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# Modeling and Dynamic Simulation of a Large Scale Helium Refrigerator

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In order to simulate the transient behaviors of a newly developed 2kW helium refrigerator, numerical models of the critical equipments, including a screw compressor with variable-frequency drive, plate-fin heat exchangers, a turbine expander, and pneumatic valves were developed. Meanwhile the related control strategies were involved. To validate these models, dynamic simulation was set to reproduce the start-up process of warm compressor station with gas management system and the cool-down process of cold box in actual operation. The calculation of helium thermodynamic properties was based on 32-parameter modified Benedict-Webb-Rubin (MBWR) state equations in the simulation. Furthermore dynamic response and stability of the simulation system were analyzed and discussed under different disturbances. The reliability of the developed models was verified by comparing the simulation results with the experimental data.

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