

Seminar

Institute for Plasma Research

Title : Thermo-Structural Analysis of SST-1 Cryopump

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Date : 6th March 2019 (Wednesday)

Time : 10:30 AM

Venue : Committee Room 4, (New Building), IPR

Abstract :

Cryopumping refers to the use of cryogenic temperatures ($<123\text{K}$) to produce vacuum in enclosed space. Concept of cryoadsorption cryopump uses advantage of porosity exhibited by forms of activated carbon and cooled to cryogenic temperatures. Across the globe cryopumps are used in various machines like DIII-D, JET, W7-X, ITER and SST-1. Cryoadsorption cryopump gives immensely large pumping speed and has number of advantages like clean vacuum i.e., free from contamination of hydrocarbons. In SST-1, volume of vacuum vessel including radial ports, vertical ports and pumping ducts is ~ 23 m³. To achieve a vacuum level of $\sim 1 \times 10^{-7}$ mbar in the vacuum vessel of SST-1 machine, baking at 2500C is done which results in increase load of the water vapor and hydrogen in vacuum vessel but resultant speed of available TMPs and Cryopumps is less to handle water vapor gas load. So, liquid nitrogen based sorption cryopump is designed for the pumping of water vapor. For condensing water vapor, cryosurface temperature of $<150\text{K}$ is required. For an efficient pumping performance of the cryopump, temperature profile of the different components was studied using thermal analysis. For a reliable operation of the pump design, thermo-structural analysis was carried out to locate the critical location of the stresses. Necessary modifications were suggested in this cryopump to perform efficiently without any failure.
