Advanced Machining Systems Benefits from New Toolpath Engine

THE BUSINESS

Precision-machined components

THE CLIENT

Advanced Machining Systems
Bend, Oregon
www.amsbend.com

CAM SYSTEM

2010 SolidWorks® CAD
and Mastercam® X4

RESELLER

MACAM Northwest

TOOLPATH

VoluMill™ from Celeritive Technologies
www.volumill.com

The Business Challenge

Advanced Machining Systems (AMS), founded in 2002 in Bend, Oregon, is a full-service CNC machining and design shop that specializes in precision-machined components. This includes incubators for medical research companies, aerospace hydraulic systems, interior parts and life support systems for medical transport helicopters, control surfaces for general aviation aircraft, as well as parts for experimental aircraft and firearms.

While their existing client base was satisfied with the company's quality work, high levels of customer service, and commitment to providing custom solutions, AMS management noticed that new business was falling short of objectives. They embarked on a thorough analysis of their business systems, resulting in a streamlined work flow and specialized areas within the shop that maximized handling efficiency.

One area that still needed to be addressed was programming time—a key step in the company's customized solutions. For example, one firearms component on the AMS production schedule is a part made of A6 tool steel that is used for rifle testing. Initiating production required 75 minutes to program the part and 35 minutes to rough out the first of two operations. In addition, run times were fixed at 1,200 RPM with a 16 IPM feed, creating tremendous wear on end mills and requiring AMS to maintain a large tool inventory.

The Business Solution

The change that has had the greatest impact, according to AMS manufacturing engineer Mark Christiansen, has been the addition of VoluMill™, the



Advanced Machining Systems in Bend, Oregon.

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Mark Christiansen, Manufacturing Engineer, Advanced Machining Systems

high-speed machining toolpath engine from Celeritive Technologies. VoluMill is a CAM-neutral, ultra high-performance, easy-to-use plug-in toolpath engine that is used in place of traditional roughing methods. VoluMill allows for ease of programming, reducing cycle times, extending tool life, and reducing the stress on machine tools.

This single-algorithm software program allows the programmer to determine and utilize the optimum material removal rate for any combination of part geometry, material, machine, and cutting tool quickly and easily. VoluMill generates a dynamic toolpath that delivers the most consistent cutting conditions possible and allows the use of the entire flute length of the tool. The use of VoluMill can significantly reduce cycle times and wear on cutting tools and machines.

"I learned about VoluMill from a colleague who told me how much this technology was reducing his company's programming and cycle times," Christiansen said. "I went to the VoluMill Web site, tried it, and discovered VoluMill did everything it claimed it would. Plus we were able to reduce our tool inventory because I could use solid end mills instead of indexable face-milling cutters. Before the end of the 15-day trial, my bosses were saying 'buy it!'"

Since VoluMill runs as a direct and fully integrated plug-in to Mastercam®, AMS was able to incorporate its use without missing a beat. Christiansen said that AMS now uses VoluMill for profiles, slots, pockets, and steps. He reports his team is now achieving at least a 50 percent savings on cycle times, even up to 80 percent in many cases. AMS has slashed programming time, especially on complex parts, and is now more profitable on current work, much more competitive on new business quotes, and more responsive to customers' needs.

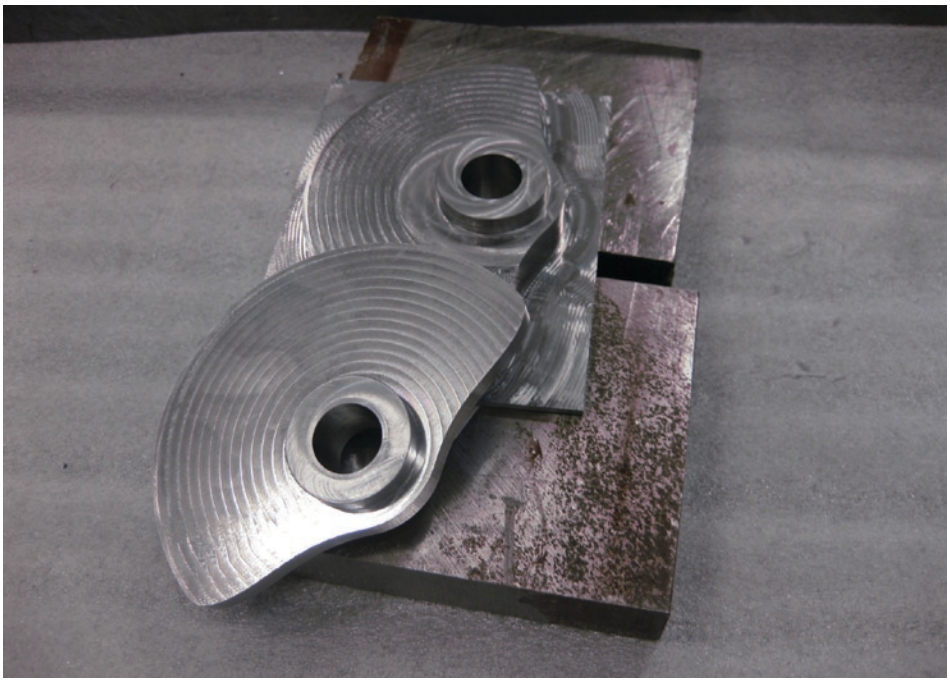
Reduced Cycle Times

AMS produces compensators for 9mm pistols from 7075 aluminum, and precision machining is critical in the manufacturing of firearms and their internal components. VoluMill has allowed AMS to realize a huge reduction in cycle times on the compensators by taking a full 1.6-inch depth of cut with a .5-inch five-flute end mill, which was not possible before.

"We went from machining this part one at a time in nine minutes, to three at a time in three minutes with VoluMill," Christiansen said. "That's a 200 percent productivity improvement, which was achievable not only because



Compensator for a 9mm pistol, machined from 7075 aluminum using a VoluMill™ toolpath.



AMS now completes this firearms testing component, machined from A6 tool steel, in 14 minutes with VoluMill™.

"Before we started using VoluMill™, it took me 30 minutes and a lot of frustration to program the part, but it took me only 14 minutes to program it with VoluMill."

Mark Christiansen, Manufacturing Engineer, Advanced Machining Systems

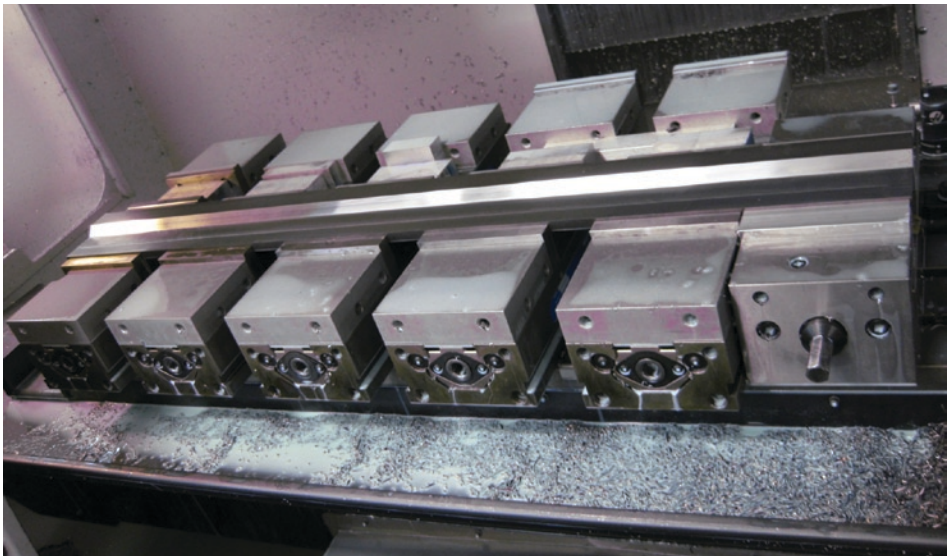
VoluMill allows us to use higher feeds and speeds, but in this case, the use of the full length of flute eliminated the need for multiple stepdowns."

Christiansen said programming with VoluMill is so easy that he is saving considerable time programming open and complex parts that are more difficult and time-consuming to program with Mastercam. For example, VoluMill takes the side profile on one part and uses dashed lines to designate where the stock boundary is to define the area to machine.

"VoluMill just programs the part after that—it's so simple," Christiansen said. "VoluMill also knows how to remove the material much more effectively than any Mastercam toolpath. It always starts out of the material, which is a lot better on the cutting tool, and is much faster, too. With Mastercam's Dynamic Mill toolpath, I have to create dummy geometry, and then do some additional manipulation just to prepare it to generate a toolpath. Before we started using VoluMill, it took me 30 minutes and a lot of frustration to program the part, but it took me only 14 minutes to program it with VoluMill—and then VoluMill roughed the part out better, too."

Greater Customer Response Times

In addition to making it faster, easier, and more cost effective for AMS to produce parts, VoluMill also allows the shop to be more responsive to its customers. An engineer from a local construction company recently walked into the shop in need of four different spacers for a concrete mold for a building project. He told Christiansen he was in a rush so he needed the parts immediately.



A construction component, machined from 1045 steel bar stock using a VoluMill™ toolpath.

"He was a new client; we'd never done business with his company before," Christiansen said. "He needed the job so fast that we didn't have time to go through our usual new product design and order processes. We designed and programmed the four parts from hand sketches and machined them in less than an hour. We never would have been able to be that responsive before. The programming and machining process would have taken us at least five hours before VoluMill."

One of the parts was a 44-inch x 2.125-inch piece machined from 1045 steel bar stock. The run time was two minutes using an inch-long, five-flute carbide end mill run at 315 IPM and 10,000 RPM. AMS programmed a .5-inch axial DOC with a .125-inch radial DOC. Christiansen indicated that before VoluMill, he probably would have used a three-flute indexable milling cutter at 58 IPM with a .118-inch depth of cut. He estimates that it would have taken 18 minutes to machine, or about nine times longer.

In addition to the savings of time in programming and machining, Christiansen also reports that the use of VoluMill toolpaths is substantially reducing the wear and tear on his tools and machines, and its use is changing the type and number of end mills AMS keeps in its inventory. "The biggest thing for me is the reduced wear on the end mills, and the ability to run our operation while stocking fewer tools," Christiansen said.

The VoluMill™ Advantage

Before AMS started using VoluMill, maintaining a large supply of different sizes of end mills in inventory was a costly but necessary aspect of their business operations. Because they used large tools to remove as much material as possible from an area, they then required a series of sequentially smaller

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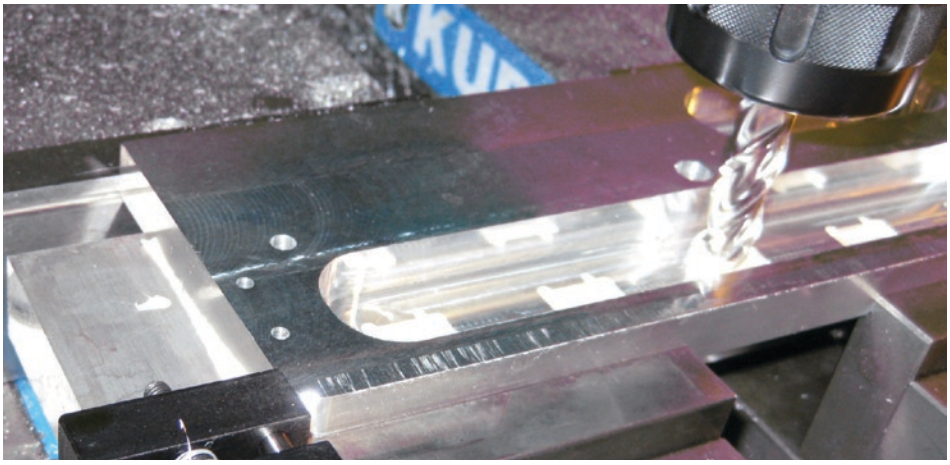
tools to remove the material where the previous, larger tools could not fit. With VoluMill, AMS has found they are able to remove all of the material with smaller cutting tools that fit all steps in the process, which is significantly more efficient than with prior methods. With the company's adoption of VoluMill, AMS purchased just a few, smaller five-flute end mills and has not had to order any new end mills.

"With VoluMill, end mills just don't wear out, even on A6 tool steel," Christiansen said. "I have been able to push the boundaries on our end mills and even push the conservative speed and feed estimates provided by VoluMill. Moving forward, as we add a new machine, which we do about once a year, we will look for higher spindle speed and feed rate capability. I never thought we'd need more than 8,000 RPM to cut steel, but with VoluMill toolpaths, we can easily use much more than that."

VoluMill also has had a tremendous impact on AMS's ability to win new business. According to Christiansen, many of its competitors have slashed their shop rates in an effort to attract new jobs or keep existing jobs, but AMS hasn't needed to follow suit. "With the increased productivity and reduced costs that VoluMill has brought to us, not only have we not lowered our shop rates, but we are able to win bids against shops whose rates are now half of ours, and still attain higher margins than we had before," he said. "With VoluMill, our success rate on bids has improved dramatically."



AMS saves eight minutes using VoluMill™ toolpaths on this semiconductor test stand component.

"We've made many changes to our operation since early 2009," said Christiansen. "It's clear that the addition of VoluMill has had the most impact. By reducing part programming and machining time with VoluMill toolpaths, especially on complex parts, our company is more profitable, more competitive on new business quotes, and more responsive to customers. These are exactly the results we were looking for to achieve success."

Celeritive Technologies, Inc. was founded to develop and market advanced productivity-improving CAD/CAM technologies. VoluMill™ offers a new genre in ultra high-performance toolpath engines that significantly increases machining productivity and product quality. This innovative, powerful toolpath engine is easy to use, performs on any part geometry, and can be used with any CAM system.

For more information and to take advantage of the 15-day free trial offer, visit the VoluMill™ Web site at **www.volumill.com**

VoluMill™ by CELERITIVE

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