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Three-dimensional measurement of the laminar flow field inside a static mixer MICHEL SPEETJENS, RENE JILISEN, PAUL BLOEMEN, Eindhoven University of Technology — Static mixers are widely used in industry for laminar mixing of viscous fluids as e.g. polymers and food stuffs. Moreover, given the similarities in flow regime, static mixers often serve as model for compact mixers for process intensification and even for micro-mixers. This practical relevance has motivated a host of studies on the mixing characteristics of static mixers and their small-scale counterparts. However, these studies are primarily theoretical and numerical. Experimental studies, in contrast, are relatively rare and typically restricted to local 2D flow characteristics or integral quantities (pressure drop, residence-time distributions). The current study concerns 3D measurements on the laminar flow field inside a static mixer using 3D Particle-Tracking Velocimetry (3D-PTV). Key challenges to the 3D-PTV image-processing procedure are the optical distortion and degradation of the particle imagery due to light refraction and reflection caused by the cylindrical boundary and the internal elements. Ways to tackle these challenges are discussed and first successful 3D measurements in an actual industrial static mixer are presented.

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