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CONTROL OF EXHAUST GAS FLOW IN CRYOGENIC STORAGE TANK ADOPTING  
THERMODYNAMIC VENTING SYSTEM TECHNOLOGY

**Abstract**

The pressure of cryogenic tank on orbit with liquid nitrogen, oxygen or hydrogen will increase gradually because of the heat leak from the solar radiation and heat conduction from spacecraft. The validation ground-experiment of liquid nitrogen tank adopting thermodynamic venting system (TVS) technology is carried out at effective storage research workbench. Firstly the experiment system is introduced and the running principle of the TVS technology is analyzed. Then in the experiment part the process is divided into mixing and parallel modes, the main difference between them is in mixing mode only cryogenic pump will work, but in the parallel mode both the pump and throttle operate simultaneously. In this paper the trend of ullage pressure and liquid temperature in the storage tank with the elapsed time is given in the two running modes, besides the flow rate of the exhausted nitrogen gas in atmosphere environment is measured. The test result shows that the duration of single cycle in mixing mode lessened gradually, whereas it increases in the parallel mode. Compared to the mixing mode, the rise rate of liquid temperature in parallel mode decreases obviously, and the total mass flow rate is less than that in directly-exhausting way, which validates that the TVS technology is effective in reducing the mass of exhausted nitrogen gas.