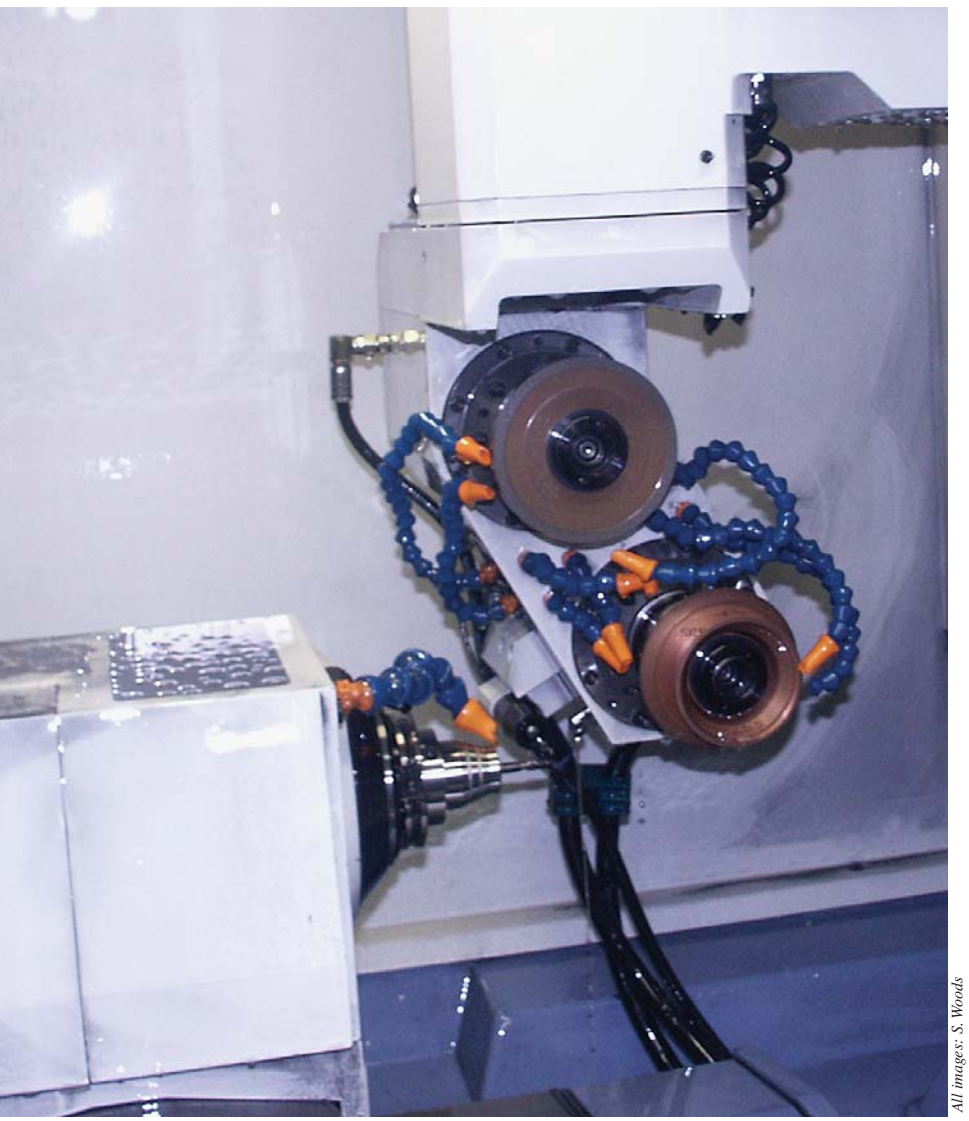
➤ BY SUSAN WOODS, FEATURES EDITOR

Cut to the Bone

A look inside a company that specializes in making tools for cutting bone.



All images: S. Woods

Oak View Tooling grinds a tool on an Anca RGX grinder.

Oak View Tooling Inc. started out making metalcutting tools but soon grew to make another type of cutting tool—the kind that cuts bone.

Matthew Dahms, Oak View's owner, began in the machining industry as an apprentice at a tool and die shop in Indiana. After about 12 years, he went to work at a major medical parts maker in Warsaw, Ind. He started out grinding standard rotary cutting tools and then became the company's tool technician. Finally, he got involved in the design process for an orthopedic surgical tool. Orthopedic cutting tools, such as drills and reamers, are used to ready a shoulder, knee or hip bone for replacement.

After about 6 years, Dahms decided to strike out on his own. He started Oak View Tooling in Columbia City, Ind., first as a shop for regrinding endmills, then later producing a line of endmills for medical parts makers. Dahms eventually found his way to making orthopedic cutting tools again. He doesn't just make them, though; he redesigns them. Typically, a customer hands Dahms a prototype and asks him to improve the design.

"That is what I do," said Dahms. "I come up with a better design that actually cuts correctly without blowing through bone and making everything ugly."

When surgeons cut bone, they are not trying to do it faster or more efficiently; they are just trying to do it correctly. If a

tool is not cutting properly, though, the doctor tends to just push harder on the tool to make it work.

Cutting bone produces chips similar to those generated when cutting wet wood. "Bone is wet and it is messy," said Dahms. "Usually, whatever they take out, they reuse for bone regrowth. They just pack it into spots and it grows right away. So it is a good thing if you can control the cutting."

Therefore, when it comes to making orthopedic cutting tools, the geometry has to be accurate. "Geometry is a lot more critical than people realize when it comes to orthopedic cutting tools. I've seen so many tools that are totally wrong. To cut properly, you have to have the right relief."

Stainless steel orthopedic cutting tools.

A prime example is a small orthopedic drill made of 17-4 stainless steel. "The customer's print didn't spell out the relief," said Dahms. "He then gave me a sample of what he wanted, but I couldn't match it because the relief was negative—it was in the wrong direction."

Dahms corrected the flaw but he had to wait a while for the customer's engineering department to look at that drill and approve the correction.

Another example is a spinal drill. The customer had drills in the field, but surgeons complained they weren't working. They had to just keep trying one after another until they found one that did work. So the customer asked Dahms to redesign the drill.

"They sent over prints and samples, but they just didn't give us enough information," he said. "They gave plenty of detail on how to label the tool and they gave the proper dimensions. Where they fell short, though, was not indicating what kind of geometry and relief was needed. Did it need to be split? Did it need to be thin? How thin? What was the core diameter? They didn't indicate these basic things. All I did was add two

Spinal drill made from 17-4 stainless steel.

things to the print, but by changing those two things, it worked fine."

Dahms focused on the split point and the end relief to produce the drill correctly. The web was too thick on the end of the tool so he thinned it down by split pointing it, making it a freer cutting tool. Also, the point relief was incorrect. It was neutral and needed to be made positive.

Making it all Work

To make design changes, Dahms has three computers running Solid Edge CAD and Anca 3-D simulation software. "With 3-D simulation, I can figure out exactly what I am going to use and how I am going to attack the tool I'm making. It shows the exact grinding wheel we are going to use and what we are going to do as far as the geometries and reliefs."

Reamer made from 17-4 stainless steel used for less-invasive hip replacement.

To make tools, Oak View uses 5-axis Anca grinding machines. It also has a 3-axis CNC precision grinding machine from Tru-Tech Systems with multiple-plunge, ID, OD and contour grinding capabilities. A 6-axis Excalibur grinder with a robotic arm is on order. The company also uses the manual machines Dahms first bought when starting out.

The tools are typically less than 1" in diameter, although the company has made a 2" tool. Oak View works with mostly cobalt chrome, titanium, stainless steels and Inconel.

With the precise geometries, Oak View does perform a lot of measuring and testing. To be able to test some of the orthopedic cutting tools, the company periodically goes to a meat market and gets a bone sample.

"We learn a lot about how bone is actually cut," said Dahms, "especially if the tool is being used on a particular section of bone—the outside hard part or the soft center. You learn a lot by watching it. It is a mess, though."

Although surgical parts usually are specified to have a fine surface finish, Dahms pointed out that this is mostly for aesthetics. It is important that the parts are burr-free, though. "These parts do not need to be polished as much as they are," he said. "Surgical tools are a throwaway item. After they are used in one person, they are not used again. So the finish does not need to be fine. It

Oak View's own Z line of submicron-grain carbide rotary cutting tools.

doesn't affect chip flow or anything."

One of Dahms' biggest challenges is finding skilled help. "The problem is finding people that have some knowledge of tool grinding," he said. "We have a good in-house training program, but it takes about 3 or 4 years to reach a good skill level. Some of our better grinders were hired after completion of a community high school Interdisciplinary Cooperative Education program. The student goes to school half the day and works half the day with the option of full-time employment after graduation."

He went on to say that grinding tools manually helps make the concept clear. "Doing it manually and figuring out how to make 3-axis moves with two hands is pretty cool," Dahms said. "Some people think you just come in and push a button. It doesn't work at all like that. This is a highly skilled trade."

Future Vision

Most of Oak View's customers are the bigger medical parts makers, including those that make orthopedic tools. They have mills and lathes to do the blanks and the heat treating. "Part of it is because we cannot make the

blank complete," said Dahms. "We have a mill but not a manual lathe. So usually I am Tier 2, which is OK."

The company is working on gaining ISO certification with the help of Scott Hartford, CEO of Zieben Engineering Systems Inc., also in Warsaw. "Together, we are coming up with a quality manual and quality procedures for our shop," Dahms said. "ISO basically means saying what you are doing and doing what you say. That way you have a high-quality product that is consistent for years to come. However, I'm finding out it involves a lot of paperwork."

For the most part, Oak View manufactures its own line of rotary cutting tools for orthopedic parts makers. But part of its growth is in producing the orthopedic cutting tools, not just providing the prototypes.

Stainless steel shoulder cutter.

And the company is definitely growing. "We are talking about 45 to 50 percent growth this year from last year," said Dahms. "Each year, we have had solid growth, around 15 percent, but this year, it is 45 percent—a gigantic jump."

So how big does Dahms want Oak View to get? "That is what I am trying to figure out right now," he said. "With 45 percent growth, we'll see. We can always expand the building to accommodate more machines. We are running three shifts now with eight employees."

Whatever the growth, Dahms is sticking with grinding. "I like grinding," he said. "It is a niche market." △