

## Cfd analysis of vortex tube

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### ABSTRACT

The vortex tube is a simple device used by many industries to produce cold and hot air streams at the same time from a single compressed air source with no external energy source or chemical reactions. By applying various inlet pressure, we can obtain different temperatures from the outlets of the vortex tube. In this CFD analysis, the Ranque-Hilsch Vortex Tube (RHVT) performance has been carried out using 3D Experience to examine the situation in which the vortex tube emits air of 0°C from the cold outlet and 40°C from the hot outlet. For this purpose, we took six 3D models with six different openings and applied 6 different pressures in each of the models resulting in 36 different instances.

**KEY WORDS:** Ranque-Hilsch Vortex Tube, CFD Analysis, 3D Experience, Compressed Air.

### INTRODUCTION

Cooling is the practical application of thermodynamics, where heat is transported by the refrigerant, a working fluid from the low temp to the high-temperature region. However, the refrigerants that have been used are the basis of environmental issues such as the loss of ozone and global warming. The vortex tube is one of the non-conventional systems for using air to act as a refrigerant [1]. The Vortex Tube is a cost-effective solution for a wide variety of cooling and manufacturing uses for industrial spots [2]. It is a compact pneumatic product with no moving parts intended to separate regular compressed air into the cold and hot air stream. They are completely operated by compressed air, reducing the need for toxic refrigerant or freon gases.

### WORKING OF VORTEX TUBE

The Ranque-Hilsch vortex tube is a mechanical system that acts as a refrigerator without moving components, by splitting the compressed gas stream into a low and high-temperature area. Such a division of the flow into low- and high-temperature regions is known as the separation effect of temperature (or energy) [3]. It consists of a nozzle, diaphragm, valve, hot-air side and a cold-air side.