

**MAKE a GIFT**

[About ISTC](#)   [Research](#)   [Technical Assistance](#)   [Resources](#)   [Events](#)

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

Metalworking fluids are an emulsion of oil in water. The emulsion stability goes down with increased hardness ions such as calcium and magnesium. Typical tests for emulsion stability involve the determination of oil losses due to dilution of water with specified hardness over 24 hours. This test is impractical for daily operations and the researchers proposed using a turbidity test that takes only ten minutes. The short time allows for the manufacturers to monitor stability in real time rather than knowing what yesterday's stability was the next day with the standard test.

### How does the turbidity test works?

The test uses a spectrophotometer that emits a known wavelength to determine turbidity of the metalworking fluid. When the metalworking fluid emulsion is hit with the light from the spectrophotometer the turbidity causes the light waves to deflect from the straight path. This deflection produces a numeric value to the turbidity. While turbidity is only a function of the number of particles, it becomes a function of both number and size when turbidity is graphed against wavelength. The turbidity versus wavelength is graphed on a log scale to get a linear slope called the wavelength exponent (function of particle number and size). Several turbidity measurements and wavelength exponent are calculated over a ten minute period. The wavelength exponent is then graphed against time. If the graph of wavelength exponent versus time shows a straight horizontal line then the emulsion is stable, meaning that particle size and number stayed the same over time. However, if the line has a negative slope then the emulsion is not stable. When hardness ions interfere with the emulsion, larger particles form which change the wavelength dependency, thus causing a decrease in the wavelength exponent.

### How does the turbidity test compare to the standard 24 hour test?

The ten minute turbidity test showed the same results as the 24 hour test.

#### Contaminants

[Aquatic Plastic Debris](#)

[Metals](#)

#### Metalworking Fluids

[A Turbidimetric Method for the Rapid Evaluation of Metalworking Fluids Emulsion Stability](#)

[An Evaluation of the Colloidal Stability of Metalworking Fluid](#)

[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](#)

[Per- and Polyfluoroalkyl Substances \(PFASs\)](#)

[Agricultural Chemicals](#)

[PPCPs in the Environment](#)

[PCBs & PBDEs](#)

[Polycyclic Aromatic Hydrocarbons \(PAHs\)](#)

[Energy](#)

[Resource Recovery](#)

[Water](#)

[Instruments & Equipment](#)

[Sponsored Research Program](#)

**Meet the Scientists**

**Kishore Rajagopalan**