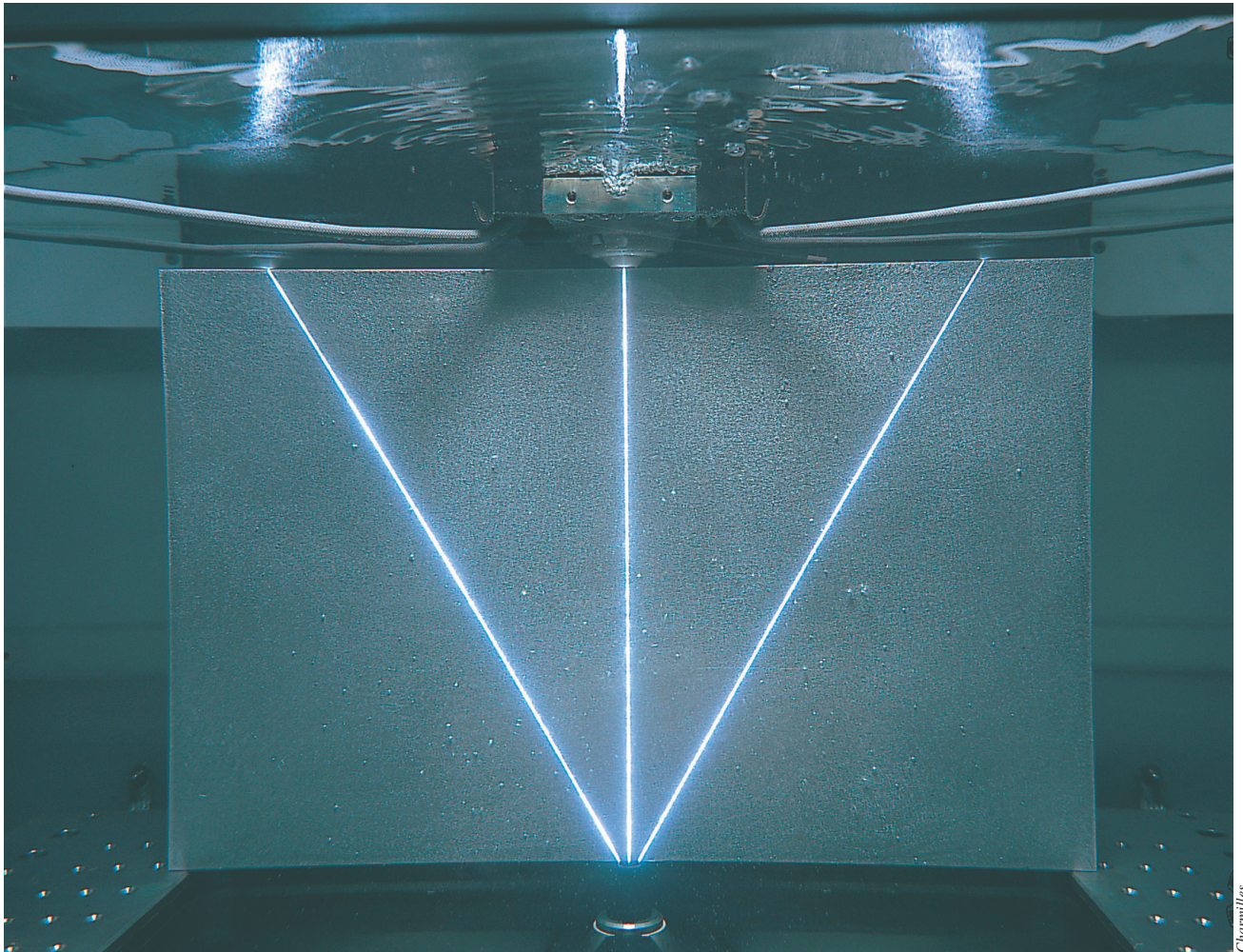


► BY DANIEL MARGOLIS, ASSISTANT EDITOR

In Production



Charmilles

Wire EDMing sees more application in parts production.

Wire electrical discharge machining historically has been a process for producing tools, dies and molds. Increasingly, though, WEDMing is being used for the production of parts.

Much of the shift is occurring because WEDMing offers numerous advantages when applied to parts production:

- It helps shops produce parts to extremely tight tolerances, offers reliability and repeatability, and lends itself well to unmanned operation.
- Because WEDMing is a noncontact machining process that exerts little, if any, force on the workpiece, the fixturing required to produce a part is less complex.

- WEDMed components have increased rigidity, because highly detailed parts can be cut in one operation rather than being machined in two sections and welded or screwed together, as might be the case when grinding or milling.
- Close tolerances can be held without generating burrs, eliminating the need for deburring operations.
- Cutting parts out of difficult-to-machine materials is relatively easy with WEDMing—it can cut any material as long as it's electrically conductive.
- WEDMing makes efficient use of the workpiece material, because parts cut out of it can be nested.

Endless Possibilities

Beyond the already established advantages of WEDMing, one of the primary reasons it's being used more for parts production, typically in the medical and electronics industries, is that awareness of its capabilities has increased. "Ten years ago, wire EDM was still a black art," said John Shanahan, EDM product manager for Makino Inc., Mason, Ohio.

One thing that's served to change this is that the current crop of engineers and machinists are learning about WEDMing as a regular part of their manufacturing education.

"For new engineers getting out in the field now, wire EDM's not a black art," said Dave Kinney, EDM specialist for Tru-Line Tool & Mfg. Co., Eagleville, Tenn. "It's mainstream machining."

As WEDMing has become more established, parts designers have become fully aware of its potential. "When you make people aware, they start thinking differently," Shanahan said. "They start thinking, 'Well, how can I apply that to what I'm trying to accomplish?'"

WEDMing gives engineers much more flexibility to design parts that are smaller and more delicate, without worrying if they can be machined or not. "All you have to do is give engineers an inkling of what they can do with a wire EDM and they come out with designs that would be impossible to machine without it," said Carl Som-

mer, owner and president of Reliable EDM Corp., Houston.

Sommer's shop has 40 EDMs, 30 of which are wire. He feels WEDMing is still indispensable for die and mold making, but noted that most of his shop's work is now parts production. He attributed this to customers purchasing their own WEDMs to make needed tools, dies and molds.

cate geometry, wire EDM is well suited to that," said Chuck Mathews, vice president of marketing and product development for DP Technology Corp., the Camarillo, Calif., developer of Esprit CAM software.

The complexity of parts being designed for WEDMing requires increasingly sophisticated software. DP Technology says WEDM shops must invest



An unsubmerged gear is WEDMed at Reliable EDM.

Wayne Applegate, president and CEO of Applegate EDM Inc., Dallas, also has noticed more shops are purchasing their own WEDMs. "So, now, you have guys like me who own a job shop, I'm trying to figure out what I can do," Applegate said.

In speaking with his customers, Applegate figured out what to do: parts production. He feels that people have become more knowledgeable about and comfortable with designing parts for WEDMing in the last 2 or 3 years. "Now, they bring us more and more parts that would be difficult to machine any other way than with a wire EDM."

Software Solutions

Parts that would be difficult, if not impossible, to machine without using WEDMing often have complex design structures incorporating small radiuses, thin walls, narrow slots and sharp corners. "When you've got intri-

in CAM software capable of directly accepting a solid model (a digital 3-D representation of a part).

Increasingly, shops will "need to work from that original design geometry, which is going to be a solid model," Mathews said.

Software developers endeavor to enable engineers to design parts for WEDMs offline with increased ease. Gibbs and Associates, Moorpark, Calif., has integrated what it calls CT-Expert for all Charmilles Technology Corp. WEDMs into its GibbsCAM 2005 software. The CT-Expert sets a WEDM's controls; the user sees on his computer screen just what he would see at the machine control. "Once he designs a part, he just dumps [the program into the CNC] and he's good to go," said Steve Aughinbaugh, application engineer for GibbsCAM. "We're trying to make it a bit more seamless."

Making the process more seamless

means less of a barrier between the customer who designs a part and the shop that machines it with a WEDM. This integration of the design and manufacturing functions is a driving force in the increased use of WEDMs in parts production. "I think there's more of a connection between the designer and the manufacturer, because everybody's trying to get costs down," said Joe McChesney, product manager for Surfware Inc., Westlake Village, Calif., developer of SURFCAM CAD/CAM software systems. "More parts are being designed to reduce costs in manufacturing."

According to Reliable EDM's Sommer, this is key: "The big thing is for manufacturers to really understand the capabilities of wire EDM so they can design around it for cost efficiency."

Breaking the Speed Limit

WEDMing has not always been a cost-efficient machining process. When it originated in the 1960s, machines cut at about 2 sq. in. per hour, making them too slow for most production applications. But WEDM's cutting speeds have since increased twentyfold. Today's WEDMs cut at speeds in excess of 40 sq. in. per hour, making them a viable option for more parts production jobs. And, these higher speeds make wire shops more competitive. Applegate said, "I used to be only somewhat competitive against [shops with] machining centers. Now I'm very competitive."

"The cutting speeds are coming up to where EDM is being used for parts that weren't deemed feasible for EDM in the past, usually due to the amount of time it would take to get [the parts] out," said Christopher Ratkovich, regional EDM applications engineer for MC Machinery Systems Inc., Wood Dale, Ill., a division of Mitsubishi Corp. Ratkovich attributed this increase in speed to advanced power generators, which supply WEDMs with more energy in a shorter amount of time. He also attributed it to better designed electrical components in general. "Everything that is developed in the electronics industry is used in EDM, so as stereos and cars get better,

Ghost in the machines

One of the foremost reasons MC Machinery Systems Inc., Wood Dale, Ill., a division of Mitsubishi Corp., maintains its EDM Museum is because its customers demand it.

More than a decade after the first Mitsubishi WEDMs were introduced into the U.S. market in 1978, the company attempted to drop them from its service and support.

"Well, that blew up in our face," said Greg Langenhorst, MC Machinery's EDM product manager who has been with Mitsubishi for more than 25 years. "We tried, and the customers came back and said, 'What do you mean? I've got five of those and they run great. You can't leave me stranded out here with an old machine and no service.'"

This led the machine builder to expand its collection of service machines—four or five of Mitsubishi's outmoded EDMs that it had kept on hand and maintained for service and support since 1981—to create the EDM Museum when the company moved into its present location in 1990. Fourteen machines are now in the museum, ranging from a 1978 DWC 100 to a HA series machine, which the company discontinued in 1994. The FX Series, which the company made from 1996 through 1999, is waiting for space in the museum.

The museum is a multipurpose asset for the company. First, it's an invaluable resource for customer service and support. "If somebody with an old G-series wire machine calls, we can stand in front of the machine and explain exactly what he needs to do," Langenhorst said. "So it's a good, hands-on asset as far as talking customers through post-warranty work."

The museum also is used internally to train new service technicians how to fix older machines.

Technicians in the company's electronics lab use the museum on a daily basis as a test bed for refurbished EDM parts, such as power supplies and control boards. "They'll go back and slide [the part] in the machine, turn it on and make sure it works right before they put it back in inventory," said Langenhorst.

According to Langenhorst, the museum sends a strong message to MC Machinery's customers that the company stands by its machines for the long term, enhancing the value of its products. "It definitely adds that extra value and explains why we're a little more expensive than some guys. And it adds to the resale value of our used machines, because we've got a 1978 wire machine in there, and we've got parts on the shelf for it."

—D. Margolis



M35 and M25K sinker EDMs from 1986 and a DWC110G wire EDM from 1984 housed in the museum.

MC Machinery Systems/Mitsubishi

so does EDM.”

Charmilles introduced its first high-speed generator, the CC generator, 3 years ago, advertising that it could be run at cutting speeds as high as 37 sq. in. per hour. Since then, competitors have followed suit, said Gisbert Ledvon, marketing manager for Charmilles, Lincolnshire, Ill. What the company did in response is improve the generator’s performance to cut at 42 sq. in. per hour within a contour. This is a specification Ledvon feels is important, particularly for parts production. “People say, ‘We can cut 47 sq. in. an hour,’ but that’s only in a straight line,” Ledvon said. “We’ve developed technology that allows you to cut 42 sq. in. an hour in a real part situation.”

wire that increases your costs, you haven’t gained anything,” said Tru-Line’s Kinney. “What the shops want is to be able to take the jobs that we’ve been doing and do them at the same consumable cost, just cut them faster.”

Ratkovich discounted the importance of using such specialized wire for high-speed WEDMing, terming them “optional” and stating that Mitsubishi’s machines are designed to use standard brass wire.

The thinking is the same at Charmilles. “If you look at the high-speed generators on a wire EDM, you can get high cutting speeds if you just use plain, brass wire,” Ledvon said. “It’s not a problem.”

But does increasing cutting speed

The cutting speeds are coming up to where EDM is being used for parts that weren’t deemed feasible for EDM in the past, usually due to the amount of time it would take to get [the parts] out.

To achieve optimal efficiency in terms of cutting speed, some WEDM builders are promoting the use of larger-diameter, coated wire. But many shops balk at the idea of using such a wire, which has a higher cost per spool. Additionally, larger-diameter wire means less wire on the spool, which means the spool needs to be replaced more often.

“If someone comes out with the latest and greatest EDM that cuts much faster, but you have to use some special

mean sacrificing accuracy? Some say yes, but given that WEDMing is already extremely accurate by nature, the difference in accuracy at a higher cutting speed is negligible.

“If I show you a rough cut, it looks excellent,” Sommer said. “And you don’t need the accuracy if the part doesn’t call for it. We’re not interested in cutting everything to ± 0.0001 ”. We’re looking for production. We want speed; the faster we can cut, the more we can cut our prices.” \triangle

The following companies contributed to this report:

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