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Experimental Investigation of Flow and Thermal Patterns in the Rotated Arc Mixer[1] OZGE BASKAN, MICHEL SPEETJENS, Eindhoven University of Technology, GUY METCALFE, Commonwealth Scientific and Industrial Research Organisation, HERMAN CLERCX, Eindhoven University of Technology
— Thermal patterns emerging during the downstream evolution of temperature fields in industrial inline mixers have been studied numerically yet experimental observation remains outstanding. This research concerns a comparative analysis between experimental and numerical studies on the evolution of the temperature fields of a representative configuration, namely the Rotated Arc Mixer (RAM), and its correlation with the flow field. The RAM is an inline mixer that is composed of a stationary inner cylinder with consecutive apertures and a rotating outer cylinder inducing transverse flow at the apertures. Design of the experimental facility is based on a 2D time-periodic simplification of the 3D spatially-periodic RAM, where the cross-sectional progression is represented by the temporal evolution. The setup consists of a circular test section with apertures on the circumference and motor-driven belts imitating the rotating cylinder. Constant circumferential temperature is achieved by an enclosing annular hot-water reservoir. The 2D flow and temperature fields are measured by 2D Particle-Imaging Velocimetry and Infrared Thermography. Preliminary results have exposed a clear correlation between temperature and flow fields: thermal patterns evolve in accordance with the time-periodic flow patterns and become persistent ultimately.

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Ozge Baskan
Eindhoven University of Technology

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