

Purpose

As you review this newsletter, I hope you can appreciate the time and effort it took to put this together.

Having been in this business for over 30 years, I find that over the last several there has been a huge increase in bad, incorrect information and half-truths provided to EDM users.

My salespeople and I experience this every day with clients that have been completely misinformed. My family has and is in manufacturing here in the USA. I believe you become competitive by having solid, documented information to make solid business and manufacturing decisions.

Whether you buy from my company or not, I hope you can use this information to grow your business and bring some manufacturing back to the USA.

Fred A. Wisen

President

North American EDM
Supplies Inc.



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**Nest Issue: Let's take the WEDM
process apart**

EDM Oil Facts

EDM oils have a know use life. This is as the oil ages the chemical and molecular structure changes. Some of these changes can be harmful and reach the point of being a carcinogen (A carcinogen is any substance, radionuclide, or radiation that promotes carcinogenesis, the formation of cancer. This may be due to the ability to damage the genome or to the disruption of cellular metabolic processes). The higher refined an oil the less of a potential issue.

The use of mineral oil or kerosene-based products, once common, should not be in a shop. The first concern is fire but along with that as the oil breaks down, which occurs within months, it becomes thicker, emit odors, becomes more acidic and can cause dermatitis. And then the problem with disposal.

Over the years the cost differential between low grade oils and synthetic oils has closed making synthetics a go to for your EDM machine.

When you look at the average life of oil, we find:

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Mineral based oils – 1 to 2-year life

Petroleum hydrocarbon - 3 to 4 years

Highly refined EDM Oil – 5 to 7 years

Semi-Synthetics - ???????

Depends on what the manufacture is calling a semi synthetic – they are not all the same.

Real Synthetic Oil – 25 to 50 years

Full synthetic oils can be filtered to almost their original sate. Providing a constant viscosity and dielectric strength. In addition, minimal odor, if at all. No concerns regarding sulfur, chlorine or carcinogens. Higher flash point, less evaporation, improved flushing, improved tool wear, resists oxidation and no dermatitis. And a big one – no need to worry about disposal.

The benefits of a full synthetic far out way the relatively small cost difference.

Do not get hung up on up on the oil recommended by the machine tool builder, in most cases they have a vested interest and profit from your purchase. A good synthetic oil will always work well and in just about all cases can be mixed with other synthetics without issue.

Terminology:

Dielectric Strength:

The minimum applied electric field (applied voltage divided by the electrode separation distance) that results in breakdown. IE: a spark

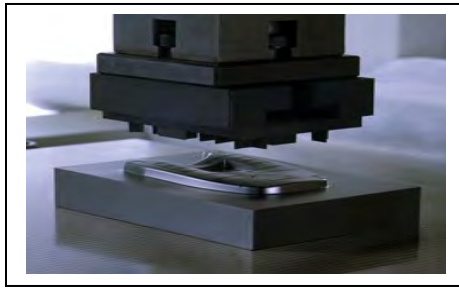
DC Arc: A short circuit between the electrode and workpiece creating a pit. Caused by poor oil quality or “pressing” the gap. (Can be a fire starter in the machine)

Duty Factor: The percentage of ratio between the pulse duration and the total cycle time.

Viscosity: A measure of a fluid’s resistance to flow. (Low viscosity oils have better flow and flushing characteristics)

VOC: Volatile Organic Compounds. Compounds with high pressure at room temperature and cause many molecules to evaporate into the air at slight rises in temperature.

Dermatitis: (In relation to EDM) The defatting of the skin upon exposure to EDM petroleum products, especially those contaminated with debris from the EDM process.



Many manufacturers view EDM fluid as a standard commodity. However, this simple approach to purchasing EDM fluid can hurt companies in the long run. They should be aware that various fluids are available today that can provide enhanced machining performance and extended fluid life.

EDM manufacturers develop EDM burn/machining conditions using new fluids with a known set of specified dielectric strength properties. If over time the fluid breaks down and loses its strength characteristics, the EDM process will take longer and become more unstable, and part quality will suffer from poor accuracy and surface finish.

The EDM’s dielectric fluid is designed to be a semiconductor with specific voltage and amperage characteristics. In EDM work the electrode never actually touches the workpiece, and there is a small gap—called the spark gap—that must be maintained to make the process stable.

EDM dielectric fluid serves two main purposes. First, it acts as a semiconductor between the electrode and workpiece to facilitate a stable and controlled spark gap ionization condition. Second, it also acts as a flushing agent to wash and remove the eroded debris from the spark gap area.

The creation and discharge of the electrical pulse starts when the voltage within the spark gap area increases to a point where the fluid ionizes and becomes conductive. Once this gap area becomes conductive, the high-power current (amperage) is immediately discharged and the workpiece is eroded away (effective machining). This process happens several thousand times per second.

Getting Familiar with Dielectric Oil

As the fluid ages and breaks down, it loses dielectric strength, and its semiconductor capabilities and electrical thresholds change. As it degrades, it can no longer provide consistent or repeatable semiconductor control to the spark gap, which directly affects machine performance.

Depending on the age of the EDM, and the level of adaptive power control capability, loss of control over the spark gap can result in damage to the workpiece in the form of DC arcs. When a DC arc occurs, rather than distributing the discharge energy in a stable and even amount over the entire electrode surface, all machining power is isolated and concentrated in a single, uncontrolled point.

When this happens, a large, uncontrolled pit or crater is produced on the workpiece. It also can damage the electrode.

Most modern EDMs have highly sensitive electronic adaptive power controls that try to correct for unstable conditions in the spark gap. While the effectiveness of this adaptive control can vary between machine makes, they all function by changing and lowering the power levels within the spark gap to a stable value, which usually means significantly reduced machining efficiency.

The more conductive metal particles that are floating in the fluid, specifically in the spark gap, the harder it is for the machine and dielectric fluid to maintain stable electrical thresholds within this area.

Unfortunately, many shops run and operate EDMs with oil that is far past its useful and efficient life. While there is no exact expiration date that can be applied to EDM fluids, operating an EDM with expired fluid will rob a shop of productive output.

It is very common to see a 20 percent or greater improvement in machining performance (reduced cycle times) after old, depleted dielectric fluid is replaced.



Give me some Real World facts!

OK, What the difference in oil brands??

Brand	Rustlik EDM-30	Rustlik EDM-250	Rustlik EDM-500	ProSource PS-967	ProSource PS-1570	ProSource PS-2100	Hirschmann Iono3000+
Physical Hazard		Cat. 4					
Health Hazard	Cat. 1	Cat. 1	Cat. 1			Cat. 1	Cat. 1
Base	Petroleum	Petroleum	Petroleum	Distillates	Distillates	Normal Paraffins	Normal Paraffins
Odor	Mild	Hydrocarbon	Mild	Mild	Mild	Nil	Nil
Boiling Point	300.2	>249.8	300.2	500	500	500	>482
Flash Point	>93	179.6	>93	248	248	246	224.6
Evaporation Specific Gravity	<1	<1	<1	<1	<1	<1	<1
Viscosity	0.8	0.82	0.8	0.83	0.78	0.78	0.79
VOC		>20.5		35	35	35	35
		72%				None	None

The above chart was developed from the available and published information of each oil. We were surprised the number of manufactures that provided very little specific information on their oils. Some oils could not be added as they presented no real information other than vague marketing terms. This explains why many EDM users are hesitant to change to a different manufacture or different oil. They have very little information on their current oil and can not make a clear decision on which product would be best for their application. Of course, the sale people selling the oils are, in most cases, just distributors where EDM oil is among the 2000 products they sell. They can read the brochure to you but not really provide any specific information, just marketing terms.

As we investigated the oils for this newsletter we found it confusing and we have been doing this for over 40 years.

We have decided to spend the time and money to develop a comprehensive list of available oils and their TRUE characteristics. Getting past the marketing terms, advertising hype and biased machine tool builder recommendations. Many of those recommendations exist with only the US importers / builder representatives, not the actual machine tool builder.

It is important the EDM users have factual information to base their decision. Our focus is to make you more efficient and knowledgeable, that can't happen unless you have real information.

Let's Get Technical

The structure of the recast layer in sinker EDM work that is formed on steels consists mainly of iron carbides in acicular or globular form, distributed within an austenite matrix, which are independent of the composition of the base material and of the type of the electrode (Copper or Graphite). The increase in carbon content in the recast layer is intrinsically related to the pyrolysis products that follows the cracking of the dielectric and is very confined to the melted and solidified work piece material forming the iron carbides. Due to the very high cooling gradient from the surface into the matrix material, the iron carbides are normally oriented perpendicularly to the surface.

The existence of cracks which start on the white layer and progress in the HAZ. The fundamental cause of cracking lies in the existence of the internal stresses which are created at the time of the machining operation. The surface crack density and the depth of these cracks are directly related to the machining conditions; the more we increase the discharge energy, the more the appearance frequency of these cracks increases. These types of cracking are due to very high temperature, and the phenomena of segregation to solidification, which is due to the enrichment in certain elements, as solidification progresses, and the internal stresses grow. The elements which have a harmful effect on steel and which increase its tendency to cracking are silicon, nickel, sulphur, phosphorus, and carbon. These are influenced by on time, off time and peak current. Lowering these will assist in crack reduction.

CONCLUSION:

The "W*" philosophy of always buy the lower price is costing you money.

Over 35 years, I have watched several companies "save" themselves right out of business.

We have a client that purchased another machine to handle their increased workload. They also buy the cheapest wire they can find. Had they just put a better wire on the existing machines, \$ 175,000 would still be in their pockets and they would have achieved the needed result. The same is true with bad or depleted oils where up to 20% of your efficiency is lost.

Many feel their current EDM process is running OK. "You don't know what you don't know" really comes into play here. They put up with wire breaks, poor finishes, excessive electrode wear, DC arcing and slow machines believing it is part of the EDM process. It is not.

It's kind of like, I thought my bicycle was the greatest mode of transportation – until I got a car. You may think your EDM is working well – but is it or have you just accepted the poor performance?? There is a big difference between value and price.

Call me, I will not sell you anything but let's talk about your EDM process and what issues you don't need to deal with. It's about helping everyone to be competitive.

If you have any question, comments or suggestion; please let me know.

I am available by phone (440) 918-3770 or by email Fredw@edmsupplies.com

All information in regard to specific products was gathered from their respective published information in the public domain. Each company was asked to provide data that they would want included in this newsletter.

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Please send your comments, questions or ideas for future newsletters to Sales@edmsupplies.com