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# C1Or4C-02: Comparison of liquid hydrogen tank performance at different storage pressures and operational scenarios using a reduced-order model

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Liquid hydrogen storage is accompanied by boil-off losses as heat leak penetrates the tank. However, these losses are also affected by tank operational scenarios which have been relatively unconsidered in the literature. To address this need, a reduced-order model capable of analyzing different operational scenarios was developed. Using this model, the present study investigates the effects of storage pressure in vertical and horizontal storage tanks on the average daily boil-off losses. Parametric studies are conducted using the dimensions of the Integrated Refrigeration and Storage (IRAS) system tank with varied venting pressure, fill level, and initial temperature of the liquid in the tank. The results indicate that storing saturated liquid hydrogen at lower pressures with no liquid extraction from the tank in steady-state cyclic venting results in lower daily losses. The initial temperature of the liquid in the tank also plays a key role in selecting a storage pressure for a tank. With no liquid subcooling, lower storage pressures are desirable but with 1K subcooled liquid higher storage pressures with larger fill levels result in lower losses. The resulting model is a useful tool for analyzing different liquid hydrogen tank operational scenarios.

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