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EDMs Take a Big Step Up To Unattended Eroding

September 27, 2018 by [ME Staff Report](#) -

Automating EDM processes takes more than good machinery

For the most part, EDMing is an unattended, or at least lightly-attended process. Unlike CNC lathes and machining centers, where a broken cutter during the night can make for a truly bad morning, sinking a mold cavity or cutting a trim die requires little in the way of babysitting—why wouldn't you let the machine run on its own after everyone's gone home for the day? If the wire breaks, the EDM will simply thread a new one. If the 'trode shorts out, the control will do its best to recover or just shut everything down until its human master comes to the rescue. No big deal.

Making EDM truly lights-out, however, requires much more than auto-headers and smart circuitry.

It means investment in robots that not only load electrodes into the sinker but transfer them to and from a nearby machining center for processing. It means wire EDMs with automated slug removal and wire changing capabilities. It means remote monitoring, in-process measurement systems, and part palletization. Most of all, it means excellent organization and a commitment to continuous improvement. It's a big investment in both time and money, but for anyone willing to tackle it, there's no reason why expensive EDM assets can't be kept running around the clock.

Get a Grip



Though less common than with sinkers, automating wire EDM equipment is an important part of increased throughput at many shops. Photo courtesy MC Machinery



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said Mike Bystrek, national wire EDM product manager at **MC Machinery Systems Inc.** (Elk Grove Village, IL). “A moldmaker could need several dozen electrodes for a large cavity, and a production shop might have a hundred or more electrodes running across multiple jobs, so it’s common to use a robot for this rather than a carousel or rack-style toolchanger.”

A robot can service multiple machines, taking electrodes from an EDM to a graphite mill or machining center. It can bring electrodes to a coordinate measuring machine (CMM) for qualification prior to setup, carry finished workpieces to that CMM, wait until they’ve been measured, and either put them on the shelf or take them back to the sinker for additional machining if necessary. It can also be used to change out mold bases or inserts, provided they fit within the robot’s carrying capacity.

“This last part really depends on the size of the workpiece,” said MC Machinery National Sinker Product Manager Pat Crownhart. “The larger the workpiece, the bigger and more expensive the robot, but as a general rule of thumb, anything that fits on a 12” (304.8 mm) square pallet is probably fair game for automation.”

Both agreed that robotic use is on the rise with sinker EDMing, but Crownhart offered several reasons why it’s much less common on wire machines, with slug management being chief among them. “With traditional punch and die work, or on aerospace parts where you’re removing a tremendous amount of material, it usually doesn’t lend itself to automation.”



Makino’s DM automation cell can exchange both electrodes and work pieces.

makes the shop more capable.

“We’re frequently approached by customers excited about the buzz,” he said. “They want to know how they can employ automation, but don’t understand that you must first have a consistent, reliable process—automating an inefficient one isn’t going to make you any more efficient.”

Makino EDM Product Line Manager Brian Pfluger said achieving reliable processes begins with having a reliable, high-quality machine. “Without the right machine platform, one that’s commensurate with the desired part quality, attempting to operate in a lights-out environment is not going to work. The mass of the machine,

Building a Better Shop

Whatever the type or brand of EDM, those who’ve automated their equipment are clearly seeing big returns. Lead times are shorter. Part quality improves. And despite what might initially seem a massive investment, operating costs fall and profit margins grow (often substantially) when automation is properly implemented.

But not so fast. According to John Bradford, VMC/EDM turnkey and automation manager at **Makino Inc.** (Mason, Ohio), EDM owners and operators should stabilize and then optimize their metalworking processes before undertaking any automation project. Doing so not only paves the way for the next step, but



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When sinking cavities, turning shafts, or milling pockets, the inconvenient truth about our industry when on stand-alone machine tools is typically no better than 40%, and EDM is no exception. True, those making long cycle times or those making millions of the same widget every year enjoy values higher than this, but the trend towards increasingly complex parts in lower production volumes, not to mention a perpetual shortage of skilled workers, means shops must automate or die.

But what does automation really mean? Cramming as many parts as possible onto the table and letting the machine run lights-out is one definition, although this approach leads to increased work-in-progress (WIP), never mind the possibility of scrapping out a boatload of parts.

In a perfect world, one-piece flow is the rule. Setup times are as long as it takes to change programs, and the machine doesn't need a human around to execute that setup. Fixture costs are much lower than in the high-density workholding scenario just described, the customer can have parts much more quickly, and there's never more than one bad part, if that.

Repeatable, highly-accurate tooling is needed to achieve this goal, as is a software package able to control machining processes. Think about every piece of information needed to set up a sinker EDM: the part location, the shape and size of each electrode, their orbit patterns, and dimensional and finish requirements. Similar requirements exist for the CMM common in any automated cell, the milling machine, and even the robot. All of this now has to be managed automatically, and the resulting "digital packet" must accompany each part as the robot moves it into the machine.

"Data management is a crucial aspect of automation," Bradford said. "The goal here should be to completely remove operators from the physical environment and transplant them into one that's virtual—sitting in front of a computer screen where they can plan and schedule jobs, write programs, and input their knowledge into a process plan. The result is far higher uptime compared to standing in front of a machine tool and feeding it this information manually."

Shops are listening. Of all the EDM equipment Makino quoted over the past year, that which included automation enjoyed a win rate nearly three times that of stand-alone machines. "Complexity aside, you can't argue with utilization rates," Pfluger explained. "Where a stand-alone machine might hit 35% uptime, basic automation will get you to around 60%, and if you add a cell controller to the mix, you're looking at 80% or higher."

The People Factor

All this talk of automation might have EDM operators nervous about their jobs, but Bob Ianitelli, president and COO of **Belmont Equipment and Technologies Co.**, (Madison Heights, MI) said there's little to worry about. "Robots can't do everything, and in many cases, it's more cost-effective to use a human operator," he said. "For example, we work with aerospace companies running two or three shifts. They have enough qualified people in place, so the immediate need to automate may not be there. However, automation should be considered whenever a shop needs additional output but can't find the skilled labor necessary to staff equipment beyond normal working hours."

As with the other sources in this article, Ianitelli noted that 2018 has been a banner year for automation, "more so than any other," he said. Much of this is due to the people shortage, as well as the demand surge that many in the industry are currently experiencing. Long story short, the need for automation isn't going away any time soon.



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erges should invest in a high-quality fire suppression system. Customers should check with municipality on codes and restrictions, as these can vary.”

Due to the complexity, the cost of these systems can be substantial, but as with the rest of the automation investment, they’re easy to justify. “Each shop is different and there are obviously many variables to consider before making a large expenditure on tooling, robots, software systems and all the rest,” Ianitelli explained. “That said, many of our customers recoup their investment in two years, others in as little as six months. It all depends on the application and what you’re trying to accomplish.”

Drop the Tank

Evan Syverson, marketing manager at **Sodick Inc.** (Schaumburg, IL), warns shops to thoroughly educate themselves before pulling the trigger on any automation investment. “EDM is already a pretty unmanned process; automation only brings it to the next level,” he said. “The main thing is to assess your requirements and make sure you have the right equipment for the job. I visited a shop recently that was convinced they needed a complete linear production cell. In reality, all they needed was a relatively simple robot to keep their sinker fed with electrodes. They could have spent way more than was necessary.”



Makino’s DM automation cell can exchange both electrodes and work pieces.

Nor is it a prerequisite that shops invest in a new machine—provided an older EDM is still mechanically sound, has features such as a drop tank for easy robot access, and some means of remote monitoring. Then, by all means bring it into the automation fold.

“You can automate all you want, but if there’s nobody there to tell you something just went wrong or what the status is, you’re going to lose valuable machine time,” Syverson said. “This is one area where the Industrial Internet of Things (IIoT) is having a big impact. It’s much easier now to remotely manage equipment, schedule jobs, and keep better track of everything; shops are becoming much more flexible, more efficient, and it’s opening a lot of doors for people.”

Straight and Narrow

Syverson recognized that his customer had no need for a linear manufacturing cell, but that’s not the case for all EDM shops. Fred Holzmacher, regional manager at **Erowa Technology Inc.** (Arlington Heights, IL), said there are some good reasons to invest in such a system.

“Bigger mold shops and those wishing to automate multiple pieces of equipment find linear cells to be more cost-effective,” he said. “Assuming you have the work to keep the robot busy and the cycle times are long enough for it to service each machine, overall investment is reduced. You can start small and add onto it as your needs grow by adding a few feet of track to one end. It’s easy to use the same robot on a sinker, a wire, an electrode mill—any machine that uses the same tooling platform. And linear cells typically come with a cell controller, greatly increasing scheduling flexibility and ease of use.”

This last point is especially important to shops struggling to find skilled operators, which these days is pretty much all of them; because cell controllers are equipped with sophisticated software, adjusting to changing



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run where and goes out to the production floor and reprograms the robot. With a cell controller, jobs with dozens or even hundreds of different jobs are managed easily, and costly mistakes

“You really get more for the money with a linear system,” Holzmacher said. “Because of the controller, you get a higher level of intelligence than a standard robot. You can schedule jobs out longer and it’s easier to decide which machines run what jobs, and when. That’s not to say that stand-alone robots don’t have their place—we still sell a lot of them—but linear systems take you to the next level.”

Drinking The Kool-Aid



Linear manufacturing cells, such as this one from Erowa, are an excellent option for growing companies or those that need to automate multiple machines.

Mark Cicchetti has been there and done that. Before taking his job as technical director for the EDM division at **Absolute Machine Tools Inc.** (Lorain, OH), Cicchetti had his own shop, where he faced many of the same difficulties as his current customers. His advice? Perfect your processes as much as possible before chasing automation.

“We started by installing the same workholding system on every machine in the shop,” he said. “You can take a part or electrode from the wire to the sinker, the mill to the grinder, the lathe to the CMM, and do so without repositioning it.”

Standardized workholding allowed Cicchetti and his team to preset all roughly 600 jobs per month offline on a CMM—no more touching off in the machine. It allowed them to easily verify that part features matched the CAD data at any step in the manufacturing process—no more inspection fixtures, no more time lost picking up datum points. And because they now knew where everything was, all the time, processes could be simulated offline, the resulting programs and offsets bundled into a neat package ready for upload to the machine tool.

The bottom line is this: standardized workholding allowed Cicchetti to increase EDM utilization from 3,500 hours annually to over 5,000, without automating.

“Instead of three guys setting up two machines each, I now had one guy setting up six machines, and getting it done in about one-fifth the time,” he said. “We did all that without a robot—if we’d had one, the results would have been even better.”

First Things First

The irony of all this is that, now that Cicchetti is on the other side of the fence, he finds himself challenging shop owners and managers to rethink their processes to improve machinery utilization and work towards automation. “It’s not uncommon for us to sell a machine and have the customer come back for a second one the following year,” he said. “When they tell me they only clocked 3,500 hours, I suggest that taking a hard look at their manufacturing processes might be a better idea.”



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machinery, you can add tooling, but if you don't optimize processes and the responsibilities of
ed, you're never going to be successful," he said. "The entire culture has to change. Without a
gm shift, the transition to automated manufacturing will be far more difficult. But for those
who can achieve it, automation is a home run."

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