

Closeup view of a titanium phaco tip in production in a Citizen Cincom B12. The parts are flooded with American Research Products Amerilube 30, an ultra-low VOC cutting oil, which has increased tool life. The cutting oil meets SCAQMD "super compliant" specifications, which in most cases eliminates the need for record keeping.

Lubing Up Productivity

How a Medical Instrument Manufacturer Increased Productivity and Gained 20% More Tool Life by Switching to Amerilube Series Ultra Low VOC Cutting Oil.

Story and photo by C. H. Bush, editor

When most people think of finding cures for the various diseases that beset the human race, they think of doctors or chemists wearing white smocks, working alone or in teams to find ways to attack the problem. Almost never will the average person add to that team skilled machinists or mechanical engineers.

Yet, more and more frequently it is a combination of doctors, engineers and machinists working together, who find ways to solve those problems. The surgeon gets an idea for a new surgical tool, the engineer figures out how to create it, and the machinist produces it.

"Our company wasn't started by doctors," says Tate Parham, director of engineering and part owner of Lake Forrest, CA's American OptiSurgical, Inc. (AOI). "But ultimately we ended up working with doctors to produce and service the products we do today. American OptiSurgical was founded in 1992 by Cam and Genie Cameron, who started out servic-

ing and repairing products for an Italian company. When that company went out of business, Cam and Genie shifted over to servicing surgical instruments. Today, we specialize exclusively in the design, manufacture and service of a wide range of phacoemulsification handpieces produced by most of the major manufacturers in the industry, including our own. In case your readers have never heard of phacoemulsification handpieces, that's a fancy name for instruments used by eye doctors to surgically remove cataracts from the human eye."

Phaco Handpieces. . . Like Miniature Jack Hammers

The surgical tools produced by AOI, aka Phaco handpieces, are about the size of a ballpoint pen.

"But size is the only resemblance," Parham says. "Our instruments are ultrasonic tools that deliver up to 40,000 ultrasonic vibrations per second to extract a lens that has a

Ben Palmer, machinist, left, and Tate Parham, discuss the next project for the company's Citizen Cincom B12, equipped with live tooling. The B12 is dedicated exclusively to manufacturing titanium phaco tips .

cataract. They're like miniature jack hammers inserted in the eye by the surgeon. The vibration emulsifies the affected lens, and the system delivers IV fluid into the eye as it evacuates or aspirates the particles during the surgery. What you may not know, is that the lens is free floating inside the eye, and once it has been completely removed, the surgeon inserts a new plastic lens rolled up like a burrito. Once it's in, the patient can see again."

The handpieces look deceptive simple on the outside, but are extremely complex and precision machined on the inside.

"To produce the phacos, what we do is stack up anywhere from two to six piezoelectric crystals, and then apply an alternating current to cause them to grow and shrink at the speed of the electrical cycle," Parham explains. "The higher the number of cycles, the faster the crystals vibrate, which yields the jackhammer effect. We use a special phaco controller, our Vizual™, to give the surgeon total control over the number of cycles applied."

In addition to the phacoemulsification handpieces, AOI also produces or sells the Vizual controller that delivers the power to the handpiece and controls delivery of the IV fluids to and from the eye during surgery. To support the Vizual console, the company buys and modifies an IV stand and produces its own foot pedal that gives the surgeon control over the console.

"We buy some and make some of the components that go into our various products," Parham says. "There are about eight different components in the surgical handpiece. But, surprisingly, the most difficult parts we make are the titanium tips, the needles that go on the end of the handpiece and are inserted into the eye during surgery."

Needle is Tough to Manufacture

Why are the needles so hard to produce?

"These tips vibrate at 40,000 cycles a second," he says, "so they can quickly reach a hundred million cycles. As a result, the ability to withstand fatigue is critical. We make them of titanium for two reasons. First, because they will penetrate the eye, Second, because titanium doesn't fatigue the way stainless does."

The real problem for Parham is that the tips have to be hollow to allow the flow of IV fluid into the eye and the removal of the emulsified cataracts from the eye.

"We peck drill 13/16" deep holes in the tips on a Citizen Cincom B12 using a 36,000ths diameter carbide drill," he explains. "The parts require extremely smooth finishes. The

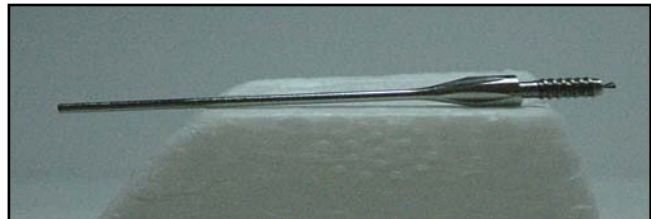
Production engineer Brad Bugea tests the Vizual console along with the phaco handpiece (in his hands) and the foot pedal.



good thing is with the Cincom, we are able to produce finished parts in one setup."

Lubricant Increases Tool Life and Improves Surface Finish

According to Parham, his two biggest problems producing the tips was the shortened life of the cutting tools used and achieving the needed surface finish.



Typical AOI 19 gauge, titanium phaco tip with American thread, .036" ID / .042" OD. Needles are produced for numerous applications in high volume.





Machinist Rene Burgos sets up to run a part on a Haas Mini Mill. In the background is a Haas SL-20 lathe.

“Because of the high speeds our tips move, we have to have a super high surface finish to avoid damaging the eye from heat,” he says. “So our components get polished and processed after machining, and the better the surface finishes before polish, the easier and cheaper it is to polish. The cutting oil used to machine the parts plays a significant role, so we’re always on the lookout for something new and better. A friend of mine told me about Amerilube 30, a new lubricant that was coming on the market, so I decided to give it a shot. We ran a comparison in actual production between Amerilube and our previous cutting oil. The results were pretty amazing.”

Parham says the Amerilube increased his cutting tool life between 15% and 20%.

“We were getting between 400 and 500 parts per tool before,” he recalls. “With the Amerilube, we were often getting one hundred more parts per tool. Plus, the surface finishes were significantly better, too.”

Parham got an added bonus with the new cutting oil, too.

“We were also happy to learn that the Amerilube 30 is what the SCAQMD (*Southern California Air Quality Management District*) calls super compliant,” he says. “That means we don’t have all the record keeping and paperwork needed to keep track of our cutting oil usage now. We like that a lot.”

The Future

According to Parham, some day in the near future, the lenses replaced during the cataract surgery will be prescription lenses specific to the patient.

“When they wake up, they’ll have 20-20 vision,” he says. “Won’t that be fantastic?” ■

Impact On Machine Shops of California AQMD’s Rule 1144

According to Naveen Berry, AQMD program supervisor, science & technology advancement, with full implementation, Rule 1144 will remove 3.6 tons per day of volatile organic compounds or VOC’s from the air.

Berry: “AQMD believes the impact of the rule will be minimal for most users, as the adopted rule mainly focuses on the use of solvents and very light oils. The rule does contain a record-keeping requirement that end users or manufacturers will need to comply with. However, Rule 1144 also contains a provision for the use of “SUPER COMPLIANT” products. Those products that contain 50 grams per liter or less of VOC’s are exempt from the record-keeping requirement in most cases. This is important to consider as Rule 1144 may require further reductions in VOC emissions in the future.”