

► BY RICH DZIERWA, EDITOR

Rock Around the Clock

U.S. wire-EDM shops can stack up better price-wise against foreign competitors by automating their production.

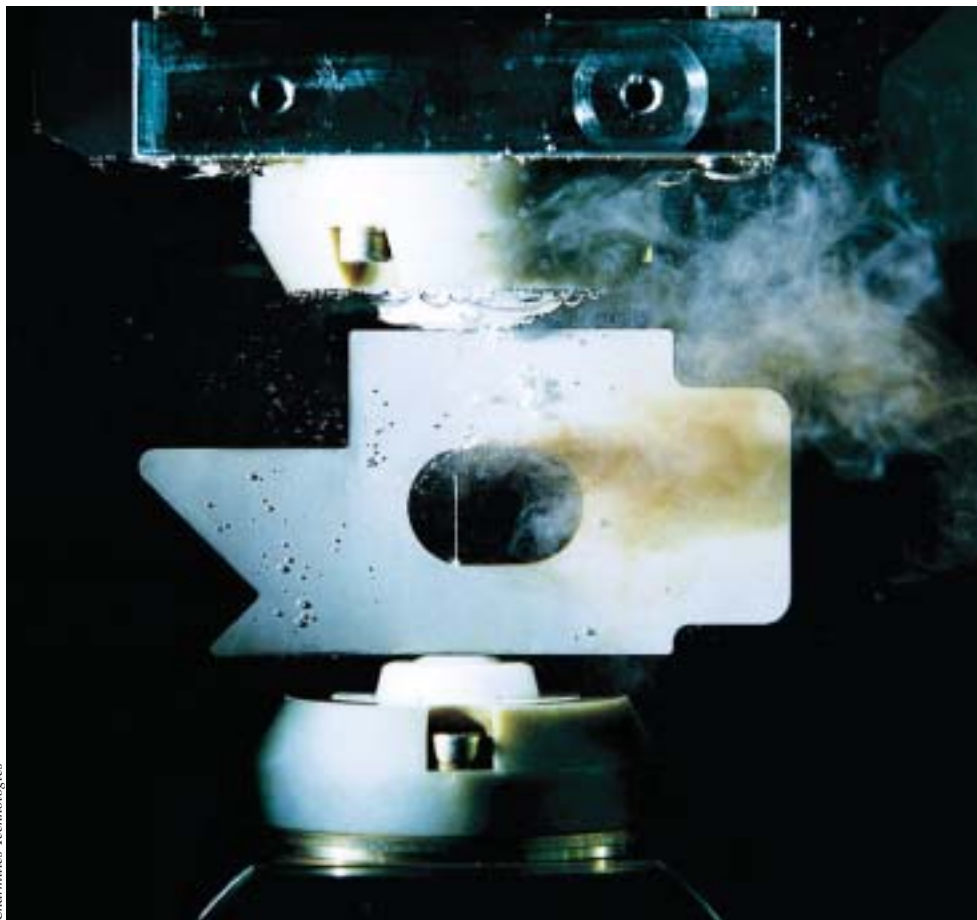
Attention wire EDMers looking to improve your productivity and profits. Here's a way: automate.

OK, whoa! Hold on! I know the reaction of many of you is to say you don't have enough volume to justify the costs. Or your business is slumping too much to invest in equipment. But for numerous shops, automation helps counter the competitive cost disadvantage that exists compared to foreign facilities—even if the core of your business is one-offs and small runs.

This is a premise many don't believe. Take Dick Heislen. He's the materials manager at Adron Tool Co., Menomonee Falls, Wis. "If you were making hundreds of parts, day in and day out, then [automation] would really fit the wire-EDM process. We're basically a job shop, and the investment just wouldn't be worth it," he said.

On the contrary, say experts, the shop producing numerous short runs of wire-EDMed parts may be best suited to automation. Loading and unloading pallets of molds, especially—but not solely—on the third shift and over weekends, is the type of process where automation can be most cost-effective.

Manufacturers typically say an EDM can deliver 5,000 hours of output per year with manual loading. The combination of robot, manipulators, parts



Charmilles Technologies

Wire EDMing has yet to emerge on a widespread basis as a process shops consider applicable to automation. Part volume, or lack thereof, is the main road block in the view of many. Some might reconsider if they take a look at how even the production of small-run orders or one-offs can be cost-optimized with the incorporation of robotic parts loading/unloading.

magazines and grippers can improve the productivity of the machine tools by some 30 percent, depending on the application, compared to manual loading.

Picking Up the Pace

EDM sales, according to one manufacturer's estimate, account for 7 percent of worldwide machine tool revenues. The equipment is now regularly used to machine molds and dies, and it is making inroads into production of form tools.

A contributor to the growth has been the gradual increase in EDM cutting speed. Robots should be considered if for no other reason than to take advantage of this.

"Ten years ago, a shop doing EDMing could easily fill up its work table, run a machine over the weekend and come in on Monday to find the machine still running," said Gisbert Ledvon, Charmilles Technologies Corp., Lincolnshire, Ill. "Now, with wire cutting speeds as high as 37 sq. in. per hour, a large part can be finished in a few hours. Unless there's some way to load a new part, a machine can sit idle for most of a weekend."

In a world where parts are being made in China by operators paid pennies per hour, the EDM that isn't running is the EDM that is driving a U.S. business toward failure.

Don't Sit Idle

In early August, business picked up for the first time in many months for H.W. Industries, Genoa City, Wis. Owner and president Jim Cline called it "a breath of fresh air." H.W. Industries makes aerospace and medical parts, among others. Cline said that HWI's improved level of orders had him hoping the worst of the U.S. manufacturing slump was behind him.

HWI has two automation systems tied to wire EDMs. The systems, configured by System 3R USA Inc., Totowa, N.J., first extend their robotic arms into a parts magazine to grasp a pallet with standard or custom grippers on which sits a workpiece for machining. The robotic arm then retracts from the magazine. It then positions itself in alignment with the wire EDM. The robot places the pallet onto a chuck.



Developing a pallet system for holding workpieces, such as one shown in the background, is a key first step to automating a wire-EDM operation. The robot pictured in the foreground is the WorkMaster from System 3R. It can serve one or two machine tools, can facilitate 1,500 positions and has a payload capacity of 300 lbs.

The robot retracts, and the EDM runs the job. When the job is completed, the robot is automatically directed to return to the wire EDM to remove the part and return it to the magazine.

Cline is unwavering in his stance on the benefits of his wire-EDM automation. He's aching for the economy to bounce back so he can reap some productivity advantages. "I've positioned myself to be more profitable in this new global economy than before."

Mind you, Cline's shop doesn't run thousands of parts a month. HWI's wire-EDM cells build stamping dies, molds and prototypes as well as some production parts.

"Automation allows you to utilize the machine tool more hours per day," Cline said.

By optimizing the machines' output, automation lowers the cost of production.

"When you buy automation, you buy time," said Nicholas Giannotte, president, System 3R. "You purchase around-the-clock machining."

Share and Share Alike

Shop owners who still need convinc-

ing should remember this: A robot can serve more than one machine tool. Whether it's two EDMs, 10 EDMs, an EDM and a mill, or some other arrangement, tying the automation system to multiple machines optimizes its use.

Mitsubishi EDM's Dave Beese said his company is working on what it calls the next step for robot sharing in the EDM environment—integration with coordinate measuring machines. "This would represent the complete package," he said, "because the best thing you can do is have a robot take a workpiece from the EDM and transfer it to a CMM and have the workpiece measured fresh after being burned."

Installations overseen by robot specialist ABB Flexible Automation, New Berlin, Wis., have tended to serve multiple machine tools. "We have put robots on servo tracks to serve a cluster of machines," said ABB's Stefan Larsson. "That makes a lot of sense for EDMing, with its long cycle times."

Larsson suggested shops pay attention to computer interfacing. "This enables off-line programming of the robots, so, when you do new setups, you

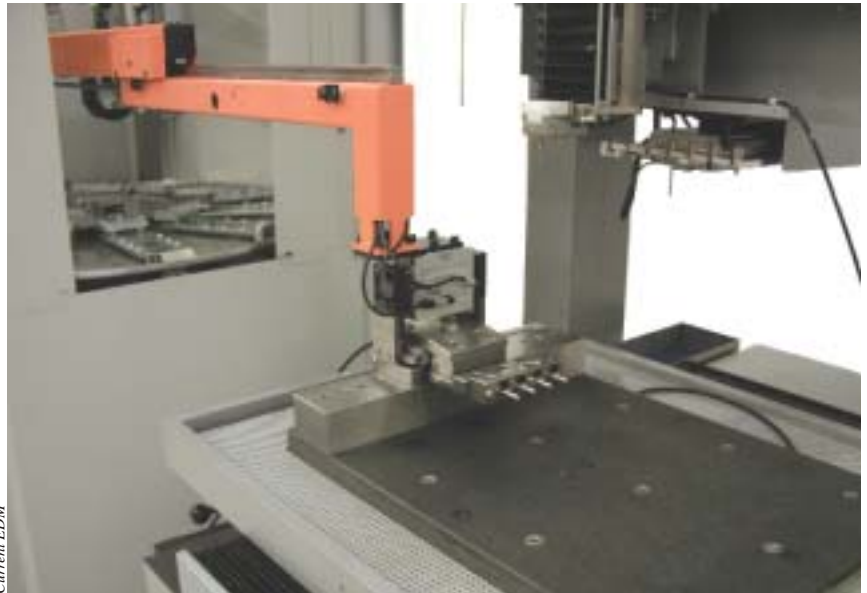
don't take the EDM out of operation."

The outlay for incorporating automation into an EDM environment is typically 50 percent of the EDM's value, said System 3R's Giannotte. Typically, an EDM and accessories cost anywhere from \$80,000 to \$500,000 or more.

"When you practice robot sharing, however," Giannotte added, "you can look at it as the robot costing half as much per machine tool. Eighty percent of our customers do robot sharing."

Get Wired

Unlike sinker-EDM operations, the wire-EDM process has only recently been married with automation systems. Threading and rethreading of the wire complicates continuous-run operation. But the improvement of automated threaders and rethreaders during the past decade—wire can be threaded in holes as small as 0.010", although the usual hole diameter is about 0.020"—



The EDMDrill Model CT500FX from Current EDM is shown married with a System 3R robot and parts carousel. Together, the equipment enables hours of unattended drilling of holes of six different diameters.

now eliminates the technical reason for not automating.

Initially, auto-threading took 1½ minutes or so. Today, auto-threading can occur in 20 seconds or less.

And Charmilles' automatic threader, for example, utilizes a proprietary software package that applies differing criteria depending on the type of wire to be threaded. For instance, a coated brass wire is annealed differently than a plain brass wire. The degrees of voltage, tension and relaxation used to thin and remove stress from the coated wire are not the same as those applied to a plain wire.

"We carry out numerous steps to prepare a wire for use, so that it becomes so straight it can almost stand up, like a needle," Charmilles' Ledvon said.

Automatic wire rethreaders are necessary should a wire break during an unattended run.

"When a wire breaks," Ledvon said, "something went wrong, such as the part moved or there was too much power applied to the wire. When our system rethreads the wire, it slightly reduces the power to the wire. It will continue to step down the power level should the wire keep breaking."

If the wire still breaks after 10 attempts, the controller tells the EDM to stop burning that workpiece, unload it

and load a new workpiece for processing.

Douglas Hagopian, co-owner and vice president of manufacturing at Hoppe Tool Inc., Chicopee, Mass., purchased his first EDM with automatic wire-threading capability in 1997. He was prompted to do this after landing a contract with The Gillette Co. to produce machine parts for two new factories the consumer products maker planned to construct to manufacture cartridges for its new Mach 3 shaver.

"Gillette had a lot of fussy location holes in those parts," Hagopian said. "Normally, we jig grind those kinds of holes. But we found we could wire EDM the holes faster. Plus, we could carry that out with nobody [operating the machine], and the process could hold [tolerances of] 0.0001" to 0.0002" all day and all night long."

Two ensuing purchases of EDMs by Hoppe—in 1999 and 2001—brought with them improved wire threading. The initial machine threaded wire in 1½ minutes. The third EDM completed the process in 22 seconds.

"Noncutting time piles up," Hagopian said. "Having that wire feeder cut and rethread so quickly is gigantic."

Hagopian stressed regular scheduled maintenance. "The last time we had maintenance performed on one of our threaders, it ran 35 percent faster than

The following companies contributed to this article:

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Current EDM Inc.
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Hoppe Tool Inc.
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H.W. Industries Inc.
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www.hwindustries.com

Mate Precision Tooling Inc.
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www.matept.com

Mitsubishi EDM/Laser
A Division of MC Machinery Systems Inc.
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System 3R USA Inc.
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www.system3rusa.com

before it was tuned up," said Hagopian.

The most impressive development of late in wire-EDM design is Charmilles Robofil 2030SI-TW twin-wire machine. The EDM is capable of switching automatically between two different wires. This means a job can first be roughed with, say, a 0.010"-dia. wire—which will inherently complete that process faster than a smaller wire. Then, the machine can be programmed to automatically switch to a wire of, say, 0.004" dia. for small-radius finishing.

"Since you don't have to cut the whole part with small wire, you can enjoy time savings of 50 to 100 percent," said Charmilles' Ledvon.

Automating is not Automatic

The first step to becoming automated is to install a pallet system. Mate Preci-

sion Tooling Inc., Anoka, Minn., has an automated pallet-delivery system serving six of its 50 EDMs. Mate manufactures tooling for sheet metal fabrication.

"The pallet is a fixture that is calibrated to the machinery," said Frank Baeumler, Mate's vice president of marketing.

If this kind of approach is foreign to many EDMers, that's to be expected.

"You have to change your thinking process," System 3R's Giannotte stressed. Job planning is paramount, he said.

"The integration of robotics starts with the selection of a person in-house who best understands how the shop's EDMs operate," said Kevin Manion, regional sales manager, Current EDM Inc., Mountain View, Calif., a manufacturer of small-hole EDMs. "This person has to be able to prepare workpieces and program the robot and the EDM."

"Automation is a commitment," Cline said, "and it creates a different job role for your employees. You spend less time on the machines and more time planning and programming."

Cline said this was evident when his company was contracted by a telecommunications firm to do rapid prototyping and machine single-cavity molds for cellular phones and pagers.

"One project concerned three molds that had to be shipped to China within 10 days," he explained. "Our people had to be more skilled than ever."

"We're creatures of habit," said Mitsubishi EDM's Beese. "It's very common that when people first hear of plans to automate, they are overwhelmed. But once they're forced to do it, they're pleasantly surprised at how easy it is to make the transition."