takes a sharp turn upward. This is the shear rate curve, based on shear during fill.

Rigorous mold tryout is about building a mold so that the molder does not have to "break the rules" to get the mold up and running.

Flow rates should be minimized where the viscosity takes a sharp upward turn, the process becomes supersensitive to fill rate changes caused by various changing factors like pressure gradients, molecular alignment, etc. When the viscosity changes and the machine is load-sensitive enough, the process gets extremely sensitive to fill speed changes, which can result in amplified pressure losses.

Knowing this, what should you do if you have a burn only because you are filling it fast? Rather than weaken the process by slowing down, fix the burn by venting, or better yet, have venting built into the tool in the first place.

Control Flow Rate

You can probably imagine what happens next. Your most skilled technician does his best finessing only to find, a viscosity change has yielded shorts or that a flash supposedly fixed suddenly got worse. Then, he thinks he's solved it but a few bad parts made it to the customer.

What if your injection pressure reached maximum level when you filled the mold? This is a very undesirable situation, as you are no longer in control of the flow rate, the variable that affects viscosity the most. In this situation, determine where the maximum loss is inside the mold or move to a machine with a higher intensification ratio. Slowing down may be an option as long as you can decrease the pressure losses and maintain a high enough fill pressure to compensate for the increased variation.

If the viscosity increases by means other than the flow rate, the machine will require more pressure. In this case, be sure that you are not close to the pressure differential between the flow control valve and the pump.

It would be better to test the mold a little more in the beginning and know its weaknesses. If you address these weaknesses early on, they won't trouble you later.

Offset Pressure Loss

It's important to have adequate pressure to offset the effects of static pressure loss during the packing phase. Quantifying pressure loss is crucial to offset these effects. It would be negligent not to look inside the cavity for this type of information. Consequently, the mold should generally be equipped with cavity pressure sensors. In some cases—for example, if you are molding buckets—it may not be required to install transducers if you are able to pack the mold well without negative effects. But when producing tight-tolerance and safety-restraint equipment, it might be foolish not to install transducers.

In addition to quantifying pressure loss, understanding it during sampling is critical, because it allows you to define steps to control and monitor the pressure loss. Here's an example of what you may see if you packed the part to a small short and measured the loss from the injection pressure: if a short occurs at 1,000 psi, it's safe to assume that there is a 1,000-psi loss from injection to the end of fill. But, if you added another 1,000 psi, it wouldn't mean there is 1,000 psi at the end of fill.

Why? Because of static pressure loss caused by poor transmission through long polymer molecules. There is a certain point in pressure loss where "things" really get critical. Be aware of that and develop measures to offset the effects of static pressure loss. Also, be sure to find out where the highest loss occurs and, if possible, reduce it.

Reduce Normal Variations

Begin with the material manufacturer's minimum and maximum limits and use the middle as starting points for the variables. You start the process from there with the goal to change them as little as possible. If change is required, try to stay within the supplier's recommended limits. If you have to operate outside the recommended range, identify the limiting factors and attempt to correct them.

You must try not to change the temperature, because changes will affect the cooling rate and cooling time. At this point of the process, the cooling time is set at whatever value required to make the part rigid enough to be ejected. I have found that meeting the quoted cycle time could mean "breaking the rules" and going outside the supplier's specifications. In this case, you have to weigh the options carefully. Setting parameters out

of the specifications is a last resort. Unfortunately, it does occasionally happen. So, it's important to focus on reducing normal variation in all phases of the production cycle.

Stay within Material Specs

You may ask, "Does it really matter if I am out of the supplier's specifications as long as I am making an acceptable part?" Yes and no. If you have a problem down the line and the customer is

concerned, the material supplier will point out what you have not done to solve the problem. Even if you clearly explain why you didn't try certain things and why you decided on bending the rules and doing a work-around, it probably wouldn't be good enough for the customer. Many times, molders bend the rules without informing the customer about legitimate concerns, the possible outcomes of molding under poor conditions and the conditions required to accomplish good results.

Surprisingly often, the root cause of the problem and the work-around would likely be something the customer couldn't live with. Therefore, it is important to explain the problems and potential implications up front and in case it becomes an issue later in the manufacturing process. Having said that, wouldn't it be better not to let it get to that point?

Flag the Tool and Expect Rejects

When any of the main process variables is compromised, flag the tool as being incapable for production. If you have to pack parts with just enough pressure to keep from over packing them— a tooling or tool design issue—and those two pressures are within a narrow range of one another, it is likely that you will make a short. At this point, you would have to explain to the customer that it's highly likely you will produce and ship rejects. Once made, however, it is nearly impossible to keep such parts from reaching the customer.

My experience has taught me that when mold designers, mold builders and molders work together in certain ways they can build capable low-cost tools that meet customers' demand for zero rejects.

While we try very hard never to ship a bad part, it is inevitable that we will fail if the process is unstable. Customers don't like to hear about getting bad parts, and they are even more upset to receive them. While we didn't build the mold and, unfortunately, we weren't part of the qualifying process, it is still up to us to explain why we shipped a product that doesn't meet customers' expectations and isn't going to pass the tests.

Cost of Rejects vs. Fixes

A current trend is getting molds built faster and cheaper overseas. When we put molds through rigorous mold tryouts, however, we find that we have weeks and sometimes months of work to do to make the tool capable of withstanding normal process variation. In some cases, we were able to avoid rejects from transfer tools because we documented the mold's incapability up front. If the reject happened, customers would not able to hold us solely responsible, because we simply restated the documented terms and mold's capabilities.

Of course, as a responsible molder, we offer alternatives to get out of this uneasy situation. Often, however, the customer is not very receptive when the cost to get a transfer tool fixed is $5,000 to $10,000. This is especially the case when the molder who previously used the tool never asked for repairs. But this is probably a main reason why many of these molders are no longer in business.

This method of handling tools and rejects is still very common in the industry because, historically, it has always been like that and "some hero" could always make the process work. So, why should we change? Because the market is changing.

Past, Present, Future

Customers' growing demands for zero rejects and low-cost, high-quality tools and parts are driving change. Molders are getting ready to meet this challenge, but customers have to recognize that they are responsible for the tooling's capabilities too, even though most customers don't want to hear that the tool is the problem if you make and ship a bad part. Especially if you find that the tool isn't capable and you allow running it in your shop anyway, it can happen that customers put you on costly sorting programs. Unfortunately, I still often simply hear customers say, "Just don't ship one reject—ever!"

Is shipping zero rejects possible? When I ask that question to a group of molding professionals, they often have a funny look on their faces. Well, I believe it is possible if we don't "break the rules" and we have a robust tool. Getting there takes some time, though. We need two things in place at all times: process control and process monitoring. Control is to reduce normal variation and monitoring is to detect abnormal variation. No process is good enough to prevent abnormal variation from occurring. So, there must be tools in place to detect and segregate variation when it happens.

Nonetheless, the industry's changing, and is also forcing molders to be extra careful when bringing in new tooling. Unfortunately, the traditional method of sampling a few parts at the mold builder's site and then transferring the tool to the molder is still very common. But, it is not hard to make a few good parts with a bad mold, because you can change parameters without thinking about the manufacturing process. We all know, however, that this way is not working in the long-term. Mold designers, mold builders and molders need to work together to design and build low-cost, high-quality tools that meet customers' demand for zero rejects. ▮

Gene Wells is a Senior Process Engineer for DJ/Nypro Plastics located in El Paso, Texas. Gene is certified Master Molder II and is responsible for the capability and manufacturability of current and new tooling. Nypro El Paso, a DJ/Nypro joint venture company, provides injection molded products and services, in partnership with customers in the consumer, electronics/telecommunications, healthcare and automotive industries.

Shotscope 4.0 Enhances Productivity and Efficiency

By David Rotondo

Moldflow's Shotscope® system is a critical quality analysis technology designed specifically to prevent defective parts from entering the supply chain. Version 4.0, released in July 2005, is loaded with exciting enhancements, both large and small, which help improve manufacturing productivity and efficiency in injection molding and die casting operations.

Automatic Shot Diversion after Downtime Occurrence

One of the most widely used features in the Shotscope system has been the ability to divert product when a process violation occurs. Shotscope 4.0 now adds to this functionality by allowing the system to automatically divert product after a machine downtime occurrence.

When a machine has been brought back into production after a period of downtime, there is an additional amount of time that is required for the machine to stabilize. The parts produced during this time period are of unknown quality and should be diverted and counted as scrap.

Shotscope 4.0 allows the user to specify the number of cycles that will be automatically diverted after a downtime event occurs. The user-specified Scrap After Downtime Event value is stored in the job template, which allows this value to be retrieved automatically each time that job is run.

Labor Tracking Improvements

Shotscope 4.0 has dramatically improved labor tracking capabilities with the addition of several key features, including the ability to log multiple operators on to one machine, automatic logout at the end of a shift and support for electronic logon/logoff using swipe cards with bar codes or magnetic strips.

Two Phases of Independent Sample Rate Control

Shotscope 4.0 now enables users to enter two, independent sample rates per cycle. For example, a user can collect data at five milliseconds (0.005 second) per point during the filling phase, then reduce the sample rate to 10 milliseconds (0.010 second) per point during the holding and recovery phases.

By setting independent sample rates for two phases of the molding process, the number of data points collected for each shot profile is greatly reduced. The benefits are significant: critical data can be stored and retrieved faster, overall network traffic is reduced and more shot profiles can be stored before archiving.

Automatic Scrap Input Counter

The Shotscope system has always had the ability to automatically count defect parts via digital inputs. Shotscope 4.0 adds new features that allow the system to count rejects by part or shot.

When counting by part, the system tallies one reject for each time the digital input signal is activated. When counting by shot, the system rejects the entire shot (based on current cavity levels) each time the input signal is activated.

This enhancement allows users to collect reject information automatically from downstream, ancillary equipment that can reject product after the molding process is complete.

Enhanced Job Template Editor

Shotscope 4.0 introduces a new and improved job template editor. In the past, it was not possible to change resources or eliminate job templates; customers reported instances of creating templates with incorrect resources, sometimes without realizing it until the template had been used on several jobs.

It is now possible to copy data from one template and create a new template. This procedure allows users to start a new, correct template and copy all

of the contents. The enhanced template editor also allows the user to edit all of the template-related fields.

Job Suspension at the Operator Interface

Sometimes the simple enhancements are the most popular. The job suspension feature has always been part of the Shotscope system, but it previously required a higher security status to access it. Now in Shotscope 4.0, job suspension can be controlled within the Operator Interface module. Operators are able to suspend the current job, start a new job, then resume the first job when required resources become available. This is especially valuable when mold problems occur and a job must be suspended in order to repair the mold.

Touchscreen Backlight Screen Saver

Shotscope 4.0 includes a custom screen saver that works in conjunction with the monitored events, thus assuring that information will be displayed when attention is required. The Shotscope screen saver disables the display the same way all screen savers work, after a specified duration of inactivity. The difference is in how the display can "wake up" or reactivate.

Users can configure the display to reactivate after one or more system events, including: machine shutdown, one or more process parameters are out of specification, all process parameters are within specification or the machine goes into an "unknown" condition. The user can also manually reactivate the display by touching the touchscreen or the keyboard or mouse.

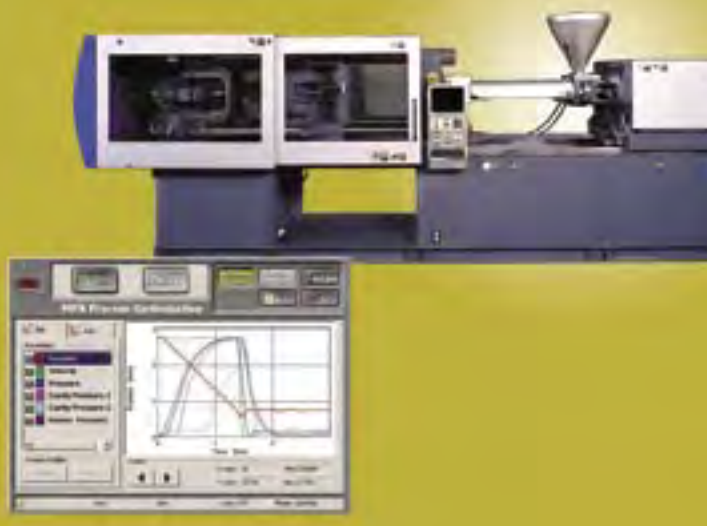
The Shotscope 4.0 screen saver also includes a backlight saver function which can help to extend the life of LCD backlight displays.

Like all Moldflow Manufacturing Solutions products, the Shotscope 4.0 release provides new capabilities intended to enhance quality, manufacturing productivity and efficiency for our customers. ▮

For more information about Moldflow Shotscope, visit www.moldflow.com.

SHOTSCOPE
Process Monitoring

Shotscope is a critical quality analysis technology designed specifically to prevent defective parts from entering the supply chain.



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MPI/Synergy Enhancements Boost User Productivity

By Murali Annareddy

Typical CAE analysis projects involve several phases, from importing geometry, to meshing the model, setting up the analysis, running the analysis, reviewing the results and creating the project report. Users have found from long experience that saving time during any phase of the workflow directly reduces the total time required to complete a given project. A primary objective for the upcoming Moldflow Plastics Insight® (MPI®) 6.0 release was to identify bottlenecks in this workflow and provide solutions to improve user efficiency and productivity.

Key enhancements have been implemented in the MPI/Synergy user interface to achieve this objective. Synergy is MPI's pre- and post-processor, and users will find a host of changes in the MPI 6.0 release which directly affect workflow and productivity issues.

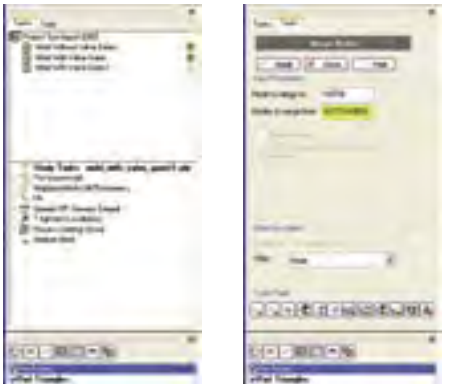
Usage scenario of Merge Nodes feature in MPI 5.1 (top) and MPI 6.0 (bottom) is an example of how the new panel-based user interface improves organization and reduces screen clutter.

Panel-based Modeling and Meshing Tools

Creating, editing and validating geometry and mesh require substantial interaction with the part model. Having uninterrupted access to the part model in the graphics window can greatly improve user efficiency and productivity. This was the motivation behind a major reorganization of the user interface in MPI 6.0. At the core of these modifications is the concept of panel-based modeling and meshing tools.

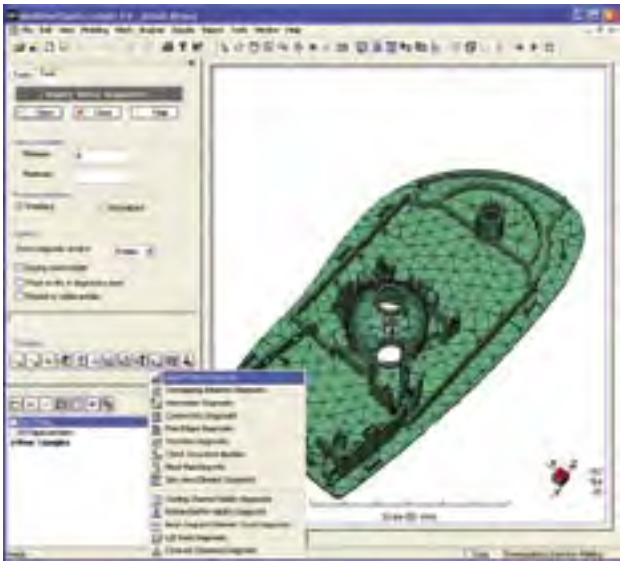
The modeling and meshing tools, which in previous releases opened on top of the part model, now have been migrated to the panels on the left side of the Synergy window. This simple conceptual change contributes to an improved organization, smoother workflow and reduced screen clutter. The part model remains visible in the graphics window, without being obscured by the tools dialog, as it was previously.

As part of this user interface reorganization, the Project and Study panels have been consolidated and made available under a Tasks tab. The modeling and meshing tools are now available under a newly created tab, appropriately titled Tools. The Layer panel continues to exist as an independent entity. While users must switch between the Tasks and Tools tabs in their panel, the Layer panel can be accessed at all times.



Layouts of the Tasks (left) and Tools (right) tabs.

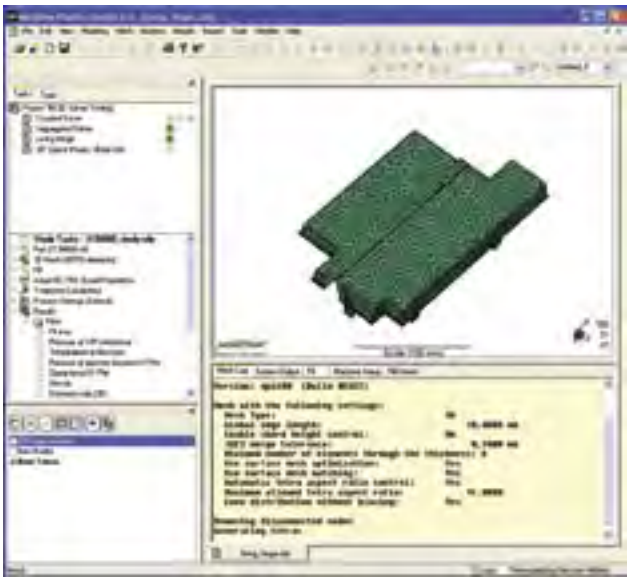
To further improve accessibility, a Toolbox has been implemented on the Tools tab. Through this Toolbox, any of the model creation or mesh editing tools can be accessed easily, without having to pick from the Modeling or Mesh menus.



New Toolbox provides easy and quick access to all modeling and meshing tools.

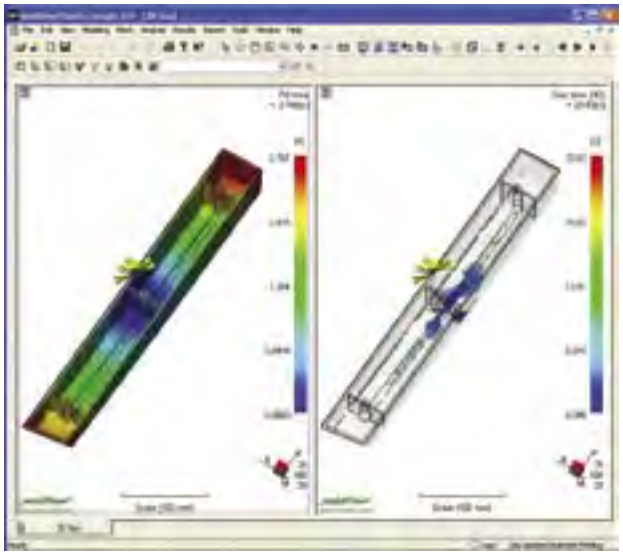
Continuing on the theme of improved organization and reduced screen clutter is the consolidation of all textual log windows (mesh log, screen output, results summary, etc.). The newly consolidated textual log window is tied to the model graphics window, thereby building an association. Through this consolidation, it becomes easier to manipulate the model based on information from the log window. The display of the textual log window can be toggled on or off.

Display of textual log windows in MPI 5.1 contributed to screen clutter



Consolidated textual log window in MPI 6.0 improves access to information without obscuring the model display.

A single mouse-button click will hide all of the panels, including the Tasks and Tools tabs and Layer panel, allowing users to utilize all available screen space to display the graphics window. This can be quite useful both during model editing and results display.



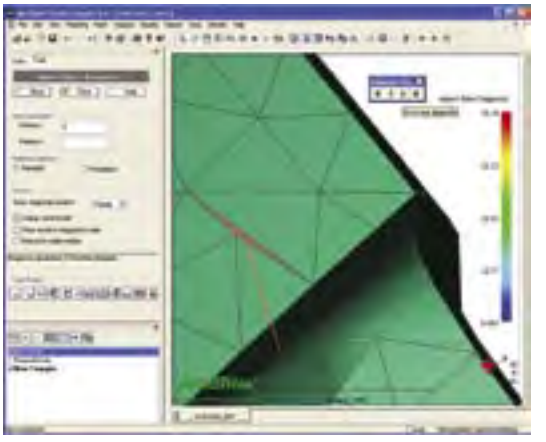
In MPI 6.0, users can hide all panels to enlarge the model area.

Directed Diagnostics

Synergy contains a comprehensive suite of diagnostic tools that allow users to validate the quality and suitability of various aspects of the mesh prior to running an analysis. Once a diagnostic query is invoked all mesh entities (part elements, beam elements, etc.) that match the query can be isolated to a diagnostic layer. This allows users to drill down and take corrective actions, if necessary.

MPI 6.0 augments this process through the paradigm of directed diagnostics. There are several components to this feature. At the heart of the new capability is a navigation tool that allows users to step through the diagnostic entities.

The diagnostic entities are automatically sorted by the order of their numerical value or severity, thus allowing users to start with the entity that is highest in value or most severe and progress to the entity that is lowest in value or least severe. Users can also jump to the first or last entity on the list. With each selection, the model is automatically oriented to give the best visibility of the diagnostic entity. Lastly, for diagnostics that have numerical values associated with them (for example, aspect ratio of elements), the value is displayed in the status bar. The combination of these tools allows users to very quickly and efficiently complete the validation of mesh quality and suitability.



Example of directed diagnostics in MPI 6.0.

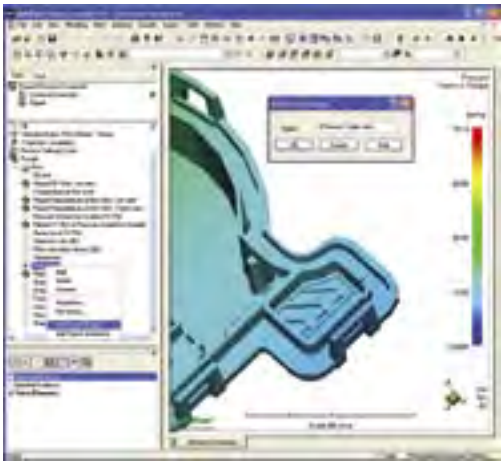
Expanded Report Generation Options

The use of project reports as a communication medium is widespread among MPI users, and MPI releases have included tools to support the report creation process for many years. These tools include the automatic HTML report generator as well as the ability to export images and animations. Today, however, Microsoft® Word and PowerPoint formats are fast replacing HTML as the preferred format for project reports. This is mainly due to the greater accessibility and superior formatting and editing capabilities of these products.

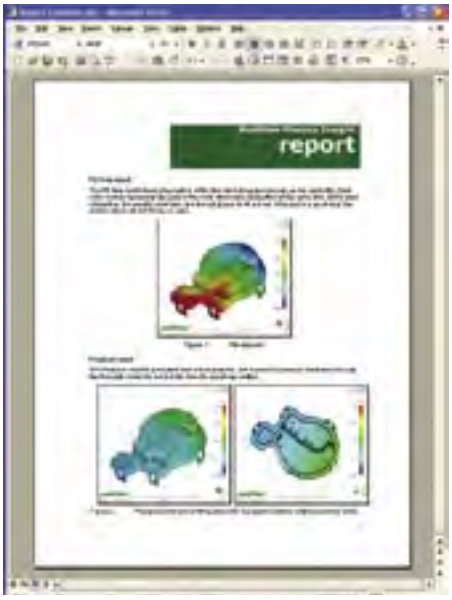
To support this growing trend as well as to facilitate concurrent review of analysis results and creation of report content, several new capabilities have been implemented in MPI 6.0.

When users are reviewing analysis results, they can create report bookmarks. A report bookmark is associated with a result and remembers the view orientation of the targeted report image. Multiple report bookmarks can be created for the same analysis result. For example, users may want to create two report bookmarks of a pressure result, one showing the entire model and another showing the close-up of an area of interest (such as the gate region). Report bookmarks are saved with the project and can be edited at any time.

After all the report bookmarks have been created, users can specify the format of their report by choosing from HTML, Word document and PowerPoint presentation formats. Once a report is created, live connectivity is maintained between MPI and the report to allow for the real-time update of both static and dynamic (report) content.



Analysis results marked for inclusion in the MPI 6.0 project report.



Example MPI 6.0 project report shown in Microsoft Word format.

Enhanced 3D Mesh Diagnostics

Several improvements have been made to the Mesh Repair Wizard to aid in diagnosing and fixing 3D mesh problems:

- Before initiating the 3D mesh diagnosis/repair, users now can pre-select which checks to perform.
- A new option to limit diagnostic checking to elements in visible layers has been implemented. This option is extremely useful when working with large 3D meshes, as it improves the speed of diagnostic checking.
- The effectiveness of automatic mesh fixing functions has been improved.
- Automatic fixing has been extended to correct collapsed regions of the 3D mesh.
- Additional fixing capability has been implemented through the identification of isolated, extremely large elements by comparing their volume to the average volume.

Local 3D Mesh Refinement

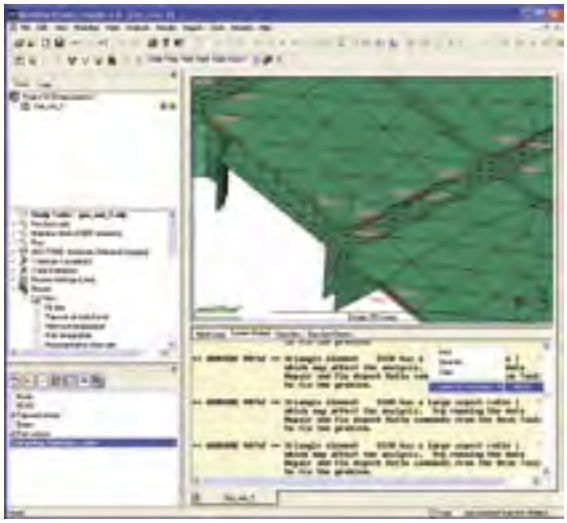
In MPI 6.0, it is now possible to perform local mesh refinement to increase or decrease the number of layers of elements in a specific area of interest. Through this option, users can achieve selective mesh refinement without affecting the entire model.

Export Part/Runner/Cooling Model to CAD System

MPI 6.0 now provides the capability to export runner system and cooling circuits in IGES format for further use in a 3D CAD modeling system. Additionally, solid surface part geometry can also be exported. Through this feature, runner and cooling circuit designs optimized in MPI can now be very quickly and effectively implemented in the CAD system prior to cutting the mold.

Enhanced Diagnosis of Analysis Errors and Warnings

In addition to keeping the user abreast of the analysis status, the MPI analysis screen output log provides a list of errors and warnings. While the analysis errors and warnings can originate from among the most critical. A new capability has been implemented in MPI 6.0 to speed up the diagnosis of such mesh-related problems. Through this feature, it is now possible to isolate the problem mesh entities to a selection list automatically. Users can review the entities on the selection list and access the various mesh editing tools to take corrective actions. An added capability of this feature is the flexibility to isolate mesh entities specific to a single warning or error.



In MPI 6.0, problem elements are isolated automatically to expedite diagnosis and correction.

MPI 6.0 Release Delivers Productivity Improvements

Key enhancements implemented in MPI 6.0 Synergy user interface address workflow bottlenecks identified in previous releases and provide new solutions to improve efficiency and productivity. Saving time and effort in common pre- and post-processing tasks such as geometry and mesh validation, error diagnosis and correction, or project report preparation, can allow users to more easily analyze complex parts, compare more alternatives and ultimately, complete more projects.

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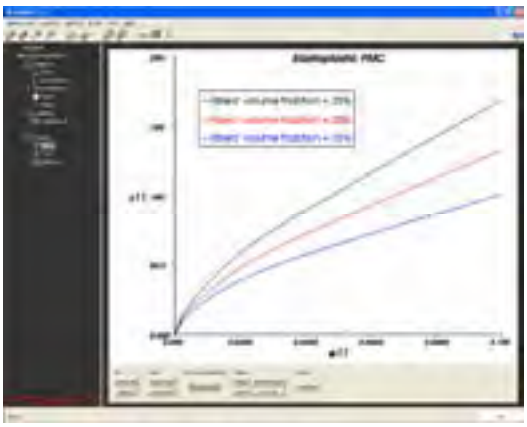

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DIGIMAT to CAE interfaces provide a general-purpose, integrative modeling solution that bridges the gap between process simulation and end-product FEA via accurate and fully predictive material modeling solution.

One typical solution procedure…

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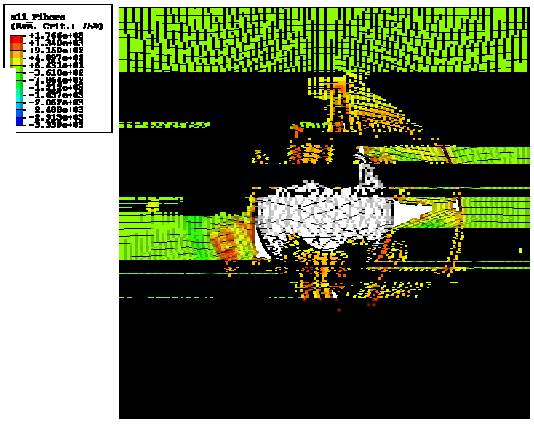
Fiber Orientation Nonlinear material Non-linear FEA



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ITT Industries Optimizes Production of Very Thin Parts

By Catherine Baghdiguian and Michel Bruehwiler

ITT Industries, Dole specializes in the design and manufacture of microphone switches and connectors for the mobile telephony, automotive, medical and data processing applications industries. Their products are marketed under the Cannon brand.

Founded in 1928, the Dole site is located in the Jura region of France. Part of ITT Industries since 1972, the Dole site currently has 450 employees. As operations at this site are tightly integrated, the design, manufacture and assembly of products and the tool shop are all at the same site. Production is highly automated, with dedicated assembly lines for each product. The manufacturing shop includes 40 injection molding machines with clamping force ranging from 80 to 100 tons. The Dole site produces approximately 500 million parts per year.

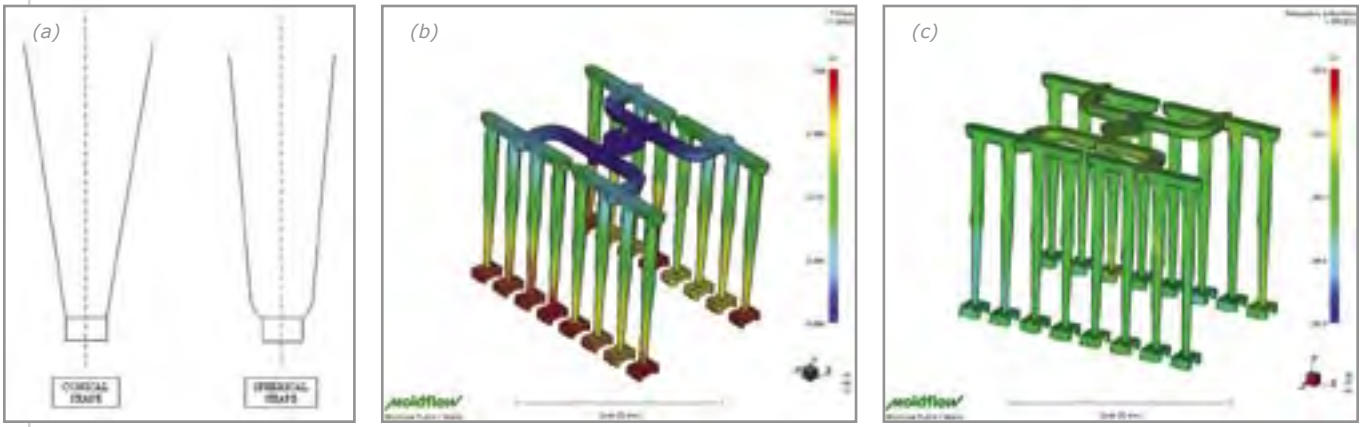
The connectors designed and manufactured at the Dole site are extremely small—some no longer than five to six millimeters. To comply with stringent customer requirements, the manufactured connectors must have the longest service life possible and meet certain standards for lead-free welding of components on printed circuits. Engineers at this site use Pro/ENGINEER® (PTC) CAD software to design their products. Historically, however, no plastic flow simulations were carried out. As a result, many product design-related issues were only discovered after production had been started.

Specifically, Dole site engineers realized that, in some cases, the injected plastic flowed irregularly through the very small gates and cavities and resulted in a high number of faulty parts. Consequently, the engineers needed to find quick yet permanent solutions to improve the quality, even though the products were at a late stage of their design-through-manufacture process. In addition to incurring the cost of the faulty mold, correcting these process problems at this late stage of the production process often meant a delay getting the products to market—often with dire economic consequences.

Mr. Wilfrid Elien, a developer engineer of plastic injection molds at the Dole site, recognized the potential for improvement and suggested using Moldflow Plastics Insight (MPI) tools to validate the product designs before production. During his time at schooling, when he used MPI for six months, Mr. Elien recognized the real benefits of doing design and simulation concurrently.

ITT also realized the value of using MPI. In July 2004, the Engineering and Design Department purchased MPI/Flow, MPI/Cool, MPI/Warp, MPI/Fiber and MPI/3D modules. With these tools in hand, the engineers were ready to address existing manufacturing concerns and perform design and simulation steps simultaneously early in the product development process.

Elien describes the benefits he gained through MPI: "Using the MPI software enabled us to re-examine the design of the parts that presented problems during the filling. Part designs are now systematically validated with MPI, and many fewer problems occur during manufacture."



Moldflow simulations helped ITT Industries, Dole to verify that modifying the sprue geometry from a conical to a spherical design (a) would enable these small, thin-wall parts to be molded successfully in a multi-cavity, three-plate mold. Fill time (b) and fkiw front temperature (c) results are shown.

Mr. Elien also says, "Thanks to MPI, the manufactured parts are of better quality and the response time to orders is reduced. The delivery schedules are also more reliable, because the majority of the problems occurring downstream are diagnosed and solved quickly."

Part designs are now systematically validated with MPI, and many fewer problems occur during manufacture.

As expected, using MPI made it possible to solve several recurring manufacturing problems at the Dole site. Elien remembers a problem with a multi-cavity, three-plate mold used to produce a small part, which is six millimeters long, three millimeters wide and one millimeter high with a wall thickness of only 0.1 to 0.5 millimeter. The gate diameter was also only approximately 0.3 millimeter. The problem was that, during the ejection phase, the sprue and runner remained stuck in the intermediate mold plate, which interrupted manufacturing. An extensive study performed by Dole site engineers using MPI resulted in a solution that involved modifying the sprue geometry near the nozzle from a conical to a spherical design. As a result, the new spherical design minimized the high shear rate domain and enabled the proper extraction of the sprue and runner.

The lessons learned from solving this particular extraction problem were used to define a new set of new mold design criteria, which apply not only to this particular mold, but also to future Dole site mold designs. Further, ITT believes that increasing the use of MPI will further improve productivity and part quality. The company hopes to optimize over-molding parts and extracting parts from molds with the overall goal of continuously reducing cost and improving design-through-manufacture processes. They estimate the cost savings due to MPI will enable them to recoup the upfront investment in less than a year.

Moldflow Communicator Aids Globally Distributed Product Teams

By Murali Annnareddy

The past decade has witnessed a widespread adoption of computer-aided engineering (CAE) software for simulating the injection molding process. Numerous companies have successfully used plastics CAE to optimize their design-to-manufacturing operations, saving thousands of dollars through a combination of reduced development and manufacturing costs, improved part quality and shorter time to market. While the general benefits of plastics CAE have been well demonstrated and are now widely understood, there is much less understanding of the assumptions, quality and applicability of specific analyses. Additionally, plastics CAE analysis is still a niche among many of the companies that perform it.

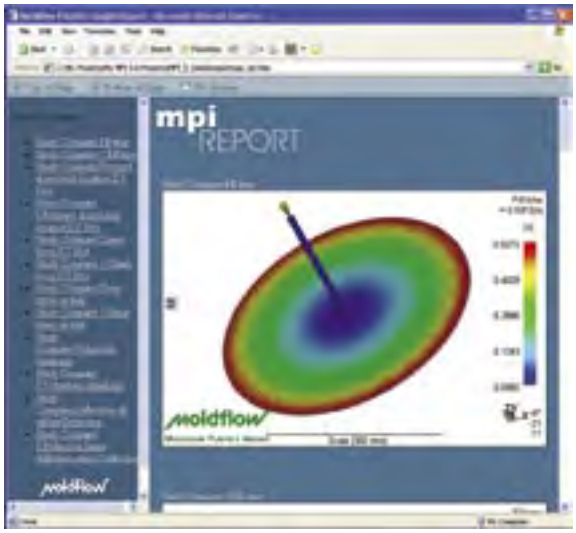
While the general benefits of plastics CAE have been well demonstrated, there is much less understanding of the assumptions, quality and applicability of specific analyses. Moldflow Communicator tackles the problem head-on.

The knowledge gained from performing CAE analyses is rarely shared across the organization. The distributed nature of the industry contributes to this situation, creating a communication barrier that is compounded by the increasing globalization of the plastics marketplace. While tooling and manufacturing outsourcing is already all too common, a growing trend is the outsourcing of analysis work. Outsourcing brings its own set of challenges, including not knowing whether the analyses were run using the desired application, model, material and process conditions.

The introduction of the Moldflow Communicator, a standalone Moldflow results quantification and visualization system, addresses these communication and applicability issues and tackles the problem head-on. In its simplest form, the Moldflow Communicator can be used to visualize analysis results generated from Moldflow Plastics Insight® (MPI®) and Moldflow Plastics Advisers® (MPA®) software. However, its true benefits lie in the ability to quantify the quality of analyses performed. This is achieved through user-specified analysis quality criteria.

Results Visualization

A key function of the Moldflow Communicator is the visualization of analysis results. This requirement addresses inadequacies of the current communication tools, which include project reports created in HTML, Microsoft Word or PowerPoint formats. These reports may include a combination of text, static images and 2D animations.



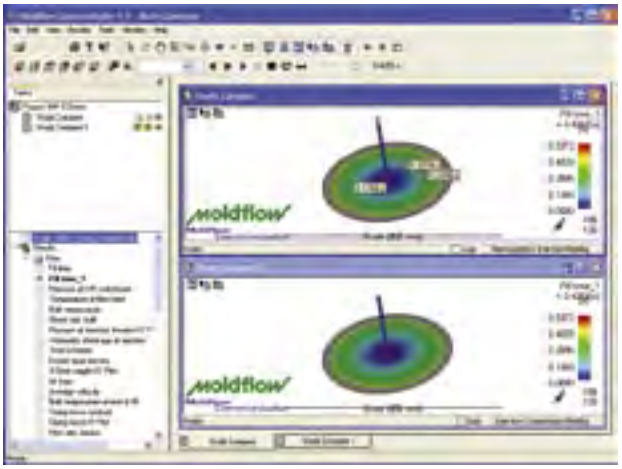
Traditional communication tools in Moldflow software, such as the HTML project report, may not be adequate for sharing critical information among distributed resources.

Says Keith Beattie, Staff Engineer at Fisher-Price, Inc., "Often I come across a project report of an analysis done by either one of our overseas vendors or manufacturing plants worldwide, wherein I wished the image was created at a slightly different angle, thus allowing me to get a better perspective. Although I could ask them to provide the analysis model with results, file sizes are a concern, especially when you only want to review a couple of results."

Through Moldflow Communicator, it will now be possible to view analysis results dynamically and interactively on 3D models, without the need to access the complete MPI or MPA product. Additionally, Moldflow Communicator features a set of powerful tools to simultaneously compare analysis results from two or more studies (a study is an analysis iteration), or from one or more studies with a set of specified analysis quality criteria. It also features options to synchronize model orientation, result

selection and result plot scale to investigate the models and results simultaneously.

Moldflow Communicator has extensive model manipulation and visualization capabilities, including the dynamic and incremental pan/zoom/rotate functions, standard view orientations, select saved view bookmarks, cutting planes and so on. Moldflow Communicator also features a comprehensive selection of result displays, including, XY plots; shaded, contour, scalar, vector and tensor plots; iso-surfaces; displacement plots; and animations.



Moldflow Communicator allows anyone to view analysis results dynamically and interactively.

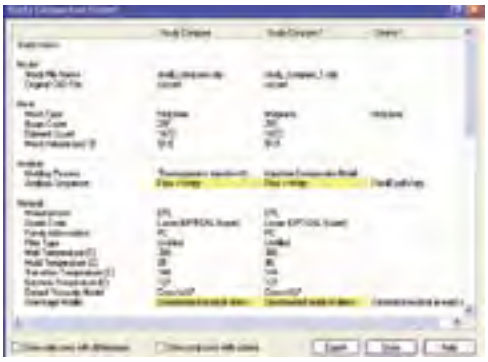
Moldflow Results File

The issue of file size efficiency is addressed through the creation of a proprietary Moldflow results file. The Moldflow results file (*.mfr) is a single, compressed file that contains model and result data for one or more studies. Moldflow analysis users have the flexibility to choose specific results for inclusion in a Moldflow results file. The upcoming MPI 6.0 release includes the capability to output Moldflow results files; a future MPA release will have similar capability.

Analysis Quantification

When a Moldflow results file is being created, certain analysis quantification information is automatically captured and saved with the *.mfr file. The quantification information includes:

- Creator information, such as user name, company and date created.
- Analysis product information, such as product name, product version and release date.
- Model attributes, such as mesh type and mesh quality.
- Analysis attributes, such as analysis sequence type, process conditions and material model.
- Result attributes, such as projected area, maximum injection pressure, time at the end of fill, maximum clamp force, maximum shear rate and more.



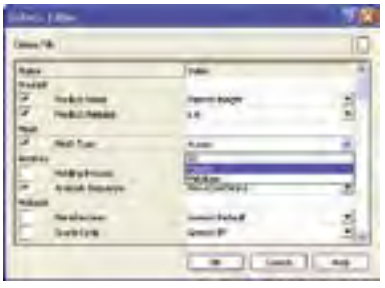
Moldflow Communicator allows users to compare analysis configurations against specified quality criteria.

Analysis Quality Criteria

Moldflow design analysis products will provide a method for users to specify required analysis attributes, or criteria. Through a comparison function, Moldflow Communicator users can easily visualize the differences between what was specified and what was obtained. An example of the analysis quality criteria in use is shown above. In the image, the table compares specified analysis criteria with an original analysis configuration and an improved analysis configuration.

Examples of analysis attributes for which quality criteria can be specified include:

- Model attributes, such as maximum aspect ratio, Fusion mesh-match ratio and more.
- Process attributes, such as maximum injection pressure, machine clamp tonnage and more.
- Material attributes, such as default shrinkage model, material melt and mold temperatures and more.



The analysis quality criteria editor allows Moldflow users to specify important information to quantify acceptable values or parameters for analysis attributes.

continued on page 32

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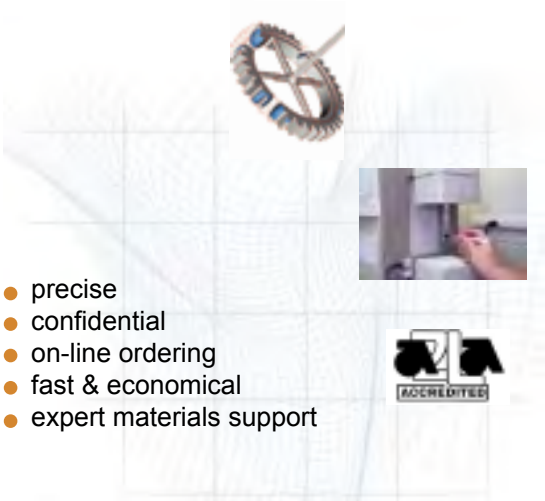

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For over ten years, the name DatapointLabs has been synonymous with on-time delivery of precision, design-quality material properties. Our *TestPaks*® provide design analysts with the unparalleled convenience of "load & go" material models for over a dozen CAE programs.

With clients spread out globally, we serve every industry segment where quality product development occurs: automotive, aerospace, biomedical, consumer products, food and toys.We find solutions to your unique testing needs.

The Matereality® Material Data Management (MDM) system permits secure global access and organized sharing of traceable material properties within and across enterprises.

Matereality® is so powerful that it effectively replaces paper as the authoritative means to store and distribute material data profiles. With capabilities far beyond simple properties viewable in most databases, it permits exchange of rich information about real material behavior between material suppliers and end users.

Moldflow Communication—continued from page 30

Availability

Moldflow Communicator will be freely accessible and can be used by both Moldflow customers and non-customers. It will be supported on Windows PC-based hardware systems. The Moldflow Communicator will initially support results exported from Moldflow Plastics Insight (MPI) 6.0. Later, it will be extended to support results from other Moldflow products, including Moldflow Plastics Advisers (MPA) software. The product will be distributed with MPI 6.0 and made available for download from www.moldflow.com.

Improved Communication Optimizes Benefits of CAE

Distributed product teams require a product to both visualize and quantify the quality of plastics CAE results data. The Moldflow Communicator was created specifically to address these needs. Through the Moldflow Communicator, the assumptions, quality and applicability of the analyses can be better understood and accounted for, and the knowledge gained from performing analyses has the potential to be shared more effectively among all participants in the design-to-manufacturing process. ▮

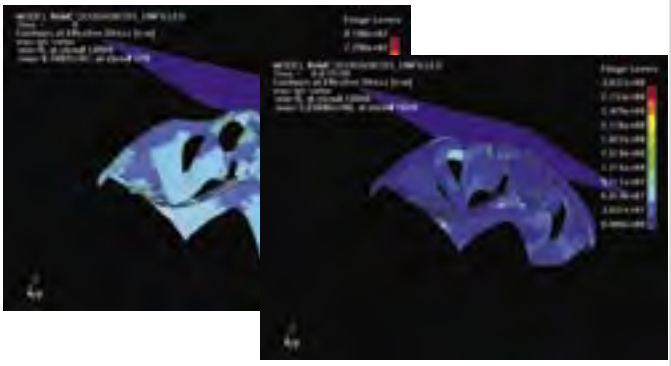
MPI 6.0 Release—continued from page 14

LS-DYNA Interface Provides Service Loading Analysis Option

MPI 6.0 includes a new interface to LS-DYNA, which is available for Midplane models. Through this interface, MPI users can export Midplane meshes and critical, analysis-specific material properties to LS-DYNA to perform more accurate and in-depth structural (service loading) analyses.

For unfilled materials, the data exported includes elastic modulus, shear modulus, Poisson's ratio and coefficient of thermal expansion (CTE) from the material database. Additionally, the layer-wise residual stresses for each element are exported.

For fiber-filled materials, similar data is exported with the exception that the modulus, Poisson's ratio and CTE values are calculated by the Flow analysis based on the flow-induced fiber orientations. Additionally, for fiber-filled materials, the fiber orientation angle is also exported.



Example of an impact analysis performed in LS-DYNA using input data from MPI. Initial condition before impact is shown on the left and result after impact is shown on the right.

MPI 6.0 Release Cuts Solution Time and Delivers User-Requested Options

The MPI 6.0 release delivers new technologies and key enhancements to analytical solvers that significantly reduce solution time, particularly for MPI/3D users. In addition, new result displays are provided to answer specific user requests for enhancements. Further, new interface capabilities add options for carrying out service loading analysis with popular structural analysis applications. All of these enhancements contribute to the goal of reducing total project turnaround times by improving user efficiency and productivity and enhancing product performance. ▮

For more information about Moldflow Plastics Insight products, visit www.moldflow.com.

Avoid Common Molding Problems with Altanium Hot Runner Process Controllers

By David Rotondo

Have you ever had a short shot get stuck in the cavity and break a core?

Have you ever had an operator inject plastic before the hot runner system is up to temperature and blow a mold seal?

Have you ever used a resin with a tight temperature window and had it overheat and expel toxic fumes into the air or harden to the point that it is nearly impossible to remove from the mold?

Any of these scenarios could have been avoided if your Altanium® hot runner process controller had been equipped with one of the many optional inputs or outputs that are available.

Options Available for All Altanium Operator Interfaces

At-Temperature Output Option

The At-Temperature output option sends a signal from the Altanium controller to the injection-molding machine when all zones in the mold are within the processing window. This signal lets the machine know that it can start making parts.

Abort Error Output Option (PCM)

The Abort Error output option sends a signal from the Altanium controller to the injection-molding machine if the mold temperature exceeds the maximum or drops below the minimum values around the processing window. The machine will immediately stop injecting and alert the operator that there is something wrong.

Choosing these options can add valuable capabilities to your Altanium hot runner process controller.

Auxiliary Output Connector

As a standard feature, the Altanium Matrix and Delta2 operator interfaces include one output option. Any of the numerous output options offered can be assigned to the auxiliary output connector located on the rear of the operator interface, labeled AUX OUTPUT (see Figure 1). The mating cable is not included with the system; however, it is a standard Conxall four-pin connector that can be found at most electronics retailers or purchased from Moldflow.

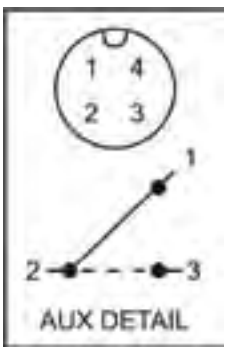


Figure 1. Auxiliary Connector Detail

Altanium hot runner process controllers can support from one to 384 zones. The self-contained controller units can be used freestanding, mounted on the mold or mounted alongside, behind or even inside the injection-molding machine. Choose among three interchangeable operator interfaces to best meet particular needs:

- *The Neo™ operator interface features a monochrome touchscreen and supports up to 12 zones.*
- *The Delta2™ operator interface provides advanced control technology for up to 48 zones through a touchpad interface and a full-color LCD display.*
- *The Matrix™ operator interface provides intelligent temperature control capabilities for up to 384 zones through 15-inch to 19-inch LCD touchscreen interfaces featuring high-contrast, full-color graphics.*

Add Multiple Options with the Altanium I/O Box

You may be saying to yourself, "I need both the At-Temperature and Abort Error output options, but the auxiliary connector only offers the ability to choose only one output option."

The addition of any input option or more than one output option requires the Altanium I/O box (Figure 2). This input/output box connects directly to the Matrix or Delta2 operator interfaces using an eight-pin communications cable.

The input and output options are sold in three packages: two options, four options and ALL. These packages are user-configurable, allowing the flexibility to change options to suit your application. For example, if you purchase the four-option package, you can choose to enable up to four input or output options in any combination. The ALL package allows you to enable every input and output option available.

Figure 2. The Altanium I/O box can be connected to Matrix and Delta2 operator interfaces to enable multiple input and output options.

Input Options

To activate any input, all that is required is the closure of two contacts on the input connector.

- Remote Standby Input Option. If the Remote Standby digital input option is turned on, it will place all the zones that have a Remote Standby setpoint into Remote Standby mode once the input signal is active.
- Remote Boost Input Option. If the Remote Boost digital input option is turned on, it will place all the zones that have a Remote Boost setpoint into Remote Boost mode once the input signal is active.
- Remote Start Input Option. If the Remote Start digital input option is turned on, it will START the system once the input signal is active. This state will remain until the STOP key is touched or Remote Stop is activated.
- Remote Stop Input Option. If the Remote Stop digital input option is turned on, it will STOP the system once the input signal is active. This state will remain until the START key is touched or Remote Start is activated.
- Remote Manual Boost Input Option. If the Remote Manual Boost digital input option is turned on, it will place all the zones that have a Manual Boost setpoint into Manual Boost mode once the input signal is active.

Output Options

All outputs are dry contacts. Whatever you put in, you will get out once the output is active.

- Alarm Error Output Option. If the Alarm Error output option is turned on, it will be activated when an Alarm or Abort condition occurs. This state will remain until the Alarm condition is cleared or reset.
- Abort Error Output Option (PCM). If the Abort Error output option is turned on, it will be activated when an Abort condition occurs. This state will remain until the Abort condition is cleared or reset.
- At-Temperature Output Option. If the At-Temperature output option is turned on, it will be activated when all zones are within the processing window. This state will remain until a zone drops out of the processing window.
- At-Boost Temperature Output Option. If the At-Boost Temperature output option is turned on, it will be activated ONLY when all zones are within the BOOST processing window. This state will remain until a zone drops out of the BOOST processing window.
- Run Light Output Option. If the Run Light output option is turned on, it will be activated whenever the green START button is active (system running). This state will remain until the red STOP button is active (system not running).
- CAN Comm Error Output Option. If the CAN Comm Error output option is turned on, it will be activated if the operator interface stops communicating with the control cards. This state will remain until communications are restored.

Taking advantage of the available add-on options can make your investment in Altanium hot runner process control technology even more valuable by enhancing your ability to detect and avoid common molding problems. ❙

For more information about Altanium hot runner process controllers, visit www.moldflow.com.

What's Your Business IQ?

By Oren Harari, Professor, Graduate School of Management, University of San Francisco

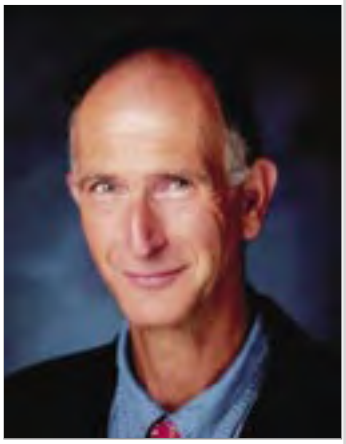
For competitive success in today's knowledge economy, intelligence is power. I'm not talking about IQ, the notorious "Intelligence Quotient." I'm talking about what I call BIQ, or "Business Intelligence Quotient." Leaders with a high BIQ do two things. One, they quickly seize new information about new technologies, scientific breakthroughs, changes in customer needs and expectations, shifts in demographics and emergence of new competitors with different business models. Two, they do something with that information, including mobilizing their organizations to create compelling and innovative solutions and products that excite customers and investors.

A diverse range of exciting and successful companies such as Jet Blue, Zara, Toyota, Louis Vuitton and Electronic Arts understand the importance of BIQ. Their product and service innovations on the front end and their cost-efficiency and value-chain innovations on the back end are cutting-edge and unique. Customers and investors recognize it.

Unfortunately, too many managers and executives do not "get it" yet. They often protect existing products, services, partners and processes rather than break new ground based on new intelligence. Some hoard information that has become outdated or simply replicated by competitors — an especially "un-intelligent" move in today's transparent economy, which, often, results in improvements of obsolete products. Continuous improvement can help companies to survive, but alone it will not help them to thrive. Sometimes, leaders wrongly assume that serial deal-making breaks them out of an earnings rut, even though more than half of high-profile mega mergers destroy shareholder value.

Japanese management scholar Ikujiro Nonaka, aptly summarizes today's competitive challenges: "When markets shift, technologies proliferate, competitors multiply and products become obsolete virtually overnight. Successful companies are those that consistently create new knowledge, disseminate it widely throughout the organization, and quickly embody it in new technologies and products." That is the essence of BIQ, and we would be wiser if we heeded Nonaka's words and insights.

Think about your customer interaction, value proposition, technology, organization and back-office operation. Are you doing the same-old, same-old? Are you clinging to familiar ground and conventional habits? Or, are you aggressively searching for information to build exciting new approaches for your enterprises? Are you teaching your employees to do the same with theirs?



BIQ is essential to developing and executing a great business strategy. Yet, the greatest strategy will not bear fruit if execution is poor. Too often, executives falsely assume that once the strategic plan is distributed, responsibilities assigned, or an acquisition is announced, then, the smooth implementation will seamlessly occur. In order to execute strategy properly, the leader must not delegate BIQ, but instead actively harness, dissect and act upon real-time information at all times. Business intelligence is a responsibility that cannot be delegated.

Here are five pointers for using BIQ and to stimulate great execution:

1. Align Operational Drivers with Your Goals

When you announce a strategic plan, align the operational drivers with your goals and track them. If being first to market with innovative products is a priority, then, intelligent execution would demand that capital allocation, performance metrics, logistics, sourcing and training all reflect that specific priority. Monitoring, evaluating and responding to the always-dynamic status of these operational drivers are fundamental components of BIQ.

2. Be Aware of the Overall Picture of Your Business

Make sure you have a clear awareness and understanding of the overall dynamic picture of your business. Sales results of a division, for example, can be misleading without knowledge of its market and customer base characteristics. Also, be aware of what salespeople promise customers, the quality of products and after-sale services, customers' reactions and attitudes and current and emerging competitors and their offerings.

3. Insist on High-Quality Information

Insist on solid information that is accurate, backed by sources that are reliable, accountable and who are not rewarded for politically massaging data. Regardless of the strategy's brilliance, if leaders

rely on distorted or incomplete data for expenses, progress towards revenue targets, cost overruns or changes in the competitive landscape, the result can be unpleasant surprises, greater risk and poor decisions—in short, inferior execution.

4. Track and Report Solid Information

Systems should consistently track and report solid information to the right people, and the output of the systems should be consistent and compatible. If, for example, only the marketing group receives regular customer feedback data, then do not be surprised if the output from R & D or operations is not customer-friendly. Similarly, if your ERP and sales system track product information differently, analyzing sales and cost figures can be fraught with errors that undermine your execution efforts.

5. Focus on Speed

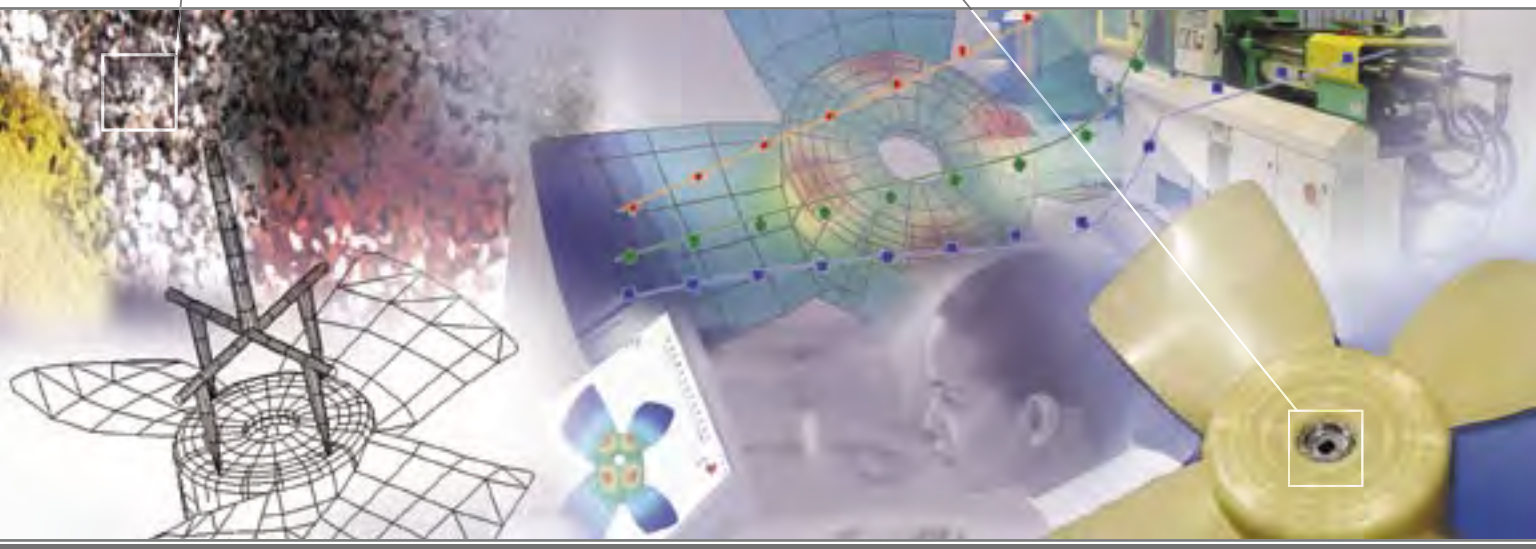
"Do it" fast because, in today's "nanosecond" economy, speed is a key factor for success and demands rapid tracking and rapid responses. Make sure you have the technology and system infrastructure and corporate culture to respond quickly. Information that is "too late" regarding problems, crises, ideas or fleeting opportunities damages both strategy development and execution.

When you execute your strategic plan or any important initiative, do you always stay in the loop? As you delegate and empower others, do you focus on the details of operations and implementations? Do you make sure that everyone gets the information required in a timely manner? Do you follow the criteria including total picture, consistent, compatible, fast and real? Do you teach your colleagues and associates to do the same?

In summary, a high BIQ helps leaders develop innovative strategies based on real trends and data points that suggest solid opportunities. A high BIQ helps leaders align their strategy with great execution. By demanding solid information, leaders with high BIQ can continually monitor the effectiveness of their strategy and the organization's progress towards its goals, making appropriate adjustments. Coupled with a strong dose of passion and courage, these are the ingredients for great leadership in today's tough market environment—ingredients that successful companies like Moldflow utilize. ▮

Oren Harari is a Professor at the Graduate School of Business, University of San Francisco, where he teaches strategic and global management. He is a prolific author and highly recognized speaker. For more information, visit www.harari.com.

From pellets to part



Accurate material properties are **critical** for **successful Plastics CAE simulations.**

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For classified advertising information, please contact David Kagan at 508-358-5848 x285, or david_kagan@moldflow.com.

Case Studies Wanted!

If your company is using a unique approach to design or manufacture injection-molded parts, we'd like hear about it, and potentially inform our readers.

There may also be potential to have an article on our web site, or have you speak at our next user group meeting.

Please contact Michel Bruehwiler
Tel: +1 508-358-5848 x289
E-mail: michel_bruehwiler@moldflow.com.

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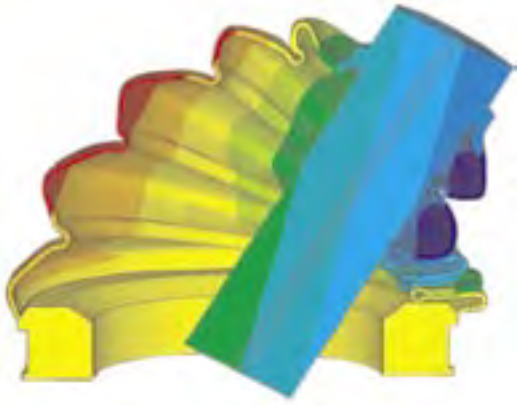

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