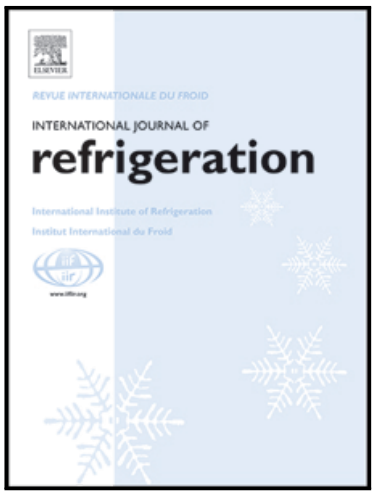

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A Geometric Model for a Vortex Tube Based on Numerical Analysis to Reduce the Effect of Nozzle Number

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Highlights

- The differences between the models are related to the shape and size of the vortexes
- The results confirm that the new model reduces the effect of the number of nozzles
- The new model increases the cooling performance of the vortex tube
- The new model decays the differences raised from the numbers of nozzles by about 80%

Abstract

A vortex tube is a simple device with an interesting role and different industrial applications, and it contains one or more tangential inlets and two outlets. It has been most commonly used as a spot cooling device in the industry. High-pressure compressible gas, usually air, enters the vortex tube from the inlet nozzles and leaves its form the cold and hot outlets at lower and higher temperatures, respectively than the inlet flow. This fluid enters the vortex tube through one or more nozzles and produces a cold vortex flow parallel to the axis and a hot vortex flow alongside the wall. The previous results show that the number of nozzles has essential roles in the performance of the vortex tube. However, in the present study, by investigating the nozzles roles, a circular model is introduced and examined numerically for reducing the effect of the number of nozzles. The results confirm that the model tested is properly reduced by the effect of nozzle number.

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