

# 26th National Symposium on Cryogenics and Superconductivity

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## Design and development of LN2 subcooler for TIFR Mumbai

### Content :

Low temperature facility of Tata Institute of fundamental Research Mumbai provides liquid helium & nitrogen along with the various support services to various facilities & laboratories within the institute. Liquid nitrogen at 4 bar pressure is supplied through a 310 meters long vacuum jacketed and super-insulated pipeline to the Pelletron LINAC Facility. While passing through pipe, properties of liquid nitrogen changes due to various losses and heat in leaks. In order to meet the required properties at receiving end, a suitable helical coil & bath type Liquid Nitrogen Sub-cooler is designed. The operating parameters of this sub-cooler will handle liquid nitrogen at 2 bar pressure with the quality factor of about 0.25 is sub-cooled by using liquid nitrogen bath at 1 bar pressure & 77.34 K temperature. Helical coiled heat-exchanger is used in order to obtain a large heat transfer area per unit volume and to enhance the heat transfer coefficient on the inside surface. Heat load, coil length & pressure drop calculations are done to estimate the theoretical values using heat & mass transfer as well as fluid mechanics principles and numerical correlations. This paper also deals with the CFD simulation of helical coiled tubular heat-exchanger used for two-phase liquid Nitrogen at 2 bar pressure flowing in turbulent region under constant wall temperature conditions.

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