

A Numerical Study on the Flow in a Pipe with Perforated Plates

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Abstract : The use of perforated plate and tubes is common in applications such as vehicle exhaust silencers, attenuators in air moving ducts and duct linings in jet engines. Also, perforated plate flow conditioners designed to improve flow distribution upstream of an orifice plate flow meter typically have 50-60% free area but these generally employ a non-uniform distribution of holes of several sizes to encourage the formation of a fully developed pipe flow velocity distribution. In this study, therefore, numerical investigations on the flow characteristics with the various perforated plates have been performed and then compared to the case without a perforated plate. Three different models are adopted such as a flat perforated plate, a convex perforated plate in the direction of the inlet, and a convex perforated plate in the direction of the outlet. Simulation results show that the pressure drop with and without perforated plates are similar each other. However, it can be found that that the different shaped perforated plates influence the velocity contour, flow uniformity index, and location of the fully developed fluid flow. These results can be used as a practical guide to the best design of pipe with the perforated plate.

Keywords : perforated plate, flow uniformity, pipe turbulent flow, CFD (Computational Fluid Dynamics)

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