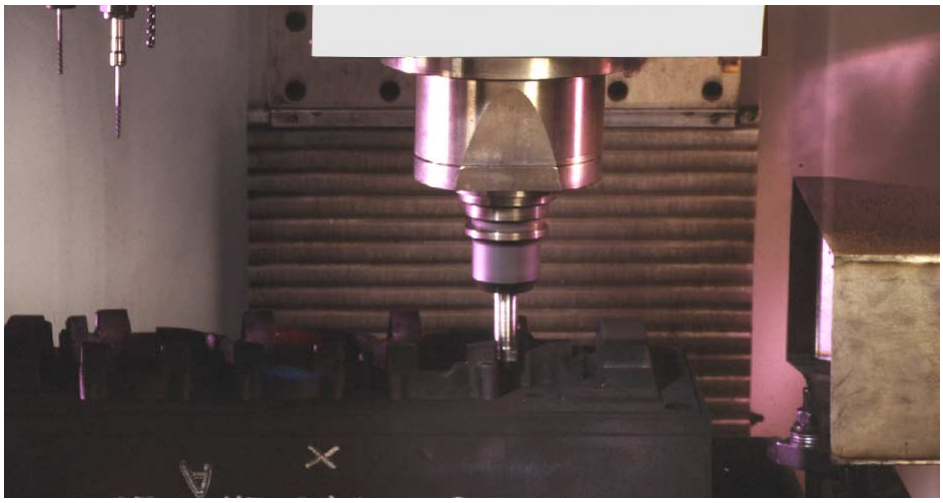

Aggressive Tool

Designed for Success

Results

- Affordable precision to match performance of higher priced machines
- Increased accuracy and effectiveness
- Untended operation
- Easier to develop programs

"A key ingredient to the machine's performance is clearly the control. The Bridgeport/GE Fanuc combination is able to match the performance of the higher priced machines."
Jerry Ryan
Co-Owner
Aggressive Tool & Machine

VMC/Control Combo Boosts Small Shop Capabilities to Win Contracts with Tight Tolerances, Low Costs

Aggressive Tool & Machine, an eight-person supplier of close-tolerance graphite electrodes for electrical discharge machining (EDM), found itself facing competitors who were making large capital-equipment expenditures.

Looking for affordable precision, co-owners Jerry Ryan and Joe Cox finally settled on a Bridgeport XV-Series vertical machining center with a GE Fanuc control.

It turned out to be a good choice. The machine's first test came when Aggressive bid to produce the electrodes for a major cellphone manufacturer's new design. The company's chief competitor seemed to have the job locked up—they were using a brand-new, $300,000 very-high-speed VMC. But Aggressive got the job.

"Simply, we won the contract because our tolerances were as tight as theirs, and our costs were lower," Ryan explains.

Aggressive achieved tolerances of ±2 µm (80 µin.) on the Bridgeport VMC, which cost less than one-third the competition's machine. The machine delivered with a spindle operating at 10,000 rpm; the competition uses a much more expensive 40,000 rpm spindle.

"A key ingredient to the machine's performance," Ryan says, "is clearly the control. The Bridgeport/GE Fanuc combination is able to match the performance of the higher priced machines in part because of a capability called Advanced Intelligence Preview Control (AIPC)." Using AIPC, the CNC analyzes the toolpath and looks ahead to determine the optimal feed rates and turning radii. The increase in accuracy and effectiveness allows the Bridgeport XV-Series VMC to achieve extremely close tolerances on smooth contours without chipping or gouging the graphite.

imagination at work

"Machining graphite is very similar to working steel or aluminum," Ryan says, "although there are some critical differences. Aggressive has put thousands of dollars and hundreds of hours into mastering those differences."

"We needed to be able to deliver the expertise and the high-quality electrodes, but we couldn't justify charging our clients for the learning curve," Ryan says.

The curve included learning how to compensate for the "overburn" that's characteristic of EDM moldmaking. During EDMing, an arc forms at the interface between the electrode and the mold stock. The electrode must be designed to account for this arc, which may be as large as 0.015" (0.38 mm).

Ryan and Cox learned to adjust their part programs to allow for overburn. In many cases, adjustments are as simple as telling the machine it's using a 0.125" (3.2 mm) ballnose mill to follow a toolpath that's specified for a 0.095" (2.4 mm) diam tool. Cutting the extra stock off either side of the specified path results in an electrode that will produce a mold that meets specifications.

Once the VMC's capabilities had been proven, Aggressive put it to work. After delivering the cellphone parts, the company landed a contract to supply the electrodes used to make water jackets and other parts for the Big Three automakers. The parts have complex profiles that must be matched to within thousandths of an inch. The large size of the electrodes, combined with the necessary close tolerances and intricate shapes, drives part programs to sizes that are uncommon in the industry. It's not unusual for a program to exceed 80 Mbyte, and some have broken the 100 Mbyte barrier that limits many CNC users.

"When we're working with tolerances five places to the right of the decimal, the programs are going to be huge," Ryan explains.

Fortunately, the machine's GE Fanuc 21i CNCs CNC includes a slot for flash memory, which allows machinists to transfer large programs onto a PCMCIA card, carry it to the machine, and download it directly to the CNC. Aggressive uses a 128 Mbyte card, and has yet to exceed the available storage.

Using the memory card also allows the CNC to operate untended. Some of the parts Aggressive machines require about 40 hours to complete. Operators can load the program, start the process, then leave for the night—or the weekend—and the VMC will continue to work untended.

Whether it's being watched or not, the machine is a significant improvement over its predecessor, according to Ryan. "This new machine is about 70 percent faster than our previous machine," he says. "The speed and reliability of the positioning servos are better, so the machine can process the part programs with less downtime."

The CNC's large memory capacity also makes it easier for Aggressive to develop programs. Ryan uses an 850 MHz Pentium® III processor-based personal computer for programming. Customers often provide engineering drawings electronically, and Ryan converts them into toolpaths using a variety of CAD/CAM software.

Once the program is loaded, the operator can use the CNC's controls to fine-tune the operation. The color LCD screen provides more information than monochrome displays, and makes the data easier to interpret. For example, program faults can be displayed in red to draw the operator's attention. Although it's seldom necessary with the complex programs that Aggressive uses, parameters and even ladder logic can be entered, displayed, and edited right at the CNC.

Aggressive used to employ macros and subroutines in many part programs, but the company now feels it's more efficient to program from solid-modeling software. For one thing, programming at the machine lacks the visual element of seeing the part take shape. In addition, when machinists program from a solid model and let the software derive the toolpaths, there are fewer opportunities for error.

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Additional Resources

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