IFPRI

International Fine Particle Research Institute

Research Project Brief

Numerical Modeling of Spray Droplet Formation

The International Fine Particle Research Institute (IFPRI) wishes to fund a research project on numerical modeling of droplet formation in atomization. Atomization is a critical process in many particle processes, and while the underlying physics of droplet formation is understood, quantitative simulation of atomizer performance is not yet possible. The objective of this project is to explore whether recent advances in simulation of complex fluid flows are sufficient to reproduce quantitatively the performance of commercial spray atomizers.

Specifically, the objective of this project is to develop an experimentally validated high-fidelity CFD model for spray atomization that captures both the near field behavior (sheet and filament formation and break up) and the ultimate far-field droplet size distribution. The model should be applicable to atomization of viscous liquids, aqueous and organic, with viscosity up to 1 Pa*s. Consideration of the behavior of non-Newtonian fluids (e.g., shear thinning) is a plus. The project should focus on pressure-driven atomizers (single or two fluid), however other atomizer types can be explored as a stretch goal.