

## IFPRI Research Project Brief

### Atomization Under Industrially-Relevant Conditions

The International Fine Particle Research Institute (IFPRI) wishes to fund a project to investigate the atomization of fluids and slurries under conditions relevant to spray drying. The approach to spray drying varies broadly by industrial application, using several different spray nozzle types and a wide range of operating parameters (mass flow, velocity and pressure), spraying fluids with myriad rheological properties in different chamber conditions (temperature and pressure). Although, there is a large body of literature on spray characteristics, little is focused on comparing sprays at conditions relevant to spray drying industry. The purpose of this research is to map the breadth of spray characteristics for a broad range of industrially relevant fluid systems and operating conditions to enable the selection of a set of nozzles and conditions for a given application. The best choice of nozzle for an application depends in most cases strongly on specifics of the application. For example, it may be critical to limit oversize particles in some application or undersize particles in other. Just focusing on an average particle size, as most of the current correlations do, is rarely sufficient.

More specifically, the project should focus on the spatial variation of droplet size distribution for a variety of nozzle types under a range of operating parameters and fluid rheology. Results should be used to develop a “comparison map” of the different nozzles, identifying their operating range and limitations in terms of quality of atomization, i.e. droplet size distribution, spray pattern, and spray stability.

While the scope of the project should be defined by the PI, IFPRI members come from many industry sectors and therefore utilize a broad range of atomizers and fluids. For this reason, at least two nozzle types and 2-3 different scales should be investigated. Fluids should be selected to span the range fluid rheologies used in spray drying, including Newtonian and non-Newtonian solutions and suspensions over a range of solid fractions.