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FINDING HEAT TRANSFER FOR LOW TEMPERATURE HELIUM FLOW THROUGH PLATE-FIN HEAT EXCHANGER USING CFD SOFTWARE

Content :

In the present study design and analysis of pate fin heat exchanger operating between 7 to 4.5 K is done using CFD (computational fluid dynamics) ANSYS Fluent. In this temperature zone, there is large non-linear property variations in the helium fluid which will be accounted in the CFD analysis. Serrated type plate-fin heat exchangers are good for high heat transfer coefficients due to high turbulence. But the serrated type gives larger pressure drop than that of other types. These can be used suitably for helium plant application, where high thermal effectiveness is important, but at the design phase it should be ensured that pressure drop is not high and it should be about few tens of mbar. The present analysis has been done to find heat transfer co-efficient for a segment of plate-fin exchanger of helium plant considering empirical co-relations of Manglik and Bergles and CFD software. This heat exchanger is designed for 2-stream counter-flow configuration with serrated fins and for operation with temperature range between 7 to 4.5 K, at pressure 4 bar for hot helium stream and 1.2 bar for cold helium stream. Serrated fins of thickness 0.2 mm, has been used. Calculated heat transfer co-efficient, based on empirical co-relations, for this heat exchanger for both streams is compared with CFD analysis results. Paper will also include modeling and meshing of Plate fin heat exchanger, finding heat transfer in the chosen configuration. This analysis is done using Computational Fluid Dynamics(CFD) code ANSYS Fluent 15. For offset fins configuration, turbulence model with standard k -ε method has been used. The velocity-pressure coupling schemes such as SIMPLE with second order up winding method have been adopted to carry out the simulations.

Primary authors : Ms. SHAH, BV (Bhakti Consultancy, Gandhinagar, Gujarat)

Co-authors : Mr. SAHU, AK (Institute for Plasma Research, Bhat, Gandhinagar, Gujarat) ; Dr. JAIN, SV (Institute of Technology, Nirma University, Ahmedabad, India) ; Dr. SHARM, P (Indus University, Ahmedabad, India)

Presenter : Ms. SHAH, BV (Bhakti Consultancy, Gandhinagar, Gujarat)

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