EXPERIMENTS AND NUMERICAL STUDY SPOT COOLING USING TUBE VORTEX (EFFECT OF PRESSURE ON THE TEMPERATURE OUTLET)

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ABSTRACT

Vortex tube is a device that produces hot and cold air from compressed air. In this study, the experimental works are conducted with different pressure inlet from 2.5 to 5 Bars. This device consists of several parts, among others: one or more inlet nozzles, vortex chamber, the orifice in the cold air pipe, the valve in the hot air pipe.

The purpose of this research was to study the flow field inside the vortex tube. By using Fluent CFD and RNG turbulence model, the analysis includes flow field flow pattern, axial velocity distribution, the total velocity, the distribution of static pressure and total pressure, total temperature distribution. These results will be validated by the results of measurements of total temperature through experimentation.

Experimental results show the difference between cold outlet temperature (10.5 °C) and heat outlet temperature (45 °C) measured by the pressure of 5 bar entrance. While the computational results indicate the presence of back-flow region (flow reversal) in the vortex tube, which causes the separation of energy and changes in the velocity distribution, temperature, pressure and density as well.

Keyword: vortex, swirling flow field, the magnitude of velocity, total-temperature distribution