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Experimental Investigation of Plane Jets Exiting Five Parallel Channels with Large Aspect Ratio

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Abstract : The paper aims to extend the knowledge about jet behavior and jet interaction between five plane unventilated jets with large aspect ratio (AR). The distance between the single plane jets is two times the channel height. The experimental investigation applies 2D Particle Image Velocimetry (PIV) and static pressure measurements. Our study focuses on the influence of two different outlet nozzle geometries (triangular shape with 2 x 7.5° and blunt geometry) with respect to variation of Reynolds number from 5500 - 12000. It is shown that the outlet geometry has a major influence on the jet formation in terms of uniformity of velocity profiles downstream of the sudden expansion. Furthermore, we describe characteristic regions like converging region, merging region and combined region. The triangular outlet geometry generates most uniform velocity distributions in comparison to a blunt outlet nozzle geometry. The blunt outlet geometry shows an unstable behavior where the jets tend to attach to one side of the walls (ceiling) generating a large recirculation region on the opposite side. Static pressure measurements confirm the observation and indicate that the recirculation region is connected to larger pressure drop.

Keywords : 2D particle image velocimetry, parallel jet interaction, pressure drop, sudden expansion
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