

A Review on Vortex Tube Refrigeration System

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Abstract- The vortex tube, also known as the Ranque-Hilsch vortex tube, is a mechanical device that separates a compressed gas into hot and cold streams. Pressurized gas is injected tangentially into a swirl chamber and accelerated to a high rate of rotation. Due to the conical nozzle at the end of the tube, only the outer shell of the compressed gas is allowed to escape at that end. The remainder of the gas is forced to return in an inner vortex of reduced diameter within the outer vortex. Main factors lead to cooling is the size of diameter tube with material used, length of tube and most important one is the compressed air pressure. Review says that as the compressed pressure increases you get the greater difference in cooling with material used as PVC as compared to copper.

Index Terms- Vortex tube, material, compressed air, cooling.

I. INTRODUCTION

The vortex tube, also known as the Ranque-Hilsch vortex tube, is a mechanical device that separates a compressed gas into hot and cold streams. The gas emerging from the "hot" end can reach temperatures of 200 °C, and the gas emerging from the "cold end" can reach -50 °C It has no moving parts. Pressurized gas is injected tangentially into a swirl chamber and accelerated to a high rate of rotation. Due to the conical nozzle at the end of the tube, only the outer shell of the compressed gas is allowed to escape at that end. The remainder of the gas is forced to return in an inner vortex of reduced diameter within the outer vortex.

It is one of the non-conventional type refrigerating systems for the production of refrigeration. The schematic diagram of vortex tube is shown in the Fig.

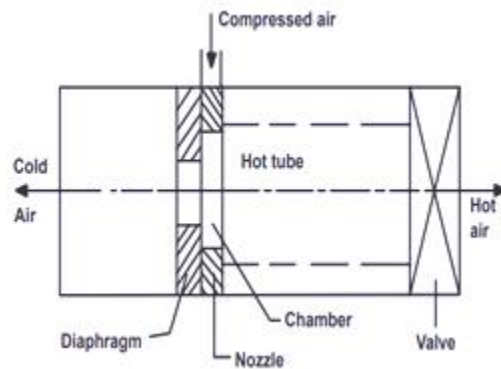


Fig: Vortex Tube Refrigeration

II. LITERATURE REVIEW

- 1) Kartik S., An Experimental Setup of Vortex Tube Refrigeration System, IJERT, Volume 4 Issue 3, March 15. In this paper study has done on temperature difference which conclude that as pressure increases temperature decreases.
- 2) Ratnesh Sahu, Rohit Bhadoria, Deepak Patel, Performance Analysis of a Vortex Tube by using Compressed Air, IJSER, Volume 3, Issue 9, Sept. 2012. In this paper COP has been calculated with different pressure and valve opening conditions.
- 3) Y.T. Wu, Y. Ding, Modification and experimental research on vortex tube, Science Direct, International Journal of Refrigeration 30 (2007) 1042e1049. In this paper the performance of vortex tube has been improved by designing the diffuser and a new kind of nozzle with equal gradient of Mach number is used.
- 4) Sarath Sasi, Sreejith M, Experimental Investigation of Vortex Tube Refrigeration, International Journal of Emerging Engineering Research and Technology, Volume 2, Issue 6,

September 2014, PP 176-186. The paper concludes that investigation on the vortex tube by changing different variable such as nozzle numbers, vortex tube material, different cone angles, different mass fraction carried out to see the performance.

- 6) Pramod Bajarang Vhankade, Design and Manufacturing of Vortex Tube, International Journal of Science and Research (IJSR), ISSN (Online): 2319-7064. The results has been calculated by using different length of hot end side with different diameters.

III.WORKING

Compresses air is entered into the system as shown in figure. The air is expands with a particular shape (tube) given to system with vortex flow created inside the tube and travels in a spiral like motion and leaves the hot air. The flow is restricted by the knob provided at the hot end side and reversed air is flowed into the system and again air expands in the tube and we get the cold air at other side of the tube. The controlling of air is done by the valve provided at the start of compressed air, hence we can controlled both hot and cold air.

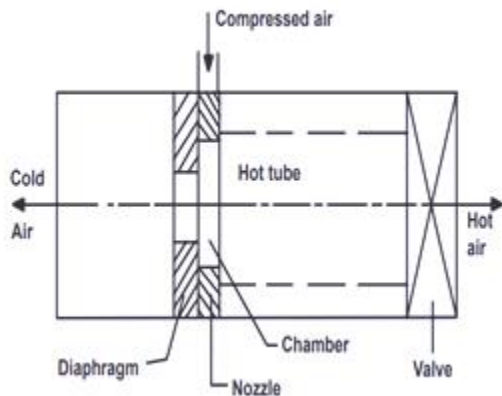


Fig: Vortex Tube Refrigeration

IV. CONCLUSION

The various study has been done on vortex tube refrigeration to improve the performance by changing the diameter of hot end, by using the different pressures, by using the various materials such as PVC, copper etc., changing orifice diameter,

changing the velocity of air flow. If the focus made on how less costly if we get the compressed air it will be really a good refrigeration system with almost no refrigeration cost.

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