

ShopSolutions

Case Histories of Manufacturing Problem Solving

Software Speeds Multitask Machining

Well-honed CNC programming skills and automated programming of multitasking machines (MTM) have enabled Sunnen Products Company (St. Louis) to increase production for two of its complex tool families. Sunnen is a manufacturer and distributor of bore-sizing and finishing equipment, engine-rebuilding equipment, and tooling and abrasives for global markets. Its equipment is used in precision industry applications as diverse as hydraulics, cylinder liners, small engines, gears, and oil-and-gas industry components.

To increase productivity in Sunnen's 10-person Abrasive Plated Tools department, Supervisor Mike Mullins had an idea of what was needed. The tools required precise

machine from Mazak Corp. (Florence, KY), which requires much tougher G and M code programming because of part-programming requirements. Each part in the first tool family had from four to ten helical oil grooves machined around its shaft. The second family included parts with up to 29 grooves. Because each groove required four or five lines of code, Mullins determined that it would take a long time to transfer the parts. Adding to the overall programming burden, errors or engineering changes would require modifying each set of lines for each groove.

With 32 years experience at Sunnen, 25 as machinist and seven as supervisor, Mullins was undeterred by estimates of

up to 1.5 hr to program each part as he began his search for possible solutions. One possible solution with canned cycles was found to be lacking; another required a long, six-month learning curve. Continuing his search for a software that would be easy to learn and highly automated, Mullins talked to Paul Nanney, supervisor of the Sunnen Tool and Development department, the company's captive tool and die shop. His 13 employees make tooling for the whole company, as well as prototype parts for tools and honing machines that Sunnen develops and markets.

Nanney's group had been successful with multitask machining and CAM software. Nanney explains, "As products evolve to become more capable, they usually become more complex, as do their individual components. It was this type of complexity that drove me to requisition a multitask machining center." The group's two

MTM centers are a Mazak Integrex 300S Mark IV, with dual spindle, single turret, steadyrest instead of lower turret, 40-tool changer, Y, B and C axes, and a Mazak 250 MY, with Y and B axes.

"What generally goes into the Integrex are parts that are complex, parts that would be quite difficult to make without the multitask machine capabilities." Nanney explains: "The

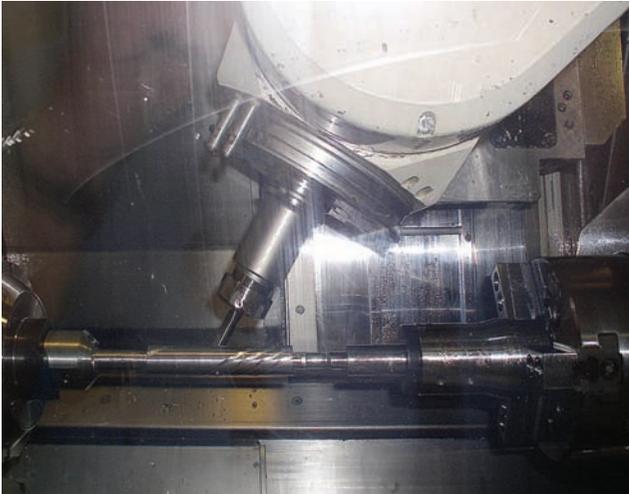


Mike Mullins, abrasive-plated tool production supervisor (left) and operator Fred Wooley inspect one of Sunnen's HPH tools automatically programmed using the GibbsCAM plug-in for machining on the Mazak Integrex 100.

multiaxis machining, primarily milling on cylindrical parts. The department had been profiling the CGT and HPH tool families on a Mazak CNC lathe, and machining the oil grooves (or flutes) on a five-axis HMC. Programming was done with conversational CNC controls.

To replace these two machines and do everything in one setup, Sunnen selected the Integrex 100 multitasking

quality and axes of the machine allow making uniquely shaped parts. Parts like that, even with the most capable people and most powerful conversational controls, require a lot of data entry, which means many opportunities for mistakes. That's why I got GibbsCAM [from Gibbs and Associates; Moorpark, CA] and made a big commitment to it, having several people trained."



A Sunnen HPH (high-production helix) tool is being machined on an Integrex 100-IV multitask machining center, which is configured as a 3 + 2 machine with X, Y, and Z axes, chuck-rotating C axis, and tilting tool rotating B axis.

Curtis Quade, tool and die maker, and Tamara Hawn, modelmaker, both long-time Sunnen employees, were two of those trainees. Quade explains: "In our department, we do our own programming and run our own parts on the machine, and we help each other. I've done little G and M code programming, but a lot of conversational, especially before GibbsCAM."

Quade's specialty is machining centers, relying on three machining centers of different sizes from Milltronics CNC Machine (Waconia, MN). "GibbsCAM saves a lot of time, especially its Profiler, which allows picking geometry from solid models that we download instead of having to enter data. The greatest savings are from error-elimination, and time saved by not having to calculate and enter numbers," says Quade.

Modelmaker Tamara Hawn typically makes only one prototype of any part, and spends most of her time programming Mazak MTMs, the 250MY with live tooling and Y axis, and the Integrex 300, although she occasionally programs a Mazak mill. Before CAM software, she used

Mazatrol conversational programming, but like Quade, she likes many of GibbsCAM's time-saving features.

Hawn's list of likeable GibbsCAM features is lengthy, if only because she says they make her job easier and faster. Because she doesn't run production, and programs the more difficult machines, her programming-to-machining ratio is high. "I spend more time programming than I do machining, because I just make one part of each prototype," she explains. "That's why I use all the time-saving features I can find." Two of her preferences stand out. One is Gibbs customer support, upon which she relies frequently. "They are always helpful, and I ask the same thing repeatedly—I forget things that I don't use all the time—and they never get impatient," she says. "They are polite and quick to help. I really like them."

The other is a GibbsCAM's automation feature, the Hole Wizard within Hole Manager. "Hole Manager automatically defines all the holes, groups them, and tells you what tools to use. I click on a part, and it fills out a chart with the different hole sizes and number of holes of each size. Hole Wizard opens a dialog that asks if you want drill, ream, or tap. It guides you through hole selection, tool selection or creation, and all the parameters you need to program the holes. I use it a lot for parts on the Integrex."

It was the automation features that interested Mullins for his abrasive-tool production. To that end, he asked Gibbs and Associates if they would create a plug-in to automate Integrex programming. "They wrote a custom plug-in for us, and now it takes about 15 minutes to write a program to machine a whole tool on the Integrex, no matter the number of grooves. That's a huge reduction from an hour and a half—83%," says Mullins. "All we have to do to program parts is enter variables into the plug-in—number of flutes, length, rotation, depth-of-cut, left or right-hand helix, taper rate over the length—and the plug-in generates a program for the Mazak. That's all. It's really easy, and automatic."

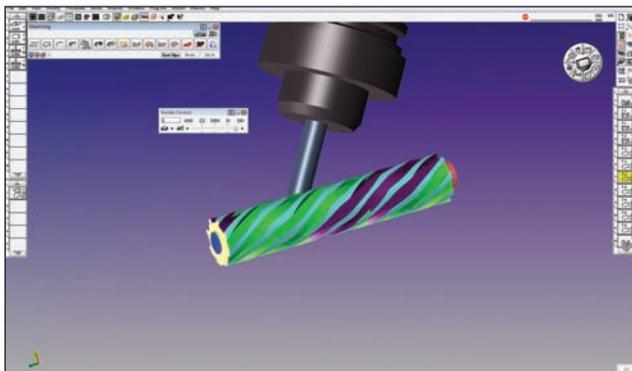
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"We came up with another idea recently," Mullins says. "We started transferring another group of parts to the

Integrex, but with these, the grooves don't start at the end of the part, at the part zero, but at some distance from it. We needed to enter another variable, an offset from the part zero, but wanted to keep programs as they were because we could use the same toolpath, but with an offset from the end. The default offset would be zero, but we could check a box for 'offset on,' enter a dimension, and go. I sent an e-mail to the Gibbs programmer, and he sent me a new plug-in in under a week. The support is fantastic."

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Mullins' group now makes parts in a single setup. The subspindle is used strictly for holding concentricity. Their "special-purpose" Integrex has a single upper turret, but an 80-tool ATC to further reduce setup. "We can keep all



GibbsCAM Cut Part Rendering verifies toolpath automatically generated by the custom plug-in. Different colors can be used for each operation, especially when the toolpath wraps around cylindrical parts.

the tools on the machine, which works well with GibbsCAM, because we can define all our tools and keep the tool



Parts from the Sunnen CGT Krossgrinding) honing tool family show the variation in size and number of machined grooves. The GibbsCAM plug-in made programming easier and automatic, and cut programming time per part by 1.25 hr.

numbers in the automatically generated programs correctly synchronized with the toolchanger," Mullins says.

The Integrex will eliminate use of two machine tools when all the parts are transferred, saving about 10% of cutting time and eliminating setup on one machine. "Part changeover takes up to 45 minutes because of tooling, which is why I got the 80-tool changer," says Mullins. "Now it takes 15 minutes to set up the part and the program. Our savings from the GibbsCAM plug-in is over an hour per program for the Integrex. With between 300 and 400 programs, that's a lot of time saved. Then add the savings from eliminated errors."

Going forward, Mullins says they may start using GibbsCAM MTM to program other parts for the Integrex, but for now, the parts outside the HPH and CGT line are simple enough to program on Mazatrol.

Paul Nanney, on the other hand, says that he wants to be prepared for the possibility of bringing some outsourced work back into Sunnen. "With the experience we have gained and expect to gain using GibbsCAM to drive the Milltronics machining centers and the Mazak lathes and MTMs, we should be prepared. for that." **ME**

For more information from Gibbs and Associates, call (805) 523-0004, or visit www.GibbsCAM.com

GibbsCAM CNC Programming Solutions

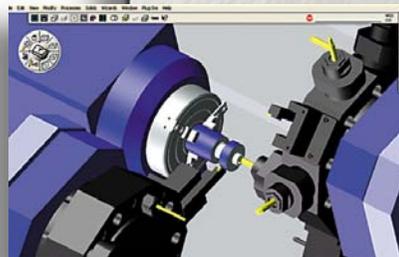
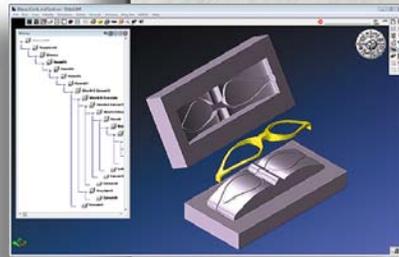
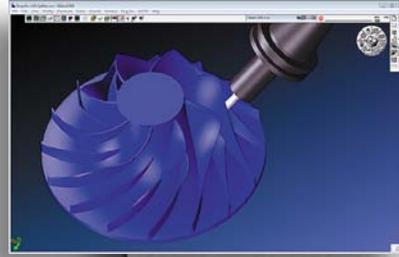
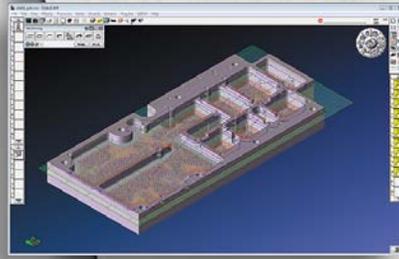
For over twenty-five years, Gibbs and Associates has been a leader in providing cutting edge CAD/CAM technology, while maintaining its signature ease-of-use and productivity. Powerfully Simple, Simply Powerful is the guiding philosophy at Gibbs. Gibbs believes in empowering the NC programmer, machinist, and manufacturing engineer, not eliminating them. Gibbs' goal is to introduce manufacturers to new technologies and new ways of working that makes their machining easier and their businesses more profitable. To achieve this goal, Gibbs creates tools that are naturally intuitive, graphically interactive, extremely visual, associative, and just plain enjoyable to use. Gibbs provides a total quality solution with the service and support successful customers require.

GibbsCAM Capabilities and Benefits

- Short learning curve makes the GibbsCAM system easy to learn and remember
- Intuitive graphical user interface, specifically designed for manufacturing, is easy to use
- Powerful macro programming capability allows users to create their own extensions to the system
- Integrated manufacturing CAD capabilities provide accurate geometry creation and modification
- Exchange data with CAD systems using DXF®, DWG®, IGES, STEP AP203/AP214, VDA-FS, ACIS®, Parasolid®, CATIA® V4/V5 or Pro/ENGINEER® formats
- Directly transfer models files from within Autodesk Inventor®, Rhinoceros®, Solid Edge® or SolidWorks® to GibbsCAM for machining
- Wizards interface technology streamlines common tasks:
 - Hole Wizard guides compound hole creation
 - Stock Wizard guides stock definition
- Interactive Feature Recognition provides an easy-to-use way to identify feature geometry to machine
- Automated Feature Recognition identifies hole features and their corresponding parameters
- Hole Manager organizes hole programming process
- Knowledge-based machining stores your company's manufacturing expertise for re-use
- Advanced toolpath generation creates fast and accurate gouge-free machining
- Full associativity automatically allows processes to be quickly and easily updated based on part model changes
- Reporter function easily generates comprehensive process documentation for the shop floor
- 3D Cut Part Rendering reveals any errors before material and machining time are wasted
- Machine Simulation allows program to be checked for potential part, tool and machine interferences
- Over 10,000 error-free post processors ensure what-you-see is-what-you-machine output with over 800 posts for MTM machine tools

CAD System Certification

GibbsCAM is certified under the Autodesk Inventor Certified Program, is a Siemens Solution Partner Program-PLM for Solid Edge Product, and is a SolidWorks Certified CAM Product.



Ease of Use

GibbsCAM's graphical user interface has been specifically designed for the types of operations performed by manufacturing professionals making for an intuitive interface that is easy to learn and use.

Breadth of Capability

Programming capabilities support production milling and turning, 2-axis and 4-axis wire-EDM and advanced machining requirements including mill-turn, rotary milling, multi-task machining and 3-axis multi-surface machining.

Manufacturing CAD

GibbsCAM provides integrated CAD functionality for geometry, wireframe, surface and solid model creation and modification necessary to support the special needs of manufacturing. Use it to program from blueprint, design fixtures and molds or repair imported data.

3D Simulation

Integrated 3D visualization capability allows the process to be simulated and verified at any time, preventing costly errors before material and machine time are wasted. The user controls the animation speed, tool display and the ability to highlight specific operations. Process and full machine simulation are supported.

GibbsCAM®

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