



CASE HISTORY

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Evolution Series VMC Eases Mold Shop's Transition to 3D Machining

Hybrid Machine, which teams the Haas VMC with a CNC control created expressly for high-speed milling of 3D shapes, produces graphite electrodes at blistering speeds at this PA mold shop

Converting your shop from a 2D to 3D machining environment is a major undertaking, but the right equipment can make the transition easier. That has been the experience of Chipsco Tools Inc., a Meadville, PA, mold shop that specializes in small, intricate, plastic injection molds for closures, electrical connectors, automotive parts and other applications.

Over the last 10 years, Chipsco has invested heavily in CNC mills, lathes and, most recently, CNC EDMs. "We wanted to have one of the strongest CNC EDM departments in the mold industry," explained Brian Learn, who owns the firm with his two brothers.

The new EDM machines exposed a problem. Chipsco machined the graphite electrodes for its sinker machines on two machining centers set aside for the purpose, but the process was slow. "The 3D geometry of the electrodes was so complex that we had to machine them at very low feed rates-6 to 7 ipm-to get acceptable dimensional accuracy and surface finish," Learn explained.

The problem was not enough to discourage Chipsco's efforts to create a 3D machining environment, however. The firm knew that it had to shorten its die/mold delivery times to stay competitive, and it could only do so by abandoning the 2D technology prevalent in the industry and going to more modern making technology.

"We weren't producing the quantity of electrodes we needed," Learn continued. "We had two or three people designing and machining the electrodes on conventional equipment, but at the end of the day they'd clock out and go home. The work started to back up. We calculate capacity in terms of hours, and we estimated that our backlog of electrodes was about 1400 hours." The backlog was dragging down our delivery times -



Barney Machinery Co.'s Evolution Series machining center, which combines the Creative Evolution CNC, a control developed specially for high-speed milling of 3D shapes, with the Haas vertical center, makes fast work of graphite electrodes at Chipsco Tools.

we had to find a better way of making electrodes fast."

Chipsco started looking at high-speed, dedicated electrode milling machines, but found them very expensive - up to \$400,000 for models with all the bells and whistles.

The search for a more affordable machine brought the shop to a seminar on high-speed milling of 3D shapes, co-sponsored by Creative Technology Corp., Arlington Heights, IL, producer of the Creative Evolution CNC, a high-speed control developed expressly for high-speed, 3D-milling applications, and by Sescoi USA Inc. Southfield, MI, distributor of WorkNC, a CAM software that automatically develops tool path for 3D-milling applications. The seminar was held in Erie, PA.



Chipsco learned all of the reasons for the dismal feed rates that it was experiencing in milling graphite electrodes on its existing CNC machines.

They also learned about the Creative Evolution CNC, a niche control developed specifically for high-speed milling of 3D shapes, and how retrofitting one or more of their machines with the Creative Evolution control would enable them to machine 3D EDM electrodes *three to ten faster* than possible with the original-equipment controls.

Because the Creative Evolution is a PC-based, open-architecture CNC control, it offered Chipsco a number of other advantages that the shop's OEM controls could not. First, because the Creative Evolution is PC-based, it includes all of the performance improvements made in PCs in recent years, such as faster processing speeds, more memory and ability to be directly incorporated in a local area network (LAN) such as Ethernet.

Servicing is also fast and easy: standard, off-the-shelf parts are readily available from a number of nearby sources at competitive rates. Upgrading, which is cost-prohibitive on many proprietary CNCs if possible at all, is relatively easy on the PC-based Creative Evolution control. That provides important protection against obsolescence, enabling users to incorporate improvements as they become available.

Chipsco came away from the seminar impressed with the advantages of the Creative Evolution control and started thinking in terms of retrofitting it to one of the machines in its shop. The firm contacted Barney Machinery Co., Pittsburgh, PA, a machine tool distributor who represents Creative Technology in the Pittsburgh and Erie areas, for more information.

Interesting Idea!

Barney Machinery also represents Haas Automation, Inc., Oxnard, CA, manufacturer of the popular Haas vertical and horizontal machining centers, CNC lathes and rotary products. And here is where the plot thickens. Barney Machinery calls on many tool, die and mold shops in the Erie-Meadville area and, while extolling separately the advantages of Haas vertical machining centers and the Creative Evolutions CNC for high-speed 3D machining, it occurred to the firm that combining the two products would result in a vertical machining center ideally suited to the high-speed, 3D-machining requirements of its customers.

Barney Machinery asked for and received permission to offer the Creative Evolution control as an alternative to the factory-installed CNC on Haas vertical machining centers sold to customers who intended to use their machines primarily for 3D machining of graphite electrodes and die/mold steels. The result was Barney

Machinery's Evolution Series CNC machining centers.

The Evolution Series, all-Haas except for the control, offers die and mold shops two very powerful tools. First, the Creative Evolution control installed on the VF0(Zero), Haas' smallest 10-hp machining center, makes a very efficient electrode-milling machine that costs substantially less than most of the dedicated electrode mills on the market. Second, the Creative Evolution control installed on larger and more powerful Haas vertical machining center models result in true *multi-purpose machines* capable of high-speed machining of graphite *and* mold and die steels.

Chipsco decided to buy a new Evolution Series machine built on the Haas VF0 machining center, rather than retrofit one of its existing machines. It equipped the machine with a dust collector and is using it almost exclusively for milling of 3D graphite electrodes for its sinker EDMs.

"The impact of the Evolution Series machine on our electrode-machining operations has been fantastic," Chipsco's Brian Learn insisted. "We have known for a long time that the future of this industry is 3D, not 2D, and have been moving in that direction. Nevertheless, when we had to decide whether to handle a job as a 2D or 3D job, there was a reluctance to go 3D because we knew it would involve machining electrodes at 6 to 20 ipm for days at a time. Now, with the Evolution Series machine we're machining electrodes four to ten times faster than before. "We didn't have to sacrifice accuracy to get the higher machining speeds," Learn hastened to add. "It's just opposite, accuracy increased. Because our electrode machining was so slow before, we would program our tool paths to leave a 0.00020-inch scallop height. Now, because we're machining much faster, we can program for a much tighter 0.00005-inch scallop height," Learn explained. "We get a better, more accurate electrode that requires little or no hand work, and get it much faster. Often, we don't have to do any polishing of the electrode or the steel before making our first samples. We go right from ED-Ming to fitting and assembly."

In the several months since Chipsco installed the Evolution Series machining center, all 3D-electrode machining has been transferred to it. As a result, machining time for the electrodes has become more predictable. "Before, we were always underestimating the amount of the time required to machine the electrodes," Learn confessed. "Now, the machining has become more consistent and we're beginning to get the jobs done closer to estimated times. "We measure our capacity in hours, and we're getting three to five times more work out of every hour than before," Learn enthused. "We have not only eliminated our 1400-hour electrode backlog but we have also reached the point where we are making electrodes ahead of time.

"Before, electrodes were made on an as-needed basis," Learn explained. "Today, we get our electrodes and steels within days of each other. If we're on a 12-week window, we can, if we choose, make the electrodes 6 week before we need them. "One of our goals has been to climb ahead of production so that we're always 12 job ahead," he added. "We're four to six jobs ahead now."

Automatic Tool Paths

Frequently, production backlogs are eliminated in one place only to pop up somewhere else. For example, Chipsco's suddenly increased electrode-making capability could have been created a backlog in the electrode-programming department. That did not happen, because Chipsco added a new 3D CAM software at about the same time it purchased the Evolution Series machining center.

"Just before we attended the high-speed 3D machining seminar, we were having trouble generating a cutter path for a particular 3D electrode with the CAM software we were using at the time," Learn recalled. "After 10 days of trying to lay cutter path, we weren't getting anywhere. We arranged with the producer of the CAM software for one of its cutter path experts to come in and create the cutter path for us. He was on the project for six days and we still weren't any closer to a usable program.

"Sescoi USA had invited us to bring challenging tool path problems to the seminar, so we brought the data for the electrode," Learn continued. "Matt Michaels of SESCOI USA loaded the data into his computer and

looked at it. He invited us to sit in on Creative Technology president Todd Schuett's presentation and assured us that by the end of the 50-minute talk the tool path would be ready. Sure enough, by the end of the presentation, Michaels had developed the cutter path using WorkNC and was able to show us a simulation of the machining. We bought the program on the spot."

High-speed machining of 3D electrodes on the Evolution Series machining center and automatic development of the machining programs for those electrodes using WorkNC have become important aids in Chipsco's transition to a 3D machining environment. "For years the prevailing attitude in the tool and die industry has been that there are so many variables in the process that it can never be automated," Learn mused. "That's outdated thinking. All of those moving targets can be made stationary, and once they're stationary we can automate them."

Delivery is Critical

Learn insists that American tool and die/mold shops are losing business to overseas firms not because of cost, but because of delivery. He is convinced that the only way to cut delivery times on molds is to automate the process using 3D technology.

"When you work in 3D environment, your starting point is the customer's 3D design data," Learn stressed. "You simply work from the existing data base, lay cutter path to it and go on about your job. There is no need to translate the design data to 2D and risk making mistakes in the process. There's no danger that someone on the shop floor is going to transpose numbers, miss a design intent...or make some other mistake that you won't catch until you go to assemble the tool.

"Because we're working in a 3D environment, we're eliminating the variables and working at automating the process," Learn continued. "Shops that refuse to embrace the new technology, that stubbornly cling to 2D moldmaking technology, will not survive. In this industry, the future will belong to shops who can deliver dies and molds in time that may seem impossible today.

"We're positioning ourselves to be among that select group by investing in products like the Evolution Series machining center and WorkNC," Learn explained. "With WorkNC, we generate more cutter path in a day than we could in a week with our previous CAM softwares. Add the faster electrode machining speeds provided by Evolution machine, and we can produce all of the 3D electrodes we need for even the most complex jobs in four days. With the new technology, we've been able to reduce our lead times from the customary 12 to 14 weeks to 6 to 8 weeks," Learn pointed out. "Our goal is to be able to deliver complete tools in three weeks." Part of Chipsco's strategy for achieving so short a turnaround time is improving the efficiency of its CNC milling operation. The shop's nine CNC mills are rarely idle as it is, but the firm expects to improve milling efficiency by retrofitting at least one of them with a Creative Evolution control.

For more information about this revolutionary product for high-speed milling contact

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