

Thinking Outside the EDM Box

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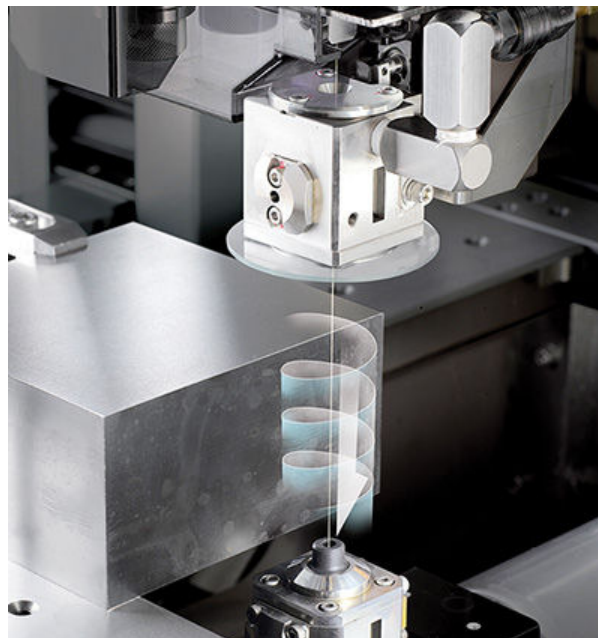


By **Kip Hanson**
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SME Media

With FABTECH 2022 in Atlanta fast approaching, it might be time to rethink electrical discharge machining's traditional roles

When EDM (electrical discharge machining) salespeople knock on doors, their prospect list varies based on the type of equipment they're trying to sell.

For sinker EDMs, moldmakers are the obvious target. Tool and die houses are the most likely buyers of wire EDM (WEDM), with a growing number going to job shops and medical device manufacturers. And while starter holes for WEDM work were once the sole responsibility for so-called EDM hole-poppers, a substantial number of these surprisingly versatile machines are now burning away on the production floors of producers of gas turbine components.



The ALN400G from Sodick boasts linear motors as well as the company's next-generation Smart Pulse Wire control and Smart Pulse Generator. (Provided by Sodick Inc.)

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Maybe it's time to hit the brakes. EDM in all its many flavors is just another tool in an increasingly well-equipped manufacturing toolbox, one that includes relatively new additions like 3D printing, laser cutting and welding, five-axis machining centers, and multi-tasking lathes.

The not-so-good old days where machine tools fell into strict categories are slowly fading away as shops of all types and sizes become more vertically integrated, flexible, and well rounded.

The Last Resort

As such, EDM is finally getting noticed by shops that, at one time, might have struggled to decipher the acronym.

"We had an application recently that required machining a series of intricate profiles in preparation for a welding operation," said Dale Hedberg, chief operating officer at Sudbury, Mass.-based Methods Machine Tools Inc., which provides Fanuc RoboCut EDM systems.

Because wire EDM uses no tool but a spool of wire, generates no cutting forces, and is able to span relatively long distances and machine tall features with minimal deflection, it was the most cost-effective approach.

"Mistakenly, EDM was too often thought of as a last resort," Hedberg acknowledged. "But with this shop, EDM was not only a viable solution, it was the preferred one. If more manufacturers considered EDM, I think they'd be pleasantly surprised."

Some of this newfound embrace is due to greater usability. Hedberg pointed to new technology that has evolved the EDM process to become simpler, more efficient, and intuitive, eliminating the technical complexity needed to operate legacy EDM equipment. Unattended operation is much more dependable and cutting speeds are faster, thus the total operating cost is lower. The controls are not only faster than their predecessors, but are as easy to use as a smartphone.

"We introduced our Fanuc RoboCut α -CiC around one year ago," Hedberg said, noting that the machine was unveiled at IMTS in September. "We're consistently finding new applications that can be applied in any shop—fabricators included."



Visitors to this year's IMTS got a glimpse of FANUC's new RoboCut c-CiC series, which was introduced about one year ago. (Provided by Methods Machine Tools Inc.)

Mark Cicchetti sees similar applications. The technical director for the EDM division at **Absolute Machine Tools Inc.**, Lorain, Ohio, Cicchetti pointed to a growing need for fixed-bed machines, resurrecting the industry's traditional "traveling wire" moniker. The company's

AccuteX AU-series, for instance, offers a maximum table weight of 22,000 lbs. [9,979 kg], up to 31" [787.4 mm] of Z-height, and boasts "open-flushing" capabilities, meaning the workpiece is not submerged during cutting.

"An architectural steel fabricator might bolt a large steel beam to the table, support the other end outside the machine, and cut whatever shapes are needed into the part," he said. "This would be far more accurate than with a plasma or laser, and isn't even possible on all but the largest machining centers. In fact, one of our customers is a well-known manufacturer of earth-moving equipment, and they're using one of our AU-10i wire EDMs to cut a series of oddly shaped holes into the periphery of a 117-inch [2,972-mm] steel ring used in one of those machines."

He also noted the use of WEDM to cut keyways into the hardened steel roll dies for continuous forming of metal coil stock and the bending of pipe, tubing, and channel. Cicchetti was also excited to discuss new technology introduced at IMTS. In **Absolute's** case, the most relevant announcement in terms of sheet-metal processing was the AP-series, a linear motor WEDM reportedly offering 0.00006" (1.52 microns) positioning accuracy, designed for progressive die manufacturing or "anywhere super-high accuracy is required."

Going to Extremes

Extreme accuracies like these were once the sole purview of jig grinding and boring machines. Although a few of these are still used, practically all such work is now performed on high-end CNC machining centers or

with Mason, Ohio-based Makino Inc.

Like his rivals, Makino EDM product manager Brian Coward has noticed fabricators using WEDM to cut odd shapes in sheet metal and architectural steel components, and for hole finishing where high precision is needed. And as several of his peers have indicated, Coward's also seeing an increasing number of job shops adding electrical discharge machining to their capabilities. Thanks to the introduction of its H.E.A.T. (high-energy applied technology) WEDM several years ago, Makino and others can now look forward to greater speed in their metalworking operations.

"Compared to most wire EDM work, the tolerances in these situations are typically not very demanding," Coward said. "What's more important is speed, a statement that can also be made in automotive stamping, for example, where they're dealing with thicker materials and the gap between punch and die is much larger than with deep drawing or progressive dies. The Extreme is the first machine in the industry to use 0.016" (0.4-mm) diameter wire, which allows our customers to machine even thick materials very quickly."

How quickly? In one example, a 4" [101.6-mm] thick D2 stamping die that once took five hours to cut using 0.010" [0.254 mm] wire required just over two hours on the Extreme, a 57-percent improvement. And because the machine uses a proprietary double-coated wire designed specifically for Makino's spark generator, much less wire was needed, further reducing machining costs. "Originally, Makino designed the Extreme for cutting away metal 3D-printed parts from build plates," Coward noted. "The more we used it, though, the more applications we found. It's literally twice as fast, without raising consumable costs."

Cutting Costs, Easing Operation

As with drills, end mills, indexable inserts, and all the other cutting tools used in any CNC machine shop, consumable costs are a big deal to anyone who does wire EDMing for a living. Mike Bystrek, national wire EDM product manager at Mitsubishi distributor MC Machinery Systems Inc., Elk Grove Village, Ill., noted that wire is the most significant expense, followed by filters, electricity, and guide replacement.

kerf created, the greater the machine's operating cost. That doesn't figure in the number of skim passes needed to achieve the desired accuracy and surface finish, of course, but the fact remains that Mitsubishi and other machine tool builders have gone to great lengths to optimize wire usage wherever possible. Bystrek noted that the MC Machinery's technology centers have taken that one step further by creating and testing material-specific cutting conditions for all the metals used in the U.S.



The U6 HEAT Extreme featuring coated wire technology reportedly increases rough machining rates up to 300 percent over traditional 0.010" [0.25mm] brass wire while maintaining comparable consumption rates. (Provided by Makino Inc.)

“Whether your shop is cutting D2, A2, CPM, or whatever, we’ve developed cutting conditions that provide the best machine performance, surface finish, and part accuracy in the shortest amount of time and with the lowest water consumption possible,” he said.

This also simplifies machine usage. Said Bystrek, “Given that many of the more experienced EDM operators are close to retirement age, we’ve focused our efforts on making our controls very easy to operate for those just entering the industry. Everything is very intuitive, there’s no guesswork or adjustments needed, and together with the optimized cutting conditions just mentioned, even less-skilled people can pretty much walk up to the machine and achieve good results.”

Turn and Burn

That’s good news for fabricators or anyone else without a team of EDM Jedi Knights at the ready. So is the ability to see machine status in real time, and understand what events might have occurred recently, whether

this year's IMTS, hailing it the "Sodick Internet of Things."



The M800 control and hand pendant shown here now come standard on Mitsubishi Electric's wire EDM machines. (Provided by MC Machinery Systems Inc.)

Product engineer Kazuki Morita was there.

"Operating history, job scheduling, current cutting conditions—Sodick customers can now manage this and other machine functions from their smartphone or computer," he said. "And assuming the customer has given them permission, Sodick IoT

allows our service people to access the machine remotely. They can change machine settings and update software versions, and if there's a problem, they can often fix it without coming onsite."

Kazuki agreed on the need to minimize operating costs without sacrificing speed. This is the idea behind another fairly new introduction —iGroove—which uses a piston device beneath the lower guide to rotate the wire during finishing cuts and continuously present a fresh surface to the workpiece. "It's especially effective on thicker workpieces, but in many cases, we're seeing up to 40-percent lower wire consumption," he added.

Going Green

It's obvious that the benefits of Sodick's iGroove and the other advanced EDM technologies discussed here extend well beyond the world of sheet-metal fabricating and structural steel. Shops of all sizes and types stand to enjoy greater capabilities and ease of use than at any time in EDM's long history. Eric Ostini, head of business development for GF Machining Solutions LLC (GFMS), Lincolnshire, Ill., said there's ongoing interest in wire, sinker, and EDM hole drilling across all sectors of the manufacturing industry, but added that electric vehicles (EVs) and now the Biden Administration's CHIPS act is adding fuel to the EDM fire.

"The big thing over the past few years has been the EV market, with the automakers and their tier suppliers producing all manner of new

stamping and forming dies, many of them for micro components. And now that the government has passed the bill for domestic IC [integrated circuit] manufacturing, that's going to flood the market with investment capital, which is why we've begun fielding a huge number of inquiries for EDM equipment and other machine tools."

The timing couldn't be better. Ostini ticked off a host of recently introduced products and technologies. These include the company's CUT X (the X stands for extreme), which will replace the well-known CUT-series WEDMs, use 3D-printed heads, and leverage GFMS' 'twin wire' capabilities. With that comes a new control—the UNIQUA—that "combines Charmilles' capabilities with Agie's way of doing things."

There's also ISPS and TurboTech capabilities that prevent wire breakage while increasing cutting speeds by 20- to 40-percent, and another module called iWire to eliminate wasted wire. "iWire adjusts wire speed based on material thickness," said Ostini. "Let's say you're cutting a stamping die or form die and the part goes from three inches [76.2 mm] down to half an inch [12.7-mm] thick, or maybe you hit a big cavity in the center of the part. iWire will sense that and slow down the spool automatically. We've seen a 30-percent reduction in wire costs because of it. Between this and some of the other things we've introduced, I think it represents a new way of thinking for GFMS and for the industry as a whole."

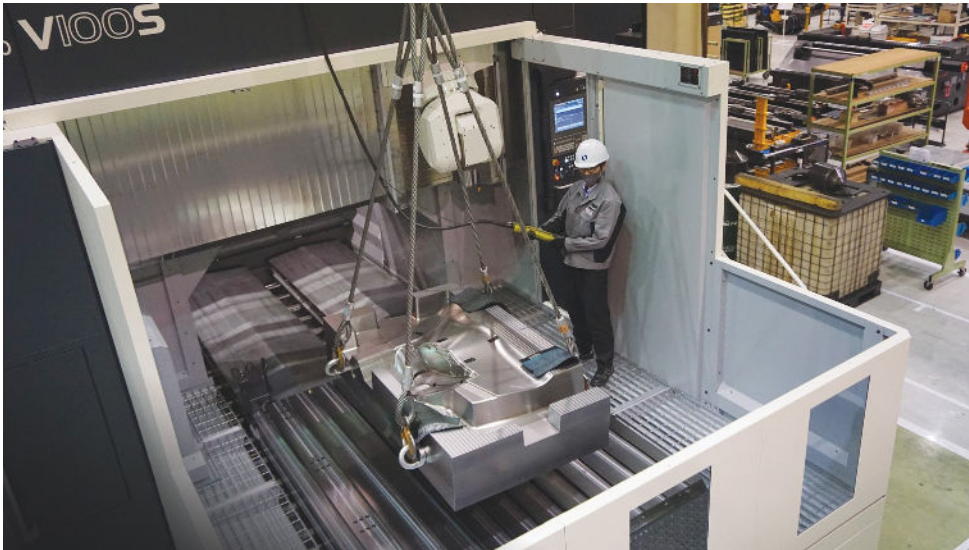
WELDING & CUTTING

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Between “Blade Runner,” “Terminator,” “The Matrix” and other blockbuster movies, Hollywood has painted a frightening picture—one in which intelligent machines attempt to destroy humanity.

By Kip Hanson



TOOLING & WORKHOLDING

Machine Tools for Toolmakers

Shown here: OPS Ingersoll’s Eagle V5C, a “high-speed, ultra-rigid 5-axis vertical machining center (VMC) with enhanced cooling controls.” (Provided by MC Machinery.)

By Kip Hanson



MACHINING & METAL CUTTING

show, Dec. 7-9 in Indianapolis, Mazak will demonstrate three automation-ready machines designed with motorsports part production in mind.

By Mazak Corp.

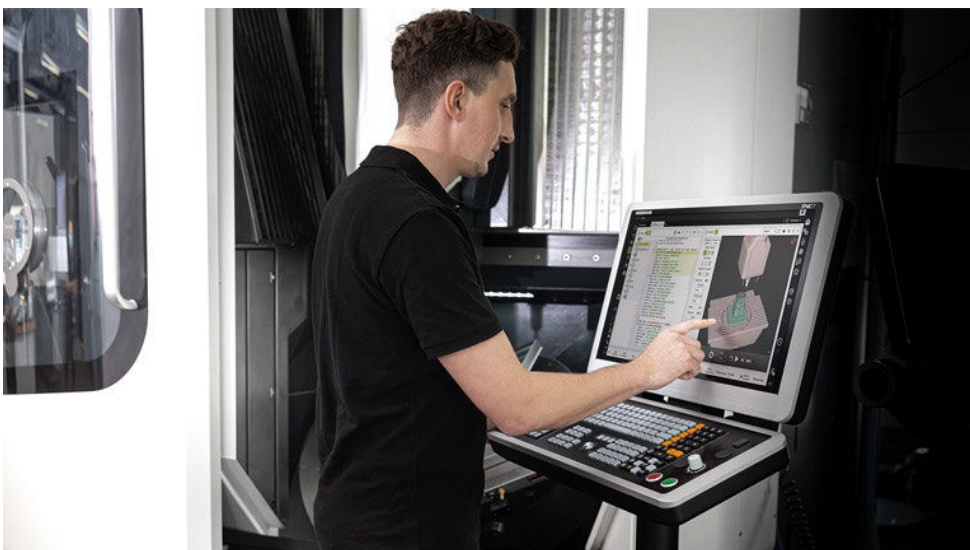


MACHINING & METAL CUTTING

Building Better Blisks

The DVF-series five-axis machining centers are designed for high-precision machining of complex parts like this turbine component in a single operation. (Provided by DN Company.)

By Kip Hanson



PRODUCT DESIGN & ENGINEERING

feeds and torques experienced by each axis throughout a cut in producing a good part, and then tracks and displays any deviations for analysis and adjustments thereafter. (Provided by Heidenhain.

By **Ed Sinkora**

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