

Development of a Prototype system for PETC.

P. Kalyan reddy, K. Durga Prasad, K. Janmejy Kumar, Varun Sheel, S.A. Haider, Anil
Bharadwaj

Physical Research Laboratory, Ahmedabad

Corresponding author: kalyanreddy@prl.res.in

As a part of our Indian Space programme, several inter-planetary missions have been planned in the years to come. Few such ambitious projects in line are the missions to Mars and Venus containing instruments aimed at understanding the planetary atmospheres. In the view of these upcoming missions and many more to come, it is planned to establish a test facility at PRL that can simulate the atmospheric compositions of the destined planets. This exclusive Planetary Environmental Test Chamber (PETC) will not only serve as a test bed for examining the survivability and performance of the instruments for such missions but also can provide first hand inputs for their fine-tuning during the developmental phase. The establishment of a new chamber for simulating Venus environment is envisaged because the chambers that are existing as of now are essentially thermo-vacuum chambers and these cannot be modified to operate for environmental simulations. The environments to be simulated may sometimes contains gases that are toxic and destroy the normal pumping systems used in the thermo-Vacuum chambers. Thus a custom made chamber for the simulations of this corrosive environment is inevitable. The engineering challenges to contain an acidic as well as a corrosive environment involves selection of suitable material for pumps to handle the traces of the corrosive gases. Design and selection of chamber material, creating a desired composition of gases and holding the composition within the permissible limits, designing a thermal circuit to maintain the required temperatures within the chamber, introducing the corrosive and acidic gases in trace levels and condensing them when required are some of the challenges to be addressed in the development of this chamber. As a startup activity for the PETC, we have indigenously built a cylindrical prototype chamber of 40 cm diameter and 50 cm length as a test case. The mixing system for gases and thermal circuit for temperature maintenance are being developed for this test chamber as a proof of concept for the upcoming chamber. Details of the design criteria of this chamber and its sub-systems and its initial performance evaluation experiments will be discussed.