October 2003

Flowfront

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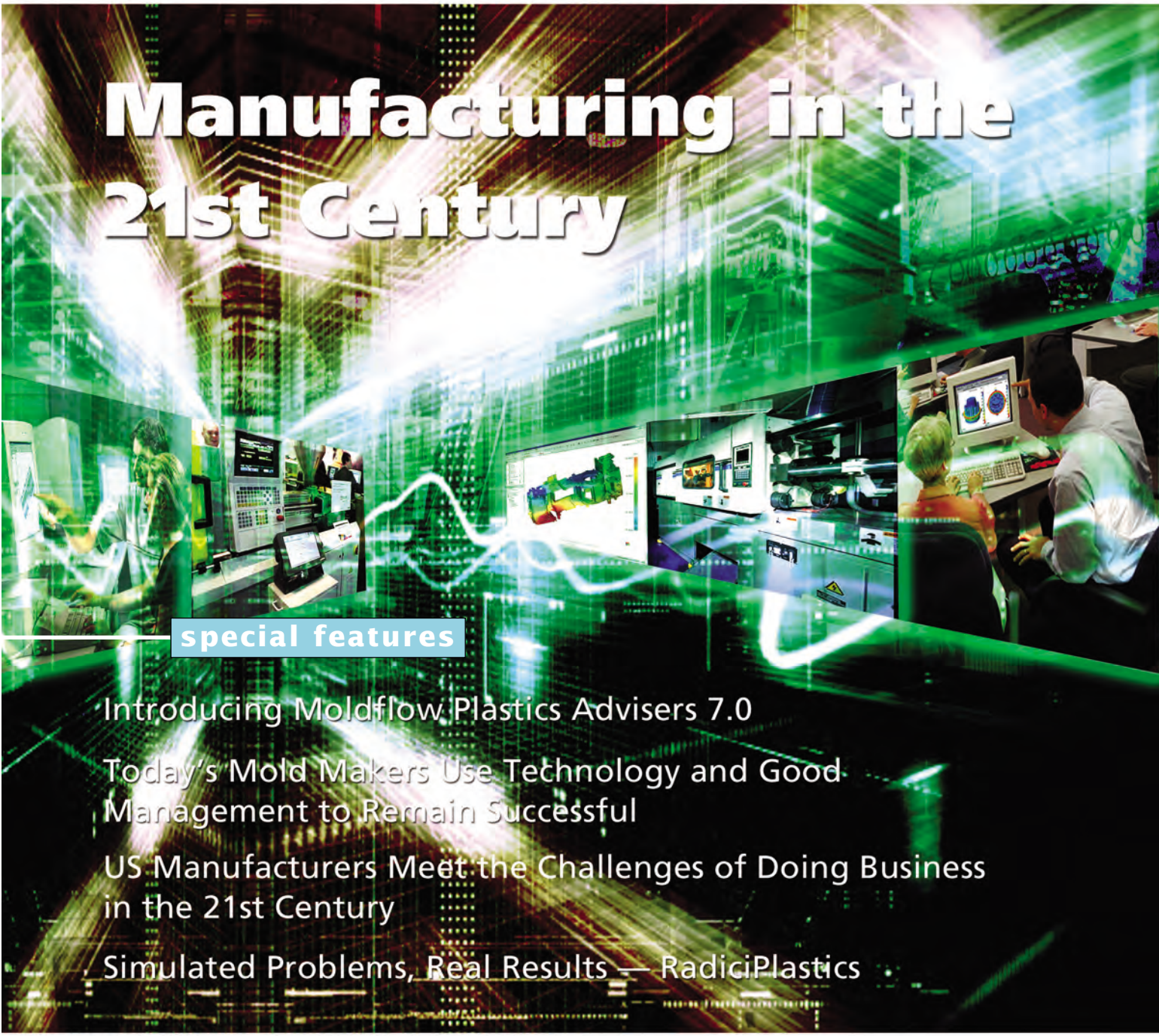

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Paul Mailloux,
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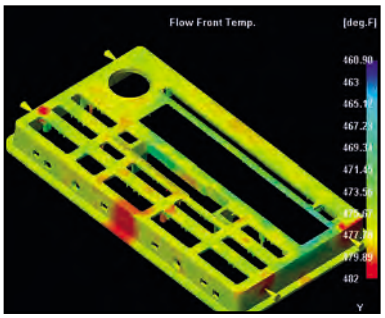

Today's Mold Makers use Technology and Good Management

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US Manufacturers Meet the Challenges of Doing Business in the 21st Century

Flowfront

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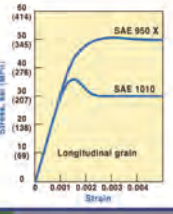

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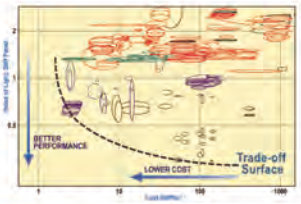

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Things are looking up.

I am feeling good, and it's about time we all did. We've certainly endured a long streak of bad news, bad executives, bad earnings results, and bad weather.

What I want to discuss are indications that global markets are finally turning around. Here is some evidence. The Institute for Supply Management (ISM) survey is filled out by approximately 465 purchasing and supply managers across the US every month. They post information related to production, new orders, employment, and inventory, which reflects the breadth of movement of manufacturing activity from month to month. Economists and politicians check the survey data for signs that the factory side of the economy is improving after a three-year slump. The ISM managers' inputs are figured into a single index called PMI based on new orders, production, employment, supplier deliveries, and inventories. A point value of 50 or greater indicates the manufacturing economy is expanding. June 2003's PMI was 49.8 percent — up from 49.4 percent in May 2003. In addition, the new order index has been above 50 percent for several months (52.2 percent in June 2003 and 51.9 percent in May 2003). These national indicators show that there is improvement ahead for US manufacturers.

Meanwhile, high-tech Silicon Valley is showing signs of renewed life. Stocks of eBay, Cisco Systems, and Yahoo, for instance, that have suffered greatly, are regaining growth and stockholder confidence. According to USA Today, Intel recently posted an eight percent year over year increase in revenue, "its biggest in three years." In addition, Oracle is up 11.9 percent, Hewlett-Packard is up 25.6 percent, NASDAQ is up 27.1 percent, Cisco is up 35.8 percent, Intel is up 60.1 percent, eBay is up 62.5 percent, and Yahoo is up 87.2 percent. This is encouraging news indeed.

Silicon Valley, home to the biggest concentration of venture capitalists and high-tech start-ups, staged the dot-com surge and subsequent nosedive in the late 1990s. Its resurgence can have significant implications for the nation's economy.

While no one expects the same high-tech boom of the 1990s, analysts expect that the US is returning to a normal environment that is nowhere as dismal as in the past few years or as out of control as in the Internet bubble.

For one, there are improved business conditions. Business spending is rising. The Commerce Department reports that high-tech sales — hardware, software, and services — are improving. Companies are reducing costs through smarter investments and improved sales. This is truly a win-win situation for software providers and their customers.

Second, NASDAQ high-tech stocks are up 27 percent this year. Thirdly, there is a resurgence of research and development. Companies are again investing in new technology and new products. The reality is that there is renewed enthusiasm and reason to celebrate market growth. And, those elements can only point toward positive growth.

In addition, there are other areas that are experiencing gains. For instance, the worldwide market for handsets took off in the second quarter of 2003, reflecting a continued consumer demand for mobile telephony. According to information from IDC, worldwide handset shipments grew by nearly 20 percent in 2003 so far. Nokia maintained its top position in the market with Ericsson regaining marketshare from LC Electronics. Nokia is strengthening its presence in the US and the world. Nearly one third of all Nokia phones shipped this quarter had color screens, as well as multimedia and digital input capabilities.

Germany's Chancellor Gerhard Schroeder says the country's economy has passed through its low point and is on the way to recovery. In August 2003, he said, "More and more economic indicators and forecasts from national and international institutions are pointing to a revival in the economy." He added that sentiment in the economy was improving and consumer confidence was significantly better.

While the new direction will take time to take hold across the US, Europe, and Asia, I am confident there will be resurgence in growth and prosperity. What are your thoughts? I am interested in learning how your organization is faring. Do you see a change in the business atmosphere? Send e-mail to flowfront@moldflow.com. I'll include your comments in the next edition of Flowfront.

Laura Carrabine, Editor

Focus on

Today's Mold Makers Use Technology and Good Management to Remain Successful

Scott Basilius, president of Basilius, Inc. (Toledo, OH) oversees a full service plastics part supplier that can support as much or as little of product development as its customers require. The company provides the technical assistance for part design, mold building, and injection molding to assist customers from product conception to production. The organization is family-owned and was established in 1952. It works as an extension to customers' needs driven by accountability, responsiveness, and service excellence.

Basilius, Inc. focuses on several key factors including design that encompasses 3D surface and solid modeling capabilities. In addition, it addresses flow analysis to optimize part tool design and rapid prototyping.

Basilius addresses tool building in terms of networked manufacturing from engineering to the shop floor; high-speed hard machining; four-axis wire, and EDM capabilities; four-axis RAM EDM capabilities; advanced manufacturing techniques; grinding; and in-house tool trials.

The company's injection molding advancements offer high performance auxiliary equipment, as well as robotic control for part removal and cycle consistency. It employs accurate gravitational blenders for mixing materials.

Basilius employs 34 workers. Scott Basilius says, "As a mold builder and mold supplier, about 50 percent of our business is automotive related. The rest is represented by other industries such as medical and consumer goods."

Robert Hoffmann is vice-president of operations of CACO Pacific Corporation (Covina, CA), a state-of-the-art provider of custom molds for leading international manufacturers. Through continuous technological advances in mold engineering and manufacturing, CACO gives its customers the edge in productivity and speed to market. High volume manufacturing companies in 27 countries worldwide rely on CACO Pacific to gain a competitive advantage. Its primary objective is to acknowledge its customers' products and market competitiveness.

CACO Pacific manufactures precision, high cavitation, high production molds for a variety of industries including personal care, medical, writing instruments, packaging, and optical media. CTI (CACO Technologies Inc.) produces a series of standard products for the molding industry, including hot runner temperature controllers, a full line of hot runner bolt on systems, MPR (Mold Rotating Plates) for multi-material molding, and LIT (Low Inertia Technology) for multi-material molding.

Edward Mack, president of Tri-Mack Plastics, a twenty-nine-year-old operation, oversees the management of this 70-person firm based in Bristol, RI. It produces high performance plastic parts for critical applications and services the aerospace, medical, electronics, chemical processing, and industrial equipment industries. "We are a manufacturer of custom plastic parts with a lot of materials expertise. We work closely with our customers, performing concurrent engineering and plastic product development, in addition to tool making, injection molding, CNC machining, and screw machining," says Mack.

Changes in the industry

As a third-generation company head, Basilius has seen some changes in the industry. "Over the past 20-25 years, we've seen a big change in the technology in terms of equipment used to manufacture the molds. In the last two years, that technology hasn't changed quite as fast. But what is more pervasive is the competition from offshore manufacturers."

In terms of new technology, Basilius takes advantage of hardware and software innovations that are now part of the marketplace. For instance, Basilius, Inc. uses Moldflow software for plastic flow analysis. The organization also uses Delcam Powermill for contour machining.

"Our customers want products quicker and cheaper, a mantra that other manufacturers are facing around the world," says Basilius. "We are being forced to compete with the lowest cost competitor on the globe. I think that European manufacturers are probably feeling the same pressures as American operations. It's the offshore Asian nations that offer low wage labor that are acquiring jobs that traditional US and European mold makers typically obtained."

Basilius says that offering services like Moldflow flow analysis is helping them remain competitive. "In terms of being involved in tool design, we normally run an analysis to determine if there will be any problems prior to cutting steel. That's a cost and time saving for us and for the customer. By using the Moldflow software upfront in the design phase, we can investigate and solve any problems before real costs are associated to the project. We perform flow analysis as a service that's as much a benefit to us as to the customer. Whatever costs and oversights we can eliminate using the software helps both parties. Our customers have learned that our upfront Moldflow services are well worth the investment. We use Moldflow Mold Adviser™ software (a module of the Moldflow Plastics Advisers® (MPA®) product line) analysis for most of our jobs. We've recognized return on investment for the technology many times over as a result of purchasing MPA," says Basilius.

Hoffmann says that the mold making industry has changed significantly over the last decade. "The environment is much more competitive," says Hoffmann. "It's extremely important to have innovative solutions to provide added value for our customers to increase their efficiencies. Without innovative products and solutions, a mold maker can only compete on price and delivery in a market where many mold makers are happy to take a job at a loss to keep doors open a few months longer. Competition from lower labor cost regions of the world is accelerating the push towards unattended machining. By utilizing new equipment and manufacturing methodologies, we are able to reduce the machinist labor hours required to manufacture a mold." The company also uses Moldflow software to help verify its designs and ensure that its molds are production ready with the least amount of testing and debugging possible.

Mack says that the biggest areas of change are in new technology and efficiency that result in higher productivity. "In terms of customers' business models, we are seeing a real evolution in their desire to utilize supplier expertise rather than keep all the expertise in-house. This new strategy has allowed us to add value to our offerings. We can participate in the concurrent engineering of their parts. One of the biggest changes in the aerospace industry, for instance, is traditionally a customer would provide us with a print of a part. Many times there were features in the part that could be problematic but the customer didn't want to discuss the issue. The engineer's design was pretty much etched in stone. Nowadays, there is much more give and take between the customer and the supplier. The result is lower cost parts and much quicker time to market."

Tri-Mack rarely receives 2D drawings anymore. "We import 3D CAD models today," says Mack. "The biggest area of concurrent engineering is in utilizing CAD models. Some of the characteristics that make them desirable for injection molding are items like wall thickness and proper draft angles. We typically get a model that is not drafted and do a lot of work to clean it up and address any issues that come up in terms of injection molding."

Tri-Mack uses Moldflow Part Adviser™ software (a module of the MPA product line) as part of every job. Mack says the software is so easy to use that it's a simple step in the development process of each part. He says that using the software differentiates his company from other tool makers. "I think that being able to offer concurrent engineering services and vertical capabilities such as participating in part design through tool design, tool building, debugging, and tool making offers our customers tremendous value. The software gives us confidence to quickly move through that process. Traditionally, a customer took several steps in the development of a new part. From going to an outside part designer or mold designer, to a tool and die shop to get it built, to an injection molder to manufacture the parts, to another shop to do secondary work or assembly. This strategy creates many opportunities for mistakes and added costs."

"Using the old methodology with four or five vendors involved, it was unclear as to who would run Moldflow and absorb the cost," adds Mack. Instead, Tri-Mack offers all of the product development steps under one roof.

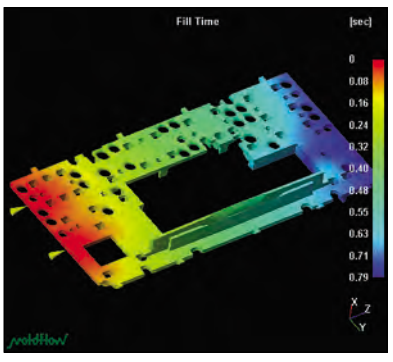
Elements of change

"The pressure is on large OEM companies to show a profit to shareholders on a quarterly basis," says Hoffmann. "This has caused a shift in purchasing strategies." He says that the economic downturn has caused many OEM companies to abandon sound mold purchasing practices. "In the past," notes Hoffmann, "these companies were focused on buying tooling that would cycle the fastest and last the longest — providing long term profitability. For many companies, the current philosophy is to purchase the cheapest tooling possible in an attempt to regain short-term profitability. This trend has accelerated the move of manufacturing to China and other low cost regions of the world." Hoffmann adds, "In the process, these OEM companies are inadvertently transferring decades of manufacturing know-how to other countries. Considerable knowledge can be transferred even in the quoting stage of a project if previous mold designs are used as the basis for the new quote."

CACO Pacific has always had the philosophy of providing innovative products to help its customers achieve the highest manufacturing efficiencies possible. During the last few years, its level of innovation has grown exponentially. In the end, this is the only philosophy that can prevail. Hoffmann says, "Poor mold purchasing decisions by OEMs to obtain short-term profit will in the end become evident when cheap tooling is run on the production floor. At the same time, we are continuously improving our manufacturing process to produce our high quality, high production molds at the lowest costs and with the lowest number of attended labor hours possible."

Success stories

Basilius says one of the company's specialties for tooling is automotive radio bezels, where there are a lot of openings in the parts for the buttons. The gate locations on these parts are very critical to the ability to mold a quality part. "It's advantageous that MPA allows us to do multiple test runs to determine the best gating locations." He also says they run several Moldflow analyses on parts that are of medium to difficult complexity. "We evaluate the results and show our customer the results," adds Basilius. "It's a great visual tool that provides another set of data that we can study and use to discuss with our customers. Prior to doing any tooling, we can review the data and decide how we want to build a part."



He says that using Moldflow is a good differentiator as a sales tool. "We include that as part of our mold design cost," says Basilius. "We build molds for

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The Virtual Classroom

By Stephen Thompson, Moldflow Corporation

In this era of budget cuts and restricted air travel, plastics professionals must continue to receive training without sacrificing their business objectives. By embracing alternatives to traditional classroom training and extending the boundaries of learning to the Internet, today's professionals receive knowledge that is compelling, compact, and consistent.

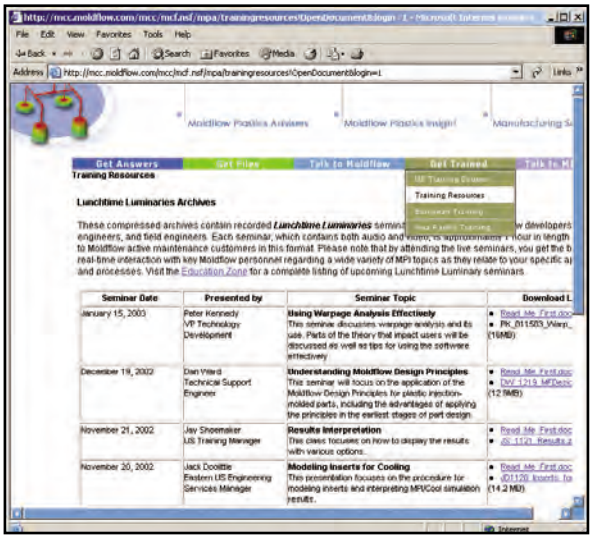
E-learning classes or seminars delivered via Web conferences are virtual classes that use Web-based collaboration programs, including phone lines for audio, to link a group of geographically dispersed participants. These virtual classrooms are best at knowledge-based learning in which participants primarily get information, rather than hands-on skill development and practice.

In practical terms, e-learning has given us the ability to learn outside a physical classroom. New Internet technology has provided the means for an advanced and wide-ranging infrastructure that provides a distributed learning environment. E-learning allows students to receive effective, specifically targeted training in a cost-effective way. Companies that supply the training content can deliver training on a global basis, while tailoring content to suit the needs of individuals.

The need for a more competent workforce has never been greater. Globalization, intense competition, and the increasing complexity of software systems drive the need for training that is not only targeted but also cost-effective. Constant retraining and assessment of skills, therefore, is a critical element that successful companies cannot afford to overlook.

For employers, the immediate benefits of e-learning are obvious. It is considerably cheaper than the traditional forms of training, both in terms of the direct cost of paying for individual courses and transporting staff to remote training facilities. It also eliminates the time employees traditionally spent at week-long or more off-site training courses.

Last year, the Moldflow Center for Professional Development began to test the e-learning waters by launching an exciting new education program designed for plastics professionals, which is referred to as "Moldflow Lunchtime Luminaries." Key Moldflow application developers, training instructors, and support engineers deliver these free, ninety-minute online seminars, which consist of topics requested by Moldflow customers. The seminars are also developed based upon the most common issues being addressed by the Moldflow technical support group each month. Topics have included understanding Moldflow design principles, analysis results interpretation, cooling analysis tips, and the theory behind the solvers, just to name a few.



Each of these live seminars is also recorded and archived so that other Moldflow customers can benefit from this information at their convenience, just two days after the actual seminar is delivered. The archived seminars include all of the audio and slide presentations used during the live event. Moldflow maintenance customers may download them from the Moldflow Community Center within the **Get Trained > Training Resources** section.

As instructional technology becomes more transparent, trainers will be able to direct their efforts toward promoting active learning and learner productivity. Newer more flexible technologies are enhancing the once missing interaction between students and students with instructors. The traditional classroom utilized to educate our customers will always have its place, but the virtual classroom — in its many forms — is the future of corporate education. The use of Web-based classrooms has grown significantly and continues to be cost-effective, scalable, and perfectly suited to workers with limited budgets and time constraints. Companies that recognize this benefit and encourage workers to attend online training will have a significant advantage in the marketplace. ■

For more information about all of Moldflow's comprehensive education options, including e-learning opportunities, visit www.plasticszone.com. Access the Moldflow Community Center from www.moldflow.com.

Working with the Moldflow Plastics Insight API Tools

By David Rieffel, Product Engineer, Siegel-Robert, Inc., St. Louis, MO

Motivation for using the API

I am going to recount my motivation for using the MPI® API tools, and hopefully, it will become yours as well. Ask yourself these questions:

❑ Has your arm, wrist, or hand ached at the end of the day because you are performing the same repetitive clicks in MPI all day long?

❑ Have you ever wished the mesh editing tools were just a little more powerful or behaved in a different manner?

❑ Have you ever wanted to create your own analysis result?

❑ Is there some missing functionality for which you cannot wait for the next software release (for an enhancement that may or may not be there)?

If you answered "Yes" to any of these questions, then the Moldflow Plastics Insight® (MPI) API (Application Programming Interface) most likely is the solution to your problems.

Where to begin?

Before that question can be answered, ask yourself, "What is my programming background?" If you have a lot of experience with C++, Visual Basic, or Visual Basic Script (VBS), then you probably can jump right into programming, and this article won't help you much. My experience has its roots in FORTRAN (with a very little bit of C++), so that is where my perspective on learning and using the API is based.

I believe that the best way to start to learn the API is not to start programming at all. I started by using the **Record Macro** command in MPI/Synergy to do simple tasks, such as move and copy, and reviewed the resulting VBS file to see how the code worked. Another good place to start is to look at other users' scripts (the simple ones at first) to see how they handle the flow of information and various API calls.

Simple beginnings

I used the **Record Macro** command to generate this code (Figure 1). I band-selected around some nodes and elements and copied them by 0,0,1. Then I band-selected around some other nodes and elements and moved them by 0,0,1. Easy enough, right?

```
1   Set Synergy = CreateObject("synergy.Synergy")
2   Set Modeler = Synergy.Modeler()
3   Set EntList = Modeler.CreateEntityList()
4   Set Vector = Synergy.CreateVector()
5   EntList.SelectFromString "N279 N278 N281 T427 T428 T668 "
6   Vector.SetXYZ 0, 0, 1
7   Modeler.Translate EntList, Vector, True, 1, False
8   Set Modeler = Synergy.Modeler()
9   Set EntList = Modeler.CreateEntityList()
10  Set Vector = Synergy.CreateVector()
11  EntList.SelectFromString "N386 N387 N388 N389 T685 T686 T687 "
12  Vector.SetXYZ 0, 0, 1
13  Modeler.Translate EntList, Vector, False, 1, False
```

*Figure 1. Script resulting from using the **Record Macro** command.*

Upon opening the saved VBS macro file, look at Line 1 and say, "What does this line do, and what is Set?" From a FORTRAN background I was, and still am, used to working with numerical, logical, and string data types. Generally, FORTRAN is not used to interface with other programs. I use FORTRAN just for basic processing of data files. So now we need to talk about object oriented programming (OOP) and what is an object. (*NOTE: This is my understanding of objects, not the textbook definitions.*)

Objects are entities that MPI/Synergy exposes through its OLE/Automation interface. The **Set** statement links the VBS variable to the MPI/Synergy program objects, and we use those VBS variables to control MPI/Synergy. In this example:

❑ Line 1 creates the Synergy variable and links it to the main application object in MPI/Synergy (the MPI/Synergy program).

❑ Line 2 creates the Modeler variable and links it to the Modeler object in MPI/Synergy. (Modeler is an object that provides modeling operations.)

❑ Line 3 tells the Modeler object to create an empty entity list (which is an object) and links it to the EntList variable.

❑ Line 4 tells the Synergy object to create an empty vector (which is an object) and links it to the Vector variable.

❑ Line 5 finally instructs MPI/Synergy to do something with all these objects that have been created! Selected nodes and triangles from the study populate the empty entity list, EntList.

❑ Line 6 sets the dimensions of the vector to copy along into the Synergy Vector.

❑ Line 7 translates the EntList, by Vector, and copies the EntList (True).

❑ Lines 8-13 perform the same operations as Lines 2-7, but the selected nodes and triangles are only moved and not copied.

A word about reference materials

Here are a few good sources for getting help on the API and writing scripts:

❑ Obtain a free VBScript editor at: http://www.koansoftware.com/freeware/VBSeditor.zip

❑ The Microsoft VBS reference is at: http://msdn.microsoft.com/library/default.asp?url=/library/en-us/script56/html/vbscripttoc.asp

❑ Within MPI: **Help > Contents > Application Programming Interface (API) > API Command Reference** (the Compound List is a good place to start)

❑ Check out the following Lunchtime Luminaries Seminars on the Moldflow Community Center (MCC) available from the **Get Trained > Training Resources** selection:

❑ Introduction to the MPI 4.0 Application Programming Interface (API)

❑ Advanced API Topics

❑ Exchange macros with other users on the MCC with the **Get Files > Macro Exchange** selection.

❑ Discuss your problems with other users through the MCC with the **Talk to MPI** Users selection.

I am a big fan of the MCC. With people posting scripts on the MCC to solve problems, reduce modeling time, and analyze results better, there is a huge potential to affect the efficiency of Moldflow users. A similar potential exists with the Talk to MPI Users forum on the MCC. These are great resources, and I recommend using them.

Make it more flexible

While using the **Record Macro** command is a good first step, the resulting script is not very flexible. Let's modify it to allow any vector to be specified for copying selected entities (Figure 2).

```
1  Set Synergy = CreateObject("synergy.Synergy")
2  Set Modeler = Synergy.Modeler()
3  Set EntList = Modeler.CreateEntityList()
4  Set Vector = Synergy.CreateVector()
5  'EntList.SelectFromString "N279 N278 N281 T427 T428 T668 "
6
7  VectorString = Inputbox("Enter a translation vector." & vblf & "Separate the numbers by
   spaces.")
8  'msgbox(vectorstring)
9
10 'take the vector string "VectorString" and separate it into an array.
11 VectorArray = Split(VectorString)
12
13 'Vector.SetXYZ 0, 0, 0.25
14 'set the vecot using the vector array.
15 Vector.SetXYZ VectorArray(0), VectorArray(1), VectorArray(2)
16
17 msgbox("Select the entities in the model which you wish to copy.")
18
19 Set SD = Synergy.StudyDoc()
20 'Modeler.Translate EntList, Vector, True, 1, False
21 Modeler.Translate SD.Selection, Vector, True, 1, False
```

Figure 2. Modified script based on a recorded macro.

First, delete Lines 8-13 and comment out Lines 5-7 of the original script (comment lines begin with a single quote mark and are not executed when the script is run). Next, add an input box so a string of numbers can be entered to represent the vector for entities to be copied along (Line 7 in the modified script).

As a test, I added a message box (Line 8 in this example) to output the vector entered in the input box. When writing code, I find it best to write a small segment of code and then output some of the results to a message box to verify that the script is behaving correctly. This message box isn't necessary to run the final script, so I commented it out.

To continue, split the string into an array (Line 11) and then set the Vector variable to the array components (Line 15). Line 17 is a message box that prompts the user to select the entities to be copied. Line 19 links the variable SD to the StudyDoc object of the MPI/Synergy program (*StudyDoc is the object used to query and manipulate studies*). Finally, Line 21 translates and copies the entities that have been selected inside MPI/Synergy.

I made two programming mistakes in my first attempt at writing this code:

❑ On Line 15, I initially used a square bracket, [, where I should have used a parenthesis, (, and I got the following error:

```
Script:  C:\MPI_4_1_Projects\scripts\mv_del2.vbs
Line:    15
Char:    26
Error:   Expected end of statement
Code:    800A0401
Source:  Microsoft VBScript compilation error
```

❑ On Line 19, I initially omitted the Set statement, and I got this error:

```
Script:  C:\MPI_4_1_Projects\scripts\mv_del2.vbs
Line:    19
Char:    1
Error:   Object doesn't support this property or method: 'SD'
Code:    800A01B6
Source:  Microsoft VBScript runtime error
```

In both cases, the error message identifies the line and the character where the error originates.

From my perspective, this example is not too difficult. Remembering the first time I tried to write a script, that experience was rather excruciating and painful. I didn't, and to some extent still don't, understand object-oriented programming. It took me a full two days to get my first try at a script to run. The second, third, and fourth scripts didn't fare much better.

So you say, "I'm not going to spend days writing scripts, what a waste of time!" or "Learning to write VBS is too difficult." *It is not a waste of time. Rather, it's an investment.* Portions of the simple coding get copied and modified slightly to create a new, more powerful code. Then, you can begin to tackle more difficult things, such as querying entity properties, putting scripts into Excel, and the like.

The more experience you gain, the quicker you will be able to create more powerful scripts.

Looking at a bit of code

For a more in-depth example, let's look at the main code of the mav.vbs script found on the Macro Exchange area of the MCC (Figure 3). The *mav.vbs* script moves or copies entities between a set of nodes. This script requires the user to pre-select entities before running the script.

```
36  '//////////////////   Main Code    ////////////////////////////////////
37  Set Syn = CreateObject("synergy.Synergy")
38
39  If syn.studydoc.selection.size = 0 Then
40    msgbox("Sorry, you have not selected anything to move/copy. Quiting Script.")
41    Set syn = Nothing
42    wscript.quit
43  End If
44
45  Set syn = Nothing
46
47  flag = inputbox("Copy objects?"&vbLf&_
48                                    "1   for yes,"&vbLf&_
49                                    "0   for no",,0)
50
51  If (flag = 1) Then
52    num_copies = inputbox("Enter number of copies",,"1")
53  End If
54
55  Set Syn = CreateObject("synergy.Synergy")
56  Set MoveList = Syn.StudyDoc.Selection
57  Syn.StudyDoc.Selection = Syn.Modeler.CreateEntityList()
58
59
60  If (flag = 1) Then
61       msgbox("Select, at least, two nodes for the copying vector."&vbLf&vbLf&_
62       "The first node will be the base node and "&vbLf&_
63       "all the following nodes will be copied to."&vbLf&vbLf&_
64       "Remember,use 'Ctrl' and banded selection, the script sorts out the nodes.")
65  Else
66            msgbox("Select two nodes for the moving vector.")
67  End If
68
69  Set NodeList = FUNGetSelection(Syn.StudyDoc.Selection,Syn.Modeler,Syn.StudyDoc)
70
71  If NodeList.Size < 2 Then
72    msgbox("Less than two nodes selected.  Quiting script.")
73    WScript.Quit
74  End If
75
76
77  ' ---- Deactivate the Local Coordinate Systems.
78 Syn.Modeler.ActivateLCS Nothing, False, "LCS"
```

Figure 3. Part 1 of the main code of the mav.vbs script.

Line 37 uses the **Set** command to link the Syn variable to the MPI/Synergy program.

In the previous examples, extra variables and **Set** statements were created to access objects in the MPI/Synergy program. In this instance, however, I didn't want to create all these extra variables. Instead, the object and its method invocation are piggybacked onto the Syn object. Study.Doc.Selection (Line 39) returns a list of entities selected inside MPI/Synergy as an EntList object. An EntList object corresponds to an ordered list of model entities. It also has a public attribute, Size, which tells how many things are selected. So in short, this line tells the script how many things are selected inside MPI/Synergy.

Line 40 displays a message box if no entities have been selected. In Line 41, setting the value of Syn to "Nothing" terminates the life of the Syn variable. It is important to terminate the life of a variable when it is no longer useful. (Consult the archived Lunchtime Luminaries session for more on this topic.) In Line 42, Wscript.quit terminates the script.

Line 47 allows the user to specify whether the objects are to be moved or copied. Line 52 prompts the user to input the number of copies, if necessary.

Line 56 moves the entities that were pre-selected to the MoveList variable. Line 57 empties the selection. This is because the Study.Doc.Selection variable is needed to select the nodes to move along.

Lines 60-67 prompt the user to select nodes. The prompt displayed to the user depends on whether the script was previously instructed to move or to copy the pre-selected entities (the MoveList).

continued onto next page

In Line 69, FUNGetSelection is a function that takes a selection and separates out the nodes. If the user band-selects around a node, the selection can include associated triangles, curves, etc. This function weeds out the unwanted selected entities (e.g., triangles).

Note these warnings:

❑ Nodal boundary conditions should not be included in your selection. The function does not look for nodal boundary conditions in the list. It would be an easy fix to solve this problem, but instead I just remember not to select those types of entities.

❑ This FUNGetSelection function has been copied into other scripts. The function has been modified from script to script, depending on how it is required to interact with the main code. So, if you copy this function from my code into yours, be careful to modify it to fit your purpose.

Line 71 checks to see that at least two nodes have been selected.

Line 78 deactivates local coordinate systems. This script won't move things properly if any are active.

Let's continue our examination of the *mav.vbs* code (Figure 4).

```
79
80
81   scale=InputBox("Enter the distance to move (or '###%' to enter a percent",,"100%")
82
83   If (flag = 1) Then
84     last = Nodelist.Size - 1
85   Else
86     last = 1
87   End If
88
89
90   SUBGetCoord Syn.StudyDoc.GetNodeCoord(NodeList.Entity(0)), VecA
91   For i = 1 To last
92     SUBGetCoord Syn.StudyDoc.GetNodeCoord(NodeList.Entity(i)), VecB
93     SUBSubtract VecB, VecA, VecB
94     If UCase(Right(scale,1)) = "%" Then
95       SUBScale VecB, Mid(scale,1,Len(Scale)-1)/100.0, Offset
96     Else
97       SUBNormalize VecB, VecB
98       SUBScale VecB, Scale, Offset
99     End If
100
101  Set Vector_1 = Syn.CreateVector()
102    Vector_1.SetXYZ Offset(0), Offset(1), Offset(2)
103    Syn.Modeler.Translate MoveList,Vector_1,flag,num_copies,False
104  Next
105
106  Syn.StudyDoc.Selection = Syn.Modeler.CreateEntityList()
107  Set Nodelist = Nothing
108  Set Movelist = Nothing
109  Set syn = Nothing
110
```

Figure 4. Part 2 of the main code of the mav.vbs script.

Line 81 prompts the user to enter the distance or a percentage of the distance between the selected nodes, along the vector to move/copy the entities.

Lines 83-87 determine the last node in the list. Because arrays are indexed from 0, the script takes the size and subtracts 1. If the script is moving entities and the user accidentally selected more than two nodes to define the vector, the point to move to is set to the second node found in the selection list.

In Line 90, SUBGetCoord is a subroutine that takes the node coordinates and places them in the vector VecA. Nodelist.Entity(0) is the base coordinate for moving/copying the selected entities.

Lines 91-104 loop on the second to the n^{th} node.

Line 92 gets the coordinates of the destination node and puts them in vector VecB. (See Line 90.)

In Line 93, SUBSubtract is a subroutine that subtracts two vectors.

In Lines 94-99, the If loop determines if you wanted to use a percentage or an actual distance to specify the actual movement dimension.

In Line 95, SUBScale is a subroutine that scales input (VecB) to the decimal percentage that was input on Line 81 and outputs it into the vector Offset.

In Line 97, SUBNormalize is a subroutine that normalizes the displacement vector.

The SUBScale subroutine in Line 98 works the same as in Line 95.

Lines 101-102 put the Offset values into another vector.

Finally, In Line 103, the script moves/copies the selection.

Lines 106-109 clear the selection and end the lives of the variables.

Of course, it is possible that my code could be simplified. However, with most of my scripts, once it works, I don't like to mess with it too much. As the old saying goes, "If it ain't broke, don't fix it."

The API in use

Now, let's look at an example of using the API to create a manifold system on a part. This example uses three scripts that are available on the Macro Exchange area of the MCC. Using the scripts helps to minimize repetitive tasks involved in accomplishing this modeling task manually.

First, we start with a midplane model of a simple part (Figure 5) on which we would like to place five drops. A model of a generic drop is available in another MPI study (Figure 6). Note that it's good modeling practice to create different types of entities on different layers (for example, one layer to hold part nodes, another layer to hold part triangle elements, another layer to hold beam elements, and so on), to make it easier to view and operate on desired entities.

Note: MPI users who wish to try this example for themselves may download the injection_part.sdy and generic_drop.sdy files from the Macro Exchange area of the MCC.

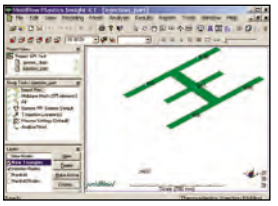


Figure 5. The model of the generic part given in injection_part.sdy.

Figure 6. The model of the generic drop given in generic_drop.sdy.

Node 637 in the lower left corner of Figure 5 is at 0,0,0 and the rest of the nodes shown are locations where the additional drops are required. **Add** the generic drop to the injection part study. Now make sure the Manifold layer is turned off, select all the beams, and turn off the Drop layers (Figure 7).

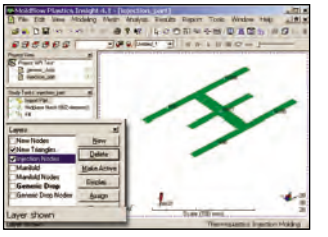


Figure 7. The drop has been added to the part study.

Use the mav.vbs script to copy the generic drop.

Type **mav** at the command prompt to run the script. Use the copy option, and specify **1** copy. Using the Ctrl key, first select N637 and then band-select around the five nodes on the part. Select **OK** on the message box, and accept the **100%** default for the distance. Upon turning the Drop layer on, the display will show that the generic drop has been copied to the five part nodes that were previously selected (Figure 8). Entities that are selected, whether their layer is shown or not, will be copied. The copied entities will be created on the layers on which the parent entity resides.

Figure 8. Using the mav.vbs script, the drop has been copied to each of the selected part nodes.

Use the scn_v2.vbs script to create nodes where the drops intersect the manifold plane.

To complete the manifold system, turn off all the layers except the Manifold Nodes and the Drop Nodes. Select the two manifold nodes, N639 and N641; these two nodes are used to represent a vector in space. Using the Ctrl key, band-select around the nodes for the outer drops in sets to create additional 3D vectors: N676 and N677, N684 and N685, N660 and N661, N652 and N653, in this order (Figure 9). Type **scn_v2** at the command prompt to create the nodes where the drops will intersect the manifold and where the manifold forms a T-intersection. Use the **Global Merge** command to merge coincident nodes.

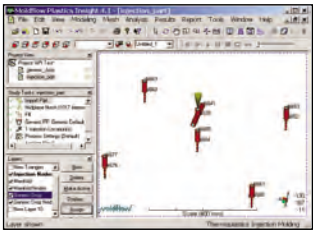


Figure 9. Select pairs of nodes in order to identify where new nodes will be created on the manifold plane.

Use the beam.vbs script to add beam elements between nodes.

Select the manifold **beam** to be duplicated. Type beam at the command prompt, then select the nodes between which to create the manifold beam. Run the script again to create the annular beams between the drops and the manifold. See Figure 10.

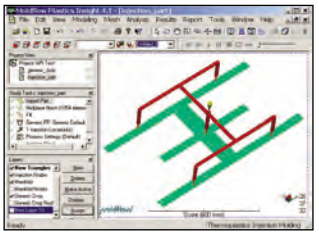


Figure 10. The completed model of the part with the manifold and drops added.

Scripts for just about anything

Scripts can be created for most of the commonly used tasks in MPI/Synergy. I have scripts for just about all of the meshing tools. I can project nodes to a plane and match nodes on a Fusion mesh. I have scripts to adjust the aspect ratios of elements, merge individually selected node sets, and control the look of the post-processing. For the most part, the only limits you have are your programming capability and your determination to create the scripts.

A word about selections

With the API, a script can query entities selected inside MPI/Synergy. The response is in the form of EntList, as described above. It is important to realize how the order and type of selection used affects the final pattern and content of EntList.

The pattern and order of data passed from the MPI/Synergy program to the recorded VBS macro script can affect the results based on how the script is coded. Figure 11 shows the different results that occur by band-selecting around Node 7, Node 13, and then Nodes 7 and 13.

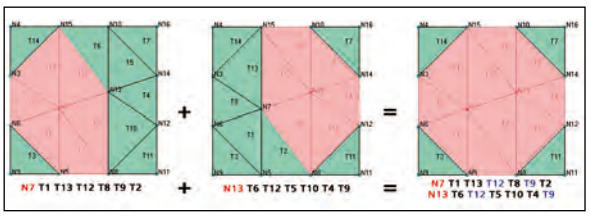


Figure 11. Entities selected as a result of band-selecting different nodes or a pair of nodes.

The first thing to note is that any time a banded selection is made, the entity (or query) list is created, or appended, in a Node, Beam, Triangle, Curve, or Nodal Boundary Condition order.

The second thing to note is that using the Ctrl key to append to the section adds entities in the same order, and items can also occur multiple times in a selection list, as shown with T9 and T12 in Figure 11. (This is why using **Ctrl+M** to rotate or translate objects can move an entity 2-3 times farther than intended because it exists in the selection list more than once!)

Now, taking the result from above and using the Shift key to deselect T5 will result in the EntList being reordered and duplicate entities removed, as shown in Figure 12. Depending on how the script is coded, this can have an undesired effect on the result.

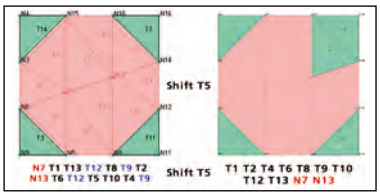


Figure 12. Deselecting an entity using the Shift key changes the order of the EntList and removes duplicate entities.

Using the Ctrl key to deselect preserves the pattern of the EntList and removes only the deselected entity throughout the selection (Figure 13).

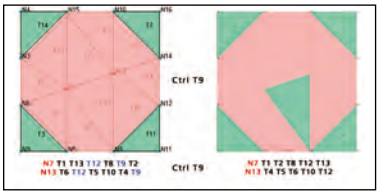


Figure 13. Deselecting an entity using the Ctrl key preserves the order of the EntList and removes only the deselected entity.

The end of the beginning

Now you have a general idea about the types of problems that the API can help you solve. You have a list of a few good references, and you have reviewed some examples of a recorded macro, how to modify a recorded macro to make it more flexible, and how to put scripts to work in a modeling task. You were given a brief overview of pattern and order in which entities are selected inside MPI/Synergy — recognizing the pattern of selection could help you to sort data for looping scripts.

Don't forget that the MCC is a great resource. Get out there and start using the API! Download someone else's script and modify it or post your own script on the MCC. If you have problems, ask for help on the Talk to MPI Users section of the MCC and post your code there.

What's in the future?

I am thinking about writing a script to create the clamp tonnage plot for a part oriented in car position. I may also create a script for growing valve gate drops. I'm currently working on a script for creating a more in-depth recommended ram speed output. ■

Simulated Problems, Real Results

Material supplier combines experience and advanced simulation technology to add value to its plastic compounds.

By Cristina Beria, Moldflow Corporation

Raw materials represent a key factor in the realization of all products. However, it is not always sufficient to use a quality material, for often several other variables linked to design and production affect the final results. For this reason, the service supplied by Italian material supplier RadiciPlastics begins with a consultation with the customer to define needs, goals, and problems related to the project. The company may perform simulations related to mold filling and product development and, based on the results, suggest solutions to be implemented in terms of materials, equipment, and molding in order to achieve the customer's desired result.

"Through Moldflow Plastics Labs," says Giovanni Pioltini, marketing manager of the Plastics division at RadiciGroup, "we have characterized a set of RadiciPlastics materials in a database which is available for simulations. To this we add the experience developed in the field of plastic materials, which enables us to address the various problems that are submitted to us by suggesting what compound to use. Yet the added value of our service is not restricted to materials alone. Thanks to the know-how we have gained in plastic molding processes, we are able to suggest modifications to be implemented on molds or part geometry thickness changes to solve or prevent possible inconveniences to our customers."

A full range of analysis

"Providing mold filling and part warpage analysis thus becomes for us a competitive advantage," says Pioltini. "When we addressed the question of what software to use, we decided to purchase Moldflow products, because they provide a complete analysis package."

Pioltini continues, "Equipment plays a major role in terms of time and global costs when developing a project. Hence, it is essential to gather as much information as possible to avoid having to implement modifications subsequent to mold construction. When a customer submits a project to us with its related production problems, including tolerances to be respected, because we have characterized our plastic compounds in order to use Moldflow simulation technology, we can identify the separate effects that cause warpage in the part, and we are able to suggest the necessary steps to counteract such problems. Another advantage of the Moldflow simulation software is the fact that it works in a three-dimensional (3D) environment. Until not long ago, software performed only two-dimensional simulations; therefore, if the part thickness was greater than three millimeters, it was difficult to simulate the behavior of a material during filling of the mold cavity with sufficient accuracy."

"When we adopted Moldflow technology," explains Pioltini, "our first experience was to tackle the development of the wheel for a supermarket shopping cart. The customer turned to us because 30 percent of these nylon wheels broke during assembly with a metal locking hook. No problem emerged from 2D simulations, but during testing with MPI/3D analyses, it became clear how the injection of the material at a given point created a turbulence which caused the formation of a bubble and consequently, the failure of the piece during fitting of the hook. We suggested moving the injection point so as to create a different turbulence. The subsequent process has shown a 30 percent reduction in the number of failures, down to just a few parts per million."

Through the years, simulation systems have taken on increasing importance. Greater needs in terms of performance and esthetics, especially from highly technical sectors, have driven the need to meet increasingly tight dimensional tolerances, and hence, the need for instruments that can meet these requirements.

Technology first

Prior to using Moldflow technology, Pioltini says the company's work was based on the tool makers' and mold makers' expertise in locating gates. "Experience is good," says Pioltini, "but that strategy caused problems. The tool and mold makers' experience was used to drive decisions regarding gating. Today, 15-20 percent of our analyses that we perform for our customers are used to check already existing tools — those that were created based on prior experience and no Moldflow analysis. In these instances, the gates have not been well placed and there are filling problems. In my opinion, this problematic situation can be corrected with a more widespread use of Moldflow software throughout the plastic injection molding industry."

Today, in order to eliminate any problems, Pioltini relies completely on Moldflow analysis prior to initiating any work for any project. "Experience is key to reading and understanding the analysis, however, we are committed to utilizing Moldflow to help us explore and determine gating locations and part filling schemes," adds Pioltini.

Moldflow for development of under-the-hood applications

Diesel engines for cars and large machinery are fitted with a control panel that develops a great amount of heat. Further, diesel oil requires a high operating temperature. Consequently, the idea arose to optimize such factors by creating a heat exchange between the two systems. "The point was to find a material that could resist high temperatures under the hood and in contact with diesel oil," says Giovanni Pioltini. "In addition, the part had a low thickness, up to five or six

millimeters, hence the material had to exhibit the least possible warpage to provide adequate dimensional stability and efficient sealing to fuel outflow. On the basis of mathematical data supplied by the customer, we have performed Moldflow mold filling and warpage analyses, to compensate for potential warpage where possible."

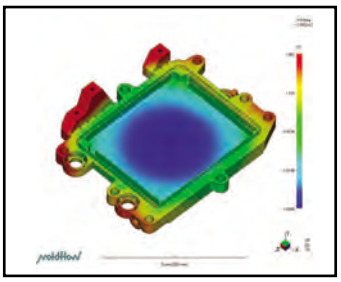
"To manufacture the component, we suggested choosing a polyamide 6.6 filled with 30 percent glass fiber, a compound that has been widely tested in these applications. We also recommended that the customer implement some modifications to the initial design to compensate for warpage and favor part flatness. In particular, some ribs were eliminated and some aspects of fuel inlet and outlet inserts were modified to prevent the creation of turbulence and weak adhesion of the material with formation of air bubbles and risks of fuel leakage. At the end of the analysis, the prototype mold was created, implementing the details resulting from the simulation to counteract part warpage."

Despite the usefulness deriving from the use of prototype molds, it is still possible that the switch from the prototype mold to the production mold could reveal some problems. Often the prototype mold has only one cavity, while the production mold may have several. The mold material also may differ between the prototype and the production mold, hence there may be differences in behavior in terms of conductivity, warpage, shrinkage, and so on. Pioltini concludes, "For all these reasons, mold development time has been moved towards the design stages, cutting construction time required. Thanks to the use of Moldflow simulation software, we are able to significantly compress cost and time for mold development, thus avoiding having to implement major modifications on the production equipment."

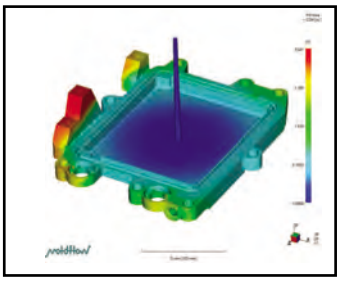
Quantifiable results

Pioltini says the use of Moldflow is a terrific time savings tool. For example, it can eliminate the need to build a prototype tool. "We can move directly to a production tool as a result of using the analysis. This represents a tremendous savings in terms of time and money," says Pioltini. "Prior to using the software, costs of repairing any tool problems — dimensioning, warpage, or filling — were often more expensive than the tool itself. With Moldflow, we avoid this costly situation, so the time to market and cost of the part are significantly reduced. In addition, we have much more confidence that the final product will be accurate and satisfy our customers' requirements."

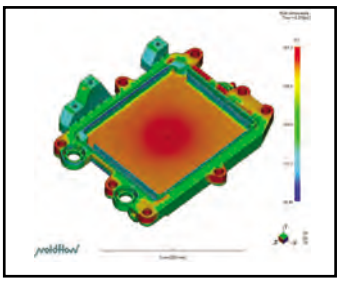
For large tools, Pioltini says that the cost of building prototypes is prohibitive, so the first shot has to be right. There are no alternatives. "We can make no mistakes," notes Pioltini. "Moldflow helps the tool makers and the manufacturers reduce new tool start-up costs. The software helps avoid problems that always occur in the production of a new tool, which can cost upwards of tens of thousands of dollars. Indeed, the technology helps us support our customers as well as save valuable time and money." ■



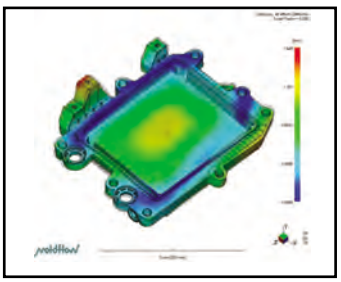
Moldflow analysis results suggest ways to optimize the part design and the molding process.



Simulating the behavior of plastic materials enables manufacturing problems to be prevented before production begins.



Moldflow MPI/3D analyses effectively simulate all stages of the molding process.



By identifying the various causes of part warpage, Moldflow simulations enable problems to be solved appropriately.

Founded in 1981, RadiciPlastics is one of the most highly qualified suppliers of polyamide and polyester engineering plastics with operations in Italy, Germany, Spain, the UK, France, Brazil, the USA, and China. For more information about RadiciPlastics, go to www.radiciplastics.com.

DO YOU HAVE A STORY TO TELL?

If so, we want to hear from you. To submit articles, case studies, or user reviews of any Moldflow technology, please contact Laura Carrabine at **laura_carrabine@moldflow.com** or call **+1 440 247 8653**.

Kistler Instrument Corporation's Technology Plans for the Plastics Market

By Gerald D. Lisowski, Managing Director, Kistler Instrument Corporation, USA

After contemplating several topics of discussion for this forum, I opted to address how Kistler plans to remain competitive in the 21st century and beyond. This commentary is especially pertinent since Kistler has been doing significant planning to continue its growth pattern that we experienced in the 20th century. These strategies can be categorized in three key areas:

❑ We will cross-pollinate technologies that we have developed for specific applications in unique markets to other markets we serve.

❑ We will partner with world class leaders as demonstrated by our recently completed agreement with Moldflow.

❑ We will acquire companies that have a synergistic fit with our strategic growth markets.

The following text explains how Kistler is realizing these strategies and I will explain how our strategic initiatives are being used to help the plastics community.

Overview of Kistler Instrument Corporation

Kistler Instrument Corporation is a worldwide company that specializes in pressure, force, and acceleration products based on quartz piezoelectric sensor technology. We are viewed as a leader in markets that need the very best instrumentation to get the most out of specific testing and/or production processes. Hence, our logo includes the words "measure, analyze, and innovate." Some of the markets we serve include engine pressure testing, acceleration, and manufacturing and plastic process optimization.

Technology advancements to be introduced to the plastics market

In the field of engines, our customers ask us for better instrumentation so that they can measure higher pressures and temperatures inside the engine combustion chamber. We have responded to this demand by growing a new proprietary crystal called Piezostar®.

We believe that this crystal will be of benefit to the plastic community as the temperatures and pressures that molders use to produce parts continue to increase. We recognize this trend not only in injection molding, but also in extrusion and die casting areas.

In the field of manufacturing, we have a number of products that can control and monitor a wide variety of production processes involving force, pressure, or acceleration. We have used this technology to help manufacturers in many types of forming, clinching, welding, and riveting processes.

We believe these controllers will be of benefit in the plastics community as many of the secondary operations on plastic parts involve similar process parameters. We have one application in which a pen manufacturer is using our process controller to determine when they have a generated a "good pen" by monitoring the forces needed to insert the plastic tube into the ballpoint pen. In another application, we are assisting a medical manufacturer to reduce scrap and increase yield by helping them join two plastic parts together correctly the first time.

In the field of acceleration, Kistler has taken a leadership role in "plug and play" smart sensor technology. In fact, as a show of our commitment in this area, one of our engineers is the secretary of an IEEE group that is determining the standards on what will be "read" from each sensor or actuator equipped with a transducer electronic data sheet (TEDS). These sensors and actuators will all be connected on a network so they can be polled for information.

We believe that this technology will play an important role in the plastics community. We will be able to bring "smart technology" to cavity sensing and hydraulic pressure sensing. For electric machines, we can include this technology in nozzle sensors. Once these "smart sensors" are tied into simulation, the operator can quickly and efficiently diagnose a problem or do preventative maintenance.

Cooperation with world-class leaders

Kistler and Moldflow have been working towards a formal relationship during the past two years. It became apparent to both organizations that the plastics industry wanted to realize the benefits of both of our respective technologies. However, plastics customers did not want to worry about the interface between our sensors and charge amplifiers to the Moldflow platform. The first step in ensuring that both companies could achieve the goals we established was to work together on a non-formal basis. We worked side-by-side installing both of our technologies on some plant-wide installations. The results for our customers were nothing short of outstanding. The time we spent during the non-formal stage of our relationship proved we had a winning formula that would help the plastic community in its quest to improve yield, reduce scrap, and slash cycle time. This is the reason that we formally announced our relationship in the US at the 2003 NPE event.

continued on page 29

2003 iMUG Conference a Success!

By Marcia Swan, Moldflow Corporation

The 2003 International Moldflow User Group Conference was a great success. More than 175 users of all Moldflow technologies traveled from across the United States and 14 other countries to attend this second international conference April 1-3 in Pittsburgh, PA USA. More than 80 participants also took advantage of the pre- and post-conference training and certification opportunities.

During the opening day of the 2003 conference, for the first time, a Manufacturing Track "conference within the conference" was held to focus on issues targeted specifically to manufacturing professionals. Customer and student presentations as well as Moldflow technical presentations focused on aspects of Moldflow's shop-floor software products, and the launch of Moldflow Manufacturing Solutions™ (MMS™) Release 1.0 was announced during the event.

Featured speakers at the 2003 conference represented both worldwide industry and academia, giving conference attendees two important perspectives of the industry as a whole. Brian Jones, president of Nypro Inc., presented "Implementing the Lean Enterprise Globally." Professor Phil Coates of the University of Bradford, UK, presented "The Dream Machine — Process and Product Measurements for Enhanced Process Understanding, Modeling and Control." In addition, Moldflow Corporation president and CEO, Roland Thomas, presented the Moldflow vision for the future of automation and optimization software technology for the plastics injection molding industry, built on the convergence of three primary knowledge areas: numerical methods, material data intelligence and manufacturing processes.

In addition to the presentations given by invited speakers and Moldflow technical and marketing staff, 16 customers delivered excellent presentations on topics ranging from application case studies to research projects involving Moldflow Plastics Insight®, Moldflow Plastics Advisers®, and Moldflow Manufacturing Solutions™ products.

Students had an opportunity to show off their work during a networking session, which focused on electronic poster presentations submitted by students representing Penn State Erie, UMass Lowell, Napier University and McGill University. This year, the advisory board awarded two Best Student Topics, and those students were invited to present their work during the conference sessions. Laurent Charrel, a graduate student at Napier University (UK), presented "Commissioning and Evaluation of Moldflow Plastics Xpert (MPX)" as part of the Manufacturing Track, and Kevin Alam, a graduate student at McGill University (Canada), presented "A Genetic Optimization of Shrinkage by Runner Balancing."

Special Interest Group (SIG) discussion sessions provided opportunities to create a dialog between Moldflow and our users that increases mutual understanding of product usage and drives enhancement requests for future releases. Each SIG discussion was co-moderated by a user representative and a Moldflow representative. Topics at the 2003 conference included Manufacturing, Moldflow Plastics Insight, Moldflow Plastics Advisers, and 3D Analysis. Plus, two new panel sessions were introduced: the Ask the Experts Panel allowed users to bring plastics analysis problems for discussion, and the Tips and Techniques Panel provided a forum for users to share their favorite ways to save time and improve analysis results.

The 2003 conference also included exhibits and demonstrations from 13 corporate sponsors, including our platinum sponsors, EDS and HP, and gold sponsors, Altair Engineering, PTC and Solidworks. Special events, including the Welcome Reception, Sponsor Fair and Customer Night Out at The Church Brew Works provided opportunities for networking and interaction among all conference participants.

In addition, participants were able to "test drive" the latest releases of the Moldflow Plastics Advisers, Moldflow Plastics Insight and Moldflow Manufacturing Solutions product lines at hands-on labs during the conference. Moldflow engineering staff were on hand to provide help and respond to questions.

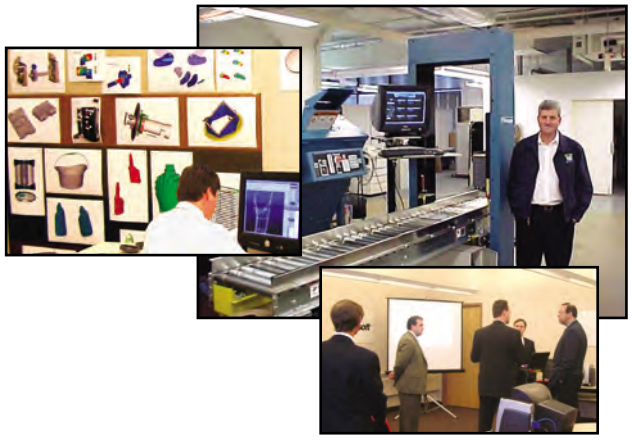
The positive response from 2003 conference participants has lead to even more ambitious plans for the 2004 International Moldflow User Group Conference, scheduled May 17-19, 2004 in Frankfurt, Germany. Find information about the 2004 iMUG Conference in the brochure included with this issue of Flowfront, or visit Moldflow's Web site to keep up with the latest developments. Go to www.moldflow.com and click on the iMUG logo icon.

2004 international iMUG Moldflow User Group

US Manufacturers Meet the Challenges of Doing Business in the 21st Century

By Laura Carrabine, Editor

In today's fast-paced market place, manufacturers feel the pressure more than ever to shrink time to market, reduce costs, and add value to the products they make. It's not easy, especially with tough challenges such as China and other low-wage nations eating up market share. We talked to several senior managers of Ohio-based organizations and learned how they are addressing these demands. We also discovered Cleveland Advanced Manufacturing Program (CAMP), a non-profit organization that delivers expert, hands on engineering, business, and training services to manufacturers and other technology-based partners. Its mission is to help existing and new manufacturers to excel and grow through understanding, adopting, and implementing innovative methods and technologies.



Chuck Sword is a software developer and owner of DHS Diecast, American Diecast Models, and Zach's Construction Toys. DHS Diecast sells collectible construction equipment models to adults, and American Diecast buys and sells vintage models and holds auctions. Zach's Construction Toys sells realistic construction toys to the children's market. The combined businesses are located in a facility in Berea, OH, and have achieved a 150-percent sales growth rate each year for the four years Sword has owned the companies. For 2003, he has already exceeded last year's revenue figures.

For the most part, Sword purchases die cast component parts for his products. Die casting is a versatile process for producing engineered metal parts by forcing molten metal under high pressure into reusable steel molds. These molds, or dies, can be designed to produce complex shapes with a high degree of accuracy and repeatability. Parts can be sharply defined with smooth or textured surfaces, and are suitable for a wide range of attractive and serviceable finishes.

Die castings are among the highest volume, mass produced items manufactured by the metalworking industry, and can be found in thousands of consumer, commercial, and industrial products. Die cast parts are important components of products ranging from automobiles to toys. Parts can be as simple as a sink faucet or as complex as a connector housing. Sword says his operations sell products all over the world. He keeps approximately 2,500 items in stock worth between $500,000 to $1 million.

Kent Marvin is president of STAM, a 30-year old, Grand River, OH, operation that began as a rotary-draw tube bender manufacturer that was dedicated to the heavy truck industry. The company provided tubing that was used to convey exhaust gases, air into the engine, or coolants that run between the

engine and the radiator. “Heavy trucks require a lot more plumbing than automobiles,” notes Marvin. Approximately 10 years ago, as vice-president of manufacturing, Marvin says the company began to diversify away from the heavy truck industry to become a more general supplier to companies that build all types of equipment. “The first logical step,” says Marvin, “was to target companies that produced engine-driven products that weren't heavy trucks. So we branched out to address machines such as excavators, graters, off-road equipment, and generators that required the same type of plumbing.”

Today, STAM provides a lot of parts and service work for the heavy truck industry, as well as serving a diverse customer base. For instance, STAM builds the legs for the machines used in nightclubs that shower audiences with snow or foam. “Bent tubular product for that type of application,” adds Marvin, “is a far cry from the heavy truck industry, and the margins are a lot better.”

Dennis Kappos is vice-president of sales and marketing for Erieview Metal Treating (Cleveland, OH). The company's territory spans from Chicago eastward in the US. The company is in the business of providing high-quality finishes for manufacturers of fasteners and stampings throughout the automotive, appliance, electrical, and marine industries. The company prides itself on being one of the innovators in the industry. New methods and processes are continually being researched. They have been a leader in their field in the search for environmentally safe processes. Erieview Metal Treating's philosophy of researching new methods, coupled with its desire to exceed customers' requirements, has enabled them to experience continued growth for more than 40 years.

Challenges in today's marketplace

Sword says that maintaining a keen fiscal eye on purchasing and budgets is key to success and profits. Marvin adds that creating win-win relationships with suppliers helps grow business and good business relationships. “When I worked for Lucas Aerospace, I developed strong ties to the various local machine shops that contracted with Lucas. I supported them, furnished them with the machine tools and tooling, and manufacturing expertise,” says Marvin. “It was truly a two-way street in which I knew what their costs were and we recognized that they needed to make a profit.”

We work very hard to work with many parts manufacturers to not only satisfy my customers, but also to help those manufacturers remain in business...It's very important to have a competitive environment.

He believes that it's in the best interest of most manufacturers to maintain a solid base of several suppliers versus just one or two. “Companies can put themselves at risk by sole-sourcing in attempts to keep prices down,” says Marvin. “If a supplier runs into trouble, the manufacturer can be left with no supplier or, at the very least, has to find a new one. This leads to the additional investment of educating the new supplier on your parts and processes. This scenario can be easily avoided by maintaining several top-notch, stable suppliers.”

He also believes that product diversification has been critical to broadening STAM's customer base. “Fortunately, because we diversified our product offerings and applications, we have remained successful,” adds Marvin.

Kappos says that while competition from China is a definite challenge, his company also faces changing environmental issues. “There are a lot of materials that are no longer being used,” says Kappos. “The push to develop and use alternative materials is being driven primarily by European and American automotive manufacturers. Certain substances are no longer allowed in their facilities. As a result, we developed, and will continue to develop new finishes to comply with the various global environmental agencies' specifications. These changes have made Erieview a more competitive and stronger company.”

Successful operations

Sword says he added new products that are produced using newer technology to be more globally competitive. In the toy industry, China plays a significant role. “We work very hard to work with many parts manufacturers to not only satisfy my customers, but also to help those manufacturers remain in business as China and other off-shore countries continue to make progress within the toy industry. It's very important to have a competitive environment,” says Sword.

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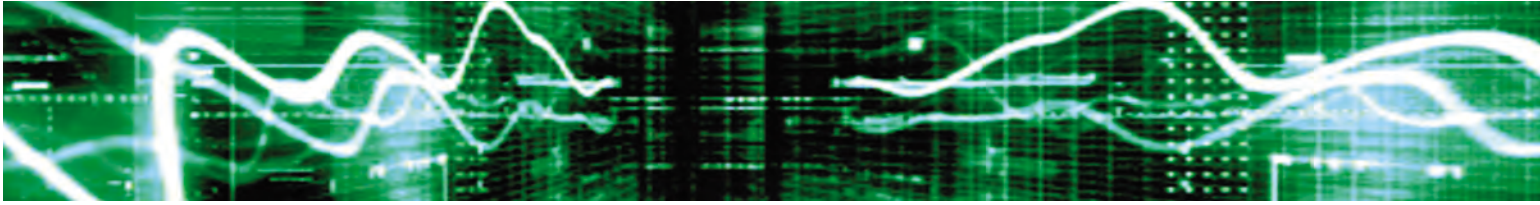


Marvin says that STAM's biggest success story is that the company was able to diversify in a slow economy, as well increase gross profit margin during a recession. "We made a conscious effort to examine our total operations to determine where and how to cut costs while remaining efficient," adds Marvin. "We did a complete self-evaluation in terms of a company-wide exercise. We have a terrific group of employees who all work as a team. We are a much healthier company today then we were on the other side of the recession because of what the recession made us do that we never would have done otherwise." In addition, Marvin says its Web site is a very powerful tool for attracting new business.

Kappos says that Erieview is actively pursuing new markets and new niches. The company is developing new coatings that remedy existing problems. He notes, "In the sheet metal industry, Phillips-head drive screws traditionally cause problems because their painted heads cause washers to stick. The head gets filled up with paint or organic coatings causing the tool drive not to work well. To remedy that situation, we developed a new coating and system that works well for those types of applications. We try to investigate different niches in the market place in which we are not competing with other metal treating companies both in the US and overseas."

CAMP delivers

For nineteen years, CAMP has assisted nearly 2,000 manufacturers with hands on manufacturing improvement projects, resulting in more than $900 million of economic impact on Northeast Ohio companies. Its 75 engineers, trainers, and industry experts work with regional manufacturers to develop and implement practical solutions that promote continuous improvement throughout the organizations they serve.

Key areas include:

- ❑ Manufacturing and business consulting, including:
  - Lean and quality systems
  - Marketing and strategic planning
  - e-Business solutions
- ❑ Product innovation (design and development)
- ❑ Entrepreneur and commercialization services

According to CAMP spokeswoman Cindy Nelson, the organization has three primary areas of focus to help the manufacturing community and provide positive economic impact to the region. "The first is helping new and existing manufacturing and technology-based companies grow by providing hands on and strategic consulting. Both shop floor and front office processes are key areas of focus. Our emphasis on continuous improvement processes help these companies improve efficiencies, cut costs, improve customer satisfaction, and achieve their strategic goals."

"The second is helping customers generate ideas and create new products and markets for new and emerging companies. We have a complete design lab and manufacturing facility to create electronic models, and build and test prototypes of the new products. Providing product innovation support today is critical to helping companies achieve top line growth," notes Nelson.

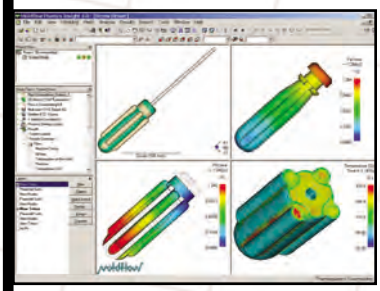
Our goal is to help companies grow from idea stage to a commercialized, viable business.

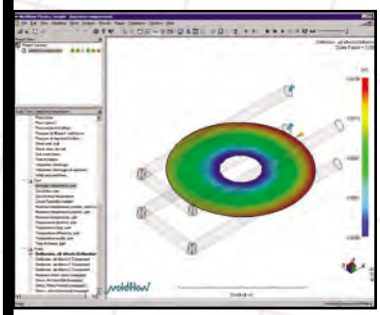
CAMP's third focus is around the commercialization of products/services and technology to form new companies. Through its entrepreneur initiative, BUILD (Building Innovation Through Learning and Doing), CAMP is able to help people with good ideas, create new businesses. Its business advisors provide a full range of services in the areas of strategy development, business and financial planning, market research, and access to capital and resources including intellectual property and patent assistance. Additionally, CAMP's incubator and manufacturing space allows these companies to build and test prototypes all in one facility. Nelson adds, "Our goal is to help companies grow from idea stage to a commercialized, viable business."

CAMP is an Ohio Edison Center funded by the Ohio Department of Development and one of 70 Manufacturing Extension Partnership Centers throughout the US funded by the National Institute of Standards and Technology. Both of these programs' missions are to combine private, public, and university support to help small and medium sized manufacturing companies grow, thrive, and be more competitive by offering services that they may typically not be able to afford. Nelson adds, "Although we are a non-profit organization, our business model resembles more of a for-profit business providing the greatest value to our customers at a reasonable price." ■

See www.dhsdiecast.com for more information about DHS Diecast, American Diecast Models, and Zach's Construction Toys. Go to www.staminc.com to learn more about STAM. For information about Erieview Metal Treating, send e-mail to dennisk@erieview-apex.com. CAMP's Web site is www.camp.org.

Did you run a Moldflow on that part?





Plastic part designers working in today's most successful companies run Moldflow analyses on every plastic part they design. Why? Because they know that optimizing their designs for manufacture before the mold is cut saves both time and money during part production.

To find out more about Moldflow's software solutions for injection molded plastic parts go to www.moldflow.com.

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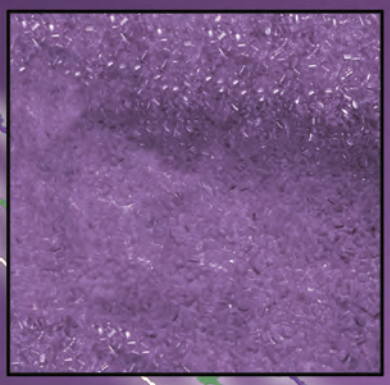

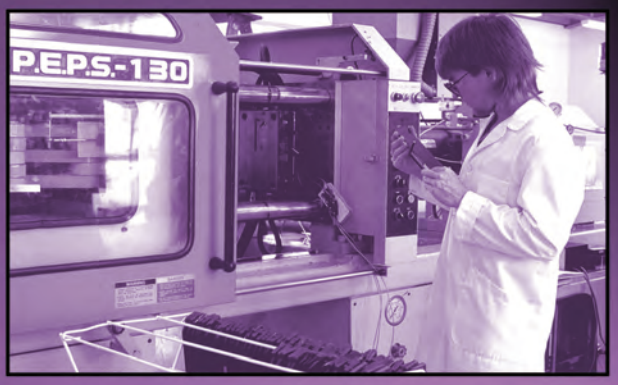

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MOLDFLOW PLASTICS LABS

How can you be sure your material properties data is right for Moldflow solutions?

Go to the source.

Moldflow Plastics Labs constantly strive to provide the highest quality material data that yields the most accurate simulation results. Our commitment to continuous improvement has lead to numerous innovations in material testing and behavior modeling as simulation technology has evolved.

Standard testing packages include a rigorous array of molding trials and data verification in Moldflow software. Each material tested and modeled for shrinkage predictions undergoes molding trials at over two dozen process settings. You can be sure that material properties data from Moldflow Plastics Labs represents the best data for Moldflow simulations.

Moldflow Plastics Labs. The right source — and we prove it.

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Moldflow Plastics Laboratories: the Innovators in Material Testing

By Russell Speight, Moldflow Corporation

Quality material data, global reach

Moldflow Plastics Laboratories (MPL) offers material testing and related services that are focused specifically on meeting the material data requirements for plastics processing simulations. Since Moldflow first began offering material testing services two decades ago, MPL has built up a wealth of experience and a reputation for innovation. Working closely with customers worldwide as well as Moldflow research and development (R&D) staff, MPL constantly strives to deliver improved testing technologies as well as the material properties data required for accurate CAE analyses.

MPL works closely with the Moldflow product development teams, providing a unique insight into the performance of CAE technology. The MPL project team works on customer-based projects, providing focused customer support and continual assessment and improvement. In addition, Moldflow maintains global partnerships with customers, universities, material suppliers and injection molding machine suppliers, driving innovation in direct response to customer expectations.

Today, Moldflow customers can contact MPL easily through any of the more than 30 sales and support offices located in 14 countries. The company also maintains R&D centers in the United States, Australia, and Europe. MPL facilities are located in Ithaca, New York, US, and Melbourne, Australia, facilitating the close interaction with R&D to which Moldflow is committed.

MPL offers a full range of material testing and data analysis services, with a special emphasis on Moldflow-recommended, injection molding-based test methods. MPL also offers test methods developed to meet C-MOLD material data requirements (C-MOLD was acquired by Moldflow in April 2000). The newly expanded and updated MPL facility in Ithaca significantly increases the company's material testing presence in the US, providing faster and more competitive response to local customers for the complete range of Moldflow material tests.

MPL material testing services include:

Moldflow Group Tests:

- ❑ MPI / MPA Filling
- ❑ MPI / MPA Filling and Packing
- ❑ MPI Filling, Packing and Shrinkage
- ❑ MPI Filling, Packing, Shrinkage and Mechanical Properties
- ❑ MPI Reactive Molding
- ❑ MPI Underfill Encapsulation

C-MOLD Group Tests:

- ❑ C-MOLD Filling
- ❑ C-MOLD Filling and Packing
- ❑ C-MOLD Filling, Packing and Shrinkage

The newly expanded and updated MPL facility in Ithaca, New York, significantly increases the company's material testing presence in the US.

Moldflow has long recognized the importance of characterizing materials under actual processing conditions in order to obtain the most accurate material properties for use in CAE simulations. MPL has developed innovative material test methods to address these specific requirements. Injection molding machines form an integral part of the MPL material testing strategy.

The innovative services offered by MPL include:

- ❑ Injection molding rheometry (IMR)
- ❑ Corrected residual in-mold stress (CRIMS) model
- ❑ Mold verification
- ❑ Thermoset material testing
- ❑ On-line data-fitting

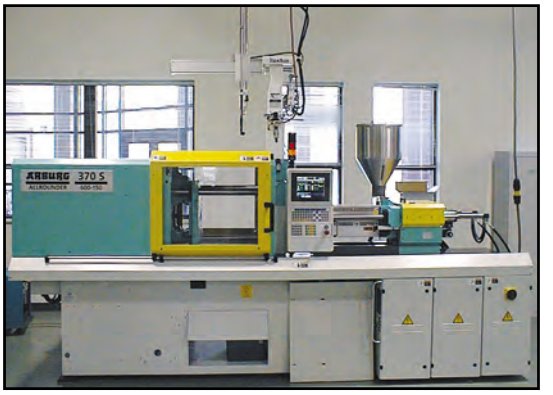
Injection molding rheometry (IMR)

Moldflow's injection molding simulation software predicts the flow of polymer through mold geometries. Accurate flow analysis requires the most relevant and accurate material rheological data. Moldflow studies have shown that rheological characteristics measured on instrumented injection molding machines yield better simulation results for both filled and unfilled materials.

This view is validated by leading researchers Professor Robert Malloy, of the University of Massachusetts Lowell, and Professor Philip Coates, of the University of Bradford, United Kingdom.

Professor Malloy states, “The overall 'processability' of a polymer or plastic melt is influenced by a variety of factors, but most importantly, by its rheological behavior. A realistic characterization of a polymer melt's shear flow behavior is particularly important for engineers engaged in any type of polymer process design, including injection molding simulations. Obtaining shear viscosity data at the pressures,

temperatures, and shear rates associated with the injection molding process is most commonly accomplished using conventional capillary rheometers. These laboratory instruments offer outstanding precision, but their 'melting mechanism' is purely conductive heat transfer. This is unlike injection molding, where both conductive heat transfer and viscous heating during plastication and injection can play an important role (i.e. shear history). Rheological data generated with a more realistic melting mechanism should lead to more realistic process simulation results. This is particularly important for fiber reinforced thermoplastics where the shear history associated with injection and plastication can have a very significant influence on fiber length and, therefore, flow behavior. Injection molding based rheometers also offer a wealth of other advantages. They are especially useful when working with materials where mixing is critical. In addition, the effects of masterbatch additives (added at the hopper) can be easily evaluated. They offer advantages in terms of test time, and these rheometers can be easily automated."



Injection molding machines form an integral part of the MPL material testing strategy.

Professor Coates adds to this by stating, "Basically, in-line rheometry (and other in-process measurements which include flow visualization, rheo-optical measurements, ultrasound, Raman, IR and UV spectroscopy) offers information about the polymer under relevant process history conditions (temperature, strain and stress histories), which off-line rheometry certainly does not. This is particularly important for 'process sensitive' materials. Using off-line measurements can, therefore, be very misleading. In-line measurements in injection molding can also allow thermal stability assessments which are not possible using off-line rheometers, where temperature soak times are often several times the typical polymer residence time in normal processing."

Corrected residual in-mold stress (CRIMS) model

Moldflow Plastics Insight® (MPI®) 4.1 simulations allow the use of three types of shrinkage data and models:

- ❑ Residual stress model (mechanical properties data required)
- ❑ Residual strain model (Moldflow shrinkage data required)
- ❑ Corrected in-mold residual stress (CRIMS) model (Moldflow shrinkage data required)

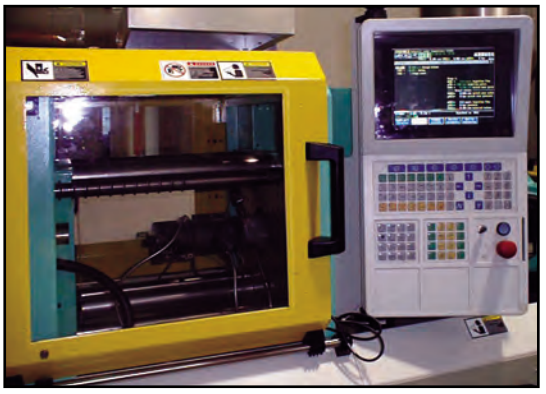
Moldflow strongly recommends using the CRIMS model to achieve the best simulation results. The CRIMS technique achieves unprecedented accuracy in the prediction of shrinkage and warpage using the predicted residual in-mold stress to correct the shrinkage predicted during the flow simulation.

Moldflow analyzed more than 20,000 moldings, each with varied process conditions, thickness, or material. The purpose was to compare the accuracy of predictions based on mathematical theory alone and those based on CRIMS. Greater than 85 percent of the predictions based on CRIMS were within 20 percent of the experimental result, whereas less than 15 percent achieved this result for the prediction based on mathematical theory alone.

MPL offers traditional capillary rheometry services for those who need this type of data.

Mold verification

Mold verification demonstrates the ability of a given material data set and simulation program to predict cavity pressure as compared to experimental molding observations. Plaques are molded on an injection molding machine which is instrumented with cavity pressure sensors. Moldings are performed at the recommended melt and mold temperatures, at various flow rates and multiple part thicknesses, as outlined in a design of experiments (DOE). Flow simulations are performed at each of the molding conditions using the measured flow, thermal, and pvT data. The predicted cavity pressures are compared to the experimental measurements to validate the material data set.



MPL recommends injection molding rheometry to generate optimum data for Moldflow simulations.

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UMass Lowell Student Obtains Real World Experience at Moldflow

Neha Mehta is a graduate student at the University of Massachusetts Lowell (UMass Lowell), scheduled to graduate in September 2003 with a master's degree in plastics engineering. She earned her undergraduate degree in plastics technology at L.D. College of Engineering in India. She has been working as an intern at Moldflow Corporation's corporate headquarters since April 2003.

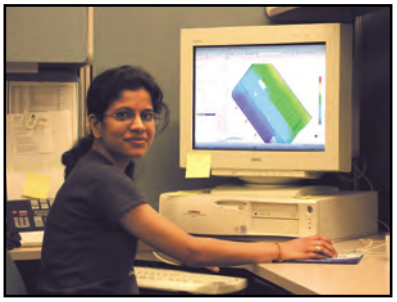
During her internship, she worked primarily in technical support providing support and expertise associated with Moldflow Plastics Advisers® (MPA®) and Moldflow Plastics Insight® (MPI®) products. Her responsibilities included helping customers with software licensing, product installation, troubleshooting, and interpreting analysis results.

She says the work at Moldflow has helped with preparation of her graduate thesis. "I have been comparing filling patterns obtained with a simulation package with actual molding trials associated with 'micro-molded' parts. I am using Moldflow software as my simulation package for that work. It's helped me a lot in developing an understanding for the MPI product. The work with Moldflow has really helped me in completing my thesis. At the same time, the internship opportunity has provided me with a great deal of hands-on experience with the software," says Mehta.

Prior to the internship, Mehta used Moldflow products at the simulation lab at the university. "I began using Moldflow software during my second semester at school," adds Mehta.

Post graduation plans

Mehta hopes to secure a position working with Moldflow products after graduating with her master's degree. "I am very confident that my education and experience using the simulation packages will bolster me into a good career. The high exposure to the technology and strong work ethics have positioned me to obtain a good position in the plastics industry. This has been a very positive and rewarding experience for me. Regarding my immediate future, I plan to continue to work with Moldflow products."



Neha Mehta working at her internship at Moldflow Corporation.

Internship programs

Mehta says the knowledge from books is not at all sufficient in terms of obtaining a well-rounded education. "At the college and post-graduate level," Mehta notes, "practical knowledge is almost more important than book-based information. Internships help prepare students to face the tough and competitive real-world working environment. For engineering students, internships provide hands-on experience in a real engineering organization."

She selected UMass Lowell for her graduate work because she learned that the college has an excellent program for plastics engineering. "I became very interested in the school because of its engineering and plastics curricula," says Mehta.

Mehta's UMass Lowell advisor and associate professor, Carol Barry, has worked with Mehta for almost two years. She teaches all the graduate students during their first semester. "Neha is a good student," says Barry. "She has been working hard on meshing parts and performing analyses throughout her studies here. She was one of two students working with me using MPI/3D. Prior to tackling the software, we hadn't done a lot of work with the 3D capabilities. Learning to use the package, we all benefited by working together to grasp concepts and functionality."

Barry says that Mehta's career prospects are much better now versus the same time last year. "Our graduate students are very successful in finding good positions," adds Barry. She says that UMass Lowell's engineering department urges students to participate in internship programs. "Generally, students with internship experience obtain better jobs when they graduate. We try to urge students to seek outside experience after their sophomore years in the undergraduate school. Graduate students, and particularly international graduate students, typically choose to spend their summers working in internship programs. If they can do it, they will."

"It's also a big advantage to all students that we have the real-world software tools here at the university. We use the technologies for research and for teaching. If students like the software, they play with it and spend lots of time in the lab using it. If they don't gravitate to it, then they can work with the injection molding machine," adds Barry. ■

You can get more information about the Plastics Engineering Programs at UMass Lowell at www.uml.edu or by contacting the department chairman at robert_malloy@uml.edu.

Introducing Moldflow Plastics Advisers 7.0

By Murali Anna-Reddy, Moldflow Corporation

Since its launch in 1997, Moldflow Plastics Advisers® (MPA®) design-for-manufacturability software has revolutionized the way that plastics part and mold designers optimize their part and mold designs. Unlike Moldflow Plastics Insight® (MPI®) software, which provides a complete suite of modules for simulating the most comprehensive range of manufacturing processes encountered in thermoplastics and thermoset injection molding across a broad range of geometry types, MPA products provide first-pass analysis tools best used in the earliest stages of part and mold design. MPA products have been designed for the "casual analyst," who is typically someone for whom running injection molding simulations is not the primary job, and answer basic questions such as "Will the part fill?" and "Where are the weld lines?" As a result, MPA tools are used extensively by part and mold designers, mold makers, industrial designers, design consultants and even by advanced CAE analysts, who use MPA results to determine which applications require the more in-depth analyses available in MPI modules.

Over the years, the capabilities of MPA software have expanded from being able to analyze only the part geometry to being able to analyze complete, multi-cavity mold layouts, including hot or cold runner systems and family molds. The results available from MPA analyses have also grown to include pressures, temperatures, sink marks, cooling quality, and gate location. The new analysis capabilities and results have been added to MPA software over the years in direct response to market feedback, to help our customers decrease time to market, improve the overall quality of their part and mold designs, and ensure that projects are delivered within budgetary constraints. MPA 7.0 is scheduled for commercial release in December 2003.

MPA 7.0 contains significant new features and enhancements for increasing user productivity, collaborating with expert users and consultants, and further optimizing part and mold designs. In addition, two new add-on modules are available to extend Moldflow Mold Adviser capabilities with the MPA 7.0 release — one for investigating the tendency for part warpage and one for evaluating and optimizing mold cooling circuit designs.

This article describes in detail new MPA 7.0 features and enhancements, including:

❑ *Connect to Consultants Tool* — facilitates communication between the MPA user and a plastics simulation expert/consultant.

❑ *New Optimization Tools* — extends the optimization focus of MPA software through a material/process adviser and a mold runner system adviser.

❑ *Moldflow Mold Adviser Extension Modules* — enables mold designers to evaluate and optimize molded part performance and cooling circuit design.

❑ *Customer Driven Enhancements* — including a material orientation plot and new runner system modeling tools.

Connect to Consultants Tool

MPA 7.0 features a utility that facilitates collaboration and monitoring of Moldflow Part Adviser and Moldflow Mold Adviser analysis results by a plastics simulation expert or consultant, usually someone within the user's organization, whom the user specifies. The Connect to Consultants tool will allow the expert/consultant to assist the MPA user with result interpretation, problem troubleshooting, alternative design suggestions, and improving the MPA user's overall comprehension of the software.

This powerful tool is simple to set up and operate. To begin with, the user specifies the e-mail address of the expert/consultant inside the software. From this point on, the expert/consultant can be notified via e-mail when a specific issue arises. The notification can be triggered either manually or automatically. In manual mode, the MPA user initiates the call to the expert/consultant. When doing this, the user can choose to provide the model and/or a report to facilitate the expert/consultant to quickly comprehend the issue and provide a response. In automatic mode, the expert/consultant can set up criteria that will trigger the automatic notification of a problem. The criteria can be specific to the current model or based on historical trends in results. The latter option allows potential problems to be detected even before they arise.

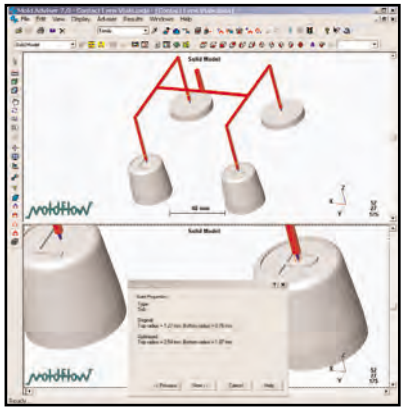
The Connect to Consultants tool will nurture a mentoring relationship between the MPA user and the designated expert/consultant in the organization and ensure the successful application of the technology. It can also turn a novice MPA user into a more informed user in the long run.

New Optimization Tools

Material/Process Adviser

Moldflow Part Adviser and Moldflow Mold Adviser users can now optimize the material selection process by evaluating several materials and identifying the material which has the largest processing window and least amount of cooling time for their part design. The user begins by selecting any number of materials, and then launches the Molding Window Analysis. The software compares each material's processing window as well as the maximum and average cooling times of the part. From this comparison, the software ranks the materials in the order of most suitable (largest processing window and shortest cooling time) to least suitable (smallest processing window and longest cooling time).

Runner System Adviser



Mold designers using Moldflow Mold Adviser will benefit from the runner system adviser, which extends the gate optimization tool (introduced in MPA 6.0) to automatically size sprue, runner, and gate components of the runner system. An optimized runner system helps to reduce scrap, improve productivity, and reduce production costs. By automating the runner system design process, mold designers will have one less issue to address regarding their mold design. While designing the runner system, the user can mark portions of (or the entire) runner system for auto-sizing. The program calculates best dimensions for each marked segment of the runner system and automatically updates the model with these calculated dimensions. The designer can review the changes made and obtain feedback on the reason(s) for the change in the dimension(s).

Moldflow Mold Adviser Extension Modules

Two new add-on modules to Moldflow Mold Adviser are being introduced in MPA 7.0 to extend its capabilities to quickly evaluate and optimize part performance and cooling circuit design.

Performance Adviser

Packing Analysis

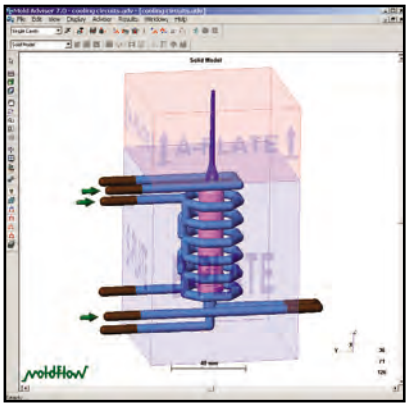
A packing analysis can be used to optimize the second stage of the injection molding process to achieve the right balance between part quality, part cost, and cycle time. Users can set up and evaluate packing profiles to determine the optimal packing pressure and duration of packing. From the analysis, the user can review the volumetric shrinkage, cycle time, and the average temperature across the part.

Warpage Indicator

Undetected, warpage can become an extremely costly problem to fix once a mold is in a production environment. The new MPA 7.0 Warpage Indicator is a traffic-light plot (analogous to the Confidence-of-Fill plot) that highlights the areas where part warpage exceeds a user-specified, acceptable warpage level relative to a user-specified reference plane. Users can investigate further for additional information on the source of warpage and obtain recommendations to fix the problem. Users evaluate whether changes made to the part or mold design or to the material or process conditions will bring the part warpage to within acceptable levels.

Cooling Circuit Adviser

Cooling Circuit Design and Evaluation



Mold designers can now quickly design and evaluate their cooling circuit layouts to achieve uniform cooling with a minimum cycle time. Regular cooling channels, baffles, bubblers, and hoses all can be modeled and evaluated. From the analysis, users obtain the part temperature and cooling time. The part temperature plot is useful in identifying hot spots and non-uniform cooling regions. The designer can then consider part and mold changes to address these problems. The cooling time plot is useful in identifying regions which are taking a longer (than average) time to cool, thereby affecting the overall cycle time. In addition, the analysis provides several results related to the cooling circuits, including Reynolds number flow rate, pressure, and temperature, all of which can help the designer to maximize the efficiency of the cooling system.

Automatic Cooling Layout Wizard

The Cooling Layout Wizard automates the cooling circuit design process by automatically generating an initial cooling system. The wizard utilizes a set of standard rules to generate the location and sizes of the cooling channels. The mold designer can adjust the cooling lines to account for ejector pins and other mold components.

Customer-driven Enhancements

Several much-requested user enhancement requests will become available in MPA 7.0. These include a material orientation plot and runner system translation tools, among others.

Material Skin Orientation Plot

The Material Skin Orientation plot displays the orientation of polymer molecules and/or fibers (if any) on the skin (surface) of the part at the end of filling. This plot assists in determining a qualitative estimate of the part strength, especially in the vicinity of weld lines. Uniform orientation leads to better surface quality, while differential skin orientation potentially causes differential shrinkage and part warpage. Part and mold designers can evaluate alternative gating strategies to reduce differential orientation.

New Runner System Modeling Tools

Moldflow Mold Adviser users can take advantage of new modeling tools that allow them to translate, rotate, and mirror portions of the complete runner system. Previously, these tools were

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North American Manufacturing in the 21st Century: You Know It Ain't Easy, You Know How Hard It Can Be

By Gisela Wilson, Director, Product Life-Cycle Management, IDC

The global market facing many North American small and mid-sized manufacturers, especially those of mature products, is one of fierce price competition, difficulties in creating product differentiation, and loss of insight into market drivers due to the absence of direct interaction with customers.

What will be the fate of small and mid-sized American manufacturers in the 21st century? These manufacturers, regardless of business model — engineer to order or manufacture to stock — or products — diesel engines or industrial fans, objects or materials — have the same overwhelming concern: cost control in the face of competition with low-wage countries.

The temptation for North American companies is to abandon their strategic goals, like product excellence, in favor of tactical maneuvers such as manufacturing cost-cuts. However, these approaches will not win in the long run against global competition. All you end up with is a losing battle of costs, and the sacrifice of quality and innovation.

What answer could one give to a manager in a small or mid-sized manufacturing company who has come to believe that superior product quality will not protect his company from fierce cost competition against cheap off-shore labor? Or to the frustrated product development engineer who complains that because of the need to cut costs his company has no staff or resources to devote to innovation?

Quality

Most manufacturers would proclaim product quality as extremely important to the company's success, and yet they also recognize the necessity of balancing quality and cost. At the same time, they feel deeply frustrated by any product deficiencies arising from the sacrifice of quality to cost. Loss of quality can mean loss of business, and companies that do a lot of repeat business with few customers risk losing their preferred vendor status. If a certain amount of degradation in quality due to cost control is unavoidable, the key question becomes: what is the customer's threshold of tolerance for product defects? Once you know that, you have two options: internal customer support or field service. Either way, customer satisfaction will be contingent upon an ongoing high level of confidence in the quick and complete correction of problems.

Direct sales channels and internal customer support have always provided feedback to the manufacturer about customer demands and market drivers. However, companies that outsource their distribution and support lose this. A manufacturer without access to timely information about the product's performance has little to go on to assure or improve its quality and hence its competitiveness.

Innovation

What role does innovation play in the manufacturing of mature products with stable technology? You may think that innovation refers simply to product development, that if there is no requirement for novelty to sustain demand, innovation plays little if any role in staying competitive.

However, the realm of innovation actually is much broader than this. Innovation can mean the invention of new products; the improvement of existing products in function, form, or substance; and new approaches in the manufacturing process itself.

Even if there is little way to differentiate a mature product from that of the competition, innovative solutions to problems of efficiency or customer support will strengthen your competitive edge. Innovation comes from individuals, not armies of cheap labor.

Cost

Manufacturing costs are, of course, the bottom line — not the whole story, but the foundation for everything else a company can do to gain competitive advantage. Cutting costs by abandoning quality and innovation is suicidal for a company. The key to cost control without self-inflicted wounds is this: maximize efficiency and monitor quality in the manufacturing process. Manage that process in a way that integrates control of and feedback from all stages of that process.

Sources of strength

What can small and mid-sized North American manufacturing companies do to improve their prospects? If we accept the current mantra of abandoning all business activities that don't play to the core strength of the company, and the current tactic of sacrificing quality and innovation to control cost, many of them should close their doors and hand their business over to their Asia-Pacific competitors.

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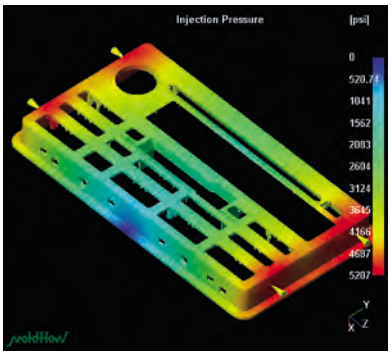
ourselves as well as for other molders. Other molders are very interested in the Moldflow data and how the mold is designed. The end user, who is buying the plastic part, doesn't care about the mold as much as getting a good plastic part, because they have to live with how that tool functions." Basilius is pleased with the MPA automated update functionality. He's the sole MPA user at the organization.



(the images were provided courtesy of Basilius, Inc.)

Hoffmann says that recently a customer wanted to increase production to produce a multi-material part. "In response," notes Hoffmann, "we developed our patented LIT system to increase the number of cavities that could be obtained in this type of mold. We assembled the entire molding system in our test lab and made it production ready. On the shop floor, we have implemented palletized systems and robots integrated with metal cutting machines and CMMs that handle our mold components and allow for dramatic increases in unattended machining. These are just two of many innovation or improvement examples."

Tri-Mack Plastics has excellent customer loyalty. "Return business is significant," affirms Mack. "New purchase orders from existing customers are the best compliment a supplier can ask for." ■

For more information about these companies, go to www.basilius.com; www.cacopacific.com; and www.trimack.com.

analyst says, continued from page 27

Such abdication would ignore the real strength of small manufacturing businesses, which has always made them the seedbed of innovation and growth: their people. Manufacturing companies need to become places where employees can bring to bear their training, their experience, and their creativity. To succeed at this, companies must enable information sharing, collaboration, and knowledge management.

Information sharing

Information sharing will help companies tear down the walls that isolate functional silos such as product development, purchasing, manufacturing, and sales from one another, and open up product and operational information to a much wider group of people. This information must, however, be presented in the right form and at the right time, depending upon the needs of the user. For example, sales and marketing probably would never need complete 3D CAD files on a product, but could use lightweight geometry visuals as part of sales information and marketing messages. Sales would never need the entire Gantt chart for shop floor planning. Sufficient for the information they want to send their customers would be a simple report on when the product will be ready for shipment.

Collaboration

Team collaboration is another component of management strategy to empower employees for innovation. Collaboration can be important not only within the company, but also with external teams, such as suppliers and business partners. For example, sales, marketing, designers, and developers often need to collaborate on product specifications or during product launches. In the past, the many technical hurdles hindered most attempts at such collaboration: Incompatible file formats, file security and access control, etc. Now, however, cost-effective and easily managed systems for team collaboration are available even to the smaller enterprises.

Knowledge management

Collective knowledge is a company's third source of strength: its past technical and operational expertise, the training, experience, and creative capabilities of its employees. Traditionally, the locations of this wealth of knowledge made it impossible or at least difficult to leverage it into real benefits for the company. Stored in individual brains, notebooks, patent applications, procedural lore, and unconnected computer files, there was no way to access or disseminate this treasure of ideas. Now, however, systems are available for gathering, integrating, providing access to, and presenting all of this accumulated knowledge in ways to assist managing change, making decisions, and tracking costs and resources.

Conclusion

Manufacturers cannot survive in this business environment simply by trying to win the battle against cost. Although cost control is crucial, quality and innovation remain necessary to sustain a competitive edge. The strategy to achieve this rests upon doing what western manufacturers have always done better than cheap labor competition: innovation, invention, and creative solutions. These abilities emerge from the capabilities of individuals. The key to achieving these goals — cost-control, quality assurance, and enhanced innovation — is to provide the appropriate tools so that individuals can use their training and experience to ensure the success of their company. ■

IDC is the premier global market intelligence and advisory firm in the intelligence technology (IT) and telecommunications industries. Its 700 analysts in 70 countries analyze and predict technology trends so that its clients can make strategic, fact-based decisions on IT purchases and business strategies. For more information, go to www.idc.com.

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Thermoset material testing

MPL offers a full range of tests for thermoset material characterization, providing thermal conductivity, solid density, specific heat, curing kinetics, and shear viscosity data:

- ❑ Thermal conductivity is measured by means of a transient line-source technique
- ❑ Solid density is measured using a hydrostatic balance apparatus
- ❑ Specific heat and curing kinetics are measured by differential scanning calorimetry
- ❑ Shear viscosity is measured by reservoir slit-die rheometry, an innovative technique that captures the effects of shear rate, temperature, and curing

The combination of these tests gives MPL an unparalleled capability to characterize the properties of thermoset materials. Thermoset material data is required for MPI/Reactive Molding, MPI/Microchip Encapsulation, and MPI/Underfill Encapsulation simulations.

On-line data fitting service

Moldflow Plastics Laboratories (MPL) is committed to strengthening its ties to the material supplier community in the interests of providing Moldflow customers with the broadest range of high-quality data for CAE simulations. The Web-based MPL/Data Fitting utility gives material suppliers the ability to create material data files that can be imported directly into Moldflow Plastics Insight and Moldflow Plastics Advisers® (MPA®) software. ■

To learn more about material testing services and data requirements for Moldflow simulations, go to www.moldflow.com, send e-mail to mpl@moldflow.com, or contact your local Moldflow support office.

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Acquisitions

Over the past two years, Kistler acquired two vehicle wheel measurement companies. These companies utilize strain gauge measuring principles in lieu of piezoelectric technology. The strain gauge technology employed in these wheels is far superior to the normal strain technology that is available on the open market. We are in the process of determining what, if any, benefit this technology can have in other markets, such as plastics, that we serve.

Conclusion

At Kistler, we believe that there is no single recipe for growth in any market in the 21st century. Rather, it will take a number of strategies that are closely bundled together to compete for market share. We always will focus on helping our customers solve their most perplexing problems. Finally, strategies are important. The execution of the strategy is even more important than the strategy itself. The single most essential ingredient of success is to delight your customers in whatever endeavor you undertake.

Kistler is one of the world's leading suppliers of measurement technology. Kistler sensors use the piezoelectric effect to measure pressure, force and acceleration. To find out more about Kistler, go to www.kistler.com

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limited to part geometry only. These much-requested tools allow mold designers to quickly and efficiently design runner systems, thereby increasing overall productivity.

Update on Supported Hardware and CAD Integrations

Microsoft Windows NT, which Microsoft officially stopped supporting in June 2003, is no longer a supported operating system for MPA software. The complete list of officially supported hardware platforms and operating systems includes Microsoft Windows 2000 and Windows XP, Sun Solaris 8 and 9, HP-UX 11.0, SGI IRIX 6.5, and IBM AIX 4.3.3.

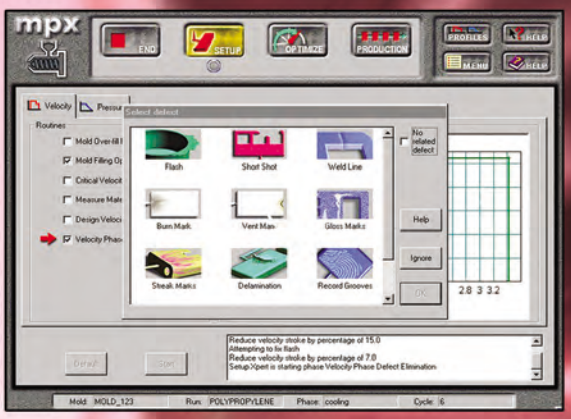
The MPA CAD-integrated versions have been updated to support the latest product releases from the world's leading CAD companies, including Pro/Engineer Wildfire, SolidWorks 2004, Solid Edge 15.0, Autodesk Inventor 7.0, and Autodesk Mechanical Desktop 7.0.

In addition, Moldflow Design Link™ 4.0 (MDL™ 4.0) is completely integrated with the Moldflow Plastics Advisers 7.0 release. MDL 4.0 provides a geometry data translation interface between MPA software and leading CAD systems using standard geometry formats such as IGES, STEP, and Parasolid, as well as allowing direct import of native Pro/ENGINEER® part and CATIA® V5 part files. ■

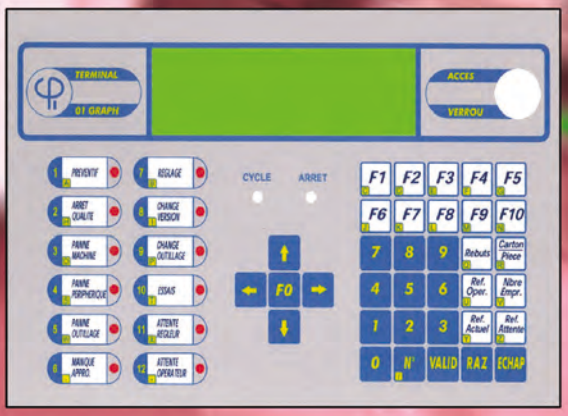
Look for the release of MPA 7.0 in December 2003. For more information about Moldflow Plastics Advisers software, go to www.moldflow.com or contact your local Moldflow representative.

Moldflow CORPORATION

Automation tools for machine set-up, process optimization and part quality control



Process and production monitoring



Production monitoring and reporting

mms
MOLDFLOW MANUFACTURING SOLUTIONS

Manufacturing Solutions

All the tools you need to be a great designer are now available in one software package.

If you need a complete product design solution that can help you manage CAD data more efficiently and communicate design concepts as well as produce them, look no further than **SolidWorks® Office Professional**. It includes SolidWorks 3D solid modeling software plus a set of fully integrated design tools. One is **PDMWorks**, easy-to-set-up-and-use data management software that's uniquely adapted to the needs of SolidWorks workgroups. Then there's **SolidWorks Toolbox**, a time-saving library of standard parts library, and an unmatched set of innovative tools for sharing design concepts via the web. At SolidWorks, we're **100% Focused** on product design. We're **Proven** in production. Our **Innovative** capabilities lead the CAD industry. And we set **The Standard** for performance and compatibility. **For more information about SolidWorks Office Professional, visit us at www.solidworks.com/completepackage.**

The Standard in 3D

SolidWorks