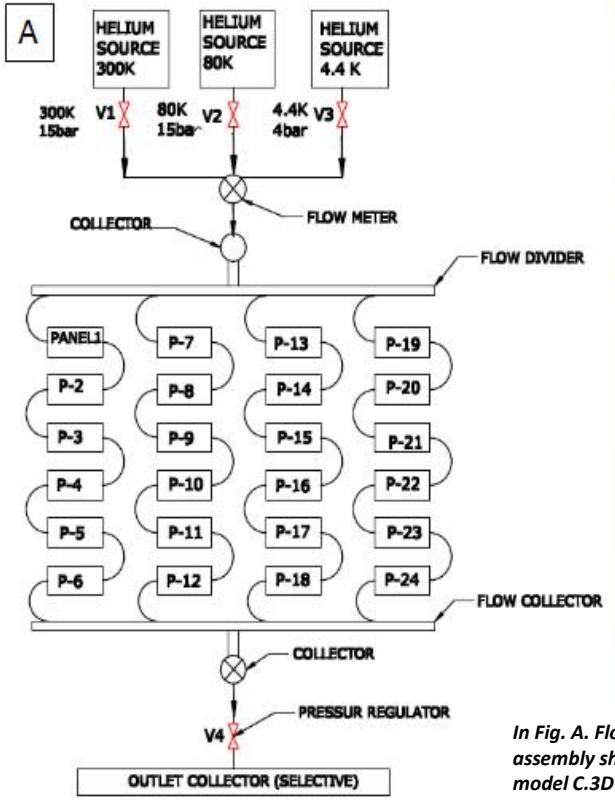
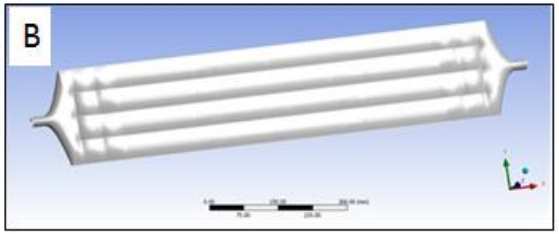
Thermo-hydraulic Analysis Of Forced Flow Helium Cooled Cryopanels Of Cryopump Using Venecia Code

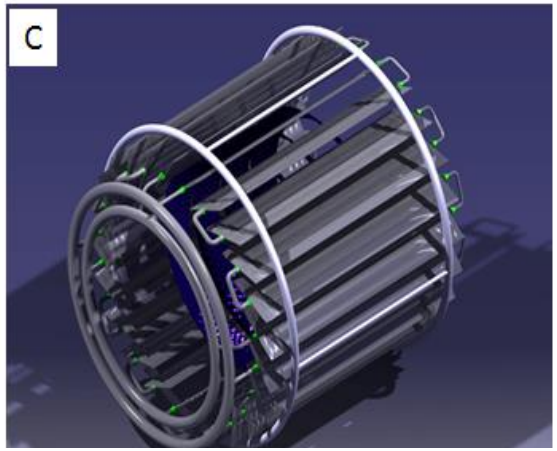
FIP/P3-50

Objective:

- Institute for Plasma Research (IPR) is working for the development of the technologies in national level relevant to nuclear fusion that will lead us to build fusion power reactors in near future.
- Design and analysis for 24-panel cryopump with expecting pumping speed greater than 50,000 litres per second is on-going at IPR.
- Understanding the cryopump operational behaviour is one of the major challenges to get the steady state operation of the cryopump and its regeneration







In Fig. A. Flow diagram of the cooling scheme for cryopump panel assembly showing different inlet supply arrangements B. Cryopanel CAD model C.3D CAD model of the cryopanel assembly of 24 panels with flow connectors and headers

Summary of results

In the present work, complete operational cycle of the cryopump has been analysed. The results shows required cool down for 300K to 80K is 190 seconds and for 80K to 4.4 K cool down it is 30 second for helium mass flow of 110 gm/s and 400 gm/s (max.). Whereas for the warm up or regeneration for 4.4K to 80K it takes 70 seconds and for 80K to 300K warm up it takes 280 seconds when the mass flow is considered 140 gm/s and ~75 gm/s respectively.

Deliverable

- In the present study, cool-down and warm up schemes of the cryopump is analysed.
- Based on the studies carried out all the cryogen supply system will be modulated to offer the best suitable flow conditions. Actual operational conditions will be monitored during the experimental testing of the cryopump system.