

Cool down analysis of 80K Cryopump

Abstract

LIVISTA facility at IPR consist of a large size 80K Cryopump. The main component of this Cryopump is a reservoir filled with liquid nitrogen (LN2) at 80K inside the vacuum chamber. The 80K Cryopump is mainly comprised of SS cylindrical vessel (Inner diameter 2m and length 5.3m), Al annular reservoir (Inner diameter 1.3 m of 16 mm thk , outer diameter 1.5m of 12.7 mm thk and length 3.7m) and Al passive thermal shield (diameter 2m and length 4m). Volumetric capacity of the LN2 reservoir is ~ 0.8 m³ and the mass is ~ 1350kg. The LN2 reservoir of the 80K Cryopump system removes the heat transferred due to radiation, conduction and accumulation of condensate on the surfaces of Cryopump.

The amount of liquid nitrogen and rate of cool down required to cool the Cryopump from room temperature is significant importance from induction of generated stress. During the cooled down phase, different physical phenomena including film boiling, transition boiling, two?phase pressure drops, back pressure generation and induction of thermal stresses occurs. The focus of this project is quantitative estimate the amount of LN2 required to cool down the 80K Cryopump and uncertainties involved.

This project also includes the literature survey, understanding and utilization of standard software's, analytical calculation, design iterations and report preparation.

Academic Project Requirements:

1) **Required No. of student(s) for academic project: 2**

2) **Name of course with branch/discipline: B.E./B.Tech. Mechanical Engineering**

3) **Academic Project duration:**

(a) **Total academic project duration: 16 Weeks**

(b) **Student's presence at IPR for academic project work: 4 Full working Days per week**

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