

# Seminar

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## Institute for Plasma Research

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**Title :** Realization of the Cryoline System for ITER

**Speaker :** Mr. Satish Badgujar  
ITER Organization, France

**Date :** 29<sup>th</sup> April 2016 (Friday)

**Time :** 03.30 PM

**Venue :** Seminar Hall, IPR

### **Abstract:**

The large cryogenic system at ITER is essential to guarantee the stable operation of the large Superconducting magnets and Cryopumps. The system of Cryodistribution and Cryolines (CL); in-kind supply from India, is an integral interface between the Cryoplant and the SC magnets as well as CPs. The ITER CL system consists of a complex network of vacuum insulated multi and single process pipe (PP) lines distributed over three different areas at ITER site with a total length of about 5 km. The conceptual design of the CLs has been completed during early 2010. The routing of the CLs is very complex with large number of bends at odd angles, branches to the users and tight positional tolerances due to limited space availability, specifically inside the Tokamak building. The CLs demand very high availability and reliability which is ensured via extensive technical specifications along with stringent design, fabrication, inspection and quality control, safety and regulatory requirements in addition to very demanding loads specification. The installation of these CLs in the Tokamak building is a very challenging and highly integrated task due to the presence of many equipment in the vicinity.

The integration of all the systems together is the basic and foremost challenge, as procurements of the sub-systems are made by different agencies. The system engineering approach was employed to manage the internal interface risks. The project and technical risk analysis at an early stage of the project ensured smooth take-off.

The conceptualization of the CL project in ITER-India, IPR started during early 2006 and has evolved since then. The procurement of the system of CLs started in the year 2010, followed by design of prototype CL and its acceptance, a basis then to follow and select the technically qualified bidders. The activity of the design of prototype CL benefited on over all understanding of not only the project team, but the industrial partners as well, further mitigating the risks. The CLs are grouped in to two main groups; X: complex cryolines (from 4 to 7 PP) and Y: relatively simpler cryolines (maximum 3 PP), for procurement, project execution and schedule control.

The talk describes the specificities on the technical, contract and project management where a highly coordinated activities and management are required as well as technical progress made so far for the ITER CL system.