

Numerical Analysis of the Flow Characteristics Around a Deformable Vortex Generator

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Abstract : Flow structure evolution around a single pair of Delta vortex generators (VGs) is studied numerically. For laminar, transient, and turbulent flow regimes, numerical simulations have been performed in a duct with a pair of Delta vortex generators. The finite element method was used to simulate the flow. To formulate the fluid structure interaction problem, the ALE formulation was used. The aim of this study is to provide a detailed insight into the generation and dissipation of longitudinal vortices over a wide range of flow regimes, including the laminar-turbulent transition. A wide range of parameters has been exploited to describe the induced phenomenon within the flow. We examined various parameters depending on the VG geometry, the flow regime, and the channel geometry. A detailed analysis of the turbulence and wall shear stress properties has been evaluated. The results affirm that there are still optimal values to obtain better performing vortices in order to improve the exchange performance.

Keywords : finite element method, deformable vortex generator, numerical analysis, fluid structure interaction, ALE formulation, turbulent flow

Conference Title : ICTFDFM 2023 : International Conference on Thermodynamics, Fluid Dynamics and Fluid Mechanics

Conference Location : Montreal, Canada

Conference Dates : June 15-16, 2023