

Experimental studies of a Ranque-Hilsch vortex tube

Abstract

Vortex tube is a device that separates a compressed flow of gas into two streams simultaneously, one giving kinetic energy to the other, resulting one hotter than the inlet temperature and one lower, without having any moving part. This research focuses on investigating the effects of various physical parameters on the performance of the vortex tube, namely cold nozzle diameter, length of the tube, and air mass flow rate at the hot end of the tube. In general, there are two major design features associated with the vortex tube, namely (a) maximum temperature differentials in vortex tube to produce small amount of air with very low and very high temperatures, and (b) maximum cooling/heating effect by producing large quantity of air with moderate temperatures. By considering the experimental results, an optimized set of parameters that contribute to the most efficient vortex tube design would be proposed depending on the desired design features.

Keywords — Vortex tube, experimental studies, parametric studies, optimization