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## CFD ANALYSIS FOR FINDING AXIAL THERMAL CONDUCTION EFFECT IN CRYOGENIC 2 - STREAM COUNTER FLOW PLATE FIN HEAT EXCHANGER

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### Content :

Thermal effectiveness of heat exchangers, used in the process cycle, is one of the important parameters which decide the efficiency of helium refrigerator/liquefier (HRL). To achieve high effectiveness, it is necessary to use plate-fin heat exchangers, which provides very high heat transfer surface area per unit volume of heat exchanger. Such heat exchangers also have benefit of low pressure drop of fluid flowing through it. These cryogenic heat exchangers will be placed within a vacuum chamber having vacuum of about 10-5 mbar and hence compact heat exchangers are preferred to reduce the size and cost of the vacuum chamber. Due to the compactness in size, there is axial heat conduction through aluminium metal medium from higher to lower temperature. This paper will discuss the CFD (Computational Fluid Dynamics) analysis for axial conduction effect in 2-stream counter-flow plate-fin heat exchanger, which will operate in the temperature zone 300 to -90 K. In this temperature zone, minor property variations in the helium fluid will be there, which will be accounted in this CFD analysis. It has 2 streams (He/He) in counter flow configuration. These 2 streams of helium are at 2 different pressure: high pressure (HP) helium gas stream of ~ 14 bar coming from the compressor system and the low pressure (LP) helium stream of ~1 bar. This analysis in CFD will take into account of fluid and material property variations and actual complex fin configurations used in the design.

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