



Health, Safety, and Environmental Affairs – The Flammability of Metalworking Fluids

In general, metalworking fluids are highly fire resistant. This is particularly true of those containing water either as part of the formulation (synthetic and semisynthetic coolants and most liquid washing compounds) or with water cutback working solutions. In most situations these types of fluids catch fire only after all of the water contained either in the concentrate or in the working solution has evaporated. This is not to say that “fire issues” are impossible when working with water-soluble products, as they can ignite when reactive metals like magnesium are machined. However, straight oils, EDM, honing oils, and solvent/cut back rust preventatives, are much more prone to fire than are their water-soluble counterparts.

When flash points (the usual way of quantifying the probability of something catching fire) are published for metalworking fluids, it is not the flash point of the fluid in use but rather the fluid as it comes from the drum that is published. When a water-soluble metalworking fluid is diluted with water, the probability of it catching on fire decreases dramatically, while the flash point of straight oils and solvents increases with its use. (The lighter phases of the fluid, the most flammable, tend to evaporate first, so over time the flash point increases.)

It is probably fair to make the following generalizations about metalworking fluids as concentrates (in the drum):

1. MWFs with high oil content, such as soluble oil, create a fire hazard in their drums (have a flash point and represent a fuel load) similar to that found with an equal quantity of lubricating oil.
2. Synthetic and semisynthetic coolant concentrates contain a fair amount of water, so they have a flash point in excess of 212° F (100° C) – the boiling point of water – and require substantial thermal energy input to evaporate all of the water from the product. All of the water must evaporate before the remaining material can “flash.”
3. Water-based or dilutable-liquid parts cleaning and rust preventative fluids also have high water content and therefore have “no flash point to boiling.”
4. Solvent cutback oil or wax-based rust preventatives have relatively low flash points based on the flash point of the solvent diluent. The faster the RP dries and the thinner its residual film, the lower the flash point will tend to be.
5. The lower the viscosity of the cutting and grinding oil, the lower the flash point. Thus EDM, honing, and grinding oils tend



to have lower flash points than hobbing or broaching oils.

There are potentially substantial cost savings of fire insurance premiums with the reduction and management of the “fire fuel load” represented by the oil present in the shop. Your insurance company typically is interested in both the fuel load in drum or bulk storage, and the fuel load in the form of oil on the shop floor. Contact your insurance agent for your policy specifics, then work with your fluid supplier and insurance agent to address the issue to your best advantage.

NOTES:

1. Because of the breadth of the metalworking fluid market and variations of operation and materials, it is impossible to make a single definitive statement about their “in use” flammability, which is why we need all the “qualifiers.”

2. The flash point is the lowest temperature where a fluid gives off enough vapors to be ignited at the surface of the fluid.
3. The auto ignition temperature is the temperature at which materials self-ignite without any obvious source of ignition, such as a spark or flame.
4. Flammable fluids have flash points of 100° F (37.8° C) or less according to OSHA and less than 141° F (60.6° C) according to the Department of Transportation (DOT).
5. Combustible fluids have flash points, greater than 100° F (37.8° C) and less than or equal to 200° F (93.3° C) per OSHA and according to the DOT have flash points between 141° F and 202° F.
6. What is true of soluble oil, semi-synthetic, synthetic or straight oil coolants (metal removal fluids) is equally true of similar stamping, and drawing fluids.
7. Once water has been added to fluid, either to dilute the concentrate, make working solution, or as the solvent or "diluent" that carries the chemistry in synthetic and semisynthetic fluids, the flash point immediately goes to above the boiling point of water (212° F, 100° C).
8. For additional information on the flammability of metal-working fluids, contact: your Master Chemical District Manager or Authorized Distributor, our **Tech Line 800 537-3365** (North America only), or our web site www.masterchemical.com



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