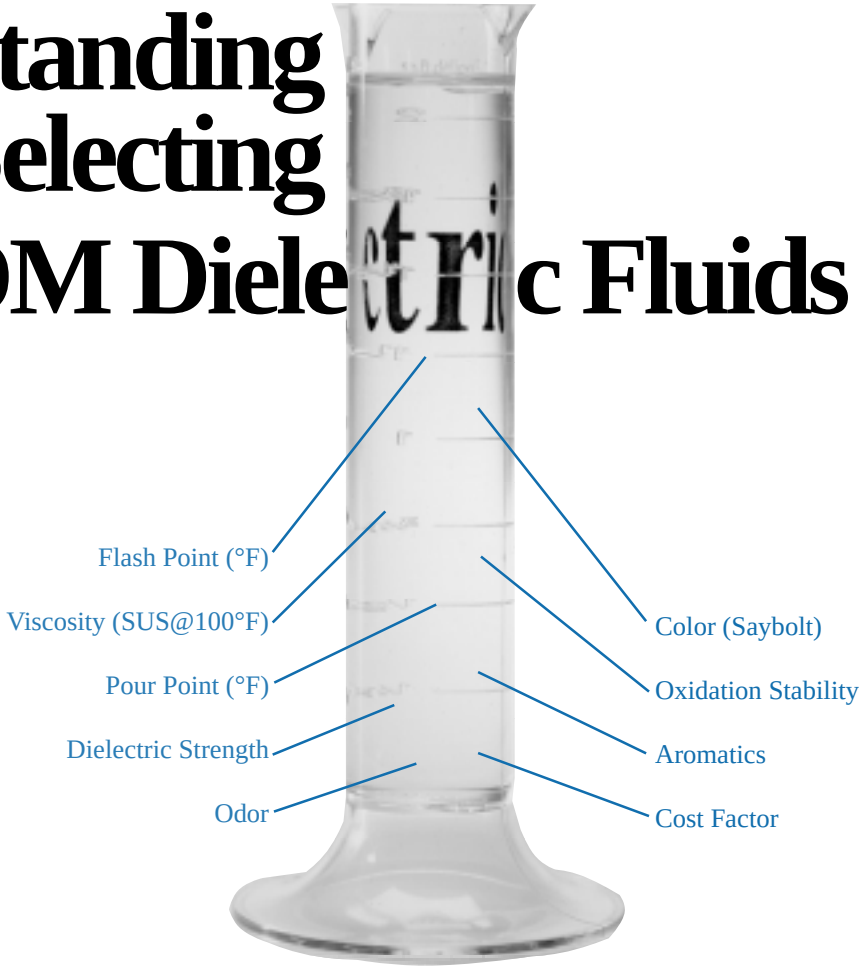
Intech EDM®

A Guide to Understanding and Selecting EDM Dielectric Fluids



A practical guide to understanding and selecting dielectric fluids for sinking EDM machines.

Dielectric fluids specifically designed for sinker EDM machines are a complex, highly refined hydrocarbon (or synthetic) product. There are numerous chemical and physical characteristics which can be used to define and identify each fluid's performance; many of which are meaningful only to chemical engineers and refiners. Making this subject even more difficult is the fact that fluid manufacturers do not all publish the same information on their products, which can make comparison and evaluation quite difficult.

At Intech EDM, we've distilled this information down to 1) identify the key, practical selection criteria, 2) provide you with understandable information, written in layman's terms, to help you make informed buying decisions, and 3) assembled a comparison chart of the popular brands of dielectric fluids in use.

Following is a description of the important characteristics of dielectric fluids, as well as a discussion of some specification terms which, although frequently used, are either irrelevant or refer to information not readily available.

Flash Point (°F)

To some extent, flash point is a measurement of the fluids' volatility, and is the minimum temperature at which a fluid will support momentary combustion (a "flash") when in the presence of an ignition source; but *before it will burn continuously* (its "fire point"). As a rule, the higher the flash point, the safer the working environment.

It's important to understand that this is *not* the temperature at which the fluid can spontaneously ignite – it must be in the presence of a source of ignition.

It should be noted that oil manufacturers normally classify the flash point temperature as a "typical" value, and the published temperature does not necessarily constitute a minimum specification.

Viscosity (SUS@100°F)

Viscosity is the measure of a fluid's resistance to flow. In general, the *lower* the viscosity rating the easier the fluid is to pump and the better its flushing characteristics, particularly in deep cavities or pockets, fine detail work, etc. (although slightly higher viscosities can perform well in some types of roughing operations).

The main tests used for viscosity are Centistokes at 40°C and 100°C, and Saybolt Universal Seconds (SUS) at 100°F, with the latter being the predominant test used in the United States.

The SUS test is done by passing 60 milliliters of fluid at 100°F through a standard size orifice. The number of seconds it takes for that amount of fluid to pass through the orifice is the viscosity of the product, with a lower number indicating the fluid is less "viscous", or freer flowing.

For example, if it takes 34 seconds, the viscosity is said to be 34 SUS@100°F. Normal variations in this procedure result in a range of values, so that a stated SUS viscosity of 34 will probably represent a range of test results from 32 to 35 seconds. Incidentally, viscosities in the range of 30 to 35 seconds are the lowest found among commercially available dielectric fluids.

Pour Point (°F)

Pour point is an indicator of the ability of the fluid to flow freely at cold temperatures, and the temperature given is the lowest at which the fluid will flow. Many dielectric fluids typically become cloudy and more viscous as the temperature approaches their pour point.

Pour point can be an important factor in colder climates if the shop is unheated over the weekends or fluid is stored outdoors or in unheated areas; resulting in the operator having to wait until the fluid warms up before it can be used. Most fluids suffer no lasting effects from being cooled to or below their pour point.

Dielectric Strength

Dielectric strength is a measure of the insulating capacity of a given fluid in an EDM environment. Higher dielectric strength helps minimize DC arcing and is frequently touted as an indicator of overall EDM performance.

However, its value in the selection process is negligible since, as soon as the fluid is used, it becomes contaminated with solids from the EDM process itself, significantly altering its dielectric strength and insulating properties. Since typical high-quality dielectric oils have acceptable dielectric strength ratings, and most manufacturers don't publish this information, we don't consider dielectric strength to be a high priority issue.

Odor

Although the presence of an odor can sometimes indicate excessive evaporation, it is primarily an issue of having an “operator friendly” workplace environment. Most high quality dielectric fluids are either odorless or have a slight but negligible odor.

Color (Saybolt)

The Saybolt color scale is often used to describe the color of EDM dielectric fluids, using numerical values of +30 to -30; with +30 indicating colorless, or water-white, and -30 a lemony, pale yellow color. Similar to odor, color has no particular affect on the function of a dielectric fluid.

Oxidation Stability

Oxidation occurs when oxygen attacks and degrades EDM fluids. The process is accelerated by heat, light, and metal catalysts; and the presence of water, acids and solid contaminants. The higher oxidation stability your EDM fluid has, the longer it will last in your system.

Since the longevity of your fluid is obviously of importance, this would seem to be a significant selection criterion. Unfortunately, the various manufacturers of EDM fluids have not settled on a standardized test of this characteristic and, therefore, the different brands can not be readily compared. However, most higher quality EDM fluids have good oxidation stability; either through the addition of an oxidation inhibitor or by the nature of the base fluid. Notably, this is not true with general mineral seal oils and some fluids not intended for specific use as EDM dielectrics.

In a practical sense, how the user handles the fluid has more to do with its life expectancy. Keeping the system as clean as possible, using better filtration, and maintaining lower operating temperatures are all operational factors which can prolong the life of the fluid.

Aromatics

The health effects of materials handled in the shop have become an increasingly major concern in recent years. Although all EDM fluid suppliers recommend good housekeeping and avoiding prolonged exposure to their fluids, in the real world, many EDM operators do not use protective devices like rubber gloves, masks, and the like.

Some EDM fluids have more of a tendency to cause skin irritation or rashes than others; notably solvent type fluids with a high aromatic content or those that contain certain additives. The Intech EDM fluids we’ve listed in the comparative table have either very low or no aromatic content.

Synthetics

Synthetic fluids are usually esters or polyolefins that are synthesized from chemical feedstocks rather than being refined from oil. These types of fluids have occasional application where very high temperatures or other unusual factors may dictate their use. These applications are fairly rare, and the cost of these synthetics is very high compared to oil-based fluids.

Cost Factor

Obviously, cost is an important factor in the purchase of any product used in the shop. However, it is false economy to attempt to save money by purchasing products which were not formulated to be used as EDM dielectric fluids. The risks of short life expectancy, potential health hazards, and poor dielectric performance simply aren’t worth it.

On the other hand, high cost does not necessarily equate with better performance or higher quality. Intech EDM offers a varied selection of dielectric fluids which are very competitively priced and of unsurpassed quality.

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Summary

To help you in the selection process, Intech EDM has included a comparison table of the popular brands and types of commonly used dielectric fluids. In preparing this comparison, only those selection criteria which are readily available, and deemed useful and significant, were used.

Selecting a high quality fluid, using good operating techniques, and maintaining fluids properly will result in increased efficiency and productivity in your sinking EDM operations.

Key Specifications of Popular Dielectric Fluids

Brands		Flash Point (°F)	Viscosity (SUS @100°F)	Pour Point (°F)
Intech EDM®	Electro 225	225	32–35	–5
	BP 180	180	32–35	–48
	BP 200	195	32–35	–50
	BP 200T*	223	32–35	+27
	Grade 1025*	260	41–44	+45
Commonwealth 244		244	32–35	+45
IonoPlus*		243	37–40	+5
Lector 45		275	43–46	+45
Mineral Seal Oil[1]		210–270	35–45	Varies
Norpar 15[2]		244	32–35	+45
Rustlick EDM 25		175	31–34	–76
Rustlick EDM 30		200	31–34	–76
US 1		244	32–35	+45

* – Synthesized hydrocarbons; not true chemical synthetics.

1 – "Mineral seal" is a generic oil and comes in many different types with widely varying specifications. They generally have low oxidation stability with resultant poor life expectancy. Their color can range from off-white to quite yellow, and they generally have a strong odor.

2 – Norpar 15 lacks an oxidation inhibitor, resulting in low oxidation stability and shorter life. Although frequently used as an EDM dielectric fluid, it was not designed for that application.

Intech EDM® Products

Intech EDM stocks a variety of exceptional dielectric fluids, including the full line of products from BP, the world leader in EDM fluids. The BP range includes fluids of varying flash points and viscosities to suit every application.

In addition, we recently introduced Electro 225, a product of over 3 years of research and development. It is an outstanding dielectric fluid with high flash point, low viscosity, no odor or color, and is exceptionally stable and long-lasting.

Our prices on these high quality fluids are extremely competitive. Call us at **1-800-678-1EDM (1336)** for a price quotation on your requirements.

Intech EDM®

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