

Software Helps Bring Relief from Back Pain



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- Daniel Powers
Intrinsic Therapeutics
Woburn, MA

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For millions of people with back pain, any type of relief no matter how great or small is greatly appreciated. In fact, for some people, the constant pain can take away all hope of ever enjoying life. Today, through innovative design, advanced manufacturing techniques, and sophisticated software, there is hope for people with chronic back pain. Intrinsic Therapeutics was started in 2000 with the mission of offering surgeons and patients better options for treating soft tissue injuries of the spine. These injuries are responsible for the majority of low back pain and sciatica suffered by over five million people in the United States alone.

The Challenge

Develop complicated toolpaths for surfacing using two and three axis milling machines.

The Solution

Mastercam Mill and Wire

Benefits

- Mastercam allows for fast and easy development of toolpaths.
- Fast and easy translation between CAD and CAM files speeds work.
- Select Library and Auto Start Position are important features in Mastercam that Intrinsic Therapeutics uses for fast and precise EDM work.
- Mastercam’s Backplot and Verify features allow you to check your toolpaths before sending them to the machine.

Project Details

Current available surgical therapies often result in the further degeneration or destruction of an injured spine. However, innovative procedures from Intrinsic Therapeutics (Woburn, MA) seek to repair the injured tissues, thereby restoring function and reducing pain.

Intrinsic Therapeutics:

Intrinsic Therapeutics is a start-up company with between 20 and 30 employees doing research and development on implants for herniated discs. An implant that they are developing seals off the herniation on a spinal disc. It will change the lives of many people with back injuries. The product is now being tested in Europe.

To make this implant, the tooling for it, and the tools for the surgeons to do the implanting, the company does all different types of machining, metal cutting, and EDM work. They have a CNC lathe, a CNC vertical machining center and a wire EDM.

Daniel Powers, shop manager, says the company’s implants, tooling, and tools for the surgeons entail many types of machining including surfacing. They can’t get too specific for how the implant or implant tools work or how they’re produced because of their proprietary nature.

Powers has been a CNC programmer for many years using various software systems. He also wrote the programs for about 15 other operators at one

job position. "I've been here going on two years as the shop manager and prototype machinist. I was a beta tester for Wire version eight and I was also a beta tester for the newest Mastercam X version."

Making Special Implants:

Powers says, "Nobody else has anything like this implant and we are in clinical testing in Europe. What we do with the machining equipment that we have here is make the tooling to make the implant. We make the surgical instruments to do the implantations also along with the workholding fixtures."

He adds, "One of our implanting devices is shaped like a probe that's roughly six inches long and encircled by a piece of $\frac{3}{4}$ inch diameter round stock. Some of it is turned on a CNC lathe. The biggest diameter on it would be $\frac{3}{4}$ of an inch. A turning center removes the excessive metal and turns some screw threads on it. Next, a hole popper EDM operation puts a hole through the six inch length of the probe. Then a profile is eroded out of the middle of it using the wire EDM machine. The vertical machining centers do 2D milling, 3D milling, and surface machining. Then the part is sent back to the EDM for more work."

Powers says tolerances for many of their parts are in the range of plus or minus five ten thousands of an inch (0.0005). The range of materials they use include plastics like Delrin® as well as metals such as Inconel® and titanium. The part that Powers just described is made from 465 surgical stainless steel.

Mastercam to the Rescue:

"Without a software program for toolpaths, these parts would be very difficult to make," remarks Powers. From other software he has used, he says that "Mastercam is the easiest. I'm the one that buys the software, and I bought Mastercam. The most complicated part of machining the probe part is the surface machining, and Mastercam has many, many surface machine toolpaths that take care of our needs. The probe is designed with certain shapes on it for the implantation process, and these need to be surface machined. Then we make whatever tooling we need to hold the probe so that we can do the various cutting operations on it. It's not a part that you can just stick in a vice."

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Powers remarks that Mastercam also has features for better and more productive EDM work. "For example, you can click Select Library in the program and a power library comes up. You pick your settings for the various materials that you're manufacturing with. Next you have Contour. There are a number of different ways that are plainly marked to control the wirepath. You can offset the wire in the control, in the computer, or both. You can also offset it in reverse. Mastercam will do virtually everything. That's what I like about it. On the next page is the lead-in/lead-out settings and there's a button called Auto Start Position. If you have that selected, it will start from wherever the thread point is. But if you don't want to use that, and you want to touch off the part and have your zero position out in space somewhere, all you have to do is deselect that button, and it will rapid traverse from the zero position over to that point and thread the wire. Mastercam has two cutting methods: One way or Reverse. If you select Reverse, it automatically reverses the toolpath and changes the G41 offset to a G42 to go in the other direction. It's easy to use and easy to have one software package for everything."

They use the Backplot feature in Mastercam to check toolpaths and it is an important feature for Powers. He remarks, "I use Backplot all the time. You

can also verify with a solid. You can put a solid box around your part and make sure the Z heights in the parameters are set at least as high as your part , and it will show a solid rendition of your cut. Then you can delete chips and your part that you just wired out will be there as a solid. You can see it and manipulate it around the screen.”

Toolpath control is a very important part of producing these unique implants, their tooling, fixtures, and surgical tools. Powers mentions that without CNC machine tools and the software to run them, products like theirs, which can relieve suffering, just couldn't be made.