Machining a Brighter Future

Stacey Wiebe

Improving Lives with Complex Machinery and the Right CAM. Machining a better world is a tough job, but someone’s got to do it. In a world where instant gratification is increasingly instant and consumables increasingly consumable, it can be easy to forget that most everything we use was manufactured by someone, somewhere at some time.

“The whole manufacturing industry is increasingly competitive,” says industry veteran Paul McAllister, engineering manager for Orchid MACDEE. “The need to stay on top of current technology is more critical than ever in order for us to remain competitive and to deliver the products and services our customers need.”

In this case, the someone is Paul McAllister and his team at Orchid MACDEE; the where is Chelsea, Mich., and the time to be more efficient is always now.

Which is no secret if you’re in the manufacturing industry.

Tasked with the mission of providing opportunities for “people to live a better life,” 35-year-old medical device manufacturer Orchid Orthopedic Solutions is made up of eight divisions that specialize in five technologies — design, forging, machining, plastics and coatings.

Orchid MACDEE, the plastics division, uses an assortment of 54 milling, turning and wire EDM machine tools to manufacture precision-machined and injection-molded parts from medical-grade plastics such as polyether ether ketone, or PEEK; ultra-high-molecular-weight polyethylene, or UHMWPE, and polymethyl-methacrylate, or PMMA.

Parts made at Orchid MACDEE range from those with simple to complex geometries, often with very tight tolerances and high surface-finish requirements.

Stiff requirements make a lot of sense considering that the final resting place of many of those parts — like knee and hip implants, and trial components used during surgery to determine best implant size — is inside the human body.

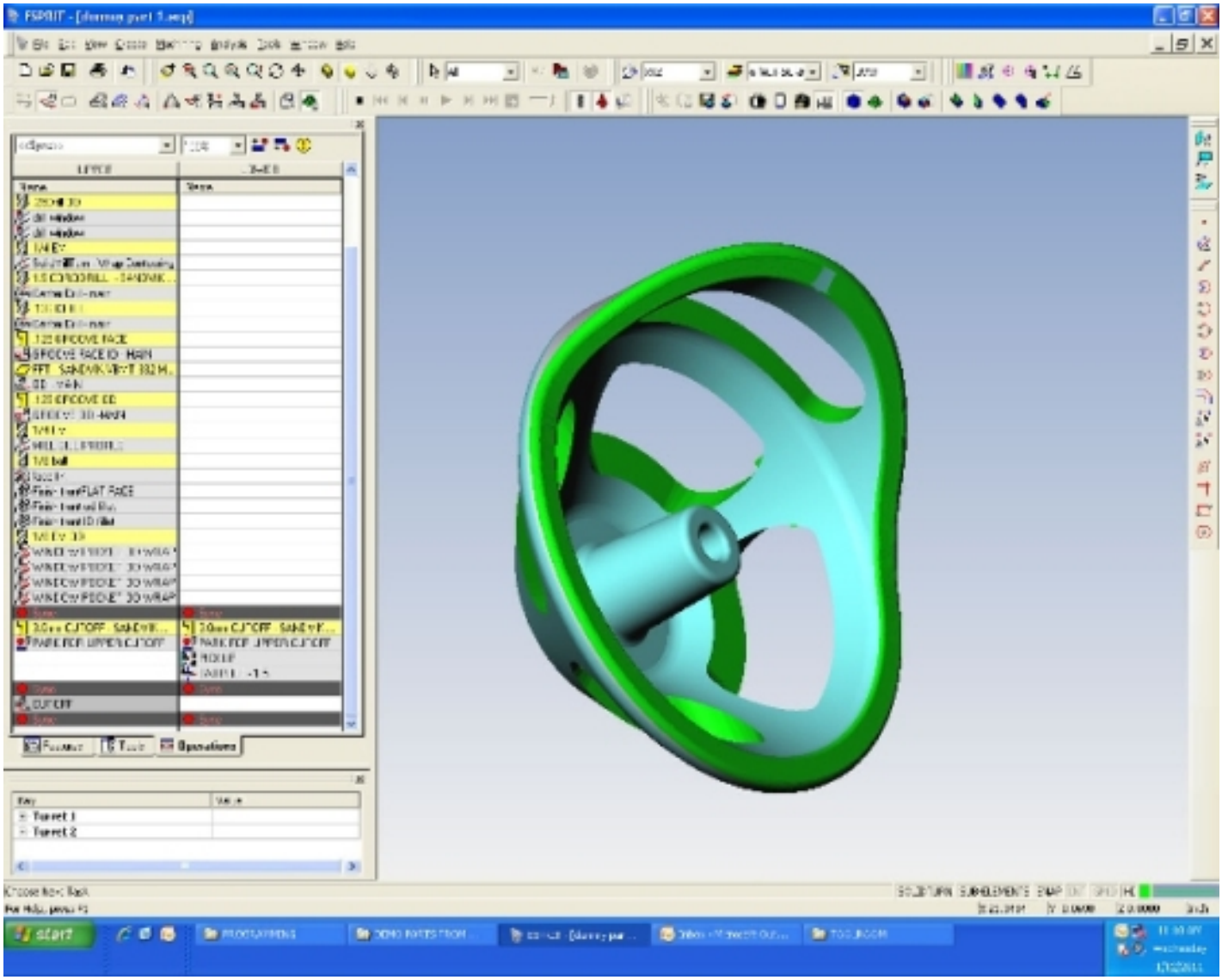
McAllister, engineering manager at Orchid MACDEE, adheres to the company's commitment to improve quality of life by striving for part perfection and staying on top of his game.

As a 20-year manufacturing-industry veteran, McAllister is able to take the long view on the past, present and potential future of machining.

"The whole manufacturing industry is increasingly competitive," he says. "The need to stay on top of current technology is more critical than ever in order for us to remain competitive and to deliver the products and services our customers need."

To deliver those products and services, MACDEE stays on top of emerging technologies in part by taking advantage of state-of-the-art machine tools. What it discovered, however, was that it needed the right machine tool and software match to make the most of its machining capabilities — which is all about maximizing time.

When the company discovered that it could not run a newly-purchased Nakamura turning center as efficiently as needed with its former software, MACDEE shopped around for a solution that could generate accurate NC code and capitalize on the full power of its investment.

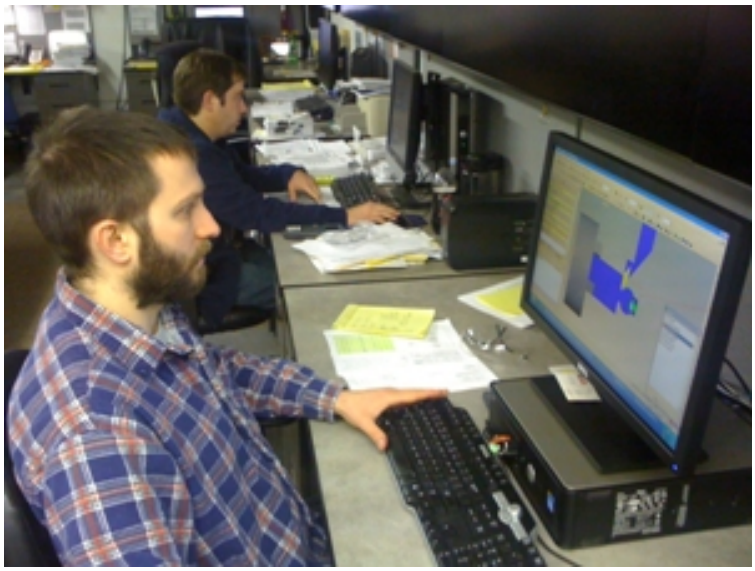


The ESPRIT test part includes blends between some surfaces that required 3D surface machining, as well as 4-axis simultaneous machining and Y-axis milling. “This test part was configured because it challenged all the machine’s capabilities and therefore it made an excellent test for evaluating ESPRIT,” McAllister says.

It ultimately chose ESPRIT® computer-aided-manufacturing (CAM) software by DP Technology Corp. specifically to run this Nakamura dual-spindle, dual-turret turning center with 4-axis simultaneous machining capabilities. ESPRIT is well-regarded in the industry for providing an integrated programming environment specifically designed for multitasking, multi-function CNC machine tools.

“This machine is the one that drove us to purchase ESPRIT CAM, since the CAM software we had did not support that machine very well,” McAllister says.

The chain of events at MACDEE that led to the purchase of ESPRIT is in step with the changing machining climate of the industry at large.



Tasked with the mission of providing opportunities for “people to live a better life,” Jessy Schlabach, CNC programmer for Orchid MACDEE, works his manufacturing magic.

It’s simple, really: Parts are becoming more complex, as are the machines that are making those parts. Sophisticated software takes the sting out the complexity of machine tools, ensuring that machine tools can take a bite out of the complexity of making complex parts.

“Even though we are regarded as experts in our niche market, we can’t just sit back and ride on our good reputation,” McAllister says. “We have to continually build on that expertise to stay ahead of the other guys.”

To test the capabilities of ESPRIT, MACDEE sent a part file to its dealer to be programmed on a timed basis. The program was written expressly for the Nakamura turning center, and it oriented the part with the “hollow end” facing out in the first operation while the windows were cut, McAllister says. The machine then transferred the part to the left spindle, where the outside diameter and top were finished.

“This part has blends between some surfaces that required 3D surface machining,” he says. “It also required 4-axis simultaneous machining and Y-axis milling. This test part was configured because it challenged all the machine’s capabilities and therefore it made an excellent test for evaluating ESPRIT.”

The company purchased ESPRIT in late 2009 and it wasn’t long before it had cause to test the new software’s mettle on the shop floor.

“We had a particular new job that was quite complex, requiring all of the capabilities that our Nakamura turning center has to offer,” says McAllister. “We

first programmed the machine for this part using our previous software, but — due to all of the wait codes and sync codes required to make the machine do what we needed it to do — the CNC programming time required was excessive," McAllister says.

The coordination of cutting operations on multiple spindles and multiple turrets is crucial to the optimization of cycle time and, more importantly, in preventing possible crashes between all the moving components on the machine. One of the strengths in ESPRIT is the ease with which milling and turning operations are synchronized across turrets and spindles to help shorten programming time as well as to optimize machine time.

As explained by McAllister, machining the part, the exact nature of which the company declined to state, is not unlike machining a wiffle ball, or, more accurately, half of a wiffle ball.

"You can envision machining half of a wiffle ball from solid bar stock with close tolerance features of, for example, a .005-inch profile tolerance," he says.

Consider that the part also requires a good surface finish and stiff cosmetic standards, and that the "thin wall section of the half-ball-shaped part make it flexible and prone to deform under tool pressure."

It stands to reason, then, that machining the part is no easy task.

"We had to develop machining techniques that would make good parts, yet hold cycle times down to meet the challenging quoted targets," McAllister says. "ESPRIT's feature-based programming aided a great deal in applying the process to several different sizes of this part."

McAllister and his team were also pleased with the first real test of ESPRIT because they were able to quickly generate NC code to "cut process development time to about one-third of what it had been."

"We went from being three times over anticipated costs to meeting cost targets," McAllister says, "and this was the very first project on which we used ESPRIT."

McAllister cites ESPRIT's operations manager, accurate simulation and "ability to post out complete programs with sync and wait codes" as reasons why the software has been easy to use and helpful in streamlining manufacturing processes.

As explained by McAllister, sync and wait codes are used to coordinate dual spindles and turrets with a dual controller, which relies on the codes to keep the machine's tools and components working together.

"This particular machine, the Nakamura, is like having two CNC lathes and one CNC mill combined in one machine," he says. "The correct sync and wait codes keep the machine from crashing as it performs multiple operations simultaneously and the operation manger makes it very simple to put sync and wait codes in at the right

places. Then we can quickly verify the sequence of operations by running the simulation."

So the mission, to pair the sophisticated machine tool with CAM software that could maximize its potential, was not so very impossible.

"We had a pretty challenging set of criteria that we expected before the purchase, but it has been able to do everything we needed so far," McAllister says.

But as McAllister knows, needs evolve with the manufacturing industry and the world at large, just as good machine tools and software evolve right along with it.

It's safe to say, however, that providing opportunities for better lives is one manufacturing niche that won't be going away anytime soon.

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