عنوان مقاله:

Examining the Uniformity of Flow Distribution in Manifolds

محل انتشار:

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خلاصه مقاله:

Flow distribution uniformity in manifolds is important in various engineering applications. In this study, the effect of manifold design on flow distribution is examined using both experimental and numerical methods. A comparison was made between a straight manifold and a gradually decreasing cross-sectional design considering two different inlet diameters. In addition, the staggered manifold case with the most homogeneous outlet was compared with the conical manifold under the same conditions. The results demonstrate that the gradually decreasing manifold design significantly improves the flow rate uniformity compared with the straight manifold. This improvement is achieved by reducing the flow rate differences between the distribution branches, leading to a more balanced fluid distribution. The gradual reduction in the cross-sectional area allows the fluid to traverse at lower velocities in regions with higher resistance, effectively minimizing flow rate discrepancies and pressure drops. In addition, the effect of varying the inlet diameter on flow rate uniformity was investigated, revealing that larger inlet diameters contribute to improved flow distribution. The outlet uniformity of the staggered manifold matches the effective performance of the conical manifold, demonstrating similar performance at a lower cost. The results highlight the importance of designing an appropriate manifold, considering factors such as inlet diameter, channel geometry, and staggered ratio, to achieve efficient and uniform fluid distribution.

کلمات کلیدی:

Hydraulic systems, Manifold, Flow distribution, Numerical simulation, Flow uniformity