

## **The Performance of a Pressure Atomizer with Upstream Flow Obstructions**

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### **Abstract**

The internal flow and the spray of a kerosene simulant formed by a pressure atomizer with an orifice diameter of 1 mm and a length to diameter ratio of 10 were studied at injection pressures between 70 and 5000 kPa. Obstructions to flow were introduced inside the injector to examine their effect on the injector's performance. Visualization of the flow inside the injector indicated that the obstructions caused the flow to cavitate. However, even without any obstruction, cavitation was observed at injection pressures as low as 200 kPa. Four distinct modes of cavitation have been identified, depending on the mass flow rate of fluid through the nozzle and the type of obstruction. Images of the resulting spray indicated that cavitation enhances atomization significantly. The distributions of droplet sizes and velocities in the spray were measured 100 mm downstream of the nozzle face using single-component phase Doppler particle analysis. For a fixed fluid flow rate, the droplet size distribution was found not to be affected by changes in the cavitation pattern.

Key words: Internal flow, Cavitation

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