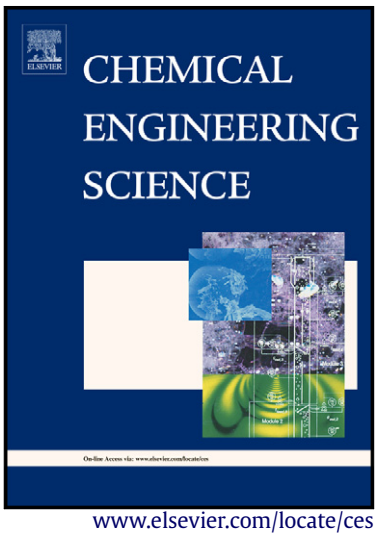


# Vortices evolution in confined laminar radial flow between parallel discs

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**Vortices evolution in confined laminar radial flow between parallel discs**

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ABSTRACT：Using particle image velocimetry (PIV) technique, quantitative flow visualization experiments are conducted to study the formation and evolution of vortex structures in laminar axisymmetric radial flow confined between two parallel discs. In this liquid flow flied, four complicated vortices namely the primary, secondary, tertiary and quaternary vortices are directly observed and characterized quantitatively using PIV for the first time. Effects of inlet Reynolds number ( $Re = 2\rho Q_{in} / \pi\mu R_{in}$ ) and geometrical aspect ratio ($e=H/R_{in}$, 1.7~4) on vortices characteristics are thoroughly investigated by presenting flow velocity vector fields and associated streamline patterns. The vortices number increases from 1 to 4 as *Re* varies from 70 to1280 with $e$=2. The critical Reynolds numbers for the onset of the vortices appearance are confirmed, which increases noticeably as $e$ decreases from 4 to 2. The size of the vortices increases with *Re* increasing (0~1400). The lengths of the primary, secondary and tertiary vortices increase linearly with $e$ varying from 2 to 4. The experimental results provide direct confirmation for reported numerical results and more detailed quantitative characteristics. The results reveal the complexity of the flow field for different Reynolds numbers and geometrical aspect ratios, which can be particularly interesting for the fundamental fluid flow study and many industrial applications involving the confined laminar radial flow.

***Key words*:** Confined radial flow, Flow visualization, Vortices, Parallel discs, PIV

**1. Introduction**

A radial outward flow (or confined radial jet) between two parallel discs is one of the fundamental flows in engineering (Moller, 1963; Raal, 1978) and involved in various industrial applications

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