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STUDY ON THE FLOW COEFFICIENT RELATION BETWEEN HELIUM AND NITROGEN OF ORIFICE PLATE USED IN ROCKET PRESSURIZATION SYSTEM

Abstract

Pressurization system is vital to propulsion system performance. With gaseous helium (GHe) pressurization system, keeping target ullage of pressurant gas (GHe) in high-pressure gas-storage tanks is necessary to supply propellant at the conditions and flow rates required to maintain desired engine functionality. In order to restrict and control the quantity of the ullage of GHe, the flow coefficient of orifice plate has to be accurately pre-estimated. In the initial test series of orifice plate at the work conditions of propellant tanks, a great of GHe is used and wasted. Statistically, a series of high-pressure GHe test payout of a certain orifice plate is fifty fold of nitrogen test, which is quite costliness. In this paper, the authors target gas characteristics and performance aspects and explore the possibility theory of substituting GHe for nitrogen by devoting to analyzing the flow coefficient relation between GHe and nitrogen of orifice plate. Furthermore, the facility configuration of pVTt and essential test work described in detail in this paper assists in illuminating the test theory and improving understanding of the use of nitrogen in future orifice plate test. The results and conclusions of this study will benefit to minimize the use of GHe and significantly decline the cost.