Machine Controls, CAD/CAM Optimize Machining Tasks

The latest advances in CNC gear and CAD/CAM software offer shops the key to improving metalcutting efficiency.

As manufacturing companies continue to pull out of the recession, developers of machine controls and CAD/CAM software systems are investing in the new product technologies that help their customers improve machining quality, metalcutting performance and overall productivity.

At CNC developer Siemens, the company keeps the pace with new technologies by investing over 5% of its revenue in R&D, notes Rajas Sukthankar, general manager, Motion Control—Machine Tool Systems,
Siemens Industry Inc. (Elk Grove Village, IL). “As a global leader in the machine tool industry, we are proud to present our latest product, the Sinumerik 808D, at this year’s IMTS in Chicago. With Sinumerik 808D, we have a complete CNC product portfolio stretching from simple two-axis knee mills to complex multi-axis aerospace machines to take care of all of your machining needs,” Sukthankar says.

Siemens CNC product family consists of the simple 808D, the midrange 828D and the high-end 840D sl CNCs, all based on the common Sinumerik Operate HMI platform, Sukthankar adds. “This innovative and easy-to-use graphical user interface makes it easy for job-shop owners to switch operators from machine-to-machine with minimal training to achieve peak productivity,” he notes, adding that the Sinumerik 828D, introduced in the US during IMTS 2010, has been highly successful with its simple, easy-to-use graphical user interface. “The success of this job-shop control can be directly attributed to its innovative tool and workpiece setup and product reliability.”

At IMTS, the company plans to showcase its CNC lineup including the flagship Sinumerik 840D sl CNC. “In automotive manufacturing, our Transline solution with its comprehensive Safety Integrated package has become an industry benchmark to protect people and machines. In aerospace manufacturing, we continue to expand our market share by leveraging our NC open architecture and local R&D to support custom kinematics and error-compensation algorithms,” Sukthankar says. Siemens also plans to introduce a new control feature, called Sinumerik Control Energy (CTRL-E), a set of powerful and technically sophisticated functions to increase the energy efficiency of machines by reducing energy consumption.

Today’s more powerful CNCs offer users much more performance with speed and improved part quality, notes Todd Drane, marketing manager, Fagor Automation Corp. (Elk Grove Village, IL). “The industry continues to push the envelope in performance. What was once considered high speed, is now low speed,” Drane states. “Fagor Automation has designed and implemented features designed around ensuring maximum servo performance and accuracy, yet without sacrificing speed and in fact, increasing speed.”

To accomplish this, CNC manufacturers must develop features that are 100% designed to enhance servo performance, which reduces cycle times and increases part finish and accuracy, Drane notes. “Our approach to this is primarily based around the 8065 CNC, in which we have increased block processing speeds to <0.5 ms while also analyzing the toolpath with advanced high-speed block look ahead utilizing nano-metric resolution,” Drane points out. Combined with Fagor’s Adaptive Real-time Feed and Speed (ARFES) control, these features allow the CNC to analyze machining conditions such as spindle load, servo power, tool-tip temperature and adapt both the axis feed rate and the spindle speed for maximum machining performance productivity, he says. The result is a reduction of cycle time coupled with a superior part finish, and extended spindle and servomotor life also is accomplished due to the improved tool utilization.

At the show, Fagor plans to show its complete lineup as the only CNC controls manufacturer producing a full line of controls for all markets plus digital and analog servomotor systems, CNC/servo turnkey package solutions, CAN I/O modules, linear and rotary absolute encoder products and digital readout products, Drane notes. “We believe what we do in providing a single-source automation solution for customers is the best method in long-term success within any market,” he says. “Our products, designed for one another, seamlessly work together ensuring the customer that the technology works as designed.” Fagor also will be challenging visitors at its booth in a race of time in solving the Rubik’s cube by pitting them against the Fagor 8070 CNC controlling the feared but clever Rubinator Machine, Drane adds.

High-speed machining on its Robodrill product line will be featured by Fanuc FA America at this year’s show, notes Paul Webster, manager, CNC engineering, Fanuc FA America (Hoffman Estates, IL). “We’re going to be bringing more machines this year for a variety of demonstrations,” Webster says. “We’ll be showing some high-speed machining functions, five-axis features, and demonstrate how these Fanuc features are tied into the machine tool directly.”

The Robodrill line will specifically showcase high-speed machining with smoother part finishes, faster cycle times, and better programming features on the controls, he adds. “The Robodrills will be machining a range of parts, from aerospace to automotive to die-mold parts,” Webster notes. “Aerospace parts typically require more contouring, so we’ll be showing things like Tool Center Point (TCP) control, tool posture control and vector programming—the ability to program in vectors. Many of these features allow the CNC to handle many of the calculations directly rather than through an extensive post.

“With five-axis machining, it’s all about the feature set on the programming side, and then when contouring, it’s all
about the surface finish, precision and accuracy,” Webster adds. “In addition, we’ll be showing a lot of robotic integration and fieldbus solutions demonstrating open connectivity to Fanuc robots and to the rest of the factory. We’re doing a lot with Ethernet/IP, Profinet, FLNet, and Modbus TCP/IP. Our connectivity to these advanced fieldbuses give us a lot of flexibility when we’re connecting to different factory environments.”

New Technologies Pace CAD/CAM

Among the key trends pacing the CAD/CAM industry is the continued push toward CAM developers offering some type of high-speed roughing feature, notes Bill Gibbs, president, Gibbs and Associates (Moorpark, CA). “What’s interesting is, I think, virtually all of the CAM companies are now offering a high-performance rough-milling algorithm,” Gibbs says. Many developers are either doing their own versions of toolpath optimization or they instead opt for using a third-party toolpath engine like Celeritive Technologies’ VoluMill, he adds.

“We chose not to do that with this case. It’s a ‘build-or-buy’ decision,” notes Gibbs, who uses Celeritive’s system. “It’s amazing that people don’t realize just how much faster they can cut a part. It’s one of only a thousand decisions to make in what is a very complex CAM software. Any good high-performance roughing cycle is going to save you 60% of your time.”

At this year’s show, Gibbs will showcase the company’s 2013 release of GibbsCAM, including its next-generation Multi-Task Machining (MTM) programming. “What these features do is they allow some things to be programmed faster,” Gibbs says. “The key focus in GibbsCAM is the ever-more complex multitask machines.” The company will demonstrate the latest developments in its complex machine programming of MTM machines, helping customers program parts quickly, accurately and efficiently. The next generation of GibbsCAM’s MTM solution helps customers use the full capabilities of complex MTM machines, including
five-axis rotary head and Swiss-style machines, solving key challenges including programming machines with multiple spindles and turrets cutting multiple parts simultaneously.

There has always been a great focus from CAD/CAM companies on developing programs that increase machining rates, speeds and feeds, without risking damage to the cutter or the workpiece, notes Glenn McMinn, president, Delcam North America (Windsor, ON, Canada, and Birmingham, UK). “Some CAM systems offer toolpath strategies that ensure a more consistent load on a tool by having it maintain a controlled engagement angle with the workpiece,” he says. “Using this approach, the tool isn’t driven into internal corners where its engagement angle, and thus the force exerted upon it, greatly increases.

“Delcam has recently developed a roughing strategy designed for solid carbide tools that’s an important development on the constant-engagement-angle theme. It’s called Vortex, and will be included within the soon-to-be-released PowerMILL 2013, FeatureCAM 2013, and many of the company’s other CAD/CAM offerings. The new Vortex toolpaths can be used in association with the step-cutting strategy already used in PowerMILL. One notable difference with this approach is that the tool does not step down immediately after each subsequent pass. Instead, extra cutting moves are added, working from the bottom of each step upwards. The result is that the amount of material that can be removed with the initial cutter is greatly increased, minimizing the amount of rest roughing required.”

One of the latest trends in CAD/CAM is smarter toolpaths, notes Mark Summers, president, CNC Software Inc. (Tolland, CT). “An example of a ‘smart’ toolpath is a hybrid toolpath which combines the best of both worlds with two different types of cutting motion,” Summers says. “The result is a much better finish and more efficient use of the tool. This toolpath is smart enough to divide your part into a series of Z sections and applies two different machining strategies to each section for a superior finish.”

Included on the list of “smart” toolpaths are the dynamic milling toolpaths that constantly adjust the toolpath to ensure the most efficient cut possible and allow use of the entire tool flute length, often eliminating the need for multiple depth cuts, Summers says. “Another trend is partnering with cutting tool manufacturers so that customers can reap the benefits of the testing knowledge and data that the tooling vendors provide,” he adds, “that we can then pass on to the end users of our software.”

At IMTS, visitors at the Mastercam booth will see the company’s current release, Mastercam X6, as well as its new Swiss Expert product, Blade Expert, and a sneak peek of something totally new, Summers notes.

Another continuing trend in the industry is the difficulty in finding employees, notes Bill Hasenjaeger, CGTech product marketing manager. “One of the biggest issues we hear repeatedly is that shops can’t find qualified employees—and this is limiting their growth,” Hasenjaeger says. “When companies can’t find the right employees, they have to find ways to become more efficient with the staff they have. One solution is to find technology that allows them to do more with the same personnel. Part program verification using CNC machine simulation software like Vericut has become an essential tool for ensuring NC programs machine the part correctly the first time, thus increasing efficiency in their manufacturing process. CGTech is seeing more companies asking for advanced simulation software, beyond what’s available with the PLM or CAD/CAM system, driven by their need to improve."
At the show, CGTech will show its latest Vericut 7.2 release, which Hasenjaeger says is a major update that continues to focus on the customer’s use of Vericut and improves simulation process effectiveness. “New features in the user interface simplify the most common user actions,” he adds. “CGTech also invested significant developer hours to increase speed by more thoroughly taking advantage of multiple processors and background processing.”

--- Patrick Waurzyniak

**Multitasking CAM**
Company will demonstrate next-generation multitask machining capabilities in the latest release of its GibbsCAM software. Focusing on helping customers program parts quickly, accurately and efficiently, GibbsCAM’s Multi-Task Machining (MTM) solution helps customers use full capabilities of complex MTM machines, including five-axis rotary head and Swiss-style machines. System’s interface walks customers through such complex part programming. Also highlighted will be GibbsCAM’s newest improvements in Automated Programming, including the introduction of “smart features” that help users program parts faster by retaining data about the feature itself, including depths, clearances and feature types such as a pocket, boss, or slot. Customers can create automatic processes for different features, which will quickly and automatically create programs to customer specifications. Improvements to the Knowledge-Based Programming capabilities continue to enable customers to automatically program families of parts and parts with similar features.

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**Machine Control Innovations**
Company will unveil productivity enhancements to several machine controls. For advanced smooth and accurate simultaneous five-axis high-speed machining, the company’s 30i-B/31i-B5 CNCs offer the new High-Speed Smooth TCP with fairing technology, which drastically reduces cycle times while improving part accuracy and quality. In addition, the Series 30i-Model B controls, which include the 30i-B, 31i-B, 31i-B5, 32i-B and 35i-B models, offer a newly enhanced high-speed and large capacity, multi-path PMC offering large-scale sequence control with a maximum of five concurrent independent ladders. Execution of common instructions is more than 2.5 times faster than previous generation, with additional capability of high-speed module executing every 1 ms. Company also is introducing its new iPendant for CNC, a handheld operator’s unit that offers mobile operability for large machine tools. The iPendant keyboard provides for both MDI data operations and manual machine control operation as integrated by the machine builder.

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**High-Speed Roughing**
The new Vortex strategy for high-speed area clearance will be demonstrated at the company’s booth. It is a major enhancement of the PowerMILL 2013 CAM system for high-speed and five-axis machining that will be launched at the show. Company also plans to add Vortex to FeatureCAM for feature-based programming and PartMaker for programming Swiss-type lathes and turn-mill equipment later in the year. The patent-pending Vortex strategy was developed specifically to gain maximum benefit from solid carbide tooling, in particular those designs that can give deeper cuts by using the full flute length as the cutting surface. It can be used for two- and three-axis roughing, three-plus-two-axis area clearance and for rest machining based on stock models or reference toolpaths. Like other Delcam roughing strategies, Vortex toolpaths are calculated to give more efficient machining by following...
the shape of the part and by keeping air moves to a minimum. This is particularly important for rest machining operations.

Delcam plc
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Metrology Software
The latest release of Verisurf X6 adds innovative features enhancements to its in-process, portable inspection, tool building, CATIA interoperability, and 3-D scanning and reverse engineering capabilities. This software package is used with many brands of 3-D scanners to generate massive point clouds for manufacturing inspection, part verification and reverse engineering, with users importing very large CAD models and performing real-time model-based inspection. New 64-bit Windows 7 release is faster and can work with very large 3-D scanner point clouds and very large CAD assemblies. It also adds a new report manager with customizable HTML, Excel, XML, PDF, document encryption, document verification checksum and AS9102 first article inspection report generator; a new CATIA V5 R22 translation validation support; a 3-D SPC option for integrated statistical process control of key characteristic inspection measurements; new InspectionExpert option for automating the creation of a drawing based AS9102 first article inspection and reporting; and new metrology device interfaces extending Verisurf’s standard metrology platform leadership.

Verisurf Software Inc.
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High-Performance CNC
Company will display a new high-performance 8065 CNC that is equipped with proprietary advanced features necessary for high-speed machining. It maintains the best machining surface finish while providing maximum accuracy. The control comes with either a 10 or 15” (254 or 381-mm) high-resolution TFT color or touchscreen LCD, Ethernet, USB and a built-in, touch-sensitive mouse pad. The system can control up to 28 axes plus four separate spindles with four different execution channels and includes Auto-Tuning system setup capability. In addition, the control offers block processing speeds of <0.5 ms while analyzing the toolpath with advanced high-speed block look-ahead using nanometric resolution. Unit employs Fagor Adaptive Real-time Feed and Speed (ARFS) capability and analyzes machining conditions such as spindle load, servo power, tool tip temperature and adapts both the axis feedrate and the spindle speed for maximum machining performance productivity. The result is a reduction of cycle time coupled with a superior part finish.

Fagor Automation USA Corp.
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Web site: www.fagorautomation.com

Mobile ERP App
The iVET is a new optional mobile add-on application to Henning Software’s flagship ERP package, Visual EstiTrack. Designed to run on most mobile devices including the Apple iPhone, and iPad, Windows 7 Phone and Google Android-based phones and tablets, this application gives Visual EstiTrack users direct mobile access to their Visual EstiTrack’s database, making it easy for them to view customers, vendors, employees, orders, inventory and company metrics directly from their touchscreen mobile hand-held device. A key feature is the ability to directly invoke phone call dialing, SMS text messages, e-mails and map/GPS features of the mobile device.

Henning Industrial Software Inc.
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Web site: www.henningsoftware.com

Updated Mazatrol Programming
Mazak shops looking to make Mazatrol programming more productive can use the latest MazaCAM CAD-to-Mazatrol interface for an easier, faster way to make parts. With the latest interface, Mazak programmers can more easily output complex shapes from a CAD file to Mazatrol without having to learn a CAD/CAM system.

System continues provides the MazaCAM CAD/CAM and Editor System that loads a CAD (IGES, DXF, etc.) file and copies the geometry to your process, eliminating difficult calculations and wasted time. In addition, MazaCAM users can create templates for a cut library, such as having several tools used
with certain depths and speeds, for a type of hole such as hydraulic manifolds. Template will save programming time because the user does not have to create the tooling every time he needs to cut these holes.

SolutionWare Corp.
Ph: 888-322-3226
E-mail: info@cncproductivity.com
Web site: www.cncproductivity.com

Shop-Floor Control
The RTStation is a rugged, stationary shop-floor device that increases operational efficiency and improves traceability in real time. Designed for effortless data input and operator feedback, the device offers superior shop floor to ERP software communication. An IQMS user interface at each manufacturing workcenter, the system graphically displays machine monitoring details such as part counts, cycle speeds and other machine processes in real time. System allows operators to print work orders, log rejects for production reporting, display job setup information and other documents, perform SPC inspections, scan barcodes, print labels, clock in/out of jobs and so much more. Powered by the Android mobile operating system, the RTStation can be used with other machines including scanners, card readers and scales. The flexible architecture serves as the platform for custom application and automation development.

IQMS
Ph: 805-227-1122
Web site: www.iqms.com

NC Simulation
The new Vericut version 7.2 CNC machine simulation and optimization software features many enhancements to improve speed, thereby reducing the time required for manufacturing engineers to develop, analyze, inspect and document the CNC programming and machining process. Along with proactively adding new features, this latest release focuses on implementing hundreds of customer-driven enhancements that help users improve the simulation process effectiveness, and increases speed by more thoroughly taking advantage of
multiple processors and background processing. Another new feature is the ability to optimize an NC program from a saved simulation. Users can adjust and re-optimize without rerunning the simulation. A new interactive panel displays cutting conditions immediately anywhere in the machining process. The user can navigate the NC program to evaluate cutting conditions and quickly see the results of adjustments to optimization settings. Company also will demonstrate its Vericut Composite Applications, machine-independent off-line programming and simulation software solutions for automated composite tape and fiber-placement CNC machines.

CGTech Corp.
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E-mail: info@cgtech.com
Web site: www.cgtech.com

ERP Forecasting System
The new Global Shop One-System ERP Release 2012.1 includes a completely rewritten Forecasting system with new tools for paperless operations throughout the plant. Forecasting system allows the user to automatically analyze spreadsheet data from customers without manual intervention. The automated customer demand level scheduling integrates with existing forecasts, work orders and purchase orders. Forecasted work orders can create real work orders according to forecasting rules by customer and by part. Updated package’s new features also include Global Shop Mobile for iPad, Android and Windows devices, tools for Global Shop’s Global Application Builder module for elimination of manual spreadsheets and databases, and updates to Global Shop document Control for paperless office, shop floor and warehouse.

Global Shop Solutions
Ph: 800-364-5958
Web site: www.globalshopsolutions.com

Shop-Floor CNC
For machine tool builders and end users, Siemens will exhibit the newest innovations in CNC, motor and drive technology, as well as new value-adding services ranging from condition monitoring and manufacturing IT to innovative solutions for CNC training and machine tool retrofits. New at IMTS 2012, company will introduce a new shop-floor CNC specifically designed and engineered for the 230V, three-phase, economy-priced market, with up to three-axis-plus-spindle control capability in milling or turning applications. Offered as a package with Siemens Sinamics drives and Simotics motor solutions, this new control will be demonstrated on a knee mill during the show. The new CNC will be available for both OEM machine builds and in-the-field retrofit.

Siemens Industry Inc.
Ph: 800-879-8079
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Web site: www.usa.siemens.com/cnc
Simulation Software
Company will showcase its NCSIMUL version 8.9 software, a comprehensive machine simulation solution for simulating, verifying, optimizing and reviewing machining programs for CNC machines. The system’s 3-D graphics enable users to avoid machining crashes while powerful algorithms and embedded process-based know-how enable optimization of cutting conditions and standardization of the shop floor documentation. Software verifies NC programs in three steps: investigates and corrects coding errors, simulates to locate and correct motion errors, and validates the part program. Company will also show its Optitool package, which analyzes cutting conditions, dramatically reduces “air cutting,” optimizes feed rates, and allows users to create better cutting strategies. The sum benefits are a reduction in the production cycle times, enhancement of cutting operations, and fast development of new G-code files for future applications.

Spring Technologies Inc.
Ph: 617-401-2197
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Web site: www.springplm.com

Factory Monitoring System
The Freedom eWARE software suite offers an all-encompassing manufacturing data reporting platform to provide availability, performance and quality feedback from any industrial asset on the plant floor. The modular, scalable software package connects to any factory asset, harvests data, dissects it and presents actionable information. System performs data acquisition, condition monitoring, energy monitoring, and cell control, and is capable of generating reports and analytics for maintenance, process optimization and OEE. The MTConnect-compliant package can interact with smart phones, tablet PCs and similar mobile devices, displaying machinery status, productivity data and machinery analytics for various systems on a plant network. System is “target independent,” capable of collecting data from any plant floor asset—without modification to ladder logic or part programming—and transforming that data into actionable information.

MAG IAS
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CAD/CAM Update
Company will showcase its latest Mastercam X CAD/CAM software, which includes many significant new capabilities such as Mastercam Blade Expert, Swiss Expert, new stock models, and more. The new Blade Expert greatly simplifies the toolpath creation process for any multi-bladed parts, including fans, propellers, impellers, turbines, and marine screws. There is no limit to the number of blades, splitters, or sub-splitters that can be programmed. New Mastercam Swiss Expert is designed to control a variety of Swiss-style NC machines, and is popular with
watch-making, medical device, dental, automotive, and electronics companies—all known for the requirement of extremely small but very precise parts. Swiss Expert supports an unlimited number of axes and channels, and for realistic simulation of the entire machine and its tools. Accurate, fully-associative stock models deliver a variety of benefits—viewing and verifying work as it progresses, performing stock model comparisons, and easily choosing existing stock for rest machining.

CNC Software Inc.
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Web site: www.mastercam.com

Turn-Mill Software
The CAMplete TruePath Turn/Mill software is offered by Methods Machine Tools on Nakamura-Tome multitasking turning centers. System includes integrated suite of G-code editing, optimization, analysis and verification tools, enabling a full range of turn-mill functions. Software was developed to create a program that could combine G code from CAM systems and hand-coded G Code into a set of programs that could be simulated, fine-tuned and optimized using detailed 3-D Nakamura machine models. The turn-mill package includes full simulation of Nakamura turning centers and programs and detailed tooling and workholding libraries. G-code editor allows modification of posted or unposted data, and changes automatically update both toolpath and G code. Optimization includes wait-code editing, reorder and move operations, and fine tuning and optimizing to simplify multitasking.

Methods Machine Tools Inc.
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CAM Software Update

The SurfCAM 6 beta version has been completed and is being made available to beta users, testers and resellers worldwide. System is on schedule to follow the previous SurfCAM V5 releases. Updated release takes existing power and control available in the software and couples it with enhancements and features to make for an improved user experience. Software includes the addition of a 64-bit version, new and updated internal technologies, and many additional features. Enhancements include new tools and material database engine; faster and improved verification technology; an updated interface; a completely redesigned help system; four new toolpath strategies; updated and new postprocessors; updated CAD translators; new productivity utilities; updated digitizer interfaces; new versions of editNC and SDNC; and enhanced TrueMill toolpath calculator and toolpath algorithms.

Surfware Inc.
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Mill-Turn Control

Company will demonstrate its lineup of machine controls and touch probes while outlining a campaign called “Accuracy: The Inside Story” that promises to give visitors insight into significant motion control issues. New product line includes the North American introduction of the TNC 640 control, the company’s first milling control offered with optional turning enabling it to perform multi-operation machining. Just as with all other TNC controls, the user only needs to enter all the programming steps for turning operation in plain language, just as for milling. The control also features an optimized user interface, which gives the user greater transparency during programming, presents functions better and displays status information more clearly. System also introduces a new stainless steel control design and a specially prepared keyboard surface and screen frame to eliminate fingerprints.

Heidenhain Corp.
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Web site: www.heidenhain.us

Swiss Machining

Company will unveil its latest version of PartMaker software for programming CNC mills, lathes, wire EDM, turn-mill centers and Swiss-type lathes. New software will feature a revamped surface machining module offering PartMaker users machining algorithms for three-, four- and five-axis simultaneous milling operations on a variety of machining platforms. CAM software for multi-axis turn-mill centers and Swiss-type lathes has a vast array of robust postprocessors and machine simulation files for virtually every machine model ever built. New Advanced Surface Machining (ASM) functionality is based on the same technology and algorithms underpinning Delcam’s PowerMILL.
and includes Delcam’s new Vortex High Speed Machining Strategies, an area-clearance strategy for which Delcam has a patent pending and has been developed by Delcam specifically to gain the maximum benefit from solid carbide tooling, particularly those designs that can give deeper cuts by using the full flute length as the cutting surface.

PartMaker Inc.
Ph: 215-643-5077 ext. 304
Web site: www.partmaker.com

Application-Specific CNCs
Company will showcase ways of enhancing the performance of machine tools with the scalability and customization capabilities of the advanced Flexium CNC kernel. The company will announce technical advances spanning its entire CNC range, including its CNC kernel and HMI, specialist drives and motors, and simulation software. The Flexium CNC kernel with its soft PLC is very popular with specialized machine tool builders because of its scalability, which allows OEMs to use the same control system across a complete range of machine designs. It can be applied economically to small machines with up to five axes and spindles, for example, or much larger machines with up to 200 axes. This particularly helps smaller machine tool OEMs with limited R&D resources to create custom solutions easily and quickly.

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