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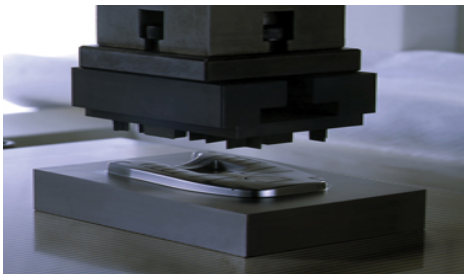

Getting Familiar with Dielectric Oil

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 it 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.

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.

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