An Evaluation of the Colloidal Stability of Metalworking Fluid

Metalworking fluids are used for cooling, lubrication, and corrosion control in the metal products industry. As of the mid-2000s, many manufacturers were using filtration or centrifugal systems to remove impurities from metalworking fluids to recycle used fluid back into their production line.

Knowing the quality of the metalworking fluid in the recycling system is important for maintaining the machining tools and eliminating metal chips and shavings. Measuring turbidity to calculate the stability of the metalworking fluid is a fast and easy experiment; however, does that test accurately depict the status of the metalworking fluid system?

ISTC's Kishore Rajagopalan and colleagues from the University of Illinois and Texas A&M University experimentally tested three different turbidity methods to see if the models accurately described the true stability of the metalworking fluids.

- Method 1: Estimate the rate of aggregation from the slope of turbidity vs. time curve at a single wavelength in the initial stages of coagulation (most popular method in the literature; **Reerink & Overbeek, 1954**)
- Method 2: Estimate the rate of aggregation from the slope of the wavelength exponent and change in turbidity vs. time (**Reddy & Fogler, 1981**)
- Method 3: Estimate the rate of aggregation from dynamic light scattering measurements to characterize particle size and dispersion stability changes over time (**Tawari et al., 2001**; **Hanus et al., 2001**)

Method 3 was the most accurate for determining colloidal stability. Method 2 was also fairly reliable, but uncertainties in determining the wavelength exponent makes the method less reliable than method 3. Method 1 predicts stability ratios that are orders of magnitude lower than the actual values because of a poor wavelength choice.

Contaminants

Aquatic Plastic Debris

Metals

Metalworking Fluids

A Turbidimetric Method for the Rapid Evaluation of Metalworking Fluids Emulsion Stability

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Development of a Novel Metalworking Fluid Engineered for Use with Microfiltration Recycling

Engineering of Ultrafiltration Equipment in Alkaline Cleaner Applications

Formulation and Testing of a Microfiltration Compatible Synthetic Metalworking Fluid

Impact of Environmental Contaminants on Machining Properties of Metalworking Fluids

Ingredient-Wise Study of Flux Characteristics in the Ceramic Membrane Filtration of Uncontaminated Synthetic Metalworking Fluids

Modeling the Effect of Tramp Oil Contamination on Selective Component Depletion in Metalworking Fluid Systems

Partial Pore Blocking in Microfiltration Recycling of a Semisynthetic Metalworking Fluid

Purification of SemiSynthetic Metalworking Fluids by Microfiltration

The Effect of Chip Adsorption on Selective Depletion from a MultiComponent Synthetic Metalworking Fluid

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