

# 26th National Symposium on Cryogenics and Superconductivity

Contribution ID : 65

## Design, Analysis and Fabrication of Liquid Nitrogen Transfer-line.

### Content :

A double walled pipeline has been designed and analyzed to transfer liquid nitrogen (LN<sub>2</sub>) from a dispensing truck to a storage tank at a distance of 10 meters.

### Summary :

Inner rigid pipe has flexible sections made of bellows to accommodate the expansion due to thermal stresses. The selection of materials was conducted by considering mechanical and thermal properties across the temperature gradient. The pipe thickness was designed for sustaining a pressure of 15-20 MPa. Layer-by-Layer Method was applied to analyze the heat transfer across the Multilayer Insulation (MLI) in the annular space between the inner and the outer pipes. The optimum number of layers of insulation was ascertained using MATLAB and was found to be 50 layers with a vacuum of 10<sup>-10</sup> MPa leading to a heat leak of 0.6514 W/m<sup>2</sup>. This was verified using CAE software (ANSYS). The shape and placement of G10 Garolite material spacers used to support and maintain concentricity of the inner pipe with respect to the outer pipe was also optimized. Heat leak was minimized at the bend and the butt joint at the end of the pipe by careful design.

Primary authors : Prof. TRIMBAKE, Amol (Vishwakarma Institute of Information Technology, S. No. 2/3/4, Kondhwa(Bk), Pune-411048, India) ; Mr. SAIGIRIDHARI, Anurag (Vishwakarma Institute of Information Technology, S. No. 2/3/4, Kondhwa(Bk), Pune-411048, India) ; Mr. SAYYED, Arsalan (Vishwakarma Institute of Information Technology, S. No. 2/3/4, Kondhwa(Bk), Pune-411048, India) ; Mr. SATHE, Chinmay (Vishwakarma Institute of Information Technology, S. No. 2/3/4, Kondhwa(Bk), Pune-411048, India) ; Mr. LADDHA, Yashwardhan (Vishwakarma Institute of Information Technology, S. No. 2/3/4, Kondhwa(Bk), Pune-411048, India)

Co-authors : Dr. GARDE, Chandrashekhar (Vishwakarma Institute of Information Technology, S. No. 2/3/4, Kondhwa(Bk), Pune-411048, India) ; Mr. SRINIVASAN, K.V. (Tata Institute of Fundamental Research, Homi Bhabha Road, Mumbai-400005, India)

Presenter : Mr. SAIGIRIDHARI, Anurag (Vishwakarma Institute of Information Technology, S. No. 2/3/4, Kondhwa(Bk), Pune-411048, India) ; Mr. SAYYED, Arsalan (Vishwakarma Institute of Information Technology, S. No. 2/3/4, Kondhwa(Bk), Pune-411048, India) ; Mr. SATHE, Chinmay (Vishwakarma Institute of Information Technology, S. No. 2/3/4, Kondhwa(Bk), Pune-411048, India) ; Mr. LADDHA, Yashwardhan (Vishwakarma Institute of Information Technology, S. No. 2/3/4, Kondhwa(Bk), Pune-411048, India)

Technology, S. No. 2/3/4, Kondhwa(Bk), Pune-411048, India)

Session classification : Poster Session 1: Abstract ID

1,2,3,8,9,15,16,21,23,25,27,28,29,30,42,44,46,47,49,50,51,58,61,65,79,81,82,87,96,97,98,  
106,126,130,189

Track classification : Cryogenics Storage and transfer lines / Space Research / Cryogenic Test & Test  
Facilities

Type : --not specified--