GEOMETRIC

CASE STUDY

CAMWorks® 2009 Plus Advanced Machines Put Roush Industries in the Winner's Circle

Roush Industries provides engineering, testing, prototype development, and manufacturing services. Closely associated in the public mind with motorsports, it also serves an array of other automotive clients, as well as aviation, electronics, medical equipment and consumer products companies. As a result, Roush's machining operation is called on to process a diverse range of parts with widely varying lot sizes, lead times and levels of complexity.

To efficiently handle this demanding workload Roush invests heavily in advanced technology, most recently in several new Mazak machines including an Integrex e-420 five-axis mill-turn center brought in, in part, to handle the growing demand for complex cylinder head porting operations, and CAMWorks® 2009 software to maximize the productive potential of the new machine tools.

One of the keys to engine performance is a properly designed cylinder head with ports that allow air and fuel to flow efficiently, producing a good burn pattern in the combustion chamber. Modifying these ports is called, appropriately enough, "porting," and it is done for racing engines and prototype engines for conventional vehicles as well. Specifically, it involves fine-tuning the shapes of the ports and the thickness of the cylinder walls along with ensuring a superior surface finish reducing or eliminating flow turbulence, allowing the air/fuel mixture and exhaust to move quickly through the ports for more horsepower.

The five-axis Integrex, by comparison, can complete the operation in a single setup, dramatically speeding the process. Another plus: The fine finishes generated with the new system have largely eliminated the need for handwork, also reducing labor costs.

However, as anyone familiar with real world machining will surmise, it was not a simple plug-and-play success story. "The CAM software we'd been using on our three-axis machines couldn't take full advantage of the greater efficiencies the Integrex made possible," says Rob Mank, Job Planning Supervisor for Roush Industries. "For example, the old software just didn't work very well when the secondary turning application was added in, which really gets quite complicated. We needed software that would support this type of machine and this type of work."

Roush Industries consulted knowledgeable users, many of whom were using CAMWorks. CAMWorks is a solids-based CAM solution from Geometric Technologies, Inc., (Scottsdale, AZ), a subsidiary of Geometric Limited. It provides an array of tools to simplify and automate complex programming tasks, to speed design and programming changes.

Importantly for companies like Roush Industries the latest version, CAMWorks 2009, heightens the software's already extensive ability to quickly generate three to five axis toolpaths as a separate thread, and in separate processes, allowing users to continue working in other areas, or on other CAM models. The key here is the system's knowledge-based database that employs Automatic Feature Recognition (AFR) to automatically define prismatic machinable features, and a technology database (TechDB) to define machining operations. Complex toolpaths can now be automatically generated, eliminating hours of programming time.

Roush has long had a highly capable and productive machining operation, but the advent of the new equipment, particularly the five-axis mill-turn Integrex, coupled with CAMWorks software, led to improvements by as much as 73 percent in a demanding and crucially important machining operation.

The new machines and the new software were both installed at Roush at the beginning of 2009. "It was a pretty big undertaking for us," says Mank, "but we had strong support from the local Michigan reseller of CAMWorks," aided with training and in ensuring that Roush had postprocessors that would support the Integrex's milling axes and turning capability.

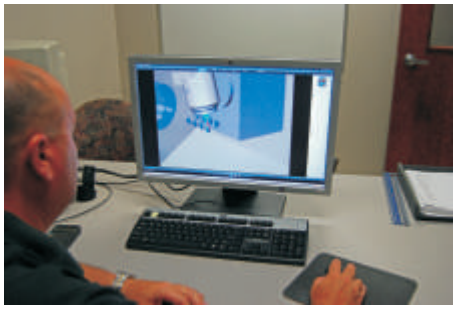

Figure 1: CAMWorks simplifies the complex programming tasks for the porting operation.

In today's highly competitive manufacturing environment speed, when linked with accuracy, is the name of the game--and armed with the new software, Roush's programming times for complex jobs like cylinder head porting have been slashed. This is due to features like automatic toolpath generation and to the ease with which CAMWorks supports four to five axis operations.

"In the past, before we had the Integrex, we had to create a program for the milling operations and another for the turning. Now, with CAMWorks, we can program the job as one operation or we can program it as two operations and then merge the two

CAMWorks®
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CAMWorks

CAMWorks is the first fully integrated computer-aided manufacturing (CAM) software designed exclusively to operate in SolidWorks and the first to offer knowledge-based, feature recognition and associative machining capabilities within SolidWorks. CAMWorks uses the same SolidWorks geometry to generate toolpaths to ensure the part you machine is the same part you've modeled.

CAMWorks helps manufacturers across aerospace, automotive, electronics and medical industries optimize and evolve their CAM automation process. CAMWorks modules are available in a variety of combinations and bundles: 2½ Axis Milling 3 Axis Milling 4 and 5 Axis Prepositioning 4 and 5 Axis Simultaneous Milling 2 and 4 Axis Turning Rotary Milling 2 and 4 Axis Wire EDM

programs together once they are proven out and run them as one." "We've gone from approximately 45 minutes doing this in the standard conventional way with two machines to 12 to 15 minutes with the Integrex and CAMWorks," notes Mank, an improvement of as much as 73 percent. In addition, programming times for this operation is also slashed thanks to CAMWorks' intuitive user interface, simulation, and other features.

Programming speed is also increased by CAMWorks' intuitive user interface, part and machine simulation, and extensive library options. "You can enter cutter paths in the library with associated tools, feeds and speeds," says Mank who finds this particularly helpful for contours that recur on numerous jobs. It helps ensure the accurate reproducibility of complex five-axis cuts like cylinder head ports and aids operators in quickly and accurately preparing jobs. "You can really personalize the system," he adds.Speed, too, is behind Roush's decision to purchase two seats of CAMWorks 2009. Mank adds, "Having two seats comes in handy during times of extra work and when something requires quick turnaround. During rush periods this helps us get programs out to the machines as quickly as possible, which is crucial because you don't want machines sitting idle."

Roush has long had a highly capable and productive machining operation, but the advent of the new equipment, particularly the five-axis mill-turn Integrex, coupled with CAMWorks software, leading to improvements by as much as 73 percent in a demanding and crucially important machining operation, has taken things to an entirely new level.

"We consider ourselves a very technologically advanced operation, but the combination of the new machine tools coupled with CAMWorks has enabled us to take things to a whole new level in terms of speed, productivity and machining complexity.This has been groundbreaking for us."

- Rob Mank, Job Planning
Supervisor for Roush Industries

Figure 2: In tandem, CAMWorks and the Mazak Integrex machine the cylinder heads for peak engine performance

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