

A Counter-flow Vortex Tube With Energy Separation: An Experimental Study and CFD Analysis

Authors : Lizan Mahmood Khorsheed Zangana

Abstract : Experimental and numerical investigations have been carried out to study the mechanism of separation energy and flow phenomena in the counter-flow vortex tube. This manuscript presents a complete comparison between the experimental investigation and CFD analysis. The experimental model tested under different inlet pressures. Three-dimensional numerical modelling using the k- ϵ model. The results show any increase in both cold mass fraction and inlet pressure caused to increase ΔT_c , and the maximum ΔT_c value occurs at $P = 6$ bar. The coefficient of performance (COP) of two important factors in the vortex tube have been evaluated, which ranged from 0.25 to 0.74. The maximum axial velocity is 93, where it occurs at the tube axis close the inlet exit ($Z/L=0.2$). The results showed a good agreement for experimental and numerical analysis.

Keywords : counter flow, vortex tube, computational fluid dynamics analysis, energy separation, experimental study

Conference Title : ICFMTE 2024 : International Conference on Fluid Mechanics and Thermal Engineering

Conference Location : London, United Kingdom

Conference Dates : March 11-12, 2024