

# Formulation and Testing of a Microfiltration Compatible Synthetic Metalworking Fluid

The mid-2000s brought a wave of innovations in the machining industry spurred on by rising costs and environmental impacts of metalworking fluids. One innovation was developed by an ISTC team headed by Kishore Rajagopalan.

A popular technique to reduce the cost of metalworking fluids was to recycle fluid back into the process while removing impurities. A proposed method of the time was to use microfiltration. However, membrane technologies were not compatible with synthetic metalworking fluids, which have a longer service life, higher bacterial growth resistance, and less mist generation. Typically the membranes would foul because either coagulates would physically block the pore space or the metalworking fluid would interact with the membrane, chemically causing blockage.

It was initially thought that no metalworking fluid could be developed to meet industry specifications and be compatible with membranes to use microfiltration to remove contaminants. However, Rajagopalan's team developed a new formula for a metalworking fluid that met both qualifications. Their formulation was very sensitive to trace contaminants; thus the team recommended that care be taken to address these issues during any new metalworking fluid formula.

**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**

**Publications**

**Formulation and testing of a Microfiltration Compatible Synthetic Metalworking Fluid**

**Applicability of Microfiltration for Recycling Semi-Synthetic Metalworking Fluids**