

SEMINAR ANNOUNCEMENT

Analysis of a Thermodynamic Vent System for long-duration space missions

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Abstract

A technological barrier for long duration space missions using cryogenic propulsion is the control of the propellant tank self-pressurization. Since the cryogenic propellant submitted to undesired heat loads tends to vaporize, the resulting pressure rise must be controlled to prevent storage failure. The Thermodynamic Vent System (TVS) is one of the possible control strategies. It is currently investigated at LEGI (Grenoble), in collaboration with LMFA (Lyon), using a combined experimental and numerical approach, with on-ground experiments performed using a simulant fluid around room temperature. Previous experiments performed in the literature have reported difficulties to manage the thermal boundary conditions at the tank wall, with spurious thermal effects induced by the tank environment spoiling the tank power balance accuracy. The presentation will explain how an improved apparatus has been designed to achieve quasi-adiabatic wall conditions. Some self-pressurization and TVS control experiments will be presented and commented. The presentation will also include the optimization of a TVS system based on a 0D time-dependent thermodynamic model and an analysis of the main features characterizing the optimal designs. The presentation will be concluded with a discussion on the requirements of a CFD solver for achieving predictive simulations of TVS performance for actual space mission conditions.

Friday, the 29th of January, 2016 at 10.30.

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