

## **Experimental Investigation of Flat Fan Spray with Solid Impurities**

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**Abstract** – Controlling the droplet size distribution generated in a spray is critical for a wide spectrum of industrial applications. The current paper investigates experimentally the spray droplets formation with addition of solid impurities with size ranging from 90  $\mu\text{m}$  - 400  $\mu\text{m}$ . The focus is on the effects of solid impurities on planar spray breakup dynamics and resulting droplet size distribution. The experiment was conducted using a standard flat fan Teejet XR 110015 nozzle. The resulting spray lamella sheet and droplets formation are visualized using a digital single-lens reflex camera (DLSR) camera. Results show no hole formation for all tested cases as observed in previous studies with oil droplets or bubbles. Adding increasingly large particles to the spray solution causes the undisturbed lamella sheet area to decrease, especially noticeable for the 400  $\mu\text{m}$  case. The spray centerline breakup length decreases significantly with addition of solid particles especially with 400  $\mu\text{m}$  particles, which may cause the mean droplet size to increase. Such argument is proved to be true based on observation as well as quantitative particle sizing at lower pressure.

**Keywords:** Spray, imaging, solid impurities, breakup, droplet size distribution