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A flow visualization and volumetric particle-image velocimetry study on low Reynolds number inclined rectangular jets YONG CHUAN KHOO, TSI Instruments Singapore Pte Ltd, TZE HOW NEW, Nanyang Technological University of Singapore, WING LAI, TSI Incorporated — Flow visualizations and three-dimensional volumetric particle image velocimetry measurements were performed on Re=2,500 jets produced by aspect-ratio of three rectangular nozzles inclined at 60° along their major and minor-planes. Results show that persistently inclined azimuthal ring vortices are formed, regardless of the exact incline-plane used. When the nozzle is inclined along its major-plane, these ring vortices undergo rapid realignments which reduce their inclination and coherence. In contrast, they retain their inclination for a significantly further downstream distance when the nozzle is inclined along its minor-plane instead. As such, gross large-scale vortex structures and behaviour are relatively similar to those observed for inclined elliptic nozzles previously. In contrast to inclined elliptic nozzles with no corners, small-scale streamwise vortex structures are produced by the rectangular nozzle sharp corners which hasten the onset of large-scale vortical changes for a faster transition to flow incoherence. These observations indicate that at the present working conditions, inclined jet behaviour is more sensitive towards the redistribution of jet circulation caused by the nozzle inclination, rather than variations between different nozzle base geometries.

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