Abstract Submitted
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Experimental study on the effect of nozzle flexibility on the evolution of a starting liquid jet[1] DAEHYUN CHOI, HYUNGMIN PARK, Seoul National University — Jet flow is universal phenomena in propulsion, cooling, mixing, and coating. Compared to a jet flow issued from a rigid nozzle, the effect of deformable nozzle has not been understood well. The purpose of this study is to characterize how the flexibility of the nozzle affects the evolution of a starting jet. The nozzle shape is thin-walled circular pipe, and is made of silicone rubber. The flexibility of the nozzle is adjusted as stiff, flexible, and highly flexible cases. The piston-motor system generates a starting jet (Reynolds number of 3,000) that accelerates initially and then reaches a constant speed in a time duration of 0.2 seconds. We use 2D particle image velocimetry (PIV), and 3D digital image correlation (DIC) for measuring the velocity field of the water jet and the deformation of the nozzle, respectively. We find that the nozzle experiences a sudden expansion process as the jet evolves, and gain in fluidic impulse is obtained. When the jet reaches a constant velocity, the nozzle exhibits periodic or static movements according to the flexibility, affecting the performance of the jet mixing, which is quantified by the entrainment rate. A discussion of a dimensionless number that governs the jet-flexible nozzle interaction will be finally discussed.

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