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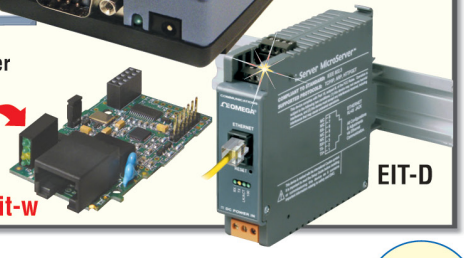

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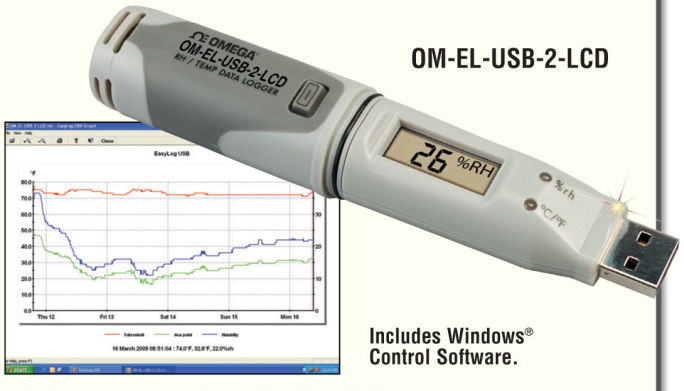

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Building Quality in Designs for Better Products

PETER VARHOL
pvarhol@deskeng.com

I just returned from the Conference of the Association for Software Testing, and have been giving some thought to how quality concepts apply to engineering designs. Is there a correlation between testing software applications and testing designs? I believe there is. The relationship is not in what we are testing, but in how we test.

Today, you probably test your designs in a variety of ways. Simulation is one popular technique; if you can simulate motion, stresses, wear and tear, tolerances, and other aspects of physics on your design and how it might behave as a completed and manufactured product, you can make some important statements about its efficacy before you release the design to manufacturing.

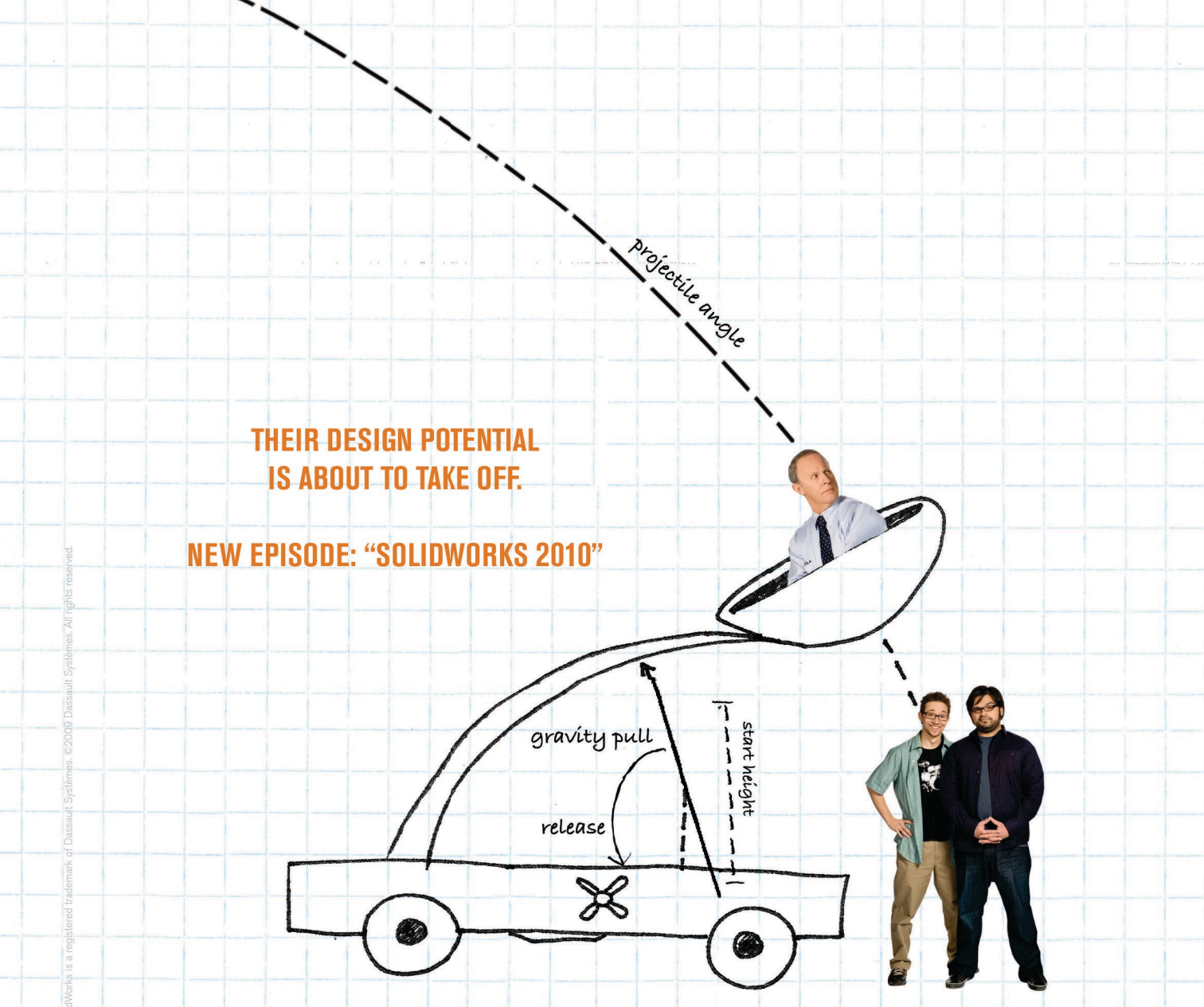
You can also test the design via prototyping, building a physical model to examine and test. A prototype can be simple or complex, from a clay mockup to an early but fully functional implementation of the final product. Of course, there is a law of diminishing returns involved; the more time you put into building a more complex prototype, the less time you have to test it.

> Testing today's designs with traditional techniques only gets us part way.

All these types of tests are good for ensuring quality. But they have limitations. Perhaps the most significant limitation is that even if the design is tested for fitness of purpose at the end of the process, it is too late to make substantive changes to the design while still meeting time-to-market requirements.

Much of today's emphasis in software development is in iterative design, build, and test—termed an agile approach in software parlance. Traditional software development methods typically have prospective users or user representatives defining business requirements for the product, which are then translated into functions, specifications, and finally working code.

An agile approach, on the other hand, involves just enough understanding of the problem domain and designing the application to start



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coding software. User stories rather than business requirements describe how it will be used, and development occurs a few features at a time, and very quickly, in the span of weeks or even days. Those features are shown to representative end users who provide fast feedback. The development team adjusts and goes through the same fast iteration again until a usable software application emerges.

Is there an equivalent approach in design engineering? I don't think so. The auto industry has been trying for years, with mixed success, to shorten its product-design cycles. However, the amount of time a new model spends in conceptualization and design is still measured in years.

For other, simpler products, an agile design strategy may seem redundant, as many designs take months or even weeks anyway. And a tangible product isn't like software, you may argue. They are not possible to test until the design is complete.

I disagree. I think engineers can and should do iterative designs, and there should be extensive involvement from users during that design process. It may involve different design possibilities, or it might mean engineers start with the aggregate and design in sets of details in stages. At each stage, the design is prototyped, and users are invited to preview the implemented features.

If it sounds too pat, it probably is. This kind of shift in philosophy is unlikely to speed up the design process, at least initially. But we'll likely end up with a better model of user expectations. ■

Contributing Editor ***Peter Varhol*** *has been involved with software development and systems management for many years. Send comments about this column to DE-Editors@deskeng.com.*

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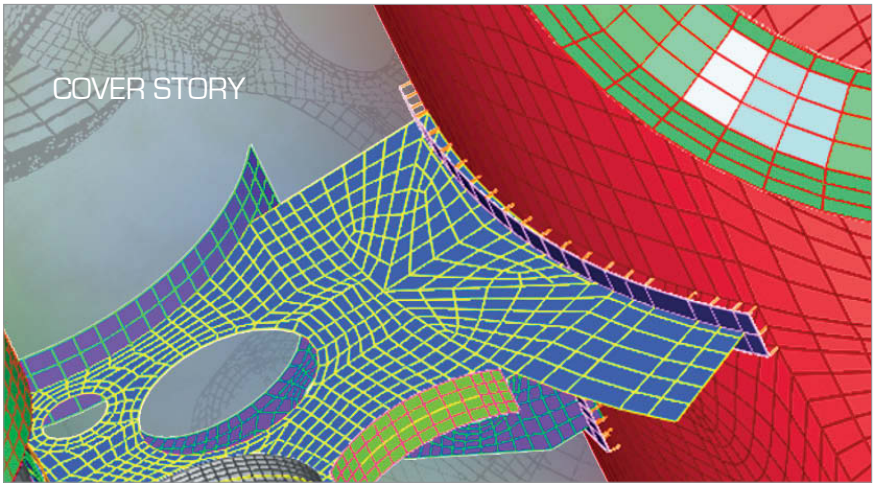
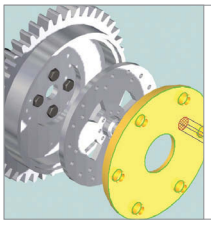
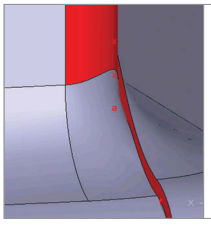
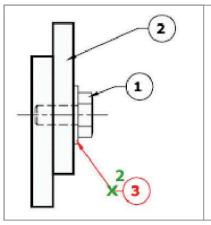
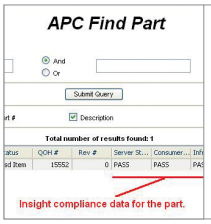


"Computers can figure out all kinds of problems, except the things in the world that just don't add up."
> James Magary









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ON THE COVER> The dynamic technologies and economic imperatives reshaping PLM are bringing the software's possibilities more in line with the needs of SMBs. This image from Siemens PLM Software illustrates Femap's new 3D surface mesher that handles complex surface geometry, enabling non experts to produce accurate results quickly and easily. *To read Tom Kevan's article, turn to page 34.*

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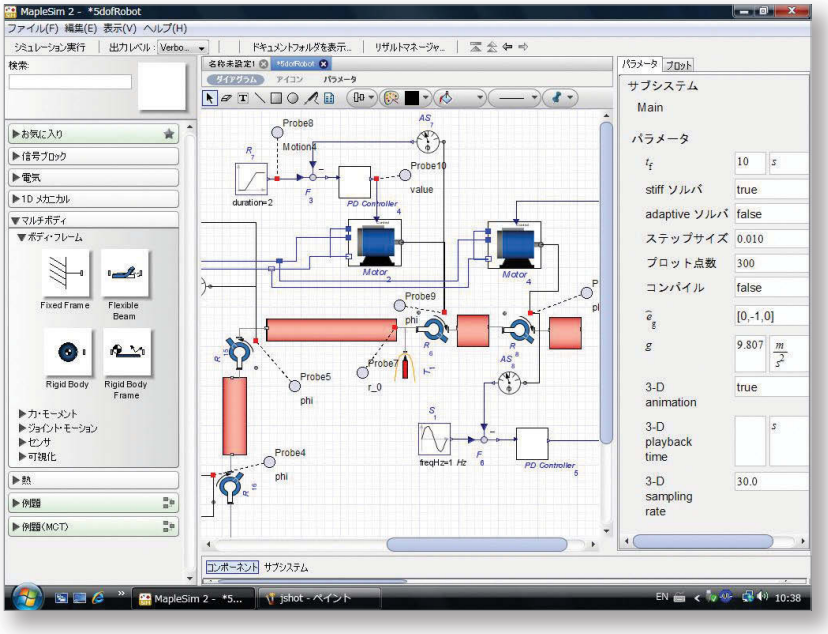
MapleSim 2 and Maple 13 Now Available in Several Language Editions

Maplesoft's recently released products MapleSim 2 and Maple 13 are now available in several languages. These products are based on Maplesoft's core technologies, which include its symbolic computation engine and physical modeling techniques.



For Japanese customers, Maplesoft has released Japanese editions of both MapleSim and Maple. In addition, Maple 13 language packs are now available in French, Greek, Spanish, Chinese, Brazilian, Portuguese, and Korean.

"Maplesoft has always responded to the needs of local markets with language editions and we see it as one of their key attributes," said Yoichi Mizoguchi, board member and general manager at Cybernet Systems Co., Ltd., Maplesoft's partner in Japan. "Maplesoft users in different countries use these products to solve difficult problems, gain better insights, and achieve better performance."

FOR MORE INFO:
> MapleSoft

CIMdata Creates PLM Certificate

CIMdata, Inc. has announced the start of its new PLM Certificate Program with recent sessions held in Helsinki, Finland, and Ann Arbor, MI. CIMdata's PLM Certificate Program is the flagship offering of CIMdata PLM Leadership, an education and training offering for PLM professionals.

CIMdata's PLM Certification Program is designed to prepare professionals at several levels to address implementation challenges.

The five-day assessment-based program includes a classroom experience, individual and team-based exercises, and individual evaluations of achievement. Upon completion, each participant receives a CIMdata PLM Certificate and becomes a member of CIMdata's global PLM Leadership community.

The next CIMdata PLM Certificate Program is scheduled later this month in Andover, MA.

FOR MORE INFO:
> CIMdata

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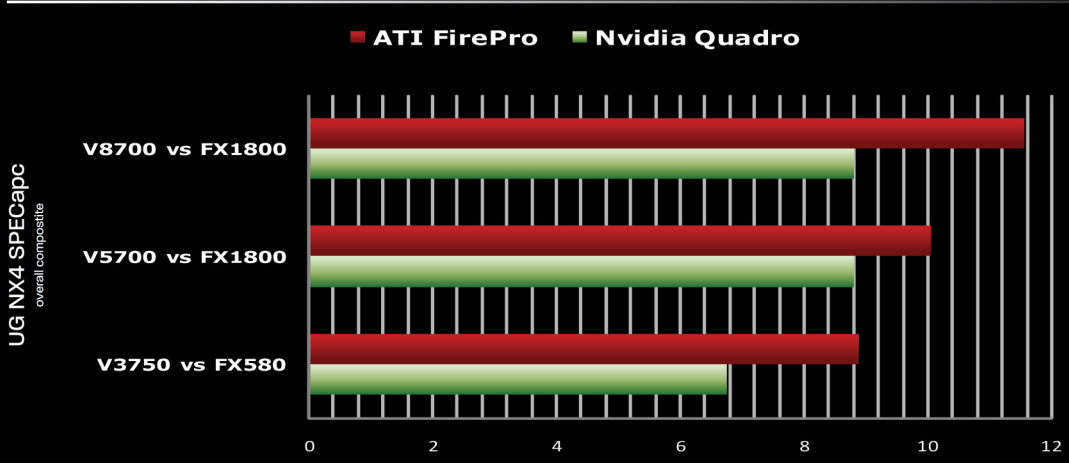
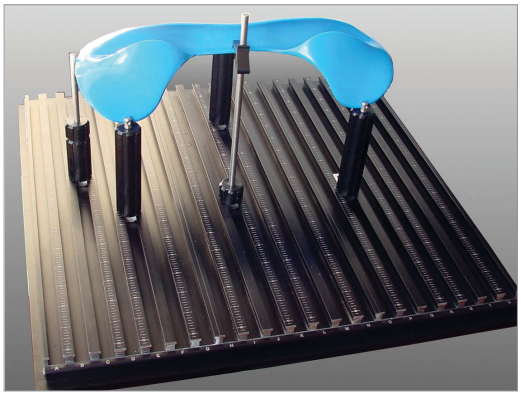


Learn more at ati.amd.com/FirePro

NVision and FixLogix Partner to Provide Part Holding for Noncontact Scanning

NVision Inc. and FixLogix LLC have partnered to provide a new modular part-holding system designed for non-contact scanning. The FixLogix part-holding system uses a T-slot fixture plate with integrated components to stage the part on the machine.



"The FixLogix system is the first part-holding system to deliver exactly what is needed for diverse engineering projects," said Steve Kersen, president of NVision.

Fixtures made for machining are designed to withstand the high cutting forces involved in machining, so they are typically expensive and block much of the part from optical inspection.

"The ideal approach to fixturing for optical inspection would be levitation," said Dan Smith, president of FixLogix. "Our new part-holding system provides the next best thing by offering a minimalist approach to holding the part firmly. We provide a standard kit that can be configured to hold nearly any part, with simple structures that minimize interference with scanning."

The T-slot plate has a clamp ledge around the perimeter, allowing lock-down with toe-clamps. The clamps feature a self-wedging design for trapping soft or fragile parts without distortion. The FixLogix part-holding system provides multi-axis positioning of locating components, which simplifies fixture construction. The frame is engraved with reference scales along the T-slots, for setup for repeatability.

NVision provides the FixLogix system as part of a complete package with its non-contact optical scanning systems like the NVision HandHeld scanner, MAXOS, and MobileScan.

FOR MORE INFO:
> FixLogix
> NVision

AlibreDesign.net Social user Site

SYCODE founder Deelip Menezes has launched AlibreDesign.net, an independent social network for Alibre Design users.

"[AlibreDesign.net] is a Web 2.0 social network where Alibre Design users all over the world interact with each other, discuss issues surrounding Alibre Design, and help each other out," says Menezes, "This social network promotes an increased level of interaction between Alibre Design users where members are free to share their experiences and speak their mind in an open environment."

Membership to AlibreDesign.net is free for life.

FOR MORE INFORMATION:
> Alibre Design
> SYCODE

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Mining Prospects Enhanced with ANSYS Simulation

ANSYS, Inc.'s software is being used in the mining industry to develop precise-delay timing for blasting. Orica USA is studying the effects of multiple blastholes on rock fracturing and fragmentation to further its ability to provide advanced blast-based services to industry.

Like other industries, mining markets are demanding low-cost products and processes that result in optimal performance and minimal environmental impact.

A blasthole produces stress waves. Multiple blastholes cause these to collide and interact—thereby magnifying, diminishing, or canceling out their effects. The physics involved are complex and dependent on the time between detonations. For example, colliding stress waves can become reinforced and reflected, producing significant damage, or stress waves can become depleted in strength due to other more powerful waves. The Orica simulation study used explicit dynamics software from ANSYS to show that blast-induced fracturing and damage lag significantly

behind the initial blast's stress wave, with the most effective delay time occurring when crack propagation and damage are maximized before a subsequent detonation occurs, a span of tens of milliseconds, depending on the rock and blast pattern.

"Mining activities remain a time- and cost-intensive business, so accurate planning is critical," said Dipankar Choudhury, vice president of product strategy and planning at ANSYS. "Such pioneering work from Orica has the opportunity to advance the entire mining industry—helping engineers to understand the physics that go on in an explosion. Technology from ANSYS enables engineers to go beyond physical constraints and perform simulated tests that would otherwise not be possible."

FOR MORE INFO:
> Ansys Inc.

LATEST NEWS

Cray Selects ASSET's ScanWorks Platform for Embedded Diagnostics in Next-Generation Supercomputers

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LMS Presents Engine Simulation Software at Trade Show

College Engineering Students Featured on PBS'"Design Squad"

EMA Becomes an Autodesk VAR

Engineering Software from ANSYS Enables Replacement of Fossil Fuels with Green Alternatives

Research firm says shipments for AMD, Intel, and NVIDIA on the rise

Jon Peddie Research (JPR) has announced estimated graphics shipments and supplier market share for the second calendar quarter of 2009. According to JPR, graphics chips (GPUs and IGPs) are the leading indicator of the PC market. The GPUs go into a system before it becomes a PC and gets into the hands of the customer.

After the channel stopped ordering GPUs and depleted inventory in anticipation of a long drawn out worldwide recession in Q3 and Q4 of 2008, expectations were hopeful, if not high that Q1 2009 would change for the better. In fact, Q1 showed improvement but it was less than hoped. Instead, Q2 was a very good quarter for vendors—counter to normal seasonality.

TABLE 1: Growth rates Q1 to Q2 from 2003 to 2009

	8 Year Average	2003	2004	2005	2006	2007	2008	2009
Change Q1 to Q2	0.83%	-5.42%	-5.18%	1.63%	-4.22%	3.13%	-0.49%	31.29%

TABLE 2: Total Graphics Chip Market for Q2 2009

Vendor	This Quarter	Market-share	Last Quarter	Market-share	Growth Qtr-Qtr
AMD	18.13	18.4%	12.81%	17.1%	41.5%
Intel	50.30	51.2%	37.20	49.7%	35.2%
NVIDIA	28.74	29.2%	23.26	31.1%	23.6%

Traditionally, Q1 to Q2 sales decline due to summer vacations and preparation for the fall. This year preparation seems to have gotten off to an early start, according to the research firm. Year to year, shipments jumped up to 98.3 million units, up 31.3% from last quarter. According to JPR, the industry won't hit the levels of 2008 until 2010. However, the firm is still predicting an upturn in the PC market in Q3 and Q4 and in particular for the graphics market.

FOR MORE INFO:

> Jon Peddie Research

Concepts NREC/Hermle Sign Partnership

Concepts NREC has signed a global partnership agreement with Maschinenfabrik Berthold Hermle AG of Gosheim, Germany, in which Hermle will offer the MAX-PAC family of CAM software to its machine customers worldwide.

Hermle provides manufacturing solutions, applications assistance, customer training, and service. More than 18,000 Hermle machines are installed worldwide, and Hermle operates via a network of company representatives in more than 50 countries. Hermle's precision machine tools are used to manufacture products in many industries with turbomachinery applications. Concepts NREC's CAM products include the MAX-PAC family: MAX-5, MAX-AB, and MAX-SI for turbomachinery impellers and related components.

FOR MORE INFO:

> Concepts NRC

> Herle AG

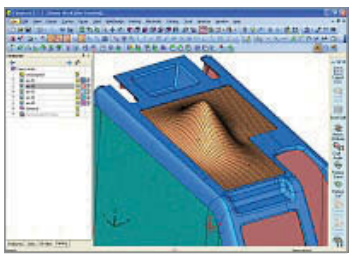
EDITOR'S PICK OF THE WEEK

FROM THE DESK OF **ANTHONY J. LOCKWOOD**, EDITOR AT LARGE, *DESKTOP ENGINEERING*

WOULD YOU TRUST THIS GUY? Well that question has already been answered by thousands of readers who have indicated they already do, implicitly. So here are Lockwood's most recent musings about the products that have really grabbed his attention, and deserve yours.

CAD/CAM System Reduces Process Times

> Version 9.0 of CimatronE helps eliminate wasted time and wasteful processes.



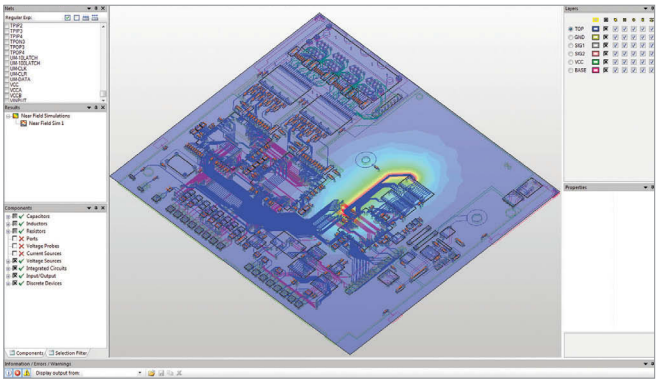
For more than 20 years, Cimatron has been a persistent force in the CAD/CAM market, quietly going about its business building up an impressive user base. But it hasn't been quiet lately. First, Cimatron created a lot of buzz acquiring Gibbs & Associates last year. Then, according to CIMdata, Cimatron's growth in 2008 positioned it as the sixth largest CAD/CAM provider globally and one of only five vendors to rank in the top 10 in every geographical region. Now, the company has introduced version 9.0 of its CimatronE suite.

CimatronE comes in extensible suites that provide the tools needed for toolmaking, mold and die design, discrete part manufacturing, reverse engineering, and even shoe making. If your gig is 2.5- to 5-axis milling, wire EDM, multitask machining, tombstone machining, and so on, Cimatron has something for you.

READ MY COMPLETE REVIEW:
> CimatronE

ANSYS Releases SIwave 4.0

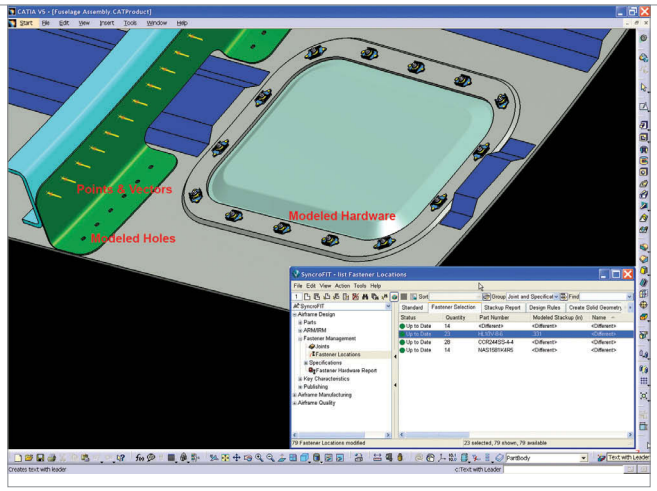
> Includes advancements in signal-integrity and electromagnetic compatibility testing.



When I first read the press release on SIwave 4.0 signal- and power-integrity analysis software from ANSYS, I was, of course, struck by the enhancements. But as I was digesting it, it occurred to me that efficiency was really the heart of this version. And that left me in a pickle. Everybody and their grandmother touts their product as making you more efficient. What could I say that was different about SIwave 4.0? Then, it hit me: It's ANSYS and 10Gb/s.

Ever since ANSYS got started, the whole idea has been to make engineering software accessible, powerful, and efficient so engineers can develop cooler, more robust things more quickly.

READ MY COMPLETE REVIEW:
> ANSYS SIwave 4.0



Automate Airframe Fasteners and Joints Management

> SyncroFIT 2009 said to save time and cut down on errors

The thing that I like most about VISTAGY is that it specializes in solving early and throughout the process all those hard-to-do product design, definition, optimization, and communications jobs that are vital to such industries as aerospace, automotive, transportation interiors, and wind energy. Their "do it early and do it often" approach is spot on for creating efficient manufacturing enterprises that will compete in the modern global marketplace. VISTAGY's recently announced SyncroFIT 2009 is a perfect example of this.

The cliff-note description of SyncroFIT is that it's a family of specialized engineering applications for designing and manufacturing airframes and large aerostructures. But more than that, SyncroFIT is a tedium slayer and process enabler.

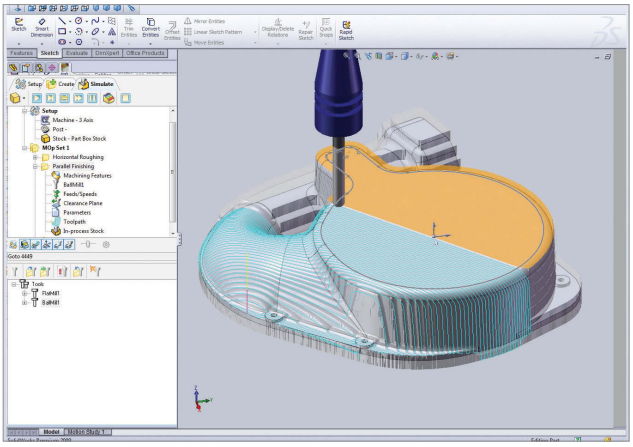
Airframes have millions of joints, fasteners, and interfaces. SyncroFIT automates their specification, validation, and management.

READ MY COMPLETE REVIEW:

> SyncroFIT 2009

CAM System Integrates with SolidWorks

>MecSoft's new VisualMILL for SolidWorks provides up to 5-axis toolpaths directly from 3D models.



Over the years, MecSoft carved out a name for itself in two ways. First, there's VisualMILL, a robust CAM system that comes as a standalone product and serves as a plug-in, general-purpose machining engine for Alibre and Rhino. Second, affordability. MecSoft provides VisualMILL in full-function, tailored-to-the-job packages. This means that they do not nick you with extra costs every time you need to do something. They've just done it again with VisualMILL for SolidWorks, which starts out at $999 and tops out around $4,000 for the full enchilada. Oh, and there are no maintenance fees for your first year and only a maximum of $399 after that. As I said, affordable.

Still, I know that marketers love to toss out the word "affordable" whether it applies or not. So, you decide. Here's what the $999 version of VisualMILL for SolidWorks gets you beyond the typical CAM tools that you expect: 2.5- and 3-axis solid, surface, and STL manufacturing.

READ MY COMPLETE REVIEW:

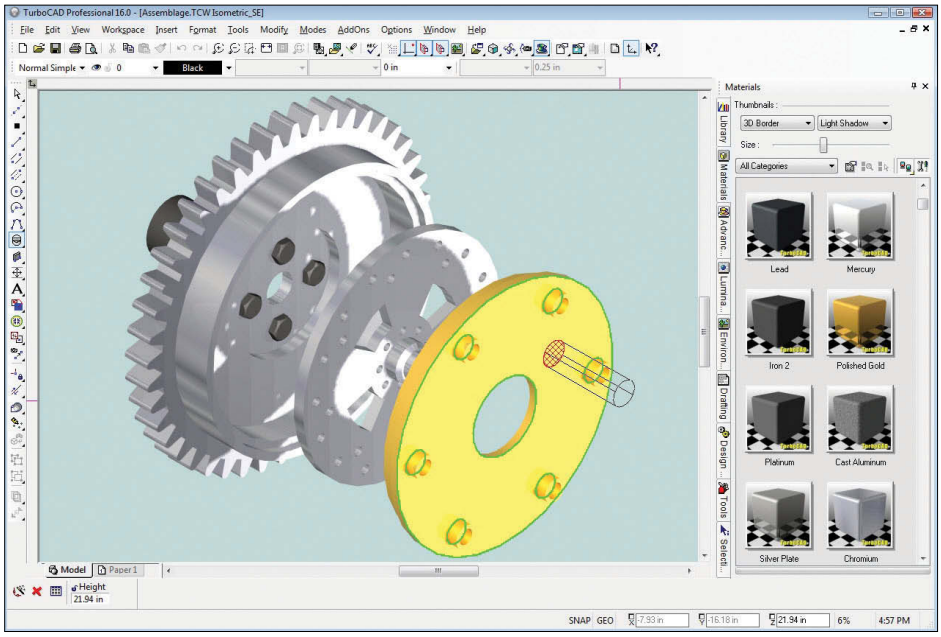
> VisualMILL

TurboCAD Pro 16: Powerful CAD on a Budget

> Improved drafting and some neat new 3D capabilities lead the list of new features.

BY DAVID COHN

TurboCAD Pro 16 is the fourth major revision of TurboCAD since an investor-led group purchased International Microcomputer Software, Inc.'s (IMSI) precision drawing group and was renamed IMSI/Design LLC. TurboCAD. It turns out Version 16 might be one of the biggest upgrades in years.



With the new QuickPull tool, you can hover over a face or region on a face and then push or pull it to offset, extrude, or imprint. You can even specify draft angle and add a chamfer or fillet.

TurboCAD Pro includes a huge selection of 2D drafting and 3D modeling functions, many based on industry-standard tools found in higher-end products. For example, the solids modeling capabilities are powered by V18 of the ACIS engine, LightWorks Rendering V7.9 from Lightwork Design enables the photorealistic rendering, and the geometric and dimensional constraints engine comes from D-Cubed.

It now includes the ability to create 2D sections based on 3D models, a new xref manager, improvements to dimensioning and Bezier curves, a new 3D quick pull function, a helix command, and new database capabilities. There are also big improvements in rendering, improved Google SketchUp import, and the ability to export to a SketchUp SKP file.

UI Showing Its Age

Long-time users may be pleased that the TurboCAD interface remains largely unchanged, with toolbars along the top and left edge of the screen, status and inspector bars along the bottom, and

a palette area on the right. But with many applications adopting the Microsoft Office ribbon bar-type interface, TurboCAD's UI looks more and more dated. Rather than simplifying that interface, TurboCAD's developers keep adding things; there are now nearly 70 toolbars. You can also create tabbed toolbars and popup toolbars that appear when you open the local menu, modify a toolbar's icons, and create your own toolbars.

There are also numerous ways of activating the same command: a button on a toolbar, a button on a flyout menu, a tool on one of the 19 palettes, a pull-down menu, or in some cases by typing a keyboard shortcut. And rather than having a single command with multiple options, TurboCAD retains its model of using a different command for each drawing option. For example, there are 13 different ways to draw an arc; you must choose the desired method when you first start the command. It can all be quite overwhelming for a neophyte or casual user.

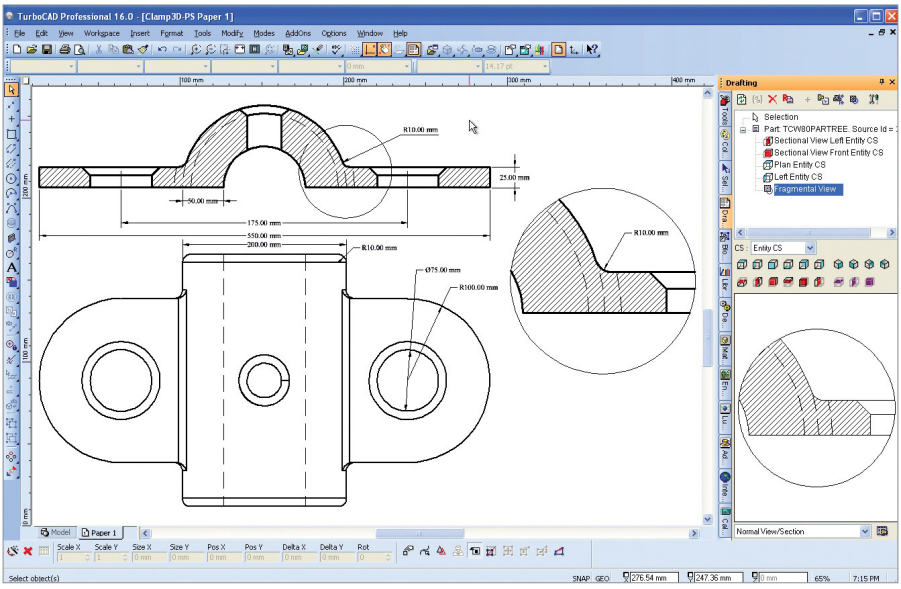
Improved Drafting and Detailing

A new XREF Manager, built into the Block palette, enables users to manage external references much more efficiently. Xrefs can also now be exported with DWG or DXF files for greater AutoCAD file compatibility. Improvements to the Drafting palette make it easier to create standard 2D views that remain associative to 3D objects. You can even create nested, associative sections. If the model is changed or the section plane

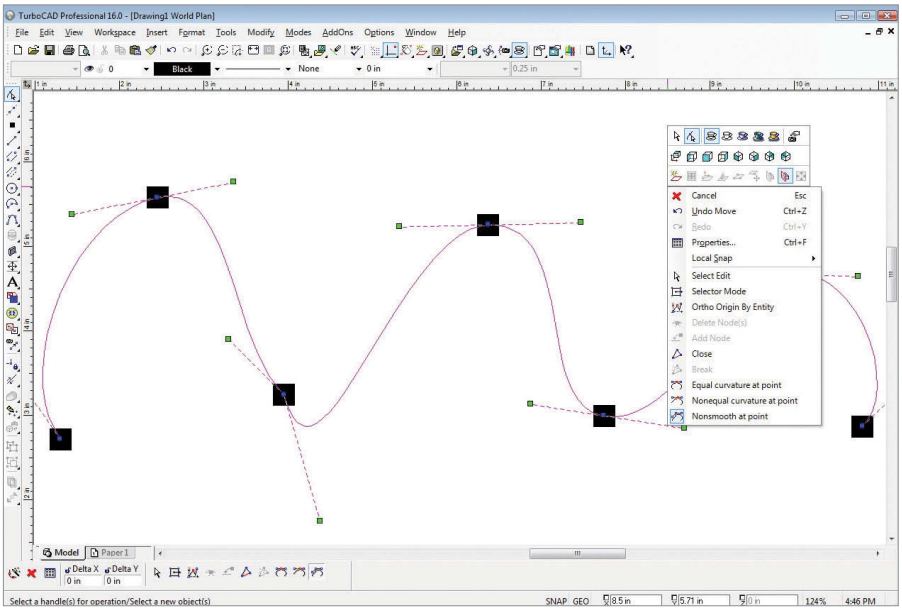
is updated, the 2D profiles are updated automatically.

TurboCAD Pro 16 has also added new options for editing Bezier curves. Equal curvature at point keeps the curve equal and smooth at the control point. Nonequal curvature at point keeps the curve smooth but lets you apply different curvature on either side of the point. And nonsmooth at point allows each side to be changed without affecting the other side.

TurboCAD Pro is one of the few general-purpose CAD programs with constraint capabilities. You can create geometric constraints, such as parallel, perpendicular, tangent, and equal that constrains selected geometry. As you add constraints, TurboCAD adds small markers adjacent to the constrained geometry, with user control of whether markers are placed on their own layer or that of the constrained object as well as the printing of those markers. You can also apply dimensional constraints that control the size of objects that appear both as dimensions within the drawing and as a variable name and value in TurboCAD's calculator palette. You can then include formulas in the calculator palette



TurboCAD 16's enhanced Drafting palette creates associative sections of surface and solid models and automatically scales dimension values to account for different scale factors used in the sections and fragmented views. The fragmented view will update automatically as the circle on the section moves.



New options for editing Bezier curves, available in a right-click menu, let you keep curves equal and smooth at a point, smooth but unequal at point, or enable you to change the curve on either side of a node independently.

to establish mathematical relationships between variables. If the program's Auto Add Constraints function is enabled, dimensions added using standard dimensioning commands automatically become dimensional constraints. We noted that in previous versions, once you had established a dimensional constraint, you could only change its value from within the calculator palette. But beginning in TurboCAD Pro 15, you can now also drag the dimension's control points or even change its value in the Properties dialog.

TurboCAD 15 also added the ability to place angular dimensions on arcs and to show linear and angular dimensions using surveyor formatting. New in V16 is the ability to create custom arrow blocks and to match dimension scaling in paper space to that in model space, features that have long been available in AutoCAD.

Great New 3D Tools

TurboCAD's 3D capabilities have always been extensive for a basic CAD program, growing more powerful with each release. TurboCAD Pro 15 introduced automatic workplanes by face. When enabled, the facet of a 3D object highlights in red when the cursor passes over it and any object you draw will be placed on that facet, similar to the dynamic UCS feature in AutoCAD. New in V16 is a QuickPull tool that lets you offset the face of an object or extrude or imprint a region on its face. You can even specify draft angle and add a chamfer or fillet to the geometry being modified.

As in previous versions, you can create 3D objects as standard objects such as boxes, spheres, cones, cylinders, and so on; by performing functions such as extruding, sweeping, revolving, and lofting 2D profiles; and by assigning a thickness to 2D objects. New in this release is an offset property that allows for the creation of a body with constant thickness. Also new is an ACIS-based Helix tool that can be used to create a 3D helical spline or a 2D spiral by specifying the starting and ending radius, the number of turns, and the height of each turn.

TurboCAD Pro 16 comes with numerous predefined styles, and controls include the ability to simulate weather conditions, lens flare, ambient occlusion, and depth of field as well other artistic effects.

Although not really new (they were added in V15), two new assembly tools also deserve mention. Assemble by Tangents changes the position of an object by aligning a cylindrical face tangent to another cylindrical or flat face. Assemble by Axis changes the position of an object by aligning axes. Both are welcome additions, but do require some effort. For example, before you can use the Assemble by Axis command, you must first use the Set Assembly Axis command to establish the two axes to be aligned, which requires a total of six clicks.

Rendering and Interoperability Improved

Significant rendering enhancements result from the inclusion of v7.9 of the LightWorks Rendering engine, including the ability to save an unlimited number of rendering styles. TurboCAD Pro 16 comes with numerous predefined styles, and controls include the ability to simulate weather

conditions, lens flare, ambient occlusion, and depth of field as well other artistic effects. Also new is the ability to simply drag and drop materials from the Material palette onto individual faces of a 3D object. Material scaling has also been improved, making it easier to preview changes on the fly.

TurboCAD Pro 15 added new bill of materials and parts list capabilities as well as the ability to create tables or import tables from AutoCAD DWG or DXF files. TurboCAD Pro 16 adds the ability to connect to a database and associate data with objects in the drawing or a TurboCAD table. A new Database Connection palette provides the tools to create and manage database connections to most ODBC and OLE databases. While quite powerful, setting up and managing database links appears to be a relatively complex procedure best left to those experienced with the various database protocols.

Compatibility with AutoCAD DWG and DXF files remains one of TurboCAD's strengths, but we were unable to open files saved in the latest AutoCAD 2010 drawing format. TurboCAD's SketchUp (SKP) file import filter has been enhanced to include version 7 files.

Units settings, dimension objects, construction lines, and camera properties are all now imported. In addition, you can export TurboCAD models to native SketchUp SKP files.

New Pricing, New Products

Starting with the previous release, IMSI/Design raised the price of its software significantly. TurboCAD Pro, the version we reviewed, now sells for $1,295. A lower-cost version, TurboCAD Deluxe, is just $129 but lacks many significant features, such as the new automatic workplane by face, lofting, BOM, and parametric part creation. But even the Pro version is no longer the top of the line. IMSI/Design now sells separate Architectural and Mechanical editions of TurboCAD Pro ($1,395 each) that add specific features tailored for those disciplines. For example, the Mechanical Edition includes tools for bending and unbending sheet metal and tubes, a flange tool, several parametric hole tools, and pattern constraints. The Architectural Edition includes parametric slabs, a style manager for architectural objects, more advanced stairs, additional parametric doors and windows, and an edit profile tool. You can even purchase a Platinum Edition ($1,495) that includes all of the tools from both vertical editions.

TurboCAD Pro has a lot to offer as a less-expensive alternative to market-leader, AutoCAD, and, with practice you could model some pretty sophisticated parts for a lot less.

And then there are add-ons and plug-ins, such as AnimationLab ($199.95) for adding animation capabilities and a CAM plug-in ($299.95) for adding 2-1/2D machining capabilities. Users who buy TurboCAD Pro and then decide that they want the additional mechanical or architectural capabilities can purchase those as add-ons.

TurboCAD Pro is a very good CAD tool with some powerful modeling features. It's also compatible with a wide range of other programs, including AutoCAD, MicroStation, FastCAD, SketchUp, and

TurboCAD Pro 16

Price: $1,295

System Requirements: Pentium IV processor, Windows XP (512MB RAM) or Windows Vista (2GB RAM), 300MB free disk space plus 64MB minimum swap space, 1024x768 resolution display, CD-ROM.

FOR MORE INFO:
> IMSI/Design LLC

a host of others via SAT, IGES, STL, STEP, and other formats. But few users are likely to confuse TurboCAD Pro with higher-end modelers like Inventor or SolidWorks. Those programs offer much more elegant tools, and many more capabilities, but at a significantly higher price. Still, TurboCAD Pro has a lot to offer as a less-expensive alternative to market-leader, AutoCAD, and, with practice you could model some pretty sophisticated parts for a lot less. ■

*Contributing Editor **David Cohn** is a computer consultant and technical writer based in Bellingham, WA, and has been benchmarking PCs since 1984. He's the former editor-in-chief of Engineering Automation Report and CADCAMNet, and the author of more than a dozen books. Please send comments about this article to DE-Editors@deskeng.com. You can also contact David at david@dscohn.com.*

CADIQ Helps Predict Success

> Predictive technologies are on a quest for CAD interoperablility to avoid costly mistakes.

BY JAMIE FLERLAGE

Years ago when I was migrating databases, I wished for a crystal ball. If I could have predicted when and where a migration would fail, I wouldn't have had to worry about downtime contingencies or long nights of troubleshooting.

My engineering colleagues have a similar need, particularly when it comes to predicting how a CAD model or assembly will behave in a downstream CAE or CAM application, and this need is just as great when it comes to translating, migrating, and re-mastering CAD data. While software providers struggle to fill the void, there are steps that design and manufacturing engineers can take to bridge the gap between "guessing" and "predicting."

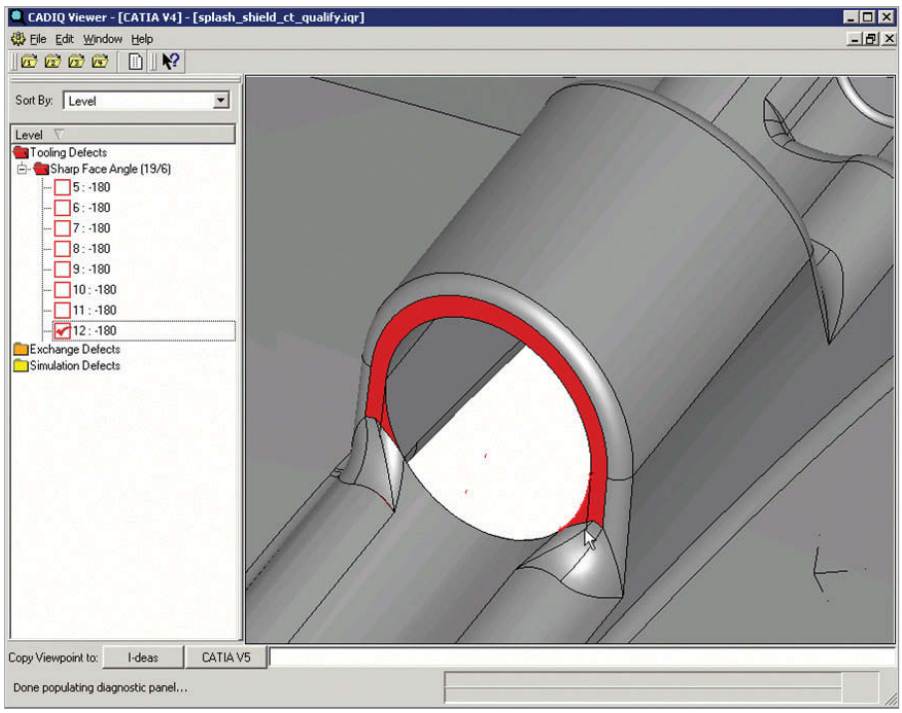


Figure 1: CADIQ analyzed this 3D model and discovered a zero-thickness feature that resulted in fatigue failure, and ultimately, scrapped parts.

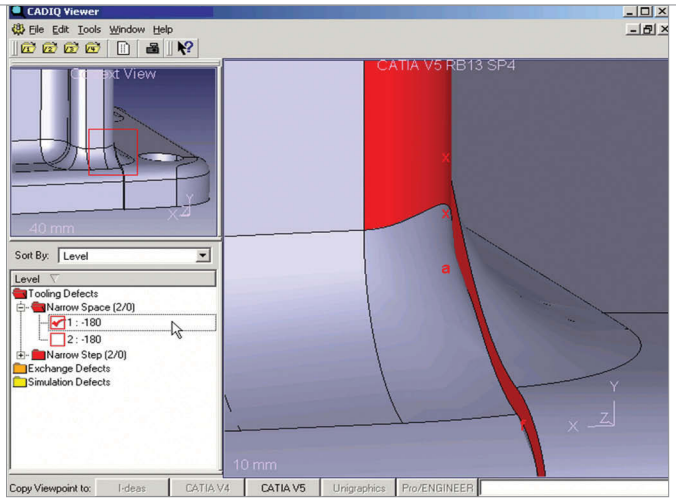
Where Many Fall Short

Engineering organizations might be reinforcing worst practices instead of best practices, piling up costs in wasted labor throughout the product-development value chain. Many of today's CAD quality tools are limited to enforcing corporate modeling standards. When these "quality" models are released, a relatively large percentage of them often fail in downstream applications. Rather than labor to find a workaround for a model that cannot be analyzed or manufactured, manufacturing groups should put the data under a "CAD microscope" to pinpoint bad geometry, capture findings, and communicate results back to desigers.

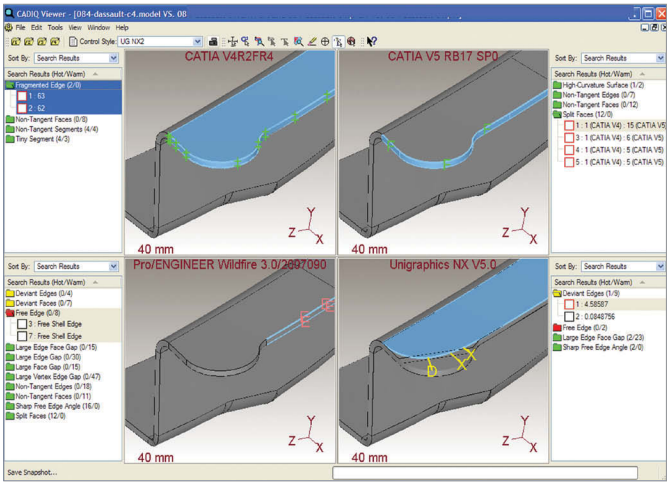
Model failures in downstream applications or, in worst cases, part failures during final product assembly can often be traced to intentional or unintentional engineering changes. A few of today's quality tools identify problems within the model, but the engineer is left to hunt for the bad geometry or engineering change. Once the problem is located, the engineer is then left to his or her own devices to repair or remodel the part. This poses four concerns: not all automated repair applications do an adequate job; repairing or remodeling a part often introduces new issues into the model that propagate themselves throughout the assembly; the changes are not always documented or match design intent; and the process adds a significant amount of non-value-added labor. Rather, users need a tool that will uncover intentional and unintentional engineering changes, capture the findings, and document action items.Many of today's CAD-centric tools lack the intelligence to predict how a model will behave in a target system (i.e., CAD, CAM, or CAE application). In many cases, the differences between a "quality" model and a "usable" model are only discovered when the model reaches manufacturing, and the engineers are forced to find workarounds. These workarounds usually require the engineer to diverge from the original design intent, either through model changes or rebuilds. This type of ad-hoc approach compromises the integrity of your master model initiative and subjects the manufacturing process to delays, labor costs, and part scrap.

Eliminating Some of the Guesswork

There is no panacea for predictive CAD interoperability, but there are ways to eliminate much guesswork and minimize the non-value-added



CADIQ found a blend with a sharp cut that cannot be manufactured.



CADIQ is identifying changes to a master model that will be used by various internal and external groups using different CAD systems.

labor in manufacturing. Designers and engineers are always encouraged to reuse models from existing products and programs, but undetected defects can cause simulation and manufacturing processes to fail. For example, a visually undetectable issue within a model caused parts to fail on final assembly (see Figure 1). If designers could have interrogated the legacy CAD data used in this example early on, they might have had enough time to rework or rebuild the model without wasting materials or delaying assembly.

It was only after this failure that the manufacturer sought out and used ITI TranscenData's CADIQ application to troubleshoot the model.

Some quality tools enforce modeling constraints, which are supposed to ensure that the designer produces a quality model. However, these tools may also force the designer to unknowingly create unmanufacturable conditions. In these situations, the manufacturing engineer is either forced to make the changes on the shop floor (which often results in the data being recreated) or wait for the changes to be made by the design team. In another example, an unmanufacturable blend was caught by CADIQ. If this error had not been caught early, the manufacturing group would have remodeled the part. For an assembly with thousands of parts, the incremental non-value-added labor costs would skyrocket.

Imagine the savings that might be realized if a part's manufacturability were ensured prior to design release.

When a master model contains geometry that cannot be used by a downstream application, it forces the downstream user to clean up the model. These clean-ups are rarely communicated upstream, which undermines the organization's ability to rely on the master representation of the data.

As a final example, an engineer used CADIQ to analyze and document the differences that stemmed from translations between the master model and its derivatives, so that the target models could be evaluated and corrected prior to their release to internal groups and the supply chain. The engineer also used CADIQ to analyze the quality of competing commercial translators (including both BREP and feature-based translators), native-to-native and native-to-neutral translation paths, and the results delivered by an offshore service provider.

Future of Predictive Interoperability

Many of ITI TranscenData's clients envision intelligent interoperability applications that automatically repair issues found within a model or that launch an interactive process that offers tips to the designer for fixing the geometry or rebuilding the part. Others are hoping for robust tool suites that perform automated functions during PLM check-in and check-out processes. Some are already changing their engineering processes to ensure the manufacturability of their models or assemblies.

Regardless of the methods used, the future of predictive interoperability technologies like CADIQ will have the greatest impact when applied early in the product development process and paired with authoring tools to intelligently predict and fix intentional and unintentional downstream usability issues. Currently, CADIQ supports upstream needs by integrating with CAD and PLM systems, automated BREP-based repair tools, and 3D PDF for documenting downstream issues. ■

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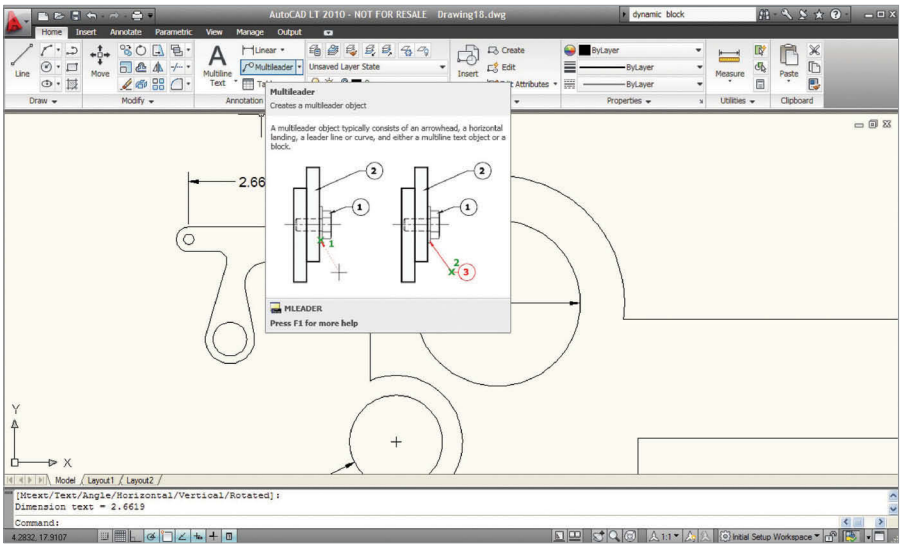
FOR MORE INFO:
> ITI TranscenData

DoubleCAD XT vs. AutoCAD LT 2010

> A comparative look at two 2D drafting/drawing program.

BY KENNETH WONG



In AutoCAD LT 2010, visual tool tips are helpful. For example, hovering the mouse over a menu item gives you a text-and-image explanation of the command function.

Early this year, IMSI/Design launched DoubleCAD XT, described by its makers as an "AutoCAD LT work-alike" 2D drafting and drawing program. In addition to the commercial version called DoubleCAD XT Pro ($695), the company has made available a free version, downloadable from the product's home page at doublecad.com. With comprehensive 2D sketching, dimensioning, and annotation tools, the free DoubleCAD XT poses a challenge to the established 2D workhorse AutoCAD LT (manufacturer's suggested retail price is $1,200, but available for around $890). In this article, we look at the two programs' similarities and differences to help you make an informed decision on which to use or buy.

Interfaces

DoubleCAD XT uses dropdown and fly-out menus, similar to classic AutoCAD; AutoCAD LT 2010 uses an expandable ribbon-bar interface similar to Microsoft Office 2007. Differences notwithstanding, the two programs offer many similar 2D drafting and annotation functions, grouped in a similar fashion. In fact, if you're a regular AutoCAD LT user, you could easily guess the locations of DoubleCAD XT commands based on what you know about LT.

For example, you would find Polyline, Arc, Rectangle, and Polygon commands under AutoCAD LT's Home tab, under the Draw panel; similarly, you would find commands with identical names under DoubleCAD XT's Draw menu. You'll find the Mirror, Copy, Move, and Rotate commands under AutoCAD LT's Home tab, under the Modify panel, or DoubleCAD XT's Modify dropdown menu. You'll find a command-line input roughly around

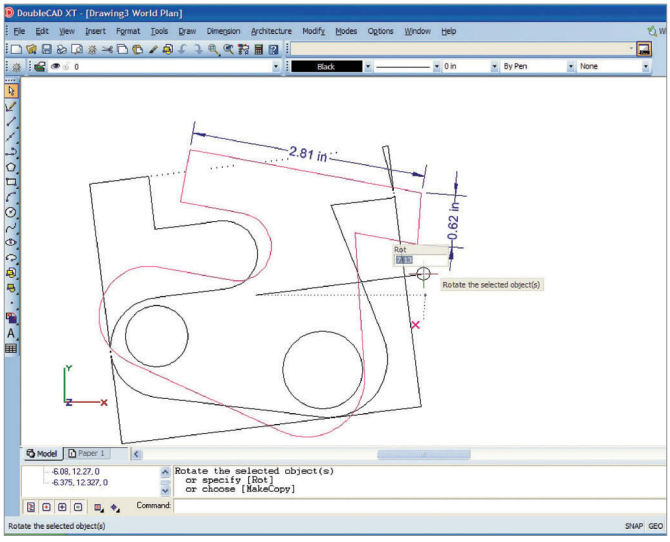
the same area in both programs. DoubleCAD XT responds to many of the basic AutoCAD and AutoCAD LT commands.

Perhaps one marked difference between the two interfaces is AutoCAD LT's visual tool tips. When this feature is turned on, hovering the cursor over an icon provides a short description and illustration that explains the command function. In DoubleCAD XT, you only get text-based tool tips with this approach.

Controlling Objects

With AutoCAD LT, you use the AutoCAD crosshair pointer to select, move, and rotate your objects. By contrast, DoubleCAD XT lets you interact with your drawing objects more directly via a handle-based system. If you've ever used a vector drawing program like Adobe Illustrator, you'll find DoubleCAD's handle-based movements more intuitive and easier to grasp, especially for operations like scaling, stretching, rotating, and moving.

When rotating objects, AutoCAD LT's methodical approach asks you to pick a point, corner, or intersection as the anchor point of the rotation before you enter the rotation angle value. On the other hand, DoubleCAD XT lets you grab the object by its handle and rotate it by the desired degree. If you need to rotate the object in a more controlled fashion, DoubleCAD XT gives you the option to edit the reference point (right-click menu > Edit Reference Point) to anchor the rotation point. In both cases, the option is crucial because, from time to time, you may need to rotate an object from a different corner or point other than its absolute center (for example, rotating a rectangle from its bottom left-hand corner).



DoubleCAD XT lets you move, rotate, stretch, and scale selected items using a handle-based control system for direct interaction. You can also edit the reference point to anchor the rotation.

In operations like Mirroring and Offset, both AutoCAD LT and DoubleCAD XT work in a near-identical fashion. You'll find that the Quick Select function in AutoCAD LT (right-click > Quick Select) and DoubleCAD XT's Select By (Edit > Select By) both let you identify and pick out objects by color, layer, and line types.

Parting Ways

Whereas AutoCAD LT lets you add hatch patterns in your drawing by drag-and-drop method (via customizable Tool Palettes), DoubleCAD XT lets you apply hatch patterns as Brush Patterns via a dropdown window. New in AutoCAD LT 2010 is the PDF underlay support. Depending on how the PDF was created, you might even be able to snap to points on the PDF image's geometry, just as you would with regular drawing objects. The program also gives you a text search command, which comes in handy when you're looking for a

particular label or phrase in a PDF.

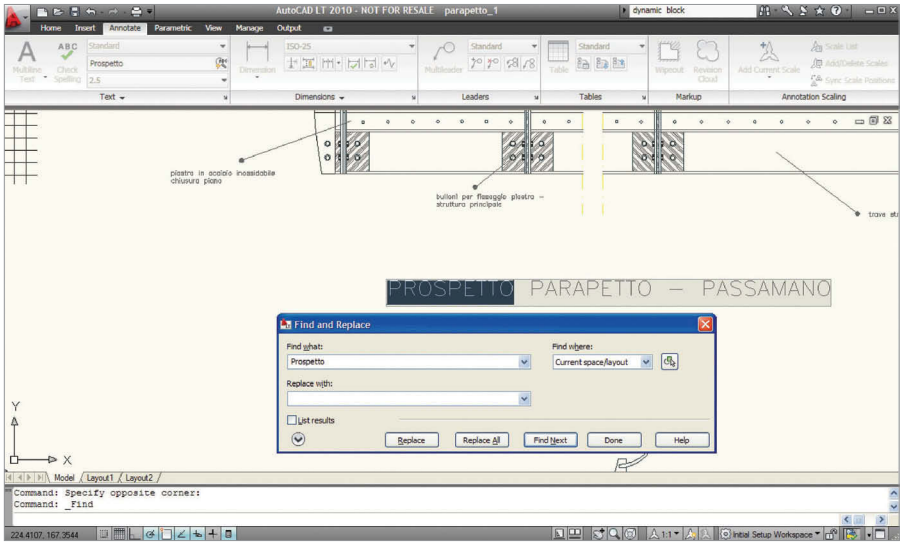
In a departure from AutoCAD LT, DoubleCAD XT offers a transparent fill, which gives you the option to stack up layers or objects on top of one another with the bottom ones still visible. You can make a color or a fill semi-transparent of fully transparent by selecting the top (or foreground) object, then choosing right-click > Properties > Brush > Transparency %. DoubleCAD XT's makers point out some features in their software—such as draw order by layer and snap prioritization—are among the AUGI wish-list items.

AutoCAD LT gives you the option to create tables with data links to external Excel worksheets. You can send the edits made in AutoCAD LT to the source file, or upload the changes from the source file to your AutoCAD LT table.

DoubleCAD XT's Table creation requires you to create the table in one place (Draw > Table) and modify it in another (Modify > Table). Being used to Excel, your natural tendency is to pick a cell and type a value into it, but this method doesn't work. You need to open up the Selection Info window (Tools > Palettes > Selection Info) to modify the table's content. Some may find this approach less intuitive.

In DoubleCAD XT, you have the option to display dimensions in different measurement units in different areas of the same object (for instance, showing one side of a rectangle in inches and another in millimeters). In the same dialog box (select dimension, right-click > Properties), you can

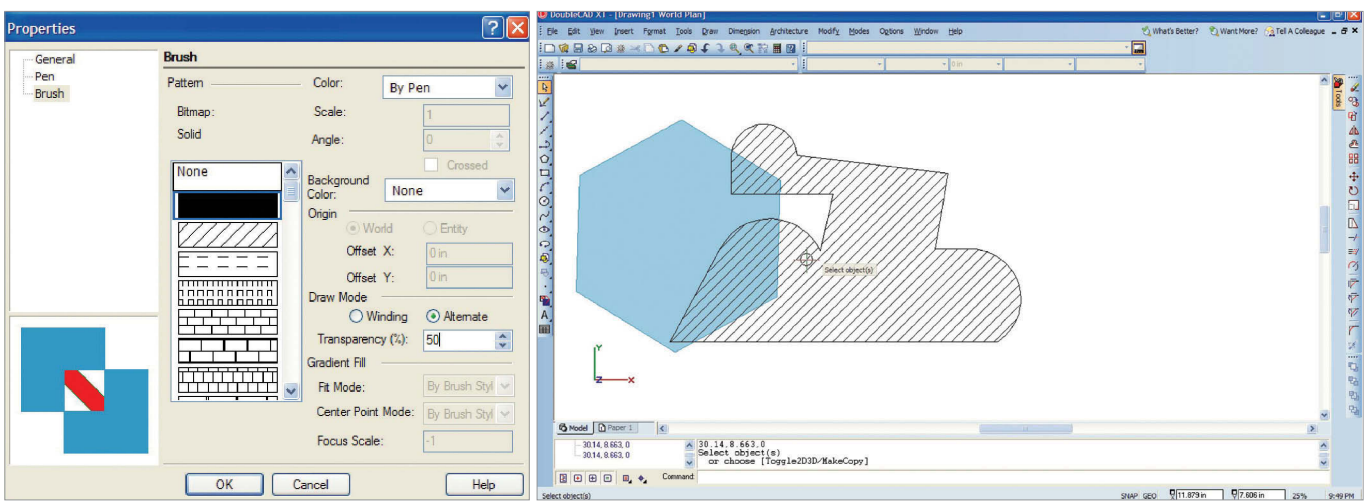
also turn on Alternate Dimension, allowing you to display the same dimension in two unit types (for example, showing the length of a single line in inches and millimeters). AutoCAD LT gives you these options as well, through Annotate > Dimensions > Dimension Style Manager > Modify. Compared to DoubleCAD XT's method, AutoCAD LT's way of accomplishing these seems less straightforward.



AutoCAD LT 2010's Find command lets you search for text strings in PDF and drawings.

AutoCAD LT lets you create and store Dynamic Blocks, which can be stretched, scaled, moved, and rotated after you have inserted them into a drawing. For those who repeatedly use the same block in various configurations (for example, the same bracket, but in different length and orientation), Dynamic Blocks is an effective way to manage the routine. (For more on Dynamic Blocks, read David Cohn's review of AutoCAD 2010 at deskeng.com/articles/aaapmb.htm.) DoubleCAD XT lets you drag and drop blocks into your drawing. The same handle-based system lets you scale, rotate, or stretch these blocks if needed.

In file-type support, DoubleCAD XT offers a wider variety of save options. AutoCAD LT lets you save your drawing as DWG or DXF; or export them as PDF, DGN, DWF, bitmap, or Windows metafile. By contrast, DoubleCAD XT supports more than a dozen formats, including DWG, DXF, 3DS, JPEG, IGES, OBJ, COLLADA, and SketchUp (with layers and blocks).



DoubleCAD XT's Properties dialog (left) box lets you create semi- or fully transparent objects (right).

Anticipating Round Two

DoubleCAD XT's current interface may benefit from some consolidation. For instance, in the default setup, many of the same drawing tools (rectangle, polygons, circles, splines, and lines) appear in several places: in the sidebar on the left, in the dropdown Draw menu, and in the fly-out Tool palette on the right. At times, in DoubleCAD XT, the Undo option seems mysteriously absent or unavailable. (This seems to occur with the Polygon command and Offset command more frequently than with others.) The program's Table creation and editing tools can also use some improvement. Redesigning them to be closer to how tables work in Excel, for instance, might make them more intuitive to edit.

These are minor detractions, especially for the first release of a brand new title. The robustness of the software suggests IMSI/Design has put a lot of effort into crafting the software.

In installation, DoubleCAD XT happens to require less time and less hard-disk space. AutoCAD LT (without the optional Design Review install) requires about 550 MB for its program folder, whereas DoubleCAD XT runs from a program folder half the size, at 225 MB. Since digital storage is inexpensive, this is perhaps a minor consideration, but it makes a difference when the program launches as DoubleCAD XT, with a smaller footprint, starts much faster.

While long-time AutoCAD and AutoCAD LT users may feel more at home with AutoCAD LT's step-by-step object manipulation, newcomers to CAD or Vector illustration might find DoubleCAD XT's handle-based approach more appealing.

Because AutoCAD LT has been in existence longer, you'll find more free training and self-paced learning materials online, both from Autodesk and from third parties. But DoubleCAD XT has managed to cultivate a groundswell in a short time since its launch, so expect the repertoire of training resources to grow. The free version allows you not only to learn the software but use it in production—no watermark in drawing, no disabled printing. ■

A Quick Look at the Two

AutoCAD LT 2010's pluses

- >The ability to use PDF underlays
- >Pop-up tool tips explaining the purposes of commands
- >Abundance of free multimedia training
- >Ability to search for text in the drawings
- >Dynamic blocks
- >Tables with data links

Double CAD XT pluses

- >A more intuitive handle-based object-manipulation system
- >Setting semi- or fully transparent fills
- >More file-type support for Save & Export
- >Faster program launch
- >Better price (it's free)

FOR MORE INFO:

> DoubleCAD

> AutoDesk

*Contributing Editor **Kenneth Wong** writes about technology, its innovative use, and its implications. You can reach him at kennethwongsf@earthlink.net, follow him on Twitter at KennethWongCAD, or send e-mail about this article to DE-Editors@deskeng.com.*

PTC's Insight Enables APC to Go Green

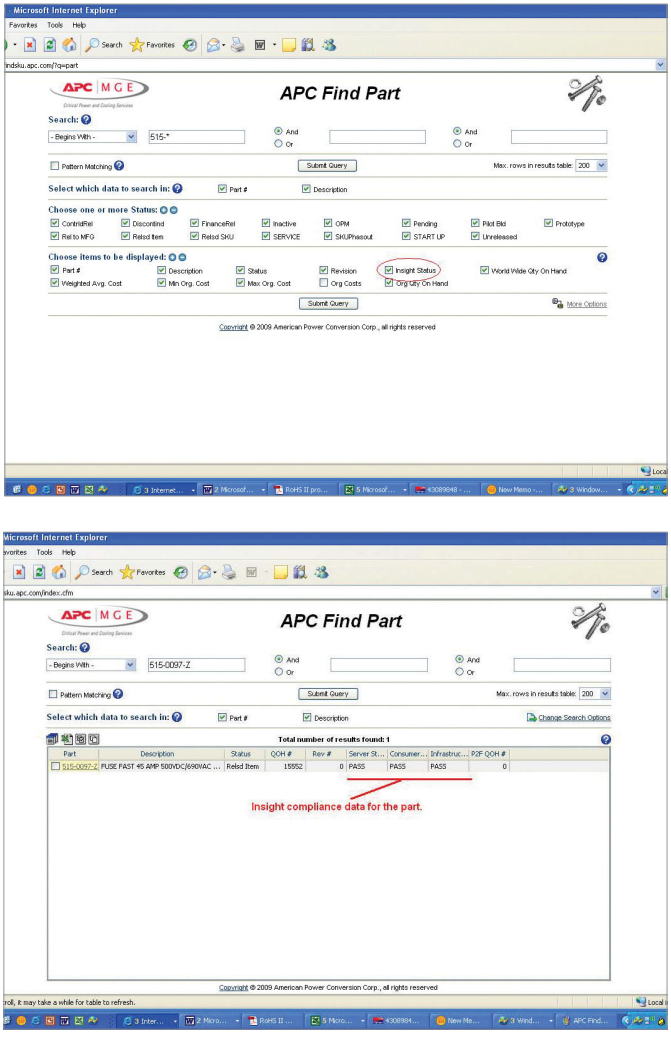
> APC met EU environmental compliance regulations by consolidating critical data with its system software.

BY MARGARET S. GURNEY

The manufacturing of electronic products is becoming more complicated these days, largely due to new regulations intended to reduce the burgeoning amount of electronic waste that is disposed of in landf lls and f nds its way into our water supply. In Europe, these regulations are known as WEEE (waste electronic and electrical equipment), and require manufacturers to take back all discarded electronic equipment and bear the cost of disposal.

This is not the case in the U.S., but as governments the world over seek ways to cost effectively manage all the electronic devices being thrown away, the WEEE approach is spreading rapidly.

"Electronic trash is the fastest growing stuff entering our landf lls," says Ray Lizotte, director for the environmental stewardship of ce at APC, a Kingston, RI-based company providing critical power and cooling services, products, software, and systems that was acquired by Schneider Electric two years ago.



A search for an APC part automatically queries a materials library and finds that the part is compliant with EU regulations.

Meeting Directives

"To deal with electronic wastes in Europe, the EU's WEEE directive deems that manufacturers must

be responsible for the disposal of the equipment they make. When we sell equipment in Europe," says APC's Lizotte, "we include the price of returning and recycling the products when they reach end of life. This ensures proper disposal."

But does this mean the EU is ahead of the U.S. in terms of environmental progress? "Not really, it's just different. But it's those differences that have made meeting these requirements a challenge," says Lizotte, who made sure APC tailored its IT and manufacturing systems to meet EU regulations, so products would sell overseas.

Associated with the WEEE directive is a second directive referred to as RoHS (restriction of hazardous substances in electronics). The RoHS regulations prohibit the use of certain materials that increase the cost of disposal.

APC, like a number of U.S. companies, has voluntarily complied with RoHS for all products it manufactures. "Every product eventually has a cost of disposal. When we remove these elements during design, then the EU compliance situation takes care of itself. However, APC, like most companies, had no mechanism in place to comprehend these substances issues."

Define Company Needs

In 2004, when Lizotte was tasked with leading the company's search for a system that could integrate with existing business systems at APC, he only considered systems that could collect data and integrate with the existing ERP system automatically.

Like other f rms, APC had until July 1, 2006, to demonstrate that its products sold in Europe were free of cadmium, mercury, hexavalent chromium (the water-soluble version being particularly toxic to humankind), lead, plus some f re retardants. Lizotte's job was to make sure APC met the deadline. APC's method for ensuring that it was not producing anything containing the toxic substances was to verify that they were not purchasing any raw material or component that contained them as well. He knew that to support his efforts he needed software that would interface with his business systems, Oracle and Lotus Notes.

After narrowing the vendors to six, it was PTC's Insight (earlier called EMARS) that demonstrated almost instantaneous compatibility with Oracle, and Notes came online a few months later.

To ensure that the APC products conformed to the regulations, the compliance status of approximately 19,000 parts had to be determined. Since every part typically has more than one supplier, this meant getting material content information for 60,000 components provided by manufacturers worldwide, Lizotte explains. APC had to conf gure a system that could query the manufacturers of those components, and compile into a database the materials contained within the electronics that APC was already using. "It had to be done, or we couldn't sell our products overseas."

Now Insight works in the background supporting the purchasing function and product design engineers. With its connection to Oracle and Lotus Notes, most of the data necessary to keep it current is automatically updated. The only ongoing task is the acquisition of material content data from new suppliers. Lizotte says this is the def ning feature of Insight's power: "It has allowed us to integrate this data into our existing business systems, in a formal way."

Lizotte says Insight manages the process for obtaining data as well as the data itself. "It generates a request for information with pre-loaded supplier contact and part information," he says, "tracks the status of all the queries, and then manages the uploading of information when it returns."

Currently almost all the components APC uses meet the directives. "Insight brings this compliance data to the people who are making decisions that ensure that our products stay compliant. For example, purchasing agents can see if the parts they want to buy are compliant before they issue purchase orders," says Lizotte. "It has all this built-in" as it stamps parts with a RoHS symbol that communicates compliance. "Its real power of being able to integrate into purchasing, factory management, and new product development is realized every time that little RoHS symbol appears" on the screen.

The EU approach to the electronic waste disposal crisis is gaining traction in other parts of the world. What was once a European phenomenon is spreading as local governments try the EU approach to address their local electronic-waste disposal crisis.

The Dif erence: U.S. and EU

The EU approach to the electronic waste disposal crisis is gaining traction in other parts of the world. What was once a European phenomenon is spread-

Other Resources

The EU's Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) regulation is the latest in a rapidly growing list of environmental regulations across the globe. REACH targets hazardous substances in products, termed substances of very high concern (SVHC), and may ban up to 3,000 chemicals used in a wide variety of products. A failure to demonstrate compliance with REACH and other regulations can have severe consequences, threatening product viability and revenue.

Trade, recharge, or recycle that old UPS instead of throwing it away, says APC. As the manufacturer of the APC and MGE brands UPSs, Schneider Electric Critical Power and Cooling Services has long been committed to minimizing the global impact of its products. From eco-friendly designs to end-of-ups-life options, APC is continually striving to find new ways to reduce the environmental impacts of its products. —MSG

> REACH

> APC

> A Green Business Guide to Business

> International Product Design, Take-Back , and Recycling Standards-Environmental Technology Programs: Engaging the Marketplace

ing as local governments try the EU approach to address their local electronic-waste disposal crisis. In the U.S., state and local governments typically handle the collection, recycling, and disposal of electronic wastes, overburdening the local infrastructure. Due to the large amount of e-waste on the West Coast, Lizotte says California is considering adopting EU regulations. "We'll see a lot more of this," he projects.

"One of the attractions to the European approach is that the makers of the products become the regulators. The government doesn't need inspectors, because APC will do it to protect our ability to sell our products. The developing world is latching on to this concept to save the expense of having to develop their own inspection program," explains Lizotte.

The amassing of data, now fully customized by APC, is communicated to other companies seeking material content information about APC products, says Lizotte. "Because of our conf dence in Insight and the data in its underlying database, we know we are producing compliant products and can comfortably communicate that data to the public."

APC is ready. Since all APC products comply for sale in the EU, it can sell its products anywhere in the world. As the APC website asks: What's in your product? ■

Margaret S. Gurney *has been an editor for the technology industry for more than 20 years, most recently as new products editor at DE. Send e-mail about this article to DE-Editors@deskeng.com.*

FOR MORE INFO:

> APC

> PTC

> Scheider Electric

The Changing Face of Product Lifecycle Management

> The dynamic technologies and economic imperatives reshaping product lifecycle management are bringing the software more in line with SMB needs.

BY TOM KEVAN

Technologies, architectures, and business models that debuted in other computing applications are now transforming product lifecycle management (PLM). The major agents of change are software as a service, service-oriented architecture, Web services, and the open-source business model. In addition, the scope of the tools that make up this software genre is expanding and incorporating new applications and functionality. The transition is still in its early stages. Like a game of musical chairs, the final resting place of these elements has yet to be decided.

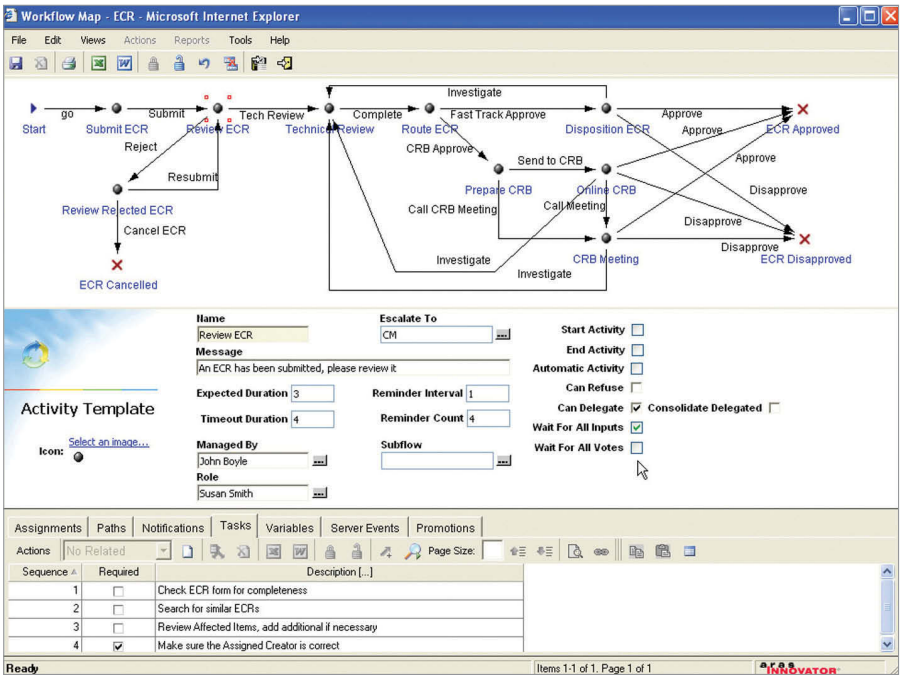


Figure 1: Powerful out-of-the-box PLM workflow templates provide global collaboration functionality. These can easily be customized for specific business practices.
Image courtesy of Aras Corp.

Accompanying these new players is a face that has become familiar in recent years: enterprises' growing intolerance for large, expensive software packages that take years to deploy and that often don't deliver on the soaring promises of their purveyors. The combination of the dynamic technical elements with the demand for quickly deployable,

less costly software is reshaping PLM. And while its final form is unclear, it does seem safe to say that one of the chief beneficiaries will be small and medium-size businesses (SMBs).

Giving SMBs What They Need

SMBs confront a common set of core challenges. These include centralizing multidisciplinary information, working with hundreds of suppliers on a worldwide stage, and making sure the contract manufacturers that perform the bulk of their fabrication are on the same page. What SMBs need most are solutions that solve these core problems quickly. "A theme for us is making sure that we provide small businesses with a very rapid, almost tactical, solution," says Eric Larkin, Co-Founder and Chief Technology Officer of Arena Solutions.

Vendors achieve this speed and agility by providing standard, preconfigured process, business rule, and best-practice templates that work right out of the box (see Figure 1, above). These allow SMBs to get up and running rapidly.

"There's a level of functionality that should be available in the software to start with," says Peter Schroer, President & Founder of Aras. "The nimbleness of our smaller customers is what's making them competitive, especially in today's economy. It's the fact that they can innovate new products and processes faster. They can change the way they do business much faster than the larger companies. That's their edge today."

Streamlining user interfaces also enables SMB to realize the value of PLM quickly. "Process-oriented user interfaces for CAD, CAM, and CAE applications (see Figure 2) that lead the user through the steps minimize the amount of training required before

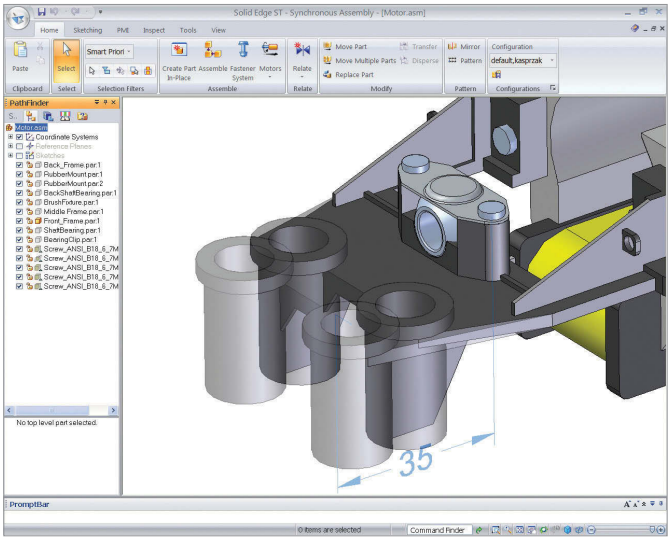


Figure 2: Solid Edge with Synchronous Technology uses Live Rules to find and maintain critical geometric conditions, such as tangencies between a small face and large cylinder. *Image courtesy of Siemens PLM Software*

companies can take advantage of the product and allow use by occasional users, as well as experts," says Bruce Boes, Vice President of Velocity Series Global Marketing for Siemens PLM Software.

Training and familiarization are also minimized by basing PLM software on Microsoft technology. "We are definitely learning that the Microsoft platform is very appealing to SMBs," says Schroer. "They already know it. Their IT groups can support it. All this supports the companies' need to be nimble."

"They look for it to be Microsoft based because more often than not they've already implemented SQL, SharePoint, and Microsoft Office," says Boes. "Also, following a Microsoft user interface promotes ease of learning and helps people come up to speed on a learn-as-you-go basis."

A feature set that indirectly supports quick and easy deployment involves scalability and extensibility. This is the ability to start small, take on one problem, and then incrementally add functionality

and users to the software as needed.

"SMBs are looking for a solution that they know will grow with them, as they go from an SMB to a large enterprise," says Bill McClure, Vice President of Velocity Series Product Development for Siemens PLM Software. "They want to be able to add more applications, or modules. Then they want to make sure there are no limitations in terms of the number of users the solution supports."

Finally, it's essential to SMBs to gain control over their engineering information (see Figure 3). Companies face lots of challenges when managing complex data on network drives. One problem is finding the latest version because there is no version control on network drives. People may have a local copy and a network copy, so there's a problem identifying the latest version. The problem is compounded when multiple people are involved. People also override each other's work or are unable to search and find old designs.

"Companies need to manage different types of data, whether it be 3D CAD data, Office documents, images, and so forth," says Siemens' McClure. "Our core PDM system is designed to be able to manage those different types of data. But probably what's more important is our software's ability to define and manage relationships among those different types of data."

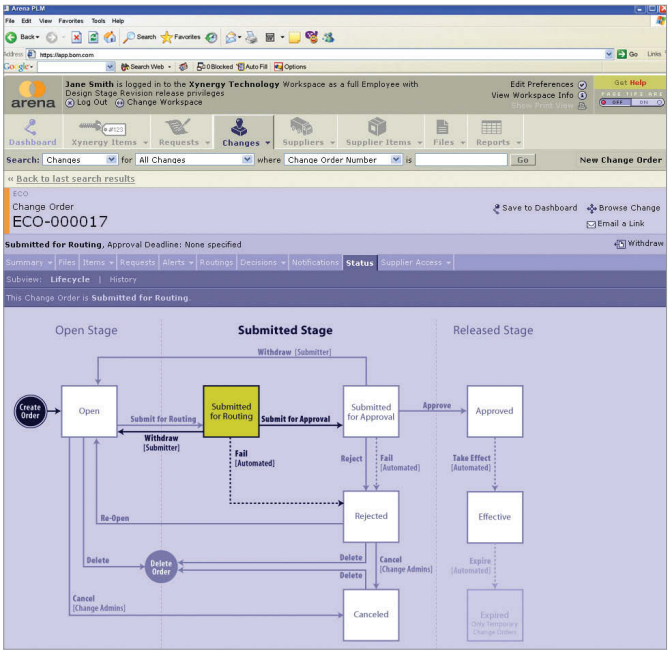


Figure 3: Arena makes it easy for companies and their partners to simplify and standardize engineering change management processes and reduce engineering change order cycle times. By supporting best practices, Arena helps ensure that product design changes are clearly communicated to the right people at the right time. *Image courtesy of Arena Solutions*

Hosted PLM

Beginning around 2000, SMBs had a new venue from which to license their PLM—hosted systems, or software as a service (SaaS). Under this software deployment model, the vendor licenses an application as a service on demand, with the software residing either on the provider's Web servers or in some way on the end users' infrastructure. Proponents claim the chief benefit of this approach is reduced cost because it eliminates significant overhead for the end user.

One of the primary vendors in the PLM space taking this tack is Arena Solutions. "We are a true multi-tenant software-as-a-service offering," says Arena's Larkin. "Our customers access the Arena application through a Web browser, so there is no client footprint, no software that they need to install on their side to make use of the solution. We do have target integrations that are built on Web services technologies, with SolidWorks and electronic design automation tools and lots of

downstream enterprise software tools, typical tools used by the mid-market."

This approach has not experienced "explosive" growth because of the risk involved. Companies are reluctant to transfer valuable proprietary product development data over the Web and have it reside offsite, out of their control. Lee Garf, Vice President of Product Management at PTC, another vendor offering a hosted solution, responds to these concerns: "I think it's a matter of perception. People will send their credit card number to buy something online, but they won't send a CAD model?"

Larkin addresses these concerns in this way: "We provide facilities for customers to maintain copies of information on their own servers, but the active copy resides in our infrastructure. We have a rigorous security regime, both from a confidentiality standpoint, maintaining servers, and continually monitoring the vulnerabilities all the way through to integrity—making sure that we have weekly, daily, and hourly snapshots of the full production data set replicated. With our solution, the customer administers their own virtual private workspace and administers access to that information. There is a security element that is fundamentally customer driven and that depends upon customer practices."

But beyond the risk issue, others challenge the validity of the overall approach. "We fundamentally question whether or not the business model is right or not," says Siemens' Boes. "We don't feel that it is necessary to go outside for software as a service because we solved the fundamental problems by building on Microsoft technology, implementing with short implementation plans and standard out-of-the-box processes, and all of the various other things we've done to build our solutions specifically for the needs of SMBs of mid-market. We've been able to create solutions that have a low total cost of ownership without going outside for shared resources. And we are able to get them implemented in such a way that people can implement them with their own resources. They don't need to go to somebody else for that implementation."

The final judgment on this assertion will come from end users. But for many, hosted PLM software offers a way to test the waters without investing large sums of money and significant human resources. They also see the model as a way to inject an extra measure of honesty into the process and avoid falling behind the technology curve.

"One of the things I like about the software-as-a-service model is that it forces honesty on the vendor because you don't collect a lot of money upfront and you don't ask a lot of the customer upfront," says Larkin. "So you have to be able to show very quickly that they made a good decision by installing this system or setting up this tool. Small businesses that are looking at putting in on-premise enterprise solutions in this day and age are just signing up for a declining and soon-to-be obsolete platform for their business."

Open-Source SOA

In addition to SaaS, technologies such as service-oriented architecture (SOA) and the Red Hat open-source model also hold the potential to transform PLM. In the PLM space, it is primarily the relative newcomers that represent the majority of the companies that base their offerings

100% on these technologies and models. Perhaps the reason for this is the fact that the major PLM vendors, which have been around 20+ years, have a lot of legacy architecture that they continue to try and bring forward.

A vendor whose products incorporate both elements is Aras. "We founded Aras in 2000 to leverage a new architecture," says Aras founder Schroer. "It's called a model-based SOA. The key here is the fact that rather than programming, the way the Aras PLM system works is you do modeling. In a sense, you draw pictures of your workflow. You draw pictures of the forms and business rules you want. It's very graphic, and the system implements the code under the covers for you. It takes a lot of complex programming out of customizing. That lets you customize rapidly without programmers. A typical IT department can do their own without having to buy a lot of consultants."

In the past 18 to 24 months, the focus of the software has shifted from primarily managing CAD files to quality data management.

SOA is well suited for PLM applications because of the amount of integration required. "Our product supports integration in three ways," says Schroer. "One is its use of the open-source model. Another is its Microsoft grounding. The third is Aras' standardization on SOA Web services. So the way we interact with all systems is XML SOAP messaging."

Aras differentiated itself even further in 2007 by adopting what it calls the enterprise open-source model. "What that means to the SMB is they can go to our website, download Aras Innovator, and install and use it—no time lock, no user limit," says Schroer. "Basically, they have the whole application. There is no charge for the licenses of software. Aras charges for training, documentation, and support contracts. If they need our help, we offer a hotline, security patches, and security updates."

The Future of PLM

For SMBs, the PLM of tomorrow will be different from what is available today. For example, in the past 18 to 24 months, the focus of the software has shifted from primarily managing CAD files to quality data management. This shift is accompanied by a consolidation that is bringing together the 20 to 40 different applications and including new types of applications, such as product planning, innovation, and risk management.

Also look for growing roles of Web 2.0 technologies. The future of PLM will be shaped by things such as FaceBook, LinkedIn, Presence Detection, and IM. These are things that have applicability to PLM.

These changes will enhance the effectiveness of PLM. And that will increase PLM's value to SMBs. ■

Tom Kevan *is a New Hampshire-based freelance writer specializing in technology. Send your comments about this article to DE-Editors@deskeng.com.*

FOR MORE INFO:

> Aras Corp.
> Arena Solutions
> Dassault Systémes
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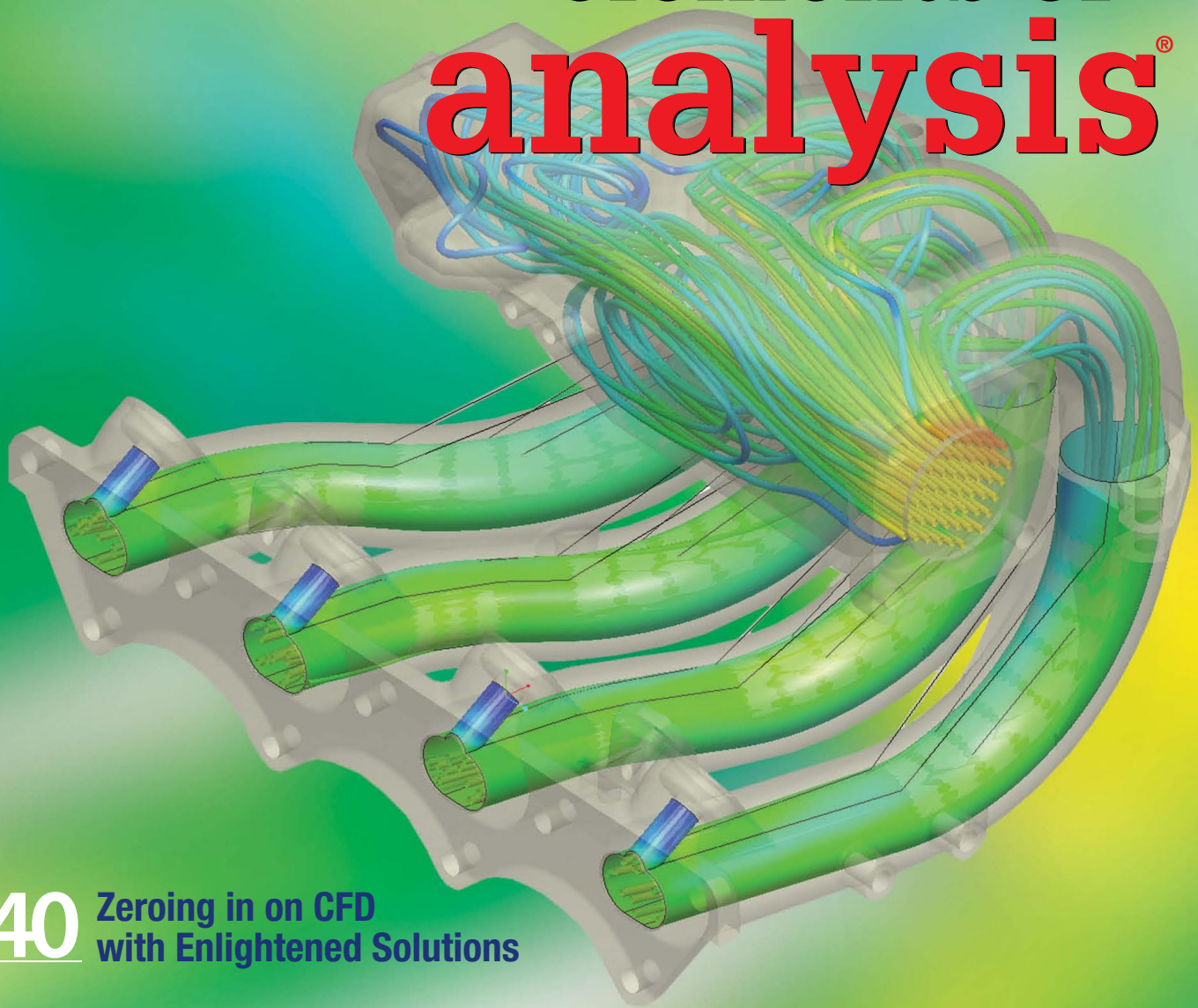


FloEFD software from Mentor Graphics, embedded here in Pro/ENGINEER from PTC, shows the airflow path and possible unwanted circulation areas (dead corners) in an engine intake manifold.

Image courtesy Mentor Graphics

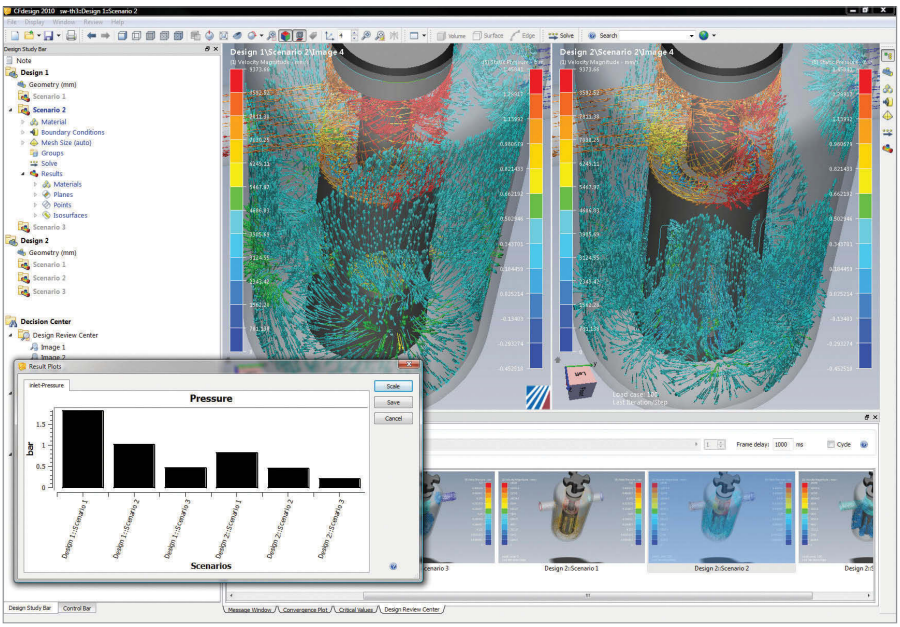
By Pamela J. Waterman

Zeroing In On CFD Solutions

> Guide designs in the right direction with enlightened flow analysis. There's a CFD package for almost every challenge.

Did you ever play Hot 'n Cold tag when you were a child? Someone would call "warmer" or "colder" or "really, really hot" depending on how close you (in the blindfold) were to finding someone.

Fluid flow analysis software based on computational fluid dynamics (CFD) may not actually flash "warmer" or "colder" on its results screen, but it, too, should guide your efforts in a logical direction. In a strong shift from even five years ago, users are applying "what-if" CFD quite early in the design process to save time and cut back on prototypes and testing. This article identifies CFD package features that help users meet this challenge.

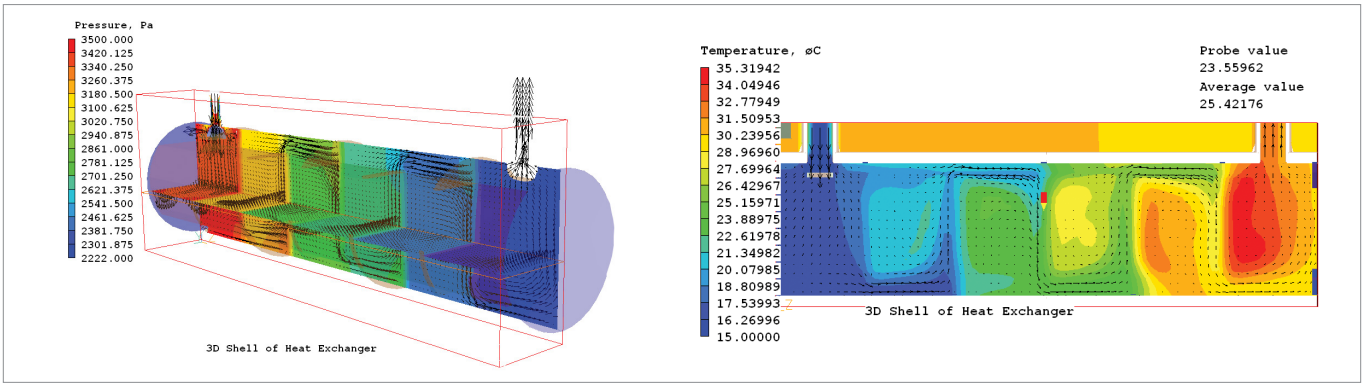


With CFdesign 2010 design engineers can easily and quickly set up a single or multi-scenario design study to help them make decisions that satisfy pass-fail, quality, and innovation objectives.
Image courtesy of Blue Ridge Numerics

Software that Moves the Game

CFD is not a one-size-fits-all proposition, but useful analysis results at any speed require a common problem-solving protocol. Users need to first define the underlying issues and create a capability checklist (see sidebar). A good general resource is the set of CFD booklets available from NAFEMS, the not-for-profit international simulation organization.

A growing speed-driven trend is to use CAD-



Flow through a shell heat exchanger analyzed with CHAM PHOENICS software, including 3D and 2D solution views. The 2D solution allows the flexibility of investigation of detailed flow around the tubes, which cannot be handled by current computers in 3D. *Images courtesy of CHAM*

based CFD software that simplifies model transfer. For example, SolidWorks offers an embedded Flow Simulation option. Users save time since there is no need to transfer or rework geometry, and in fact no need to create separate fluid-volume geometry for the analysis. This allows users to make design changes based on fluid flow analysis and iterate the design without additional input. A wizard prompts for menu inputs, helping even inexperienced users quickly set up boundary conditions and material properties, define goals for output quantities, and create useful displays of parameter results.

Taking the CFD vendor point of view, CFD-CADalyzer from ESI Group supports both rapid sequential and parallel CFD simulations. Working directly on a CAD model, the analysis software is packaged in versions tailored for Pro/ENGINEER, SolidWorks, Solid Edge, Autodesk Inventor, and other MCAD products. One user describes it as providing first-order estimates in a matter of minutes.

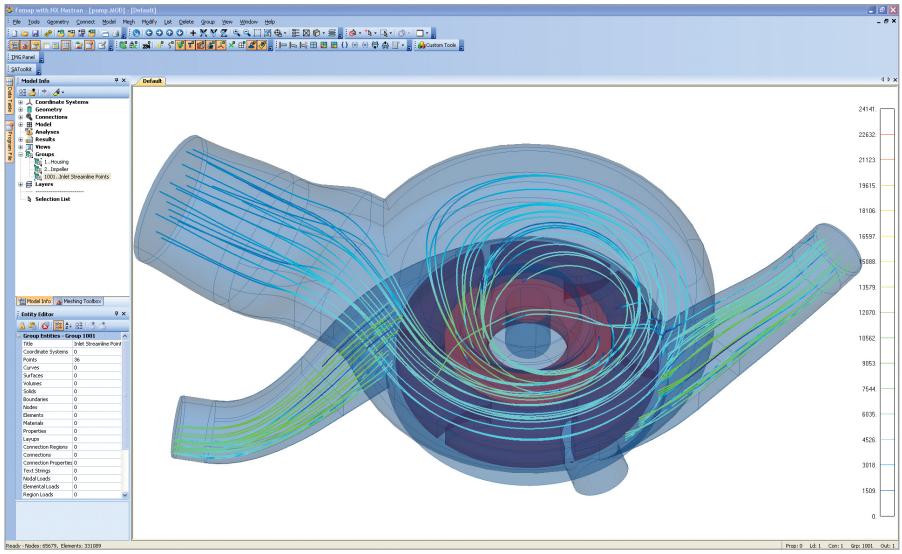
Mentor Graphics Mechanical Analysis Division (formerly Flomerics) offers its FloEFD electronics cooling analysis software embedded in CAD packages such as Pro/ENGINEER Wildfire and CATIA V5. The company says FloEFD saves time by automatically creating the relevant fluid domain as differentiated from the solid model. Users can also quickly create multiple design variations by modifying just the CAD model without having to reapply loads, boundary conditions, and material properties for each variation.

Blue Ridge Numerics has been continuously improving its CFdesign software, which is opened from and associative with eight CAD packages. A new design tree structure lets users clone and edit not only model designs but complete scenarios of loads and materials. One design is automatically meshed, then many lightweight scenarios are quickly run for comparison. Users can also save time by assigning mesh regions and changing the mesh in just one area. Low memory needs permit real-time operation on laptop systems.

To speed up the human decision-making process, CFdesign has added two more capabilities. A Decision Center presents a unified interactive view of product performance and a new Design Review Center hosts a unique filmstrip approach to viewing simultaneous, multiple views for easy comparison. Additional software modules incorporate higher levels of underlying physics and

simplify analysis speedup via networked high-performance computing resources.

CD-adapco's STAR-CAD series enables engineers to quickly evaluate "what-if" design scenarios with its bidirectionally associative versions for CATIA 5, NX, Pro/ENGINEER, and SolidWorks. Based on its STAR-CCM+ finite volume product, the specific versions offer CAD-to-postprocessing functions built with automation in mind. Users need only prepare a simulation for the first design configuration. The same template and settings for physical setup, geometry repair, meshing, solution, and postprocessing are automatically applied. Optional Power Session licensing allows simultaneous solutions on multicore processors, speeding up the investigation of multiple design variations.



Femap Flow from Siemens PLM lets users quickly investigate "what-if" studies by re-using the same CFD domain with multiple locations of boundary conditions. Image courtesy of Siemens PLM Femap Flow from Siemens PLM lets users quickly investigate "what-if" studies by re-using the same CFD domain with multiple locations of boundary conditions. *Image courtesy of Siemens PLM*

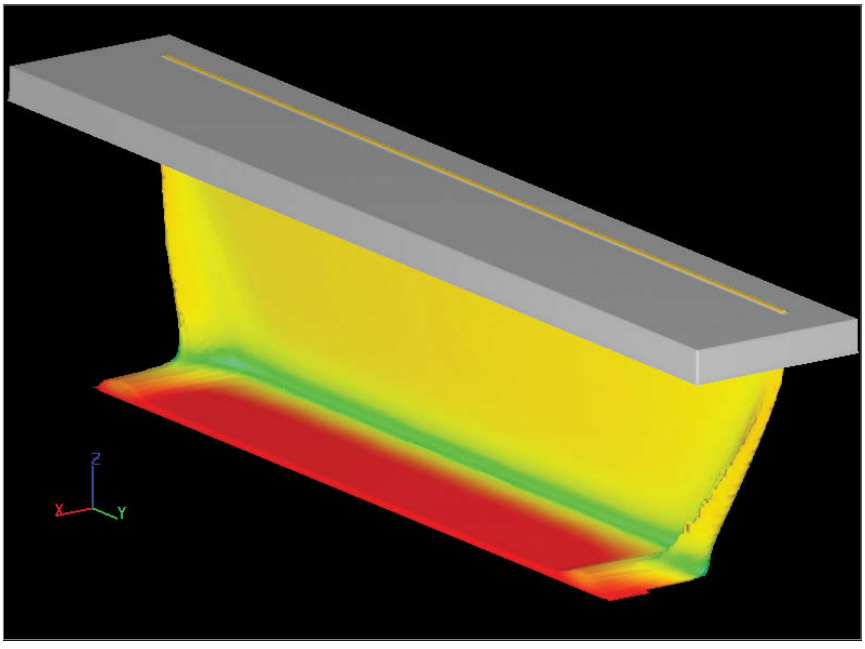
More Ways to Step Up the Pace

CAD-based CFD continues to add capabilities, but the attraction of blending usability with power has led more traditional developers to tackle this challenge, too. From ANSYS to NEi, companies across the industry have added software features to compress the design process.

ANSYS' Workbench framework offers bidirectional parametric CAD associativity as a starting point for all its products, including CFX and Fluent CFD packages. (Of note is both solvers' capability to scale up to use parallel processors.) Then ANSYS DesignModeler and DesignXplorer support two approaches to narrowing design variations. ANSYS users can define a range of values for geometry, material properties, and boundary conditions, and DesignModeler will run those scenarios automatically. To go beyond manual "what if" simulations, DesignXplorer links to the parameter manager and lets you find out, say, what happens if you change air velocity by 10 percent.

COMSOL Multiphysics software uses associativity to cut down on analysis time, whereby any changes in geometry cause a corresponding update in the boundary conditions and fluid properties. The package provides a multiparameter sweep tool for varying model values and a multivariable Optimization Lab for zeroing in on the optimized set. COMSOL Multiphysics also scales linearly with the number of nodes to take advantage of compute-cluster efficiency.

At Concentration Heat and Momentum (CHAM), PHOENICS software helps users quickly run hundreds of simulations via a Relational Data input that links together common features. It stores them in a concise Parameterised Input File (PIF) from which the relevant parameters are automatically retrieved for specific trial combinations. Application-specific "gateways" speed up PIF definitions, and a Constant-Optimising Package automatically searches for optimum results based on user-defined ranges.



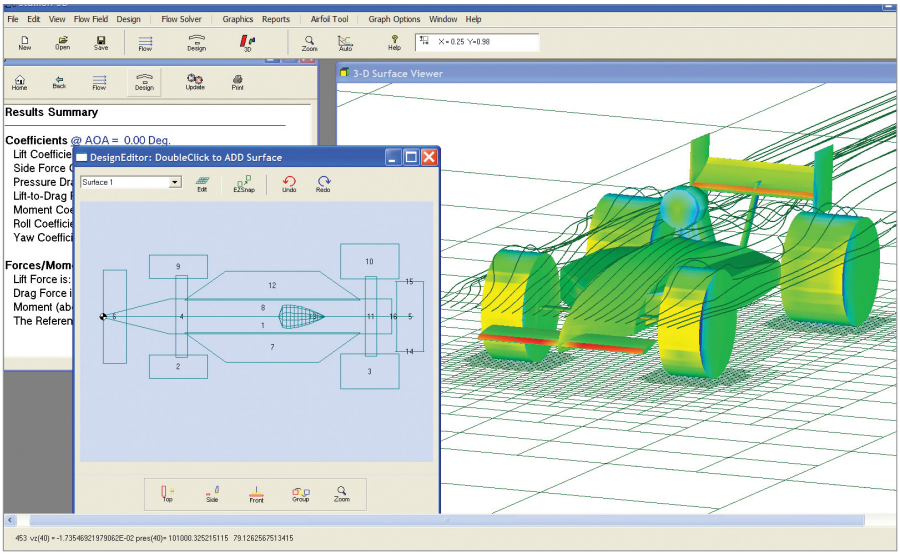
FLOW-3D's FAVOR method supports rapid and easy mesh generation of a slot-coating apparatus and subsequent flow simulation. The device issues a coating liquid through the narrow slot onto a smooth, flat surface that is sliding by. The result is a very uniform and thin film of liquid such as paint, an emulsion, or a protective coating.
Image courtesy of Flow Science

NISA/3D-Fluid from Cranes Software is a general-purpose CFD code for fluid-flow and heat-transfer problems. It can handle a wide range of high-end problems, from the mixing and combustion of multiple species to fluid flow at hypersonic speeds. Yet it also works at the designer level by automatically placing a mesh and analyzing initial geometry, then retaining all boundary conditions and analysis parameters for subsequent runs with finer details.

Siemens PLM offers strongly coupled flow and thermal analyses within its Femap Flow product. By connecting directly to Solid Edge geometry, Femap synchronizes the CAD and CFD components and allows easy CAD changes for updating the flow model. Extensive geometry clean-up tools help with model setup while "what-if" studies save time by reusing the same CFD domain under multiple boundary conditions. Fluid domain connections are also automatically created between disjoint and dissimilar element interfaces.

ALGOR's FEMPRO package simplifies analysis setup by automatically generating the fluid medium around the CAD model without the user having to define it surface by surface. The company's Design Scenarios approach to analysis means that users can set up a batch of scenarios with varying loads and constraint sets, and with one click tell the software to run through all of them. Users can also monitor results in real time and make changes as necessary.

With FLOW-3D from Flow Science, quick design iterations stem from the independence of mesh and geometry. The software uses a unique fractional areas/volumes (FAVOR) approach to defining problem geometry, and a fast, free-gridding



Aerodynamic flow past a race car, with colors depicting pressure, as designed in the built-in editor of Stallion 3D from Hanley Innovations. Automatic grid generation detects immersed boundaries without the need for user intervention.
Image courtesy of Hanley Innovations

technique for mesh generation. A Navigator function manages batch simulation scheduling, and the parallelization of the codes permits efficient use of multiprocessor resources.

NEi software has recently added a CFD capability to its analysis suite, incorporating Tdyn from Compass IS. NEi CFD now offers fast fluid-flow solutions due to its integrated pre- and postprocessing environment and easy-to-use coupled-variable utility. It also includes wizard assistant tools at each step of the process, and allows user-defined functions for physical properties and boundary definitions.

Taking a Different Slant

Hanley Innovations focuses on rapid aerodynamics conceptual analysis and design with its inexpensive, pay-as-you-go Stallion 3D CFD package. Given an .stl CAD input file, the software uses an automatic grid-generation process. Eliminating human interaction for each design change greatly speeds up solution times. Users can also view intermediate solutions and make real-time adjustments (e.g., to grid size) as needed.

Scripting offers another way to speed up multiple analyses. Cradle North America, a regional division of Software Cradle, markets SC/Tetra (unstructured mesh) and STREAM (structured mesh) full CFD programs with parallel licensing options. Both packages accept command lines executed from external programs, allowing users to create automated processes from geometry import to postprocessing tasks.

To generate multiple simulations from a master file, ACRi includes a "meta" command that works across its suite of CFD packages including ANSWER for general analysis. The function supports multiple studies of sensitivities, stochastic and/or objective-function optimization simulations. A highly intuitive CFDStudio GUI lets users make quick changes in geometry, input, or output functions.

Acknowledging that speedups are beneficial across the full scope of a CFD solution, some companies have put major efforts into targeted slices of the problem. For example, while partnering with CD-adapco to offer a CFD solver capability, SIMULIA also markets its own Isight optimization tool that helps users conduct fast design tradeoff studies.

Exa's Power Flow analysis has always been a time saver because of the way it automatically discretizes the fluid domain. Now the company has devel-

Back to Basics – Defining Essentials

To zero in on viable CFD software, start by generating a list of the types of fluid flow problems you expect to solve. List the software requirements and features that you believe are necessary.

Contact CFD software development companies and review their product literature against your list.

Next, talk to analysts who perform similar simulations and learn about their experiences with each CFD program you are considering. Then, request trial usage of candidate CFD packages to be certain that they can accurately model your physics and are easy to use.

Further, consider the balance between the package's cost and features. Are you buying an annual lease or a perpetual license? What is the cost of additional processors and additional features?

— Roxanne Abul-Haj

oped a new preprocessor called PowerDelta that not only heals and meshes parts quickly, but also creates a workflow and history tree for managing the design process. A feature-based tool simplifies modifications throughout the model, speeding up "front-loaded" tasks for fast total analysis.

MSC Software markets FluidConnection, a CFD preprocessor that uses a new concept, abstract modeling, in an object-oriented way without the need for specific geometry. Designed to work with, not replace, existing engineering software tools, it parametrically supports major CAD and CFD applications, and automatically generates the mesh without the need for expert assistance. Productivity across an overall simulation is also increased through use of a new SimManager CFD Connect process management module.

Metacomp Technologies says that one of the keys to its speed is the unified preprocessing of structured, unstructured, and multi-block grids. And, quite beyond the scope of this article, you'll find benefits with TrueGrid and GridGen preprocessing software and EnSight and Tecplot postprocessing packages. Their power can cut the time needed to set up any analysis and mull the significance of its results.

The Usual Caveats

Over the past decade, FEA software has moved successfully into the designer toolbox. However, since CFD analyses face the often greater challenges of nonlinear behavior and many more possible algorithms, results can be much more sensitive to small differences in initial conditions. The skill of the designer must be matched to the operation of the software.

You will find different packages list similar functions, so ask questions about what they don't mention. With solid answers, you will identify which package leads to your best design path. ■

*Contributing Editor **Pamela J. Waterman** is an electrical engineer and freelance technical writer based in Arizona. You can contact her about this article via e-mail sent to DE-Editors@deskeng.com.*

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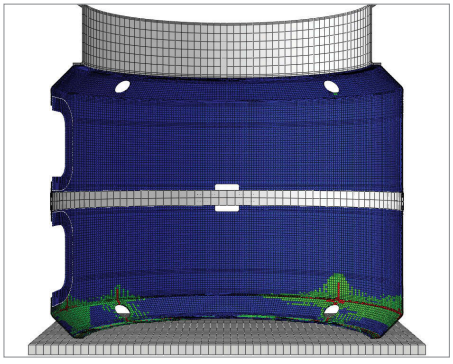
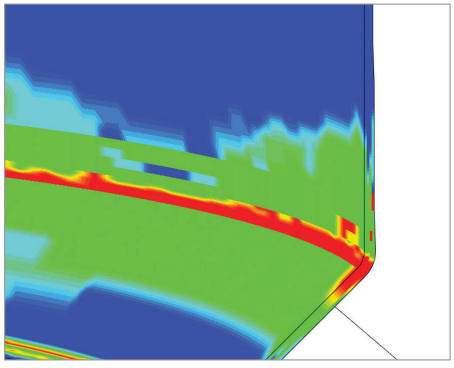
By Jason Gies

Abaqus & Helius:MCT Validate Minotaur IV

> Updating laminate

You hear a lot about pain points in the analysis community these days. And often, you must reach a certain pain point before even looking to an alternative solution.





Side view of CASPAR showing an envelope failure quilt plot. Blue elements indicate no failure, green elements indicate matrix failure, and red elements indicate fiber failure.

In the composites analysis community, there are several subjects that are considered to be well beyond the pain point. In general, the composites industry uses heritage designs based on methodology more than 30 years old. These techniques use expensive experiments like open-hole tension tests to produce strength values and then treat the composite laminates as a single material—or black aluminum (a term coined by the analysts). This approach has led to extreme conservatism in composite structures.

In an unprecedented program funded by the Air Force Research Laboratory's (AFRL) Space Vehicles Directorate, CSA Engineering and Firehole Technologies set out to not only prove this overdesigned-out-of-ignorance theory, but to provide a software solution that is integrated with current finite element analysis (FEA) packages, uses standard material characterization, addresses the analysis of the composite in a multiscale fashion, completes these tasks efficiently, and robustly converges on a solution.

"The genesis for the large structural failure program at AFRL Space Vehicles Directorate was really to make a definitive statement regarding the ability of the aerospace community to optimize designs of large composite structures," said Dr. Jeffrey Welsh, former program manager for integrated structural systems at the directorate.

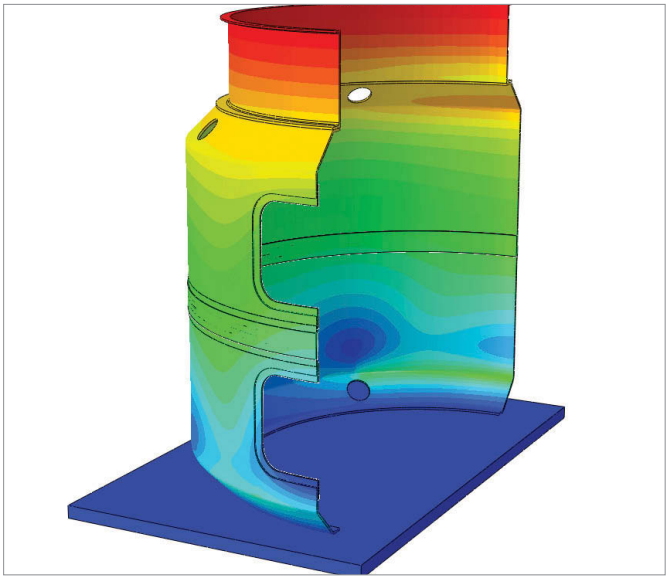
The program started with qualification and failure testing of the Composite Adapter for Shared

Payloads (CASPAR). This structure was designed to carry multiple payloads aboard the Minotaur IV launch vehicle (the first two launches are scheduled later this year) by optimizing the available payload envelope.

Consisting of two symmetric 74-in. diameter solid composite laminate cylinders, CASPAR is approximately 60 plies thick, comprising industry-standard carbon/epoxy pre-impregnated (pre-preg) composite material. The major diameter tapers to an all-composite flange at both ends. Each of the two shells contains a single access door in the cylinder and four equally spaced vent holes are located in the fore and aft flanges.

All analysis of this structure was performed with the commercially available software package, Helius:MCT from Firehole Technologies in conjunction with Abaqus/Standard from SIMULIA, Inc. Prior to the physical failure testing of CASPAR, a progressive failure analysis was completed with Helius:MCT based upon the worst-case load condition from the qualification test. This loading scenario placed maximum compression opposite the access doors.

The CASPAR structure was successfully tested to failure, exhibiting highly nonlinear behavior. A significant level of localized matrix and fiber failures occurred prior to the ultimate failure of the structure. The MCT analytical and experimental results show excellent correlation. Initial matrix cracking was predicted within 11



This isometric view of CASPAR shows a displacement plot with red indicating maximum—and blue, no—displacement.

percent, gradual global softening of the structure was predicted with the increase of matrix failures, failure of the lower radius was predicted within 1 percent, and the ultimate failure of the structure was predicted within 15 percent of the actual experimental load.

The CASPAR structure survived a loading of more than eight times the worst-case service load condition. This conservatism translates into mass inefficiency. Lack of confidence in analytical simulation is a major contributor to the extreme conservatism that exists in most composite structures.

Over the course of the program, it was shown that accurate failure predictions can be provided for space structures. Analysis was performed using advanced methods in an industry setting:

- Predictions for failure initiation, propagation, and ultimate failure were provided.
- Materials were characterized using available data generated from standard test methods and previously reported.
- All analysis was performed in a time frame measured in weeks, including model developent, run time, and documentation.

Researchers achieved the most accurate results when multicontinuum technology composites failure simulation was coupled with advanced FE techniques. Analysis using traditional techniques consistently over-predicted failure by a factor of two or more.

Although a change in analysis philosophy will be required; accurate, meaningful analysis of composite structures is achievable. Improved confidence can be gained, producing better designs. With advanced tools like Helius:MCT, a mass efficient structure can be achieved, providing improved mission performance and reduced cost.

While one of the most complex in terms of response to loading, CASPAR is one of several recent success stories for Firehole's Helius:MCT product. Blind failure predictions made on two other space flight hardware items were within 3 percent accuracy of ultimate failure. ■

Jason Gies *is VP of business development for Firehole Technologies. Send comments to DE-Editors@deskeng.com.*

FOR MORE INFO:

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> CSA Engineering

> Firehole Technologies

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By Christopher Hardee

FLUENT & Flow Sim Aid Personal Genome

> CFD and microfluidics help develop tool to predict one's future health.

You hear a lot about pain points in the analysis community these days. And often, you must reach a certain pain point before even looking to an alternative solution.

In the composites analysis community, there are several subjects that are considered to be well beyond the pain point. In general, the composites industry uses heritage designs based on methodology more than 30 years old. These techniques use expensive experiments like open-hole tension tests to produce strength values and then treat the composite laminates as a single material—or black aluminum (a term coined by the analysts). This approach has led to extreme conservatism in composite structures.

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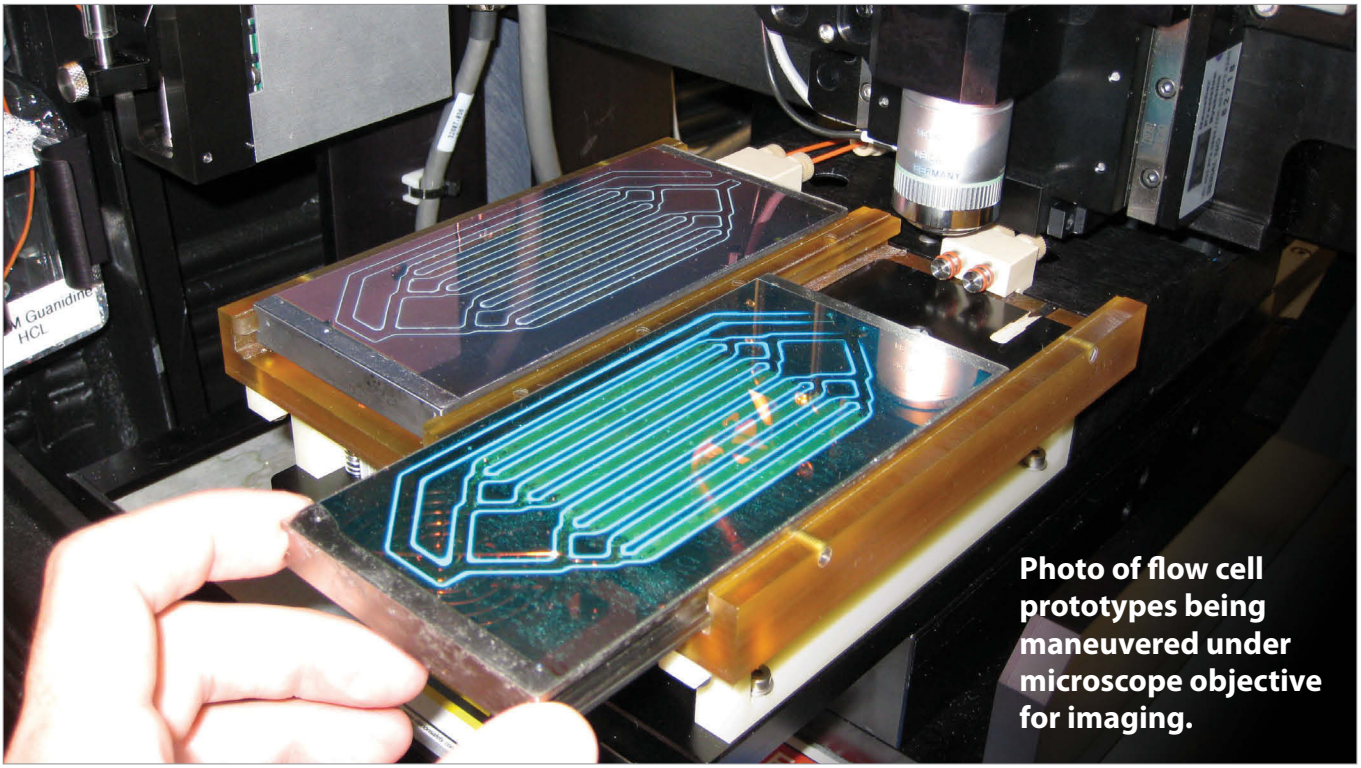

Photo of flow cell prototypes being maneuvered under microscope objective for imaging.

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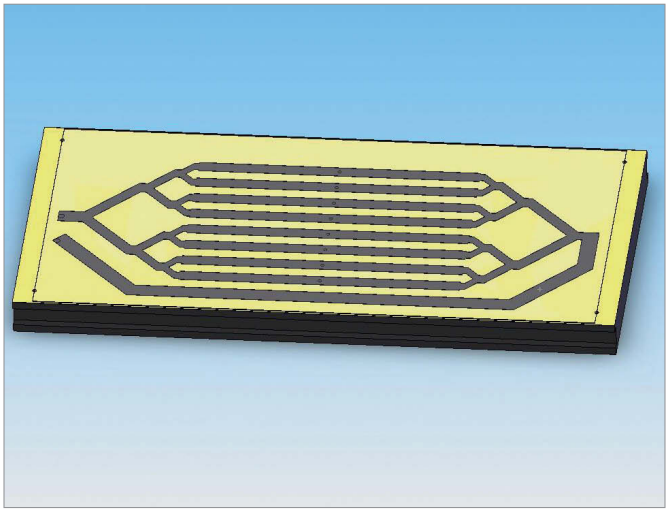

FIGURE 1: SolidWorks model of final flow cell design with a single inlet and outlet and eight parallel channels.

Abaqus/Standard from SIMULIA, Inc. Prior to the physical failure testing of CASPAR, a progressive failure analysis was completed with Helius:MCT based upon the worst-case load condition from the qualification test. This loading scenario placed maximum compression opposite the access doors.

The CASPAR structure was successfully tested to failure, exhibiting highly nonlinear behavior. A significant level of localized matrix and fiber failures occurred prior to the ultimate failure of the structure. The MCT analytical and experimental results show excellent correlation. Initial matrix cracking was predicted within 11 percent, gradual global softening of the structure was predicted with the increase of matrix failures, failure of the lower radius was predicted within 1 percent, and the ultimate failure of the structure was predicted within 15 percent of the actual experimental load.

The CASPAR structure survived a loading of more than eight times the worst-case service load condition. This conservatism translates into mass inefficiency. Lack of confidence in analytical simulation

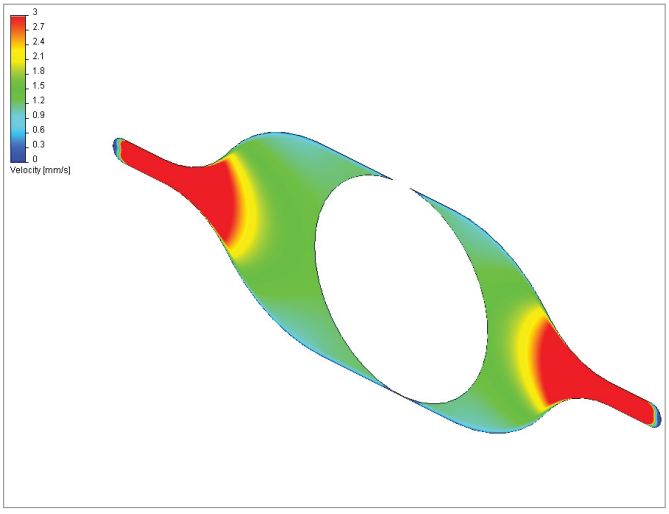

FIGURE 2: Flow cell velocity as calculated using FLUENT CFD analysis, with the inlet represented on the left and the outlet on the right.

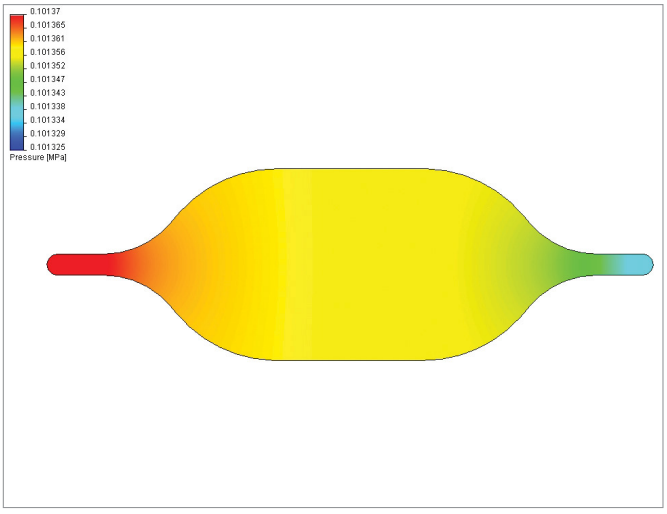

FIGURE 3: Flow cell pressure as calculated with FLUENT. The inlet (left) shows high pressure and the outlet (right) shows low pressure.

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Christopher Hardee *is a New Hampshire-based freelance writer and marketing consultant who focuses on technical topics and organizations. Send comments about this artricle to DE-Editors@deskeng.com.*

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> SolidWorks

By Fred C. Jensen, P.E.

Engineer's Toolbox:

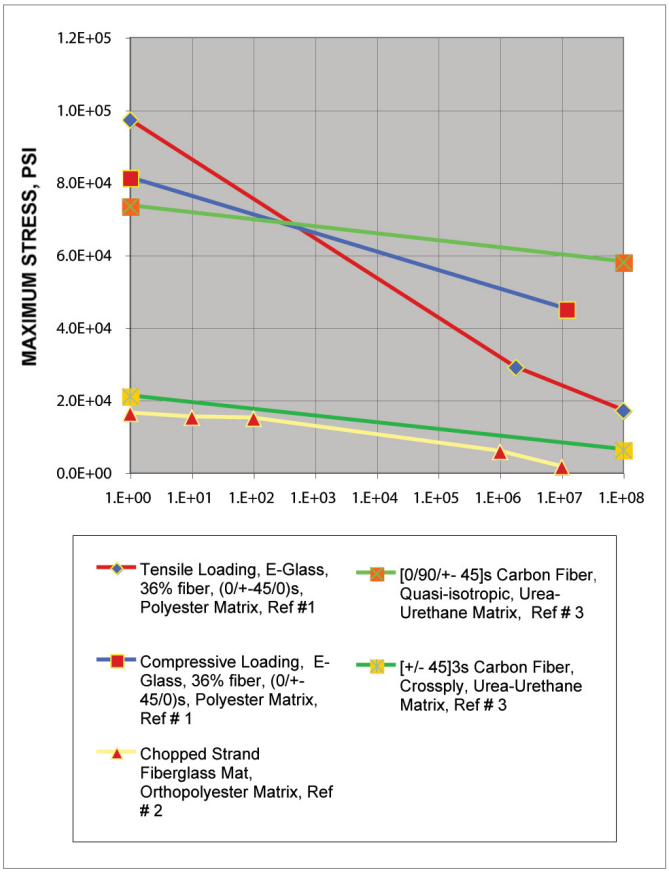
Mechanical Fatigue of Composites

Composites, used in more and more applications, are now widely used in the transportation industry—including aerospace, automotive, and marine—as well as in a range of applications from wind turbine blades to garden tools. Engineers today should know and understand composites as an integral part of their design toolbox.

Composite construction is defined as a structural material system composed of a combination of two or more materials. In the context of this article we assume the structural material consists of reinforcing fibers such as E-glass (fiberglass), carbon fiber, and some filler material held together by a composite matrix binder or resin.

An important parameter of composite construction is the structure's fatigue life. The technical literature is now full of composite fatigue data, but composite design requires more care and study by the practicing professional. Caution should be exercised when using commonly published fatigue data for composites because construction techniques and composite material properties can vary widely; high cycle fatigue data should be collected at a slow enough cycle rate so as not to induce hysteresis heating in the composite test sample; and test sample sizes must be representative of the application.

It should be obvious that a composite laminate schedule consisting of crossply construction of plus or minus 45 degree reinforcing [+/- 45°]s will have a worse cycle life than a laminate schedule with some fibers in-line with the stress direction. For example, the chart above compares the crossply laminate with the quasi-isotropic symmetrically repeating laminate [0/90/+-45]s. Here the 00 fibers are in-line with the stress direction.



Fatigue strength of selected composite laminates: Cycles to failure at ambient room temperature.

Table 1: Construction details for the laminates used in line graph

Description	Fiber %	Matrix	Industry	Failure Mode (Used to identify fatigue failure)	Ref:
[0/+/- 45°/0)s Resin Transfer Molded (RTM)(a)	E-glass (volume 25 to 45%)	Orthophthalic Polyester, matrix	Wind turbine blades	Complete separation	1
CSM (b)	E-glass (volume 25 to 40%)	Orthopolyester	Boat building	Laminate failure	2
[+/- 45°]3s crossply, [0 / 90°/45°]s quasi-isotropic	Carbon fiber (volume 39 to 43%) (c)	Urea-urethane Bayer Corp. 420 IMR (internal mold release)	Automotive	[0 /90°/45°] Sudden break, [+/- 45°] Mixed mode failure (d)	3

Notes:

(a) The 00 (the load direction) consisted of D155 (15.5 oz/yd2) mat. The 450 consisted of DB120 Material (12 oz/yd2) mat.

(b) Chopped Strand Mat with 4-5 cm fibers of glass held together by a binder.

(c) Carbon fiber, Thornel T300 in the 6K version, high-modulus, fiber bundle consisting of 6000 individual filaments with the following properties; Strength = 3.20 Gpa, modulus = 228 Gpa, failure strain = l .4%, filament diameter = 7 µm.

(d) Ref 3, authors suggested using a 2% offset in the maximum strain to define the failure point of the [+/- 45°] laminate.

What may not be as obvious is that there is an optimum fiber density for maximum cycle life. Components made with very high percentages of fiber reinforcements do not make for higher cycle lives. A fiber density of 36 to 42 percent in a laminate is about optimum for cycle life. In fact, tensile fatigue resistance drops rapidly as fiber volume is increased above the 40-45 percent range.1 This increase in fatigue sensitivity at higher fiber content is not offset by the higher initial strength. It appears that the fibers need the matrix to keep each single fiber from contacting its neighbor, thus preventing rubbing and bending over each other.

Since composite materials can be good thermal insulators, it is important to be careful not to overheat the test sample with internal friction when collecting high cycle structural data. The test frequency, as recommended by the Automotive Composites Consortium, varies with stress in accordance with the following relation:

Test frequency = k (S ultimate) / (S max – S min) where k was 3 Hz, S ultimate is the UTS of the composite, S max is the maximum stress in the cycle, and S min is the minimum cyclic stress. S min is usually taken as one tenth of S max. See Reference 4 for additional details.

The test sample must be large enough to include the important structural details of the laminate. Testing small bundles of fibers may not give representative results. Reference 5 describes the work

of Sutherland, Mandell and Creed, where testing at frequencies up to 100 Hz, shortened the test period for 108 cycles to just 11.6 days. Adequate heat transfer was achieved by using very thin specimens, approximately 0.06 in. thick. One needs to verify that their laminate can be represented by such a thin test sample before using that data.

Some additional comments about designing composite structures for long fatigue life: Reference 1, observed no measurable effect of matrix material on cycle life when comparing good quality unsaturated orthophthalic polyester resins, vinyl ester resins, or epoxy resins.

Table 1 describes a few representative laminates widely used in industrial applications. Included is the industry application. Since this is intended to be a short introductory article on composite fatigue life, the reader should refer to the source references listed in the table for critical design work.

The composites listed in Table 1 have their estimated fatigue lives plotted in the line graph above. Even though the chopped stand mat (CSM) composite has the lowest fatigue life of those presented, it is cheap to produce. This allows thick sections to be fabricated, which will lower the over-all stress values allowing good service life in many applications.

Readers should refer to the source references listed in the table for critical design work. ■

***Fred C. Jensen**, MSME, P.E. is director of engineering at Patriot Engineering Co, providing mechanical engineering solutions (design, FEA, CFD, machine/product development and build) since 1979. You can send comments about this article to DE-Editors@deskeng.com.*

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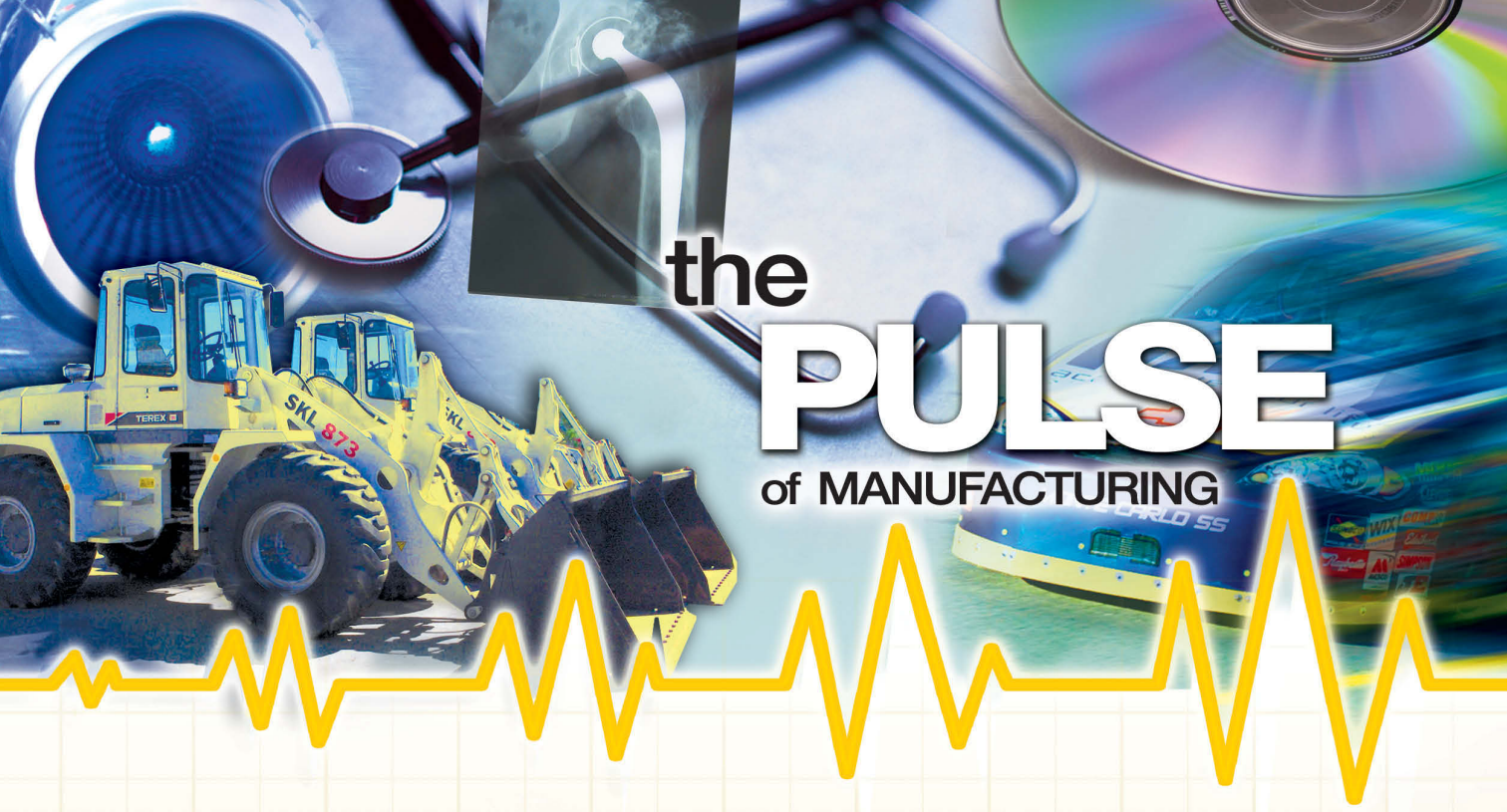
FOR MORE INFO:
> Patriot Engineering Co.



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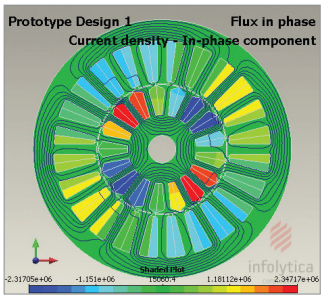

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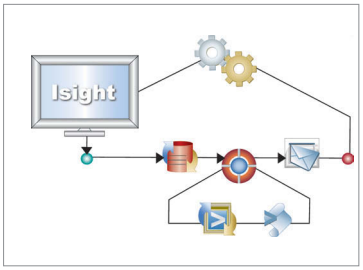

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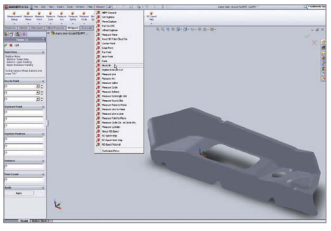

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Manufacturing Success Despite a Difficult Economic Environment

> This year's mantra among rapid technology companies: go after manufacturing.

BY SUSAN SMITH

Nowadays, a primary topic of conversation is how we are all surviving these difficult times. Yet despite the economic doldrums affecting everyone, some companies in the rapid technology sector are maintaining successful operations. Desktop Engineering asked a handful of them how they've weathered the downturn.

A number of factors are in the mix: Traditional markets such as aerospace, and medical and dental are still doing well; rapid prototyping (RP) companies are transitioning from building concept models to manufacturing final products; services bureaus are more popular and numerous; and the tools that help users streamline processes, saving time and money, are hot.

An engineer removes parts from the Stratasys Fortus 900mc machine, which was designed for direct digital manufacturing (DDM). *Image courtesy of Stratasys*

Moving RP into Manufacturing

"Go after manufacturing" is this year's mantra among RP companies.

Shane Glenn, Stratasys' director of investor relations, said that, in spite of the global economy's generally negative impact, they are experiencing a trend toward rapid manufacturing with their high-end Fortus line.

"We are a traditional equipment manufacturer

with technology that's not necessarily new, but which offers great value to the end user," said Glenn. "End users that have historically used our technology in the design and engineering phase of new product development are taking that technology and incorporating it into latter stages of manufacturing occasionally and using the technology for the manufacture of end-use parts."

Both Stratasys' low-end and high-end additive fabrication systems are based on fused deposition modeling (FDM) technology and use a similar operating process. Stratasys refers to their large systems (Fortus) as 3D production systems and the smaller, lower priced systems as 3D printers (Dimension and uPrint).

Glenn said, "flat is the new growth, … it's all relative, we're living in an environment none of us today has ever experienced. It's unprecedented what is happening globally and in financial markets and manufacturing. Stratasys is doing well … compared to what's going on in the overall economy."

In Q4 of 2008, according to Glenn, maintenance contracts (and thus revenue) increased, driven by an increase in the installed system base.

Dimension targets customers for whom 3D printing is relatively new and whose focus is concept models and prototypes. In this economy, they are reluctant to make those purchases, according to Glenn. A few years ago, low-end 3D printing was the faster growing part of Stratasys' business.

Strategically, Stratasys has made a significant shift from a distribution model that is direct to one that is indirect with distributors for the Fortus brand.

"We've made significant changes just on the high end in the past six to twelve months…," explained

Quickparts, which offers online quoting, can handle a host of materials.
Image courtesy of Quickparts

Glenn. "At the low end side … we've also made some big changes (providing a better product that is affordable) with our most recent product, uPrint. At the other end, we will continue developing new applications to go after manufacturing."

Recently Stratasys wrapped the uPrint and Dimension business groups back together rather than operating them separately—coinciding with the aforementioned distribution model. The uPrint is small enough to actually fit on a desktop, and is very easy to use.

EOS North America, a fully owned subsidiary of EOS GmBH, is an OEM selling and supporting German-manufactured EOS machines from offices in Oregon.

North American VP Jim Fendrick said, "I haven't

seen any waning in interest in our product. There are many needs in industry, but there has been a dramatic drop-off of the financial means to obtain them. It's hard to go to the board of directors and ask for half-a-million dollars to save the company money just after laying off 2,000 people. That's the big change I've seen."

While the economy is currently keeping the company from hiring people it might otherwise have hired, it will not lay anyone off.

Fendrick said privately owned EOS North America began its fiscal year in October at about 5-6% ahead of last year, down from their typical 30-40%, "but not a negative effect yet," he said.

Industries the company has served include medical, aerospace and "other," which include service bureaus, manufacturers of non-medical or aerospace parts. "Medical is still going strong, aerospace is going somewhat, and 'other' has disappeared but been replaced by more medical," reported Fendrick.

One positive is the medical industry's discovery that there are many new applications for EOS equipment. Some dental labs have replaced the casting process for copings and crowns by sintering with EOS equipment, enabling more accurate, faster, cheaper copings and crowns. In the medical field, there are numerous projects for instrumentation using customized instruments for implants.

A titanium motorcycle brake mount manufactured in a direct-to-metal laser sintering machine from EOS.
Image courtesy of EOS

One positive is the medical industry's discovery that there are many new applications for EOS equipment.

EOS recently announced that Morris Technologies, Inc. purchased an EOSINT M 270 system to laser-sinter titanium, the company's ninth direct-to-metal laser sintering machine acquired from EOS. Morris Technologies spokesman Greg Morris says yearly demand for laser-sintering services has increased, and it expects a great demand for titanium parts. The new system will be used to offer rapid prototyping and manufacturing in titanium to aerospace and medical industry customers.

Materials and Tracking

Manufacturing processes are being developed to certify materials, know their origins, provide batch numbers, and certify material temperatures during sintering. Each layer might have a different parameter requiring certification. "All that information must be tracked," Fendrick said. "We have to develop equipment to measure temperatures in different areas of the building document, and these processes requiring modifications to our equipment are being worked on today."

Fendrick said that both software and hardware are affected by these changes. If a new type of material is derived that requires a more powerful laser that the company would need to develop, it would also require a hardware modification to capture

A titanium motorcycle brake mount manufactured in a direct-to-metal laser sintering machine from EOS. *Image courtesy of EOS*

information with sensors.

"There's a lot of new interest, and applications being discovered for it," said Fendrick. "I'm not worried about survival.… Watch costs, support customers, supply good product; you'll be OK."

Rapid Services

Rapid prototyping services have proliferated in recent years, in some cases offering 24-hour turnarounds. These service bureaus are doing well and growing to meet the increasing demand for custom and mass-produced parts.

Quickparts makes it easy for customers to buy, offering good prices and helpful staff. "We do the same thing as Home Depot, but we do it with custom parts for engineers who are developing their product," explained Patrick Hunter, president of sales and marketing.

Hunter described the company as a "virtual manufacturer" for custom parts. "Our business model leverages the excess capacity in the market so that we can provide the best price and service to our customers for their low-volume custom parts needs," he said. "We don't have equipment, don't do manufacturing ourselves—we serve the customer with high-end sales service and high-end project management service and we partner with best-of-breed markets and attract relationships with Quickparts to produce our orders on demand."

Quickparts, which provides online quoting for custom parts and provides low-volume injection molded parts out of engineered plastic in a matter of days, is focused on reaching $1 million in revenue. Hunter said that Quickparts will not lay anyone off; in fact, it's looking for great people.

Tools for Streamlining Work Processes

Another company citing medical as one of its primary industries is privately owned Materialise. Colleen Wivell, general manager for the U.S., said that Materialise addresses diverse markets: medical device, automotive, aerospace, consumer goods, and universities. That diversification, said Wivell, makes the company more resilient.

In the U.S., Materialise provides sales, technical support, training, and marketing for the company's software products. Like other RP firms, Materialise in the U.S. has experienced delays in hiring new people. And, like other RP firms, Materialise finds that the medical implant business is less affected by the recession in general.

"Yes," said Wivell, "budgets have been slimmed down because of the economy and some people have been concerned about what this new healthcare system will mean to the healthcare industry. But the medical device industry is still going strong."

Tools that will help customers streamline their processes for more efficiency are increasingly valuable. Materialise is focusing its attention on its technical line of products.

A case in point is E-Stage, an automatic support generator, a software product that can run as a standalone and can generate reports automatically. "It's very accurate, and when you build a part that's been set up with automatic supports, it uses less material, they're easier to remove and the parts are easier to finish," said Wivell. The product primarily focuses on support generation for stereolithography.

The company's Magics product enables designers to save materials. Services bureaus may use Magics to check every part for feasibility before building it.

One product from Materialise focused on SLS technology, SmartSpace, automatically does 3D nesting based on a part's geometry. "Packing that build platform tighter and building more parts will save time and money," said Wivell.

Through partnerships with customers, RP companies will discover new material and product needs destined to fuel growth for the future.

Although we may see some consolidation in the market, the drive currently is to find cheaper ways of getting products manufactured, and customers finding new applications for existing technologies. Through partnerships with customers, RP companies will discover new material and product needs destined to fuel growth for the future. ■

*Contributing editor **Susan Smith** has been working as an editor and writer in the technology industry for more than 16 years. Send e-mail about this article to DE-Editors@deskeng.com.*

FOR MORE INFO:

> Stratasys

> Electro-Optical Systems (EOS) North America

> Quickparts

> Materialise

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Engineering Workstations Change Dramatically

> Workstations were a passing fad, but you still have to pay attention to what you purchase..

BY PETER VARHOL

Workstations like this Nehalem-powered system from HP promise to deliver high performance at very low costs for engineering design, analysis, simulation, and rendering activities.

We don't talk about engineering workstations as a computing platform very much today. That's because many higher-end off-the-shelf desktop and even laptop computers have enough power to serve that role. For a few thousand dollars, you can buy a system that can satisfy most of your needs as a design engineer. You can pay still more, but the days of the $50,000-plus specialized workstation are long since past. And the recent demise of SGI, whose assets were acquired by Rackspace, didn't help the reputation of pure engineering workstation systems.

And that leaves many questions unanswered. What is the best processor for your type of work? How much storage do you need, and what type of storage is best? What about memory? Is a large, high-res monitor essential? Is there a systems architecture that works best for engineering? What operating system works best for you?

That few thousand dollars can be spent in a variety of ways. The best way will depend on the type of work you do, the applications you use, and your own way of working. In any case, you should understand the tradeoffs so that the system you or your organization purchases does the best job for you, today and in the future.

Hardware Architecture Alternatives

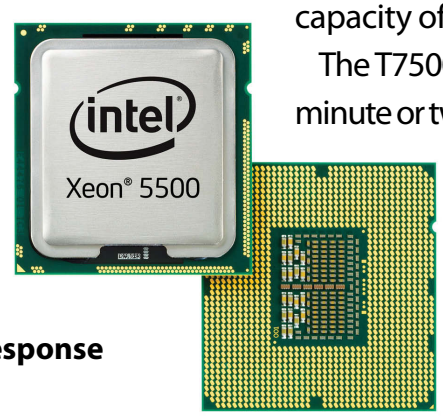
The standard PC remains the most flexible architecture for a wide variety of engineering ap-

The NVIDIA Tesla processor uses the strong floating point performance characteristics of the company's graphics chips to provide a high performance coprocessor. Utilizing multiple processor cores, it can be very effective in high parallel computing tasks.

plications. It can be used effectively in analysis, design, simulation, data acquisition, and software coding. The combination of price, performance, and familiarity give it a built-in advantage for engineering uses.

Further, specific models from Dell and HP are designed to be used by engineering professionals, and usually have a lot of memory, fast disks and data transfers, and the most advanced processors available.

Intel's Nehalem architecture has the promise to make a significant difference for high-performance computing (HPC) applications. One significant innovation in Nehalem is its so-called Turbo Boost Technology, which delivers additional performance automatically when needed by taking advantage of the processor's power and thermal headroom. It does so using a technique that we once called overclocking. It was well known to those of us who built our own PCs 15 or 20 years ago that the Intel processors were capable of running faster than their rated clock speeds. Replacing the clock crystal with a faster one was an easy way of getting a computer to run faster with a slower and less expensive processor. Nehalem does it in a different way. It detects when a processor core is running at close to capacity, then overclocks itself one step at a time to be able to run its workload more easily. As the workload diminishes, it clocks back down to its normal speed.



Intel's Xeon 5500 series, also known as the Nehalem architecture, provides for the ability to automatically "overclock," or increase its maximum execution speed, in response to high workloads.

The processor also incorporates scalable shared memory with memory distributed to each processor with integrated memory controllers and high-speed point-to-point interconnects. Specifically, it has the memory controller on-chip, rather than across the memory bus on a separate chip. This enables the controller to understand what is happening in the processing pipeline and make fetch decisions based on that tight coupling. This approach has the potential to improve performance by ensuring that data and instructions are ready to go so that pipeline stalls become less common.

Last spring Dell announced the Precision T3500, T5500, and T7500, a computer line that incorporates the Intel Nehalem architecture (now called the Xeon 5500 series) and high-end NVIDIA and ATI graphics processors. Perhaps most impressive, the top-of-the-line T7500 has a maximum memory capacity of an incredible 192GB.

The T7500 can render complex designs in a minute or two, designs that took 10 minutes or more on earlier high-performance systems. The interior of the tower system is elegantly designed, fitting dual processors, 12 memory slots, and assorted other hardware in a standard case.

HP uses the Nehalem primarily for servers, but is also offering the Z800 workstation for applications requiring significant horsepower. While the most powerful version is not yet available as of this writing, it will be comparable to the system from Dell in memory capacity and bus speeds.

Another architecture alternative is a system with a standard Intel processor, but with the ability to access and execute code on other types of processors for specific purposes. It might be thought of as a compute coprocessor, or set of coprocessors, for highly compute-intensive tasks.

For example, last fall NVIDIA delivered a 960-core GPU system using its high-end graphics processors. This system, called the Tesla, is priced at just under $10,000. The system is rated at 36 TeraFLOPS, making it theoretically possible to solve all but the most computationally intensive problems.

Granted, standard applications can't run on systems like this—most commercial and custom applications are typically compiled to run on industry-standard Intel processors. But NVIDIA makes compilers available, so custom code can be compiled to run on this platform, and in doing so take advantage of the parallelism offered by the multiple cores.

You can still get a few systems with some of the Reduced Instruction Set Computing (RISC) processors from the likes of Sun and Digital (now a part of HP) that were in vogue in the 1990s for HPC, especially for heavy-duty floating-point computation. While both Sun and HP still manufacture such systems, they are a much smaller force in the market than they were a decade ago.

Operating Systems: Still a Choice?

There was a time when engineering workstation was synonymous with the Unix operating system, a family with a common heritage but separate versions from Sun, IBM, HP, and others. Today, Unix of all flavors is pretty much in decline, giving way to the open source Linux look-alike.

The appeal of Unix in the 1980s and 1990s was in its technical sophistication. You could multitask different applications, use network resources transparently, run sophisticated scripts, and in general do more complex tasks than you could with traditional desktop operating systems.

Today, however, Microsoft's Windows has adequate sophistication and is used almost universally. Thanks to the increasing capability of Windows across generations, as well as the increasing power of its host Intel processor family, Windows is the OS of choice for many engineers and engineering design applications. While it lacks the maturity of Unix, it has a single owner that puts vast resources into making it better.

There is little clear advantage to choosing Linux except perhaps for cost (and some would claim reliability), especially given limited application availability, but the option remains available.

That's not to say that Unix has completely disappeared; far from it. Apple's highly capable Mac uses a version of Unix, and Sun has open-sourced the Intel version of its Solaris Unix brand. However, application availability has suffered in recent

years, and Unix remains a player primarily on the existing RISC systems.

And the open source Linux is also a rising player in the workstation realm. Sixty-four bit versions of Linux can be installed on Intel-based systems as well as a variety of others. There is little clear advantage to choosing Linux except perhaps for cost (and some would claim reliability), especially given limited application availability, but the option remains available.

Everything is a Tradeoff

Unless you have unlimited money to spend on your engineering workstation, you are going to face certain tradeoffs. Here is where your priorities should be:

Memory: It remains true that the more memory you have, the larger the working set your operating system can support. Your applications will, in general, run faster, because the code and data is being accessed from fast memory. Get as much memory as your budget will allow. Most systems intended for engineering use and equipped with a 64-bit OS can handle tens or even hundreds of GB of memory, and you should strongly consider spending more here than less.

Video: First, we need a lot of real estate on our displays. Scrolling incessantly to see the entirety of our design takes time and energy. Second, we need high resolution. It's important to see and work on large parts of the design at a very detailed level. Third, we need speed. We can't wait seconds or even minutes for the screen to repaint. That means a high-performance video card with lots of video memory.

Processor: The processor counts, but not as much as it used to. Pure clock speed used to be the differentiating factor, but today multiple processor cores take over where clock speeds topped out.

Specialized peripherals: Anything that will help your analysis, design, or engineering efforts is a good choice. This could be data acquisition hardware, an optical disk, solid-state storage, or an extra large and fast hard disk.

Just because it doesn't make sense to get an expensive, high-performance RISC workstation for your work today, doesn't mean that you can't get the best system your limited dollars can buy. But while the tradeoffs you have to make are less obvious, the system will likely serve you well for a long time. ■

*Contributing Editor **Peter Varhol** has been involved with software development and systems management for many years. Send comments about this column to DE-Editors@deskeng.com.*

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> Apple
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> NVIDIA Corp.
> Sun Microsystems, Inc.
> Unix

Third Wave Systems to Release AdvantEdge FEM 5.4 in August

>**Third Wave Systems, Inc**. has announced the upcoming release of AdvantEdge FEM version 5.4 on August 3. AdvantEdge FEM is a materials-based software solution for the optimization of metal cutting.

The FEM software provides information about heat f ow, temperatures, stresses, and forces for machining processes. Version 5.4 introduces additional user-friendly features.

Among the new and/or enhanced features in AdvantEdge FEM version 5.4 are 3D chip refinement for added control over chip mesh; chip-only display in 3D for viewing chips independently of uncut workpieces during result analyses; user-defined workpiece initial mesh size for more control over initial 3D workpiece mesh; improved 3D engine performance; performance improvements for faster 3D initial mesh; and more.

For more information, visit Third Wave Systems, Inc.

OMEGA Engineering Introduces New RTD Probe/Transmitter

>**Omega's** new wireless RTD probe/transmitter assembly features a stainless steel probe connected to a polypropylene watertight housing.

Units are shipped ready to install and operate with the push of a button. The assembly is available with or without 3-A approved thermowells for clean-in-place sanitary applications.

Each receiver also includes free software that converts users' PCs into multi-channel temperature monitors, chart recorders, or data loggers. Each wireless probe assembly transmits process temperature, ambient temperature, signal strength, and battery status in real time.

This FCC/CE compliant product works with all OMEGA UWTC Series USB or Web-Enabled Ethernet Receivers and Wi Series Meter/Controller/Scanner and DIN.

Prices start at $265.

For more information, visit OMEGA Engineering.

Icona Solutions Releases New Version of Aesthetica

>**Icona Solutions Ltd.** has announced the availability of aesthetica Version 3.1, which applies manufacturing tolerances and deformation information directly to a 3D CAD model to enable real time, ìwhat you see is what you getî perceived quality studies using imagery early in the product development process.

Among new features and functions introduced with V3.1 are the ability to import and re-use measured or pre-analyzed data on the variation of locator features on existing products or vehicle platforms; to import tolerance specification sheets and make assumptions based on the current manufacturing capability; and to import measured or simulated form variation for individual components. A direct interface to Autodesk Showcase and improvements to the existing Bunkspeed HyperShot interface enable photorealistic visualization of aesthetica deformed models.

There are three new modules for importing and then re-using existing variation data and tolerance stack-up models: the Feature Tolerance Importer, Tolerance Specification Importer and Part Variation Importer.

For more information, visit Icona Solutions Ltd.

Schott Systeme Releases Pictures by PC 3.4

>**Schott Systeme GmbH** has announced the inclusion of parallel processing functionality within the latest release of its CAD/CAM software Pictures by PC 3.4, reducing toolpath calculation times up to 60 percent, according to Schott.

With more complex machining strategies, especially when using 5-axis simultaneous techniques, toolpath calculation times become longer. The Schott Systeme team has rewritten its software to ensure that the latest 32 and 64 bit versions can parallel process toolpath calculations.

Schott Systeme cite immediate speed gains of between 30 to 50 percent for its 32-bit version on a dual-core processor, and anticipate gains of up to 60 percent when running on a quad core.

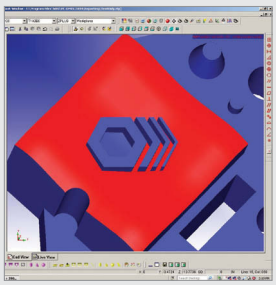
For more information, visit Schott Systeme GmbH.

CGTech to Demonstrate VERICUT Composite Apps

>**CGTech** is presenting the latest developments in composite fiber placement programming and simulation at the CompositesWorld Expo 2009 on Sept. 28. The show takes place Sept. 28-30 at the Renaissance Schaumburg Hotel and Convention Center in Schaumburg, IL.

During the exposition CGTech will be demonstrating VERICUT Composite Applications: VERICUT Composite Programming (VCP) and VERICUT

Hexagon Metrology Releases PC-DMIS 2009



>**Wilcox Associates Inc.**, (wilcoxassoc.com), a Hexagon Metrology company, has announced the release of PC-DMIS 2009, the latest version of its CAD-based metrology software.

PC-DMIS 2009 is a family of software products covering a variety of metrology hardware platforms and solutions sold under the banner of Enterprise Metrology Solutions (EMS). PC-DMIS 2009 rolls out enhanced versions of PC-DMIS CMM and PC-DMIS Vision software, and also introduces new products such as PC-DMIS Planner and PC-DMIS Reporting Suite.

The core product of the EMS suite is PC-DMIS CMM, which is used primarily on automated coordinate measuring machines (CMMs), offers new functional and visual improvements. A new feature is Protected Mode Execution, a ìrun-onlyî mode with password protection against all editing or changing of the program or reports. PC-DMIS 2009 offers enhanced geometric dimensioning and tolerancing (GD&T) support for all standard GD&T calculation methods including ASME and ISO, plus additional option selections, and real-time dimensional calculation. New CAD support for the growing JT format is included as well.

Other new measurement capabilities for non-contact 3D laser probes include the display of laser stripes, measured features, and measured points. New laser hole and cone auto-feature measurement are also added.

For more information, visit Wilcox Associates..

Composite Simulation (VCS) in booth 300.

VCP reads CAD surfaces and ply boundary information and adds material to fill the plies according to user-specified manufacturing standards and requirements.

CGTech will also be exhibiting VERICUT 7.0 CNC machine simulation and optimization software, which reduces the time required to develop, analyze, inspect, and document the CNC programming and machining process.

For more information, visit CGTech.

Alligator Technologies Releases USBPGF-S1

>**Alligator Technologies** has introduced the USBPGF-S1, a USB controlled single-channel programmable signal conditioning instrumentation amplifier and low pass filter.

Configurable to a variety of applications, the USBPGF-S1 is available in a range of filter characteristics. Each USBPGF-S1 can configure itself from power-up with changeable, but non-volatile configuration, and can operate independently in both a turn-key or host computer controlled scenario. The new module is compatible with all 12, 16, or 24-bit A/D devices, according to the company. It is designed for filtering applications in sound and vibration testing, ultrasonics, acoustics, structural analysis, industrial, test, scientific, and laboratory data collection. It is also suited to applied mechanical applications in electronics, aerospace, field research, automotive, and process control.

The USBPGF-S1 provides the user with the ability to mix and match filter characteristics, independently select and program each module's coupling (AC or DC), corner frequency, and gain steps up to x1000 in either single-ended or differential measurements.

For more information, visit Alligator Technologies.

HP Introduces Workstation with Six-core AMD Opteron Processor

>HP has announced the integration of the Six-Core AMD Opteron 2400 Series processor into its family of HP Workstations.

The HP xw9400 Workstation taps the power of the new AMD Opteron processors to deliver higher productivity, especially for multi-threaded applications, multi-tasking, and mega-tasking environments.

The HP xw9400 Workstation can accommodate up to two Six-Core AMD Opteron processors—for a total of 12 cores—each of which offers up to 34 percent more performance per watt over the previous-generation quad-core processors, according to the company.

AMD HyperTransport 3.0 technology (HT3) increases interconnect rates from 2 gigatransfers per second (GT/s) up to a maximum 4.8 GT/s. Additionally, the HP xw9400 can be configured with the ATI FirePro V7750 3-D workstation graphics accelerator.

HP xw9400 Workstation using the six-core AMD Opteron 2400 processor drew the most visitors on deskeng.com in July.

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NEW PRODUCTS

InterTech Unveils M-1075y Leak Detectors with Communication

>Design engineering departments in manufacturing companies with applications requiring high-speed leak testing of parts can now integrate leak testing into test-intensive assembly operations using the new **InterTech** M-1075-Y Mass Flow Leak Detectors from InterTech

The detectors feature touch screen with menu-driven operator controls; embedded web pages, allowing managers to monitor and access operations remotely, including interactive test parameter updates; real-time display of all leak test stages and data storage for up to 1,000 test records; ethernet-connectivity for integration into existing factory networks or solutions; USB ports to speed backup; password-protected operator log-in; quick interchange of test sequences for multiple product testing; WiFi option; and ad-hoc network capabilities.

For more information, visit InterTech.

MecSoft Releases New VisualMILL for SolidWorks

>**MecSoft Corporation**, the developer of VisualMILL, AlibreCAM, RhinoCAM, and other computer aided manufacturing software solutions, has announced the release of VisualMILL for SolidWorks, an integrated CAM software solution for SolidWorks users starting at $999.

By using the familiar interface of SolidWorks to implement the feature set of VisualMILL CAM software, VisualMILL for SolidWorks gives users a single-window integration. It includes full model associability to generate 2-1/2 axis, 3 axis, 4 axis, and 5 axis indexed tool paths for high speed machining. ■

For more information, visit MecSoft Corporation.

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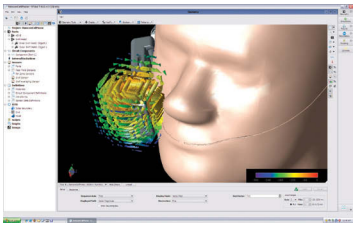
XFdtd 7.0 for 3D EM Simulation



XFdtd® 7.0 (XF7) by Remcom is the market's most modern 3D electromagnetic simulation software for FDTD based modeling and simulation. XF7 simplifies workflow for design engineers with an overall focus on the iterative nature of the design process. XF7 marks a departure from other standard 3D EM solvers with a simplified and streamlined user interface, cross-platform functionality, and several time-saving features that are unique to the market.

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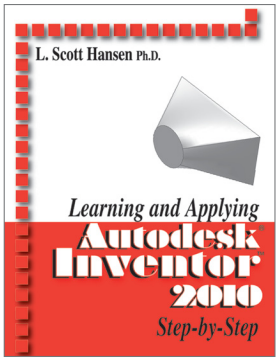

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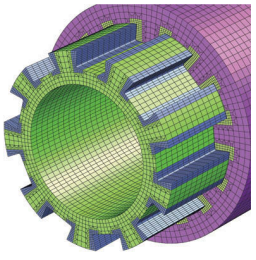
Mesh Generator and Pre-Processor for FEA and CFD Analysis



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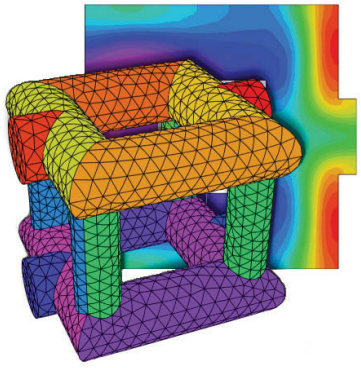

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> PDE Solutions, Inc.

CADRE Pro 6 For Windows Vista/XP/2000

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Automate Data Transformation for Greater Efficiency

PAUL PERREAULT
Anark Corporation

Today's economic climate has affected most industries, leaving many manufacturers seeking new and innovative solutions to achieve their goals of working leaner, faster, and smarter. For many of them, sharing 3D product data efficiently and effectively remains a difficult and potentially costly necessity.

As products become more complex, organizations need scalable solutions that cut costs, accelerate product development, and facilitate collaboration with internal and external stakeholders. Several factors, each requiring an individual solution, complicate sharing design data. Among them are poor data quality, incompatible CAD formats, intellectual property protection, easy transfer of complex data, access to data within the PDM/PLM system, and ensuring the data is current throughout the supply chain.

Perhaps the most painful of all these issues is maintaining currency between derivative (and distributed) CAD data and original design data. To describe this problem in plain terms, imagine spending two

> Success today depends on operational efficiency and task automation.

hours preparing and converting a simple CAD file for a vendor who needs precise B-rep data to make a mold. This seemingly insignificant two hours scales quickly when multiplied by the number of files that require such treatment and the number of times parts are revised. Assuming a labor cost of $100 per hour, it's easy to imagine how hundreds of thousands if not millions of dollars are being wasted on CAD data preparation that doesn't necessarily add value to the end product. Unfortunately, this manual process is prone to error, which can cascade up and down the supply chain.

The concept of "CAD transformation" encapsulates the entire process of translating to different file formats, restructuring the assembly hierarchy, and attenuating unnecessary detail—all for the explicit

goal of producing case-specific derivatives of original designs for each role in the extended manufacturing enterprise. Anark Core Workstation is an easy-to-use transformation tool that drastically reduces the time required to prepare and convert CAD data.

The software uniquely fingerprints each face in the CAD file, allowing designers to change geometry without breaking automation. Recording CAD transformation actions as a "recipe" means organizations capture and leverage the knowledge required to prepare CAD files for suppliers and partners. Automating these processes saves countless hours when designs change and removes the human factor as a potential source of error. Automated CAD transformation makes sharing design data easier, more cost-effective, and shows immediate results.

Success today depends on operational efficiency and requires the elimination of tasks that don't add value to the end product.

A recent example of this involved conversion of complex Pro/ENGINEER assemblies into lightweight 3D models for a customer's online parts catalog. Prior to working with Anark's solutions, the conversion process took 15 hours per assembly and required a highly skilled 3D modeler to manually rebuild portions of the assembly that couldn't be simplified enough to meet the requirements of the catalog application. Time spent converting heavy CAD data into lightweight mesh models was a hidden yet significant cost. This process, in turn, delayed timely delivery of the catalog and prevented regular updates and maintenance. Using Anark Core the customer was able to cut time spent on the task by a factor of 15 to less than one hour per assembly.

Success today depends on operational efficiency and requires the elimination of tasks that don't add value to the end product. Developing processes that facilitate communication and collaboration among all partners is essential to remaining competitive. Automated CAD data transformation increases efficiency while helping manufacturers share data and collaborate effectively, eliminating a significant source of product development waste. ■

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