

# 26th National Symposium on Cryogenics and Superconductivity

Contribution ID : 57

## Design of Nitrogen Cryolines for ITER

Thursday 23 Feb 2017 at 13:15 (00h15')

### Content :

The ITER Cryogenic system is essentially one of the most complex systems in the world. This system consists of helium and nitrogen cold boxes for generating the required cold temperatures of helium and nitrogen respectively. These cryogens are carried by cryogenic transfer lines from cold power source to applications. These cryogenic transfer lines are of about 5 km in length having complex geometry (considering bends, angles, branches, etc.) and stringent criteria for design. The ITER cryolines are presently under preliminary or final design phases except the nitrogen lines which are under manufacturing phase after successful completion of final design.

These nitrogen cryolines have length of around 600 m with pipe in pipe geometry and diameters of these process pipes ranging from DN 15 to DN 250 with outer vacuum jacket ranging from DN50 to DN400. These nitrogen lines are intended for transferring (i) liquid nitrogen from nitrogen cold boxes to storage areas, from storages to various applications (ii) cold nitrogen gas from applications back to the nitrogen cold boxes. The sizing of these nitrogen lines has been optimized based on the available pressure drop limit. In order to meet the specification of heat load as '2 W/m', the design of internal components such as internal sliding spacers, fix spacers has been performed and layers of multi-layer insulation (MLI) have been calculated accordingly. The paper describes the major input data, constraints for design of nitrogen lines, their design & analysis approach and major outcome.

Primary authors : Mr. CHOUKEKAR, Ketan (ITER-INDIA, IPR)

Co-authors : Mr. SHAH, Nitin (ITER-INDIA, IPR) ; Mr. PANJWANI, Rajkumar (Inox India Private Limited) ; Mr. BADGUJAR, Satish (ITER Organization) ; Mr. GRILLOT, David (ITER Organization) ; Dr. SARKAR, Biswanath (ITER Organization) ; Mr. KAPOOR, Himanshu (ITER-INDIA, IPR) ; Mr. JADON, Mohit (ITER-INDIA, IPR) ; Mr. KUMAR, Uday (ITER-INDIA, IPR) ; Mr. BHATTACHARYA, Ritendra (ITER-INDIA, IPR) ; Mrs. JOSHI, Bhumika (Inox India Private Limited) ; Mr. GEHANI, Vijay (Inox India Private Limited) ; Mr. KANZARIA, Hiren (Inox India Private Limited) ; Mr. VYAS, Hardik (Inox India Private Limited)

Presenter : Mr. CHOUKEKAR, Ketan (ITER-INDIA, IPR)

Session classification : Technical Session 5

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

Type : Contributory Talk