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# C1Po3A-03: Numerical simulation of active refrigeration for liquid helium storage

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The storage and transportation of liquid helium inevitably lead to overpressure and leakage due to its extremely low boiling point and high evaporation rate, resulting in helium loss. By introducing cooling through a cryocooler, the thermal losses can be effectively reduced, potentially achieving ZBO(zero-boil-off). However, research on liquid helium lossless technology is still limited. This paper presents a numerical simulation study on the pressure evolution process during the active cooling of a liquid helium dewar. The study focuses on the 500L liquid helium storage platform at the Institute of Physics, under the condition of a 7.5W heat leakage. The numerical simulation of the self-pressurization process of the liquid helium dewar indicates that the pressure evolution follows a generally linear growth trend. Under overpressure conditions, the introduction of cooling results in a decrease in pressure, exhibiting a three-stage depressurization process. After a certain period, the pressure stabilizes. The results demonstrate that active cooling can effectively suppress the overpressure phenomenon during the storage and transportation of liquid helium, reducing helium loss, which holds significant importance for the storage and transportation of liquid helium.

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