Optima Manufacturing Achieves Productivity and Cost Savings Using VoluMill™

THE BUSINESS

Machining components for the energy industry

THE CLIENT

Optima Manufacturing
Calgary, Alberta
www.optimamfg.com

TOOLPATH

VoluMill™ from
Celeritive Technologies, Inc.
www.volumill.com

The Business Challenge

Optima Manufacturing is located in the heart of Canada's vital oil and gas industry, which stretches from coast to coast, but has deep roots and an annual $39 billion market in Alberta alone. By virtue of its location, 90 percent of the company's business is machining components for the energy industry.

Optima was formed in 1990 by five experienced principals sharing a commitment to the highest design, precision machining, and assembly standards. Today, Optima's recently expanded modern facility contains state-of-the-art CNC multi-axis machining centers and turning centers, CNC EDM machines, grinders, and additional machining support equipment. Optima's commitment to quality is demonstrated by a host of gauging equipment including a CNC CMM and optical comparators, plus surface and hardness testers. The company prides itself in operating an efficient, open organization with company-sponsored continuous learning programs to keep abreast of rapid changes and improvements brought about through the application of technology.



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Although most of Optima's business is in the oil and gas industry, it also services customers in the aerospace, environmental control, agriculture, and telecommunications sectors by providing process design services, extremely close tolerance machining, and precision assembly. Strict adherence to ISO standards throughout the manufacturing process benefits customers in both the Canadian and export markets.

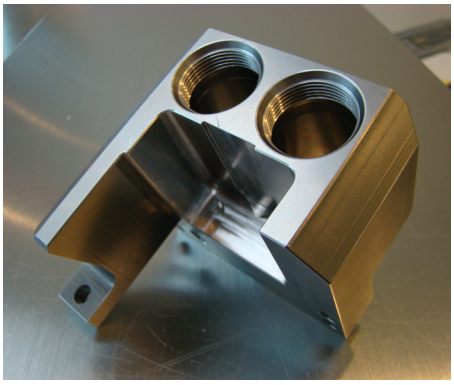
The Business Solution

Jonathan Wang, Optima's CNC programming supervisor, is responsible for adding productivity to the company's commitment to quality. Having been introduced to the VoluMill™ toolpath engine by a colleague more than a year ago, he has put it to good use on more than 100 components for the oil and gas industry. Most of these are machined from nickel-based and other difficult-to-cut materials.

Wang's group uses a CAM system that uses the traditional parallel offset method to generate toolpaths. Optima recently purchased VoluMill to improve productivity with simplified programming, shorter cycle times, and extended tool life.

"Our four programmers are very busy," said Wang. "We can't afford to spend a lot of time tweaking a part program. We estimate that the time to generate a part program using our CAM system's toolpath engine took 10 times longer than it does now with VoluMill. Even then, we wouldn't get the advantage of VoluMill's controlled and consistent material removal rate.

"One major area of improvement is the milling of inside radii on pockets and contours," said Wang. "Traditional toolpaths would simply plunge the cutter into these corners, placing very high loads on the tool and spindle, often causing deflection and accuracy issues. VoluMill's approach generates all motions in a sweeping pattern with a smaller cutter to mill these radii. As a result, VoluMill toolpaths remove the material much faster while putting far less stress on the cutter and machine."



This Inconel® gas and oil industry part took 40 minutes to rough using a traditional toolpath and only 17 minutes using a VoluMill™ toolpath.

Still, management had to be convinced to invest in this revolutionary technology, so comparisons were performed on actual production parts for the

Application Parameters for Inconel Energy Part A

Material: Inconel® 718

Machine:
Shizuoka Fanuc 18i Mill

Tool Holder:
Haimer® BT40 Shrink Fit

	OLD PARAMETERS	NEW PARAMETERS
Toolpath	Traditional	VoluMill™
End Mill	Coated Carbide	Coated Carbide
End Mill Dimensions	3/8"	3/8"
SFM	98 ft./min.	98 ft./min.
RPM	1,000	1,000
IPM	8	12
ADOC	0.125"	0.5"
RDOC	0.01"	0.02"
Ramping	drill a hole first to 0.5"	1.5°
Tool Life/Usage Per Part	1 part	2 parts
Cycle Time	40 minutes	17 minutes
Cost Savings		$100/part

"Not only is the cycle time dramatically shorter, but the extended tool life is impressive. By cutting 1/2" deep, we were able to utilize the full length of the flute of our end mill instead of concentrating the wear pattern at the corner, making the tool useless for the next part."

Jonathan Wang, CNC programming supervisor, Optima Manufacturing

Application Parameters for Titanium Energy Part B

Material: Titanium 6AL-4V

Machine:
Shizuoka Vertical Milling Machine

Tool Holder:
Haimer® BT40 Shrink Fit

	OLD PARAMETERS	NEW PARAMETERS
Toolpath	Traditional	VoluMill™
End Mill	Coated Carbide	Coated Carbide
End Mill Dimensions	1/2"	1/2"
SFM	120 ft./min.	120 ft./min.
RPM	950	950
CLPT	0.0015"	0.0025"
IPM	5.7	9.5
ADOC	.08"	0.5"
RDOC	0.02"	0.025"
Tool Life/Usage Per Part	1 part	2.5 parts
Cycle Time	18 minutes	11 minutes
Cost Savings		$70/part

energy industry. One was machined from Inconel® 718 using a 3/8" coated carbide end mill mounted in a Haimer® 40-taper shrink-fit holder for rigidity. Both toolpaths were run at 1,000 RPM, but that's where the similarity ended.

According to Wang, the Inconel part took 40 minutes to rough with a 0.125 depth of cut using a traditional toolpath. Using a VoluMill toolpath, Optima was able to reduce roughing time to 17 minutes using the same size end mill and RPM, but a 0.5 depth of cut.

"Not only is the cycle time dramatically shorter, but the extended tool life is impressive," said Wang. "By cutting 1/2" deep, we were able to utilize the full length of the flute of our end mill instead of concentrating the wear pattern at the corner, making the tool useless for the next part."

Another comparison was performed on an energy industry component machined from titanium 6Al4V using 1/2" diameter coated carbide end mills. Wang said the titanium part took 18 minutes to rough at 950 RPM, using a 0.08 axial depth of cut and a 0.2 radial depth of cut with the traditional toolpath. The VoluMill toolpath reduced roughing time to 11 minutes using the same size end mill and RPM, but with a 0.5 axial depth of cut and a 0.025 radial depth of cut.

According to Wang, when he factors in the cycle time reductions and improvements in tool life, Optima saved $100 per part using VoluMill toolpaths on the Inconel component and another $70 per part on the titanium piece. He estimates VoluMill paid for itself in less than a month.

"Management was easily convinced to purchase our first VoluMill license with such a quick return on their investment," said Wang. "Now we have two workstations loaded with VoluMill,



This Titanium energy industry component took 18 minutes to rough using a traditional toolpath and only 11 minutes using a VoluMill™ toolpath.

and ultimately, all of our programmers will have their own version rather than competing with each other for it."

Wang also reports an improvement in Optima's on-time delivery results. In addition to shorter cycle times, with improved tool life, operators spend less time changing tools and there are fewer incidents of having to re-run a job due to a tool failure. As a result, the machines are not only running faster, but with less interruption.

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The VoluMill™ Advantage

"Our first approach with VoluMill was to tackle new parts and offer the most competitive price we could to get the business," Wang said. "But then I asked the guys to scour the shop floor for more opportunities to convert processes into VoluMill toolpaths to make them more efficient. That's a real opportunity to directly improve profitability by up to 50 percent on jobs you already have."

As the world looks for alternative energy sources, those in the oil and gas industry are making every effort to make their products more affordable and efficient. With Optima Manufacturing adopting VoluMill toolpaths, it is doing its part to not only make its operation more profitable and efficient, but it's also allowing its customers to do the same.

Celeritive Technologies, Inc. was founded to develop and market advanced productivity-improving CAD/CAM technologies. VoluMill™ is a patent-pending ultra high-performance toolpath engine that significantly increases machining productivity and tool life. VoluMill is a full-featured, CAM-neutral, 2- and 3-axis toolpath engine for any geometric configuration.

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

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