

How Polymeric Anti-Mist Additives Work

Mineral oils, synthetics, semi-synthetics, and water-based fluids are used in formulating metalworking fluids for machining processes to cool the tooling surface, remove metal debris, and provide lubrication during machining. Metalworking operations are very dynamic. The fluid is subject to a variety of stresses that can atomize the fluid thus creating a fine mist. A portion of the mist can consist of very fine droplets of about 5 microns or less. These very fine droplets can remain airborne for long periods before settling out. These droplets can create significant problems related to worker exposure, equipment maintenance and possible fire hazards, especially in the case of mineral oil based mists.

Typically, many industrial plants that do machining operations attempt to control metalworking fluid mists by containment and collection. Collection systems can be very expensive and their efficiency can be limited.

High molecular weight polymeric anti-mist additives in metalworking fluids help to prevent the formation of very fine droplets. Only small amounts, typically as low as 10 ppm, or preferentially, a few hundred ppm to a few tenths of a percent are effective in controlling mist formation. Polyisobutylene (PIB) is one polymer type that is available in molecular weights of about 1 million, is readily available and economical. Other high molecular weight polymers are also available and function in the same manner. In higher concentrations, PIB polymers are very effective tackifiers for industrial lubricants.

Adding very small amount of high molecular weight polymer to a metal working fluid results in an increase in the elongational viscosity but with an insignificant change in shear viscosity. In other words, the fluid elasticity (or tackiness) is increased which increases the average particle size of mist droplets. The increased particle size decreases the number of airborne particles formed and decreases the distance from the machining operation that the particles will fall.

As machining operations, fluid circulation and collection systems return metal working fluid to the machining surfaces, the polymer undergoes mechanical degradation (shear) and as such, the anti-mist performance of the polymer decreases. As a result, polymeric anti-mist additives need to be replenished periodically.

Benefits:

Average mist reductions of 50 to 70% can be observed in metalworking operations. Polyisobutylene (PIB) solutions are inexpensive, non-toxic and have no adverse effects on metalworking properties.

Anti-mist products available:

Download Functional Products Industrial Products Catalog:

<http://www.functionalproducts.com/products/industrial-lubricant-additives/>

Download Functional Products PIB tackifiers Catalog: www.functionalproducts.com/tackifiers