Techtips

by Roger Kern

Techtips is a collection of useful ideas, techniques, and procedures designed to further EDM knowledge.

Sometimes a number of little things can have as much positive effect on significantly improving manufacturing operations as one Big Thing. It is in that spirit that this issue's Tech Tips column presents a compendium of

mini tips for Wire, Sinker, and Small Hole EDM.

Wire EDM

Replace Power Feed Cables

Power Feed Cables are a crucial element in getting the Power Supply spark energy to the cutting gap, yet they are often overlooked when it comes to maintenance. Power Feed Cables live in a tough environment, being either continually immersed in or splashed by deionized water and cutting debris. Over time, they will begin to "rot". The cable insulation deteriorates and the heat shrink seal at the cable termination begins to leak, allowing water to leak into and corrode the cable core and the connections. Since the deterioration is gradual, the loss in performance is often not noticed, especially if test cuts are not performed regularly and compared to original baseline data. Deteriorated Power Feed Cables can reduce machine performance as much as 50%. Power Feed Cables should be replaced every two years.

Avoid Home-Made Power Feed Cables

Power Feed Cables are deceptively simple in appearance. However, due to the nature of the high frequency pulses they carry and monitor, their design and construction is quite sophisticated. The length, wire gage, number of conductors, number of strands per conductor, insulation, and termination are all carefully tuned to the specific characteristics of the machine and power supply. Needless-to-say, soldering a couple connectors on the ends of some welding cable in an effort to save a few dollars is foolhardy.

Clean The Lower Arm Insulator

Most wire machines utilize an insulating member to isolate the metal housing that contains the wire guides and energized power feeds from the metal frame of the machine. This insulating component is often made either of "green glass" (G10 Laminate) or ceramic. Over time, this insulating component can become coated with cutting debris washed onto it by the cutting process. Since the cutting debris particles are conductive, they can eventually form a conductive bridge that will allow the cutting pulses to "leak" to the machine ground. Just like Power Feed Cable deterioration, this condition progresses unobtrusively, gradually robbing the machine of its cut-

ting power. ***Fig. 1*** depicts the green glass lower arm hand of a Fast Track equipped Agie, that has been neglected and is covered with debris. ***Fig. 2*** depicts the same component after it was cleaned. Which one resembles your machine?

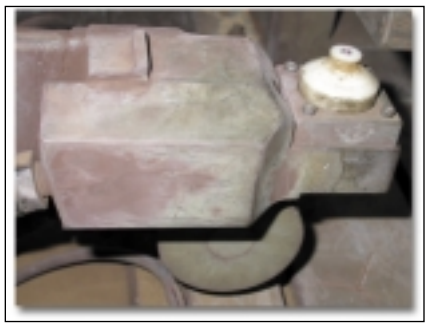

Fig. 1

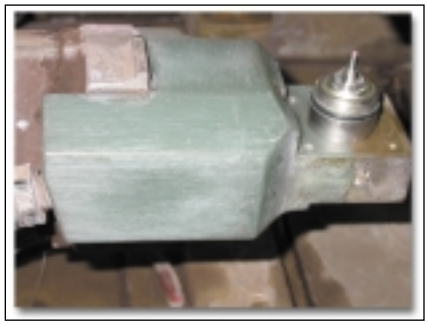

Fig. 2

Change The Water And Clean The Tanks

At least once a year, the Wire machine's dielectric system should be drained and cleaned. In theory, the filter and resin systems should keep the water in pristine condition forever, but in reality, over time, most systems can benefit from a complete dielectric change-over. While the system is down, take the time to scrub both the clean and dirty tanks (a thankless but necessary job) to remove settled out cutting debris and bacteria. Re-fill the system, and once the conductivity is back to normal, change the filters. (Please note that in some municipalities, you are no longer allowed to drain Wire EDM dielectric water into the sewer system due to the zinc content of the water)

Clean The Guides

Weekly, disassemble the wire guide system and ultrasonically clean all the components that contact the wire (guides, pre-guides, power feeds, etc). You will be amazed how much crud comes off these components. Be sure to use a heated, industrial grade ultrasonic cleaner ***(Fig. 3)*** with the appropriate mixture of industrial grade ultrasonic cleaner solution ***(Fig. 4)***. You can be a hero if you also go into the office and offer to clean your co-workers' jewelry at the same time! This one step can eliminate many of the "mystery" threading and performance problems that often plague Wire EDM operations.

Fig. 3

Fig. 4

Check Those Power Feeds

When the power feeders are totally worn, the machine stops cutting. However, more often the machine's performance is significantly compromised before total failure occurs. Be sure to check both the upper and lower power feeds, as the lower power feed usually suffers from more rapid deterioration, since the eroded wire passes over it along with the cutting debris.

Lube Those O-Rings

O-rings are commonly used to seal many components in a Wire EDM. They can be found in numerous places on filter housings, dielectric fittings and valves, and in the flushing sections of the upper and lower arms. O-rings are usually designed to be lubricated, even though they are only sealing static components. They will last longer and things will come apart and reassemble smoother if you lubricate the O-rings with Silicone O-ring Lubricant. ***(Fig. 5)***

Fig. 5

Get Rid Of The Heat

A Wire EDM is a collection of heat sources, which if not managed, can seriously compromise the accuracy and longevity of the machine. Two of these sources can be readily managed by some imaginative duct work. ***Fig. 6*** shows some 12" flexible duct being utilized to direct the heat output of the power supply into the ceiling, which is often the return plenum of the room's air conditioning system. ***Fig. 7*** shows a similar setup for the dielectric chiller, with the addition of an in-line duct fan booster. These two low cost improvements will effectively remove a considerable amount of heat from the immediate area of the machine.

Fig. 6

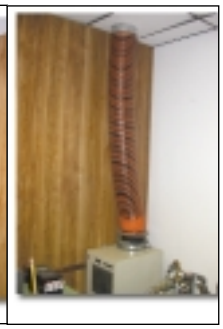

Fig. 7

Sinker EDM

Change That Oil

The dielectric oil should be changed regularly. Every year for petroleum based oils in a single shift operation, and every two years for synthetic based oils. The dielectric fluid for a sinker is not the place to economize. I strongly recommend that all users upgrade to synthetic dielectric fluids. Why?

First and foremost, one of the biggest drawbacks to working on a sinker machine is having your hands in the oil. The operator "smells like an EDM machine", deals with cracking skin, dermatitis, and always has oily hands. These problems virtually disappear with synthetic oils. With a high quality synthetic dielectric oil, you can rub it on your hands and then wipe them with a paper towel, leaving virtually no residue or smell. The only people who object to the extra cost of the synthetic dielectric fluid are the "bean counters" who never have to put their hands in the oil. Besides, since it lasts twice as long, it is actually more economical in the long run, saving on both purchase and ever-more-costly disposal costs.

Clean The Sump

As an apprentice, one of the most disgusting jobs I was assigned each year was to clean the sump of the Blanchard grinder. That is, until I was assigned to clean the sump of an EDM sinker. Mucking out the oily debris from inside the oil reservoir (yes Virginia, on some machines you have to take off the tank cover and just crawl in there) is probably the low point of my manufacturing career. But, it needs to be done! Sometimes ya just gotta do what ya gotta do! By the way, please remember to order the replacement oil and a new tank door gasket before you start the job. After cleaning, pour some of the old oil back in, and run the pumps for a while to pick up any of the loose crud in the system. Then, drain the oil, change the filters and put in the new oil.

Small Hole EDM

Square Up The Guide Holder

When was the last time you checked the squareness of the wire guide on your small hole machine. While the guide holder assembly and guide holder squareness adjustments are often quite crude and tedious, if you need your holes to be square, you cannot ignore this procedure. If the guide is not square, it will start the tube on the wrong path, which can quickly become a big time error on a thick part. There are three ways to square up a tube guide:

- Optically with a toolmakers microscope

Let the tube protrude 4" from the guide, and using a toolmakers microscope, run the column (not the servo) up and down, making adjustments in both axes.

- Electrically with a squaring fixture from your wire machine

Let the tube protrude 4" from the guide, and using the X and Y screws, bring it up against the contacts of the squaring fixture, checking with either an ohmmeter or a test light, and adjusting until the tube touches both contacts simultaneously.

- Mechanically with and indicator

Let the tube protrude 4" from the guide, and using an indicator, run the column (not the servo) up and down, making adjustments in both axes. This method only works with larger diameter tubes that do not deflect under indicator pressure.

A simple check on the resulting squareness is to hold a dowel in a vee block, pick up the top of the dowel, and burn a hole through it and check the runout of the hole at the bottom of the dowel. The squareness error equals the runout divided by two.

Ground your parts properly

It is especially important to take extra care to properly ground carbide and aluminum workpieces in a small hole machine. Most manufacturers recommend that a ground wire be directly attached to the workpiece in an area that has been mechanically cleaned of oxidation (emery cloth or scotchbrite works well). A common symptom of a poor ground is extremely high electrode wear.

All EDMs

Don't Roast Your Chiller

A refrigerated dielectric chiller is usually rated for capacity for an ambient temperature of 80°F. Locating a chiller up in the attic, out in the hot warehouse, or even in an unventilated closet, will severely limit its capacity and dramatically shorten its life.

Don't Turn It Off

It is common knowledge that electronic components are adversely affected by the electrical surge and thermal effects when they are first turned on. In this era of expensive energy and the pressures for conservation, turning off your CNC machine at the end of each job, day, weekend, or even vacation is false economy, because it significantly shortens the life of the electronic components. Years ago, my company routinely shut down all CNC equipment for our annual vacation. Invariably, when we returned, we would have issues with depleted back-up batteries and machines that wouldn't re-boot or start. Certainly, turn off the pumps, but leave the electronics alive all the time and you will be rewarded with substantially fewer electronics problems.

Change Those Air Filters

One of the most neglected items of electronic equipment maintenance is the timely replacement of the air filters that are found on most CNC and Power Supply Cabinets. These filters collect a surprising amount of dirt, even in the cleanest of shop environments. It has been my experience that these filters need to be checked and most likely changed twice per year. A dirty filter significantly reduces the amount of cooling air entering the electronics cabinet, thereby increasing the temperature of those critical computer components. It is best to change rather than clean these filters. Cleaning with an air gun can either dislodge dirt that can then make its way into the cabinet, or damage the filter media, allowing dirt to enter the cabinet once it has been replaced. This is another

case where trying to save money by adapting an ill-fitting furnace filter (furnace filters are inch while cabinet filters are metric) or making your own is false economy, considering the investment in the machine tool control or power supply. Please note that most air filter elements are unidirectional. Look for a small arrow to indicate the airflow direction for the element.

Out Of Sight, Out Of Mind

Deep within the confines of most CNC and Power Supply cabinets are a host of cooling fans. These fans have the crucial job of cooling the power supply and power boards as well as circulating air throughout the cabinet. There are often as many as 10 to 12 fans in one machine. ***(Fig. 8)*** Over time, one-by-one, these fans will begin to seize. I have witnessed many machine installations in which more that half of the cooling fans are inoperative. This condition can have a cumulative and disastrous effect on the life of critical electronic components. The only way to check the fans, is to CAREFULLY open the cabinet door with the power on and find and check them. If they are all spinning at normal speed, then turn off the power and spin each one by hand to check for any bearings that may be dragging or rough. Be careful to replace only with OEM fans, since even though they look similar, there are many fan variations in mounting, operating voltage, current, and rotation direction. Also, when you remove and replace a fan, be sure to note and duplicate the air flow direction
(Fig. 9).

If you pay attention to these "little" details, you will be handsomely rewarded by significant improvements in the productivity, quality, and reliability of your EDM operations.

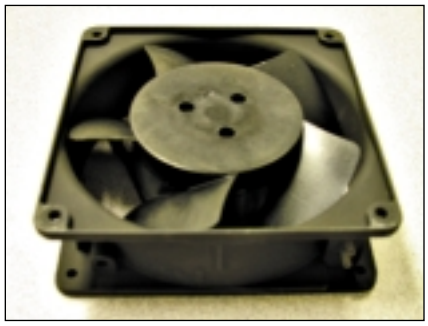

Fig. 8

Fig. 9

Any suggestions for future topics are welcome. Tell us what you would like to read about.

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