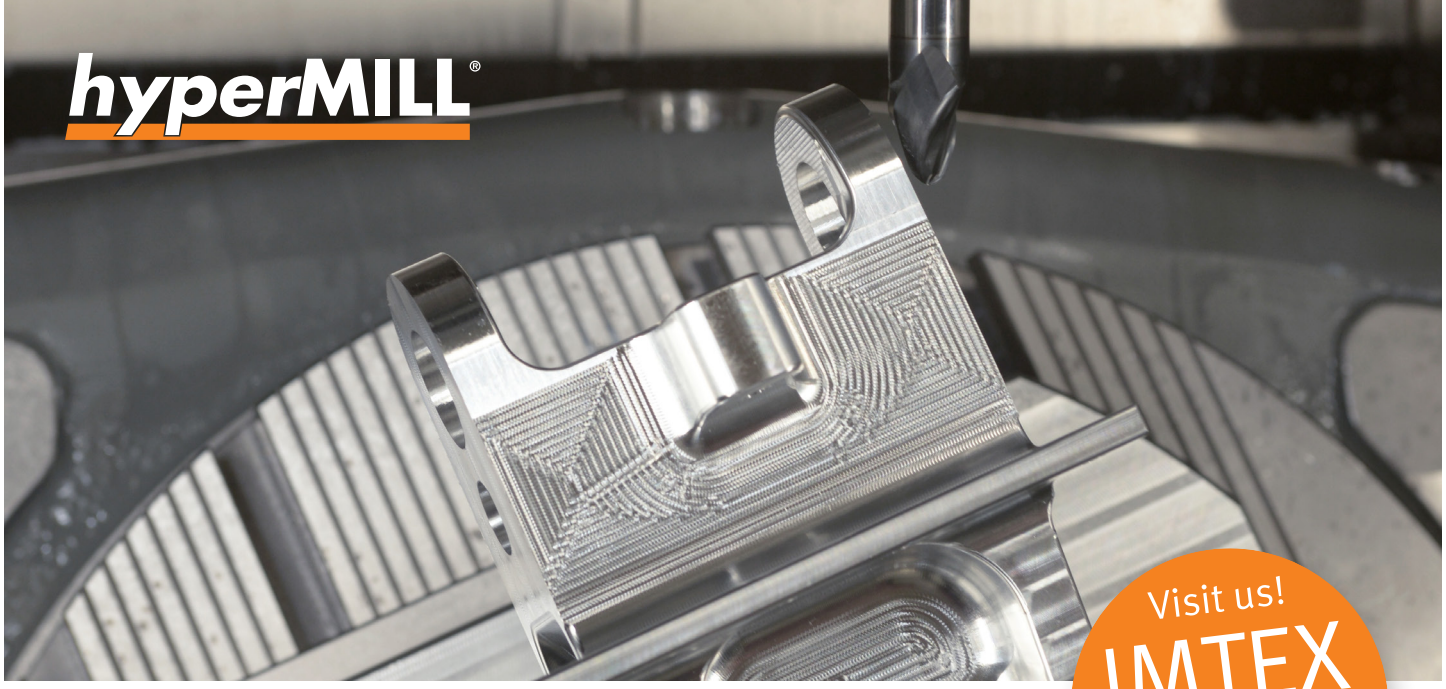


CAM Software Plays Key Role

To grow in today's manufacturing world, shops need to consolidate operations, automate, increase efficiency, capture and analyze data and more, in order to fully leverage opportunities in thriving industries such as aerospace. Accomplishing this requires not only high precision equipment and advanced technology.

It also requires a well-defined strategy and process approach. This is precisely the route that Linda Tool, a New York City machine shop traveled, even amid the throes of the great recession. Mr. Mike DiMarino, owner of Linda Tool, reached this conclusion in 2008 when manufacturing, like many other industries, languished severely. "At the onset of the great recession when business had slowed to a trickle, we realized that the old model of one operator per machine was totally unsustainable," said DiMarino. "So we took a long hard look at our situation and decided if we were to have a future, a totally new strategy would be required. "One of the initial triggers leading to this realization was driven by a decision we made to pursue more advanced machining after we were given an opportunity to make parts for a large aerospace supplier" continued DiMarino. "Although there was certainly an element of risk, we decided to go all in, become a qualified dock-to-stock aerospace tier-two supplier and be AS9102 certified."

A lofty goal such as this would require many moves, beginning with 5-axis machining and advanced tooling. For a shop whose mainstay was turning, with secondary milling operations on conventional VMC's, this was a major step. Unwavered, DiMarino plunged ahead and acquired the necessary technology. In the process, he and Mr. Dave Holmes, Linda Tool's Production Manager, would learn that in addition to 5-axis and innovative tooling, aerospace machining success is equally impossible without the right CAM software program to execute the work.

Defying the Norm

Whether its precision machining in New York City, attaining eco-friendly status, or making about-face decisions during the great recession, Linda Tool defies the norm. Founded in 1952, today the 28-person shop, knitted into the Red Hook section of Brooklyn, is a quiet, inconspicuous building at the curb. But once inside, there is a hum of precision in the making from the packed shop floor's state-of-the art equipment that ranges from 3, 4 and 5-axis machining centers, to multi-tasking lathes, CMM's and more, for handling a steady flow ›

About

LINDA TOOL

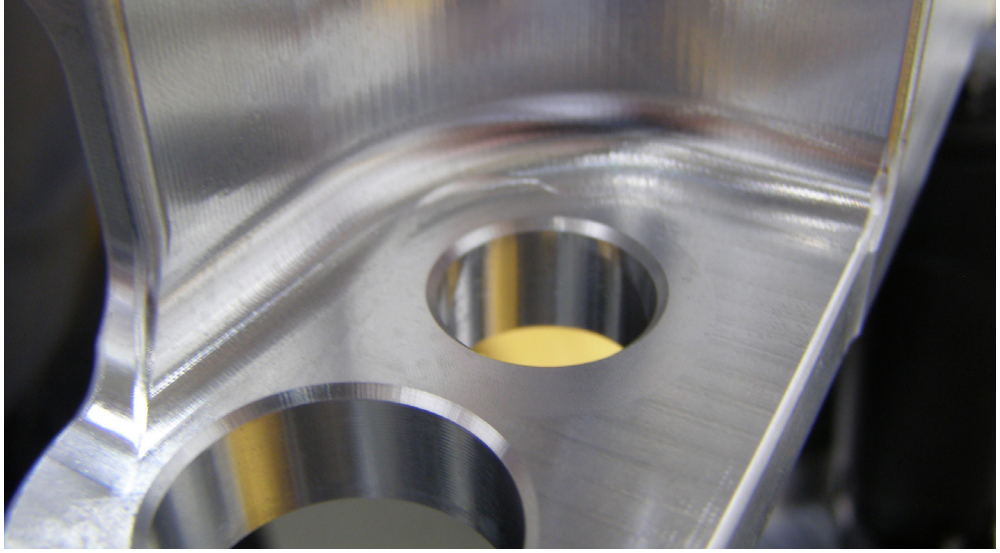
Years of experience – millions of precision machined components

› Since 1952, Linda Tool has been helping small manufacturers, Tier 1 suppliers, as well as the world's leading OEMs maintain their competitive edge with the highest quality precision machined components.

www.lindatool.com

Click to see the video

Aerospace part programmed with hyperMILL



of aerospace and defense, industrial, medical, oil and gas and communications work. What's literally above the shop is even more interesting – the entire rooftop consists of a garden where employees grow vegetables and flowers in engineered soil. Linda Tool strives to have a small carbon footprint. All machines are equipped with mist collectors, an HVAC system with HEPA filtration runs around the clock, the green roof enables heating and cooling energy reductions, and all waste is recycled.

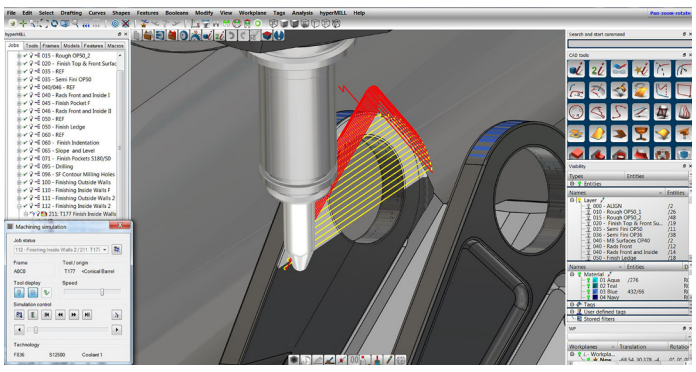
Perhaps the most important element of Linda Tool's unconventional approach is the production process itself, which starts at the end, not the beginning. "A key facet of the new strategy we deployed in 2008 was to first carefully determine the finished part, and then map out every step throughout the shop that is required to ensure the part meets or exceeds spec," explained Holmes." It begins when we decide to make the part and every step in the process throughout the whole shop is documented, saving time and maximizing quality and throughput. We work in teams, applying a manufacturing process approach."

> We wanted a highly efficient, stable process, and that's exactly what we got with *hyper*MILL®. We are very pleased with *hyper*MILL®."
>
> **Mike DiMarino, Owner Linda Tool**

New CAM Solution to Discover A New Angle

The process approach is what led to Linda's search for a solution to successfully machine 7075 aluminum landing gear forgings. "When a big aerospace opportunity came our way – a horseshoe-shaped planar part with tight pocketed inside corners, we tried to figure out a way to efficiently machine the part by face cutting, swarf milling or using a ball nose end mill," said Holmes. "We had invested in leading 5-axis technology with a Hermle C22 machining center, the best machine for the part, but we weren't sure how to attack it. We needed a more practical solution for maximum throughput and efficiency. "We were evaluating the advanced CAM software package called *hyper*MILL® from OPEN MIND Technologies AG, and focused on the *hyper*MILL® MAXX Machining features, which was highly recommended, and learned that one of it's innovative programming features was the ability to dramatically drive increased material removal rates via conical barrel cutters – also known as circle-segment end mills." OPEN MIND developed the concept of conical barrel cutter machining with tapered tools that also have a large radius ground into the taper. Ultimately, the software combined with the end mills, shaves off up to 90% of the time it takes to machine conventionally with ball nose tools.

The need to maintain precise angles of engagement and dedicated tool paths that are unique to different circle-segment tool types makes CAM software critical in the use of circle-segment tools. In this screen capture you can see a particularly tricky section of a part being machined using circle segment tooling.



The key to success – Innovative 5-axis Technology

The testing confirmed what Linda Tool knew – that leading 5-axis technology is the key enabler to aerospace machining success, and none of it is possible without a powerful CAM software solution. And although Linda Tool deliberately implemented the new 5-axis operation via the Hermle and *hyper*MILL® MAXX Machining software at a slow, measured pace over 3 to 6 months to get the shop fully acclimated to the approach, it was no surprise when Holmes witnessed repeated successes without a hitch. "We were aware that OPEN MIND was one of the first CAM developers to tackle 5-axis machining technology, so we were confident with *hyper*MILL®" said Holmes. "Right from the start we got perfect parts."

The *hyper*MILL® CAM software suite enables a wide range of powerful 5-axis strategies for machining challenging geometries, freeform surfaces and deep cavities at maximum efficiency levels. Depending on the geometry and machine kinematics, a user can choose between 5-axis machining with a fixed tool angle, automatic indexing or true simultaneous machining. All toolpaths are generated fully automatically with collision checking and avoidance.

The performance package of *hyper*MILL® MAXX Machining offers three powerful modules for drilling, roughing and finishing that make it possible to achieve the highest rates of machining productivity. 5-axis helical drilling opens large areas prior to roughing, using a standard cutter, and uses a 5-axis helical tool path to efficiently remove material and evacuate chips. For fast, reliable machining the roughing module includes cycles for milling spiral and trochoidal tool paths, as well as options that identify large inscribed tri- ›

angles or circles within components to optimally machine them with simple tool paths, completing the pocket by indentifying the regions with remaining material. Dynamic feed rate adjustment according to actual cutting conditions constantly ensures milling at the highest possible rates. This results in optimal milling paths with maximum material removal. High-performance roughing of both prismatic and curved component faces with 5-axis techniques is supported.

Innovative algorithms in *hyper*MILL® CAM software ensure that a constant chip volume is continually removed. This delivers high utilization rates without exposing the tool to undue stresses, resulting in roughing speeds of up to 70 percent higher than conventional milling. With *hyper*MILL® innovative 5-axis Tangent Plane Machining, OPEN MIND developed a unique ability for plane machining enabling cycle time reductions of up to 90 percent when used with conical barrel cutters. In addition, stepover widths of six to eight mm or more are possible with the large radii of conical barrel cutters, resulting in exceptionally smooth surface finishes and longer tool life.

5-axis Tangent Plane Machining and 5-axis Tangent Machining, which is deployed on Linda Tool's aero landing gear part, and is well suited for both accessible and hard-to-reach planes, also enables a high degree of precision that far exceeds what is possible by machining with a ball mill. The measured roughness values are often five to ten times finer than machining with ball nose mills.

Post processing with *hyper*MILL® software is virtually flawless and is arguably the most reliable in the industry. "*hyper*MILL® posts fast, but what we are most impressed with is its reliability and repeatability" explained Holmes. "I was a bit skeptical at first when OPEN MIND implemented it and gave us the green light, but they were right. The process is so stable and proven in our shop that we don't have to

check the parts when we run. In fact, we could have saved at least months of time if I only listened to OPEN MIND initially and trusted that it would work right away. "The software works well and is so essential for our throughput that we are planning to integrate the entire shop with *hyper*MILL®. It also helps to have a strong relationship. Partnering with OPEN MIND has been very successful. Their support is exceptional and responsive" said Holmes. Added Anna Litovskaya, a programmer at Linda Tool, "I am very pleased with *hyper*MILL®. It has helped a lot and I have now used it for almost every part program we make." ■

About OPEN MIND Technologies AG

OPEN MIND is one of the world's most sought-after developers of powerful CAM solutions for machine and controller-independent programming.

OPEN MIND develops optimized CAM solutions that include a high number of innovative features not available elsewhere to deliver significantly higher performance in both programming and machining. Strategies such as 2.5D, 3D as well as 5-axis milling/mill turning, and machining operations like HSC and HPC are efficiently built into the *hyper*MILL® CAM system. *hyper*MILL® provides the maximum possible benefits to customers thanks to its full compatibility with all current CAD solutions and extensive programming automation.

OPEN MIND strives to be the best and most innovative CAD/CAM manufacturer in the world, helping it become one of the top five in the CAM industry according to the "NC Market Analysis Report 2021" compiled by CIMdata. The CAD/CAM solutions of OPEN MIND fulfil the highest demands in the automotive, tool and mold manufacturing, production machining, medical, job shops, energy and aerospace industries. OPEN MIND is represented in all key markets in Asia, Europe and America, and is a Mensch und Maschine company.

OPEN MIND
THE CAM FORCE

We push machining to the limit

www.openmind-tech.com

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