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OPTIMUM DESIGN AND THERMAL ANALYSIS OF COMPOSITE INSULATION STRUCTURE  
USED IN CRYOGENIC STORAGE TANKS ON-ORBIT**Abstract**

Study shows, cryogenic propellant tank with Composite Insulation Structure and broad area cooler (BAC) technology can effectively reduce the evaporation loss and prolong the storage time of the cryogenic propellant on orbit. Under the influence of periodic non-uniform heat flow in space, the hot side temperature of composite Insulation Structure is the key parameter affecting the heat leakage of the cryogenic tank, and the coating with low absorption emission ratio ( $\alpha/\varepsilon$ ) can reduce the outer temperature effectively and greatly reduce the heat leakage. If the BAC is embedded in the middle of the Composite Insulation Structure, and compared with BAC and direct cooling of liquid hydrogen in two different ways, in the same conditions, BAC can save 60.41% and 63.76% in weight and power of active refrigeration system. In addition, the weight and power consumption of active cooling system with different storage time and BAC at different locations in MLI are study, the optimal design results are obtained at the expense of the minimum cost.