

Abstract Submitted
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Stability of Flow around a Cylinder in Plane Poiseuille Flow HUA-SHU DOU¹, AN-QING BEN², Zhejiang Sci-Tech University, FLUID MECHANICS RESEARCH TEAM — Simulation of Navier-Stokes equations is carried out to study the stability of flow around a cylinder in plane Poiseuille flow. The energy gradient method is employed to analyze the mechanism of instability of cylinder wake. The ratio of the channel width to the cylinder diameter is 30, and the Reynolds number based on the cylinder diameter and incoming centerline velocity is 26 and 100, respectively. The incoming flow is given as being laminar. It is found that the instability of the cylinder wake, starting near the front stagnation point upstream. The recirculation zone behind the cylinder has no effect on the stability of the wake. In the wake behind the recirculation zone, the flow stability is controlled by the energy gradient in the shear layer along the two sides of the wake. At high Re, the energy gradient of averaged flow in the channel interacts with the wake vortex, strengthening the wake vortex structure. Due to the large ratio of the channel width to the cylinder diameter, the disturbance caused by the cylinder mainly occurs in the vicinity of the centerline and has little effect on the flow near the wall. The velocity profile on the two sides of the cylinder wake in the downstream channel remains laminar (parabolic profile).

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