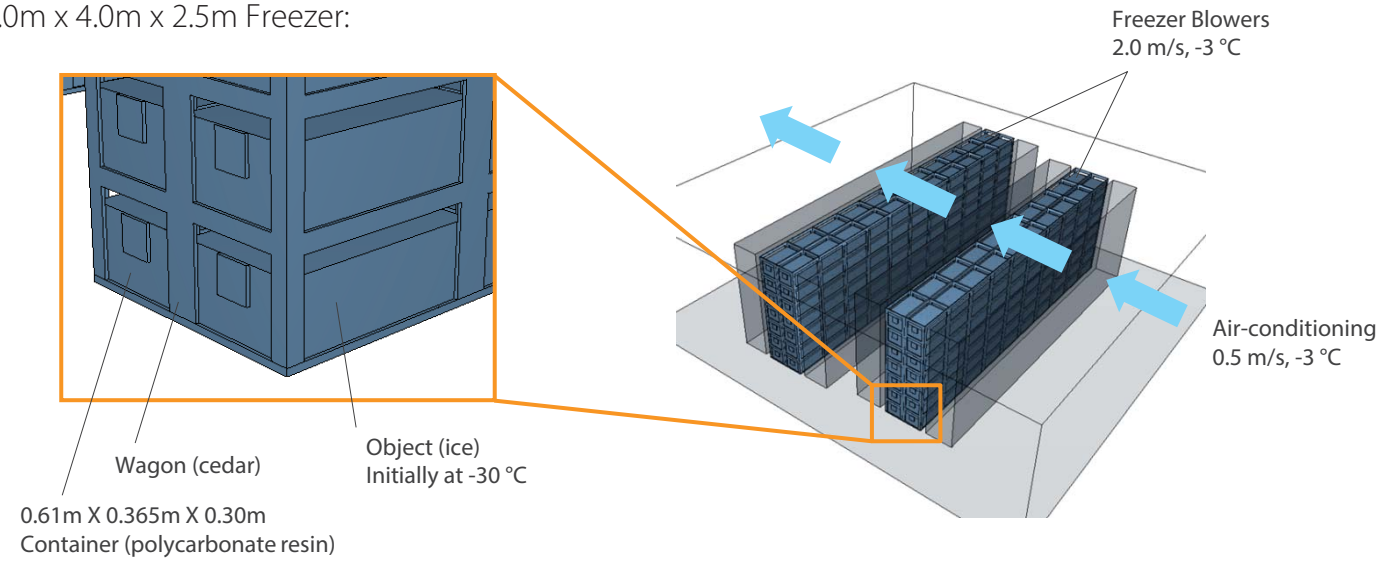
Thermal Analysis of Commercial-Size Freezer

scSTREAM is used to analyze transient temperature changes in a commercial-size freezer. Ideally, the freezer contents should be 'warmed' by blowers from -30 °C up to -3 °C over a 24 hour period.

Simulation Model

4.0m x 4.0m x 2.5m Freezer:



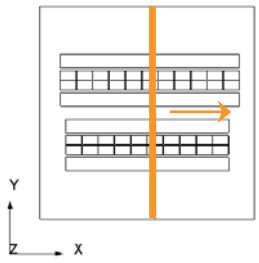
Simulation procedures

First, a steady-state analysis is performed to establish the flow field of forced convection in the freezer. In order to shorten the total calculation time, the flow field obtained from the steady-state analysis is used as a fixed boundary condition for the transient temperature analysis, which will consider temperature changes over a 24 hour period.

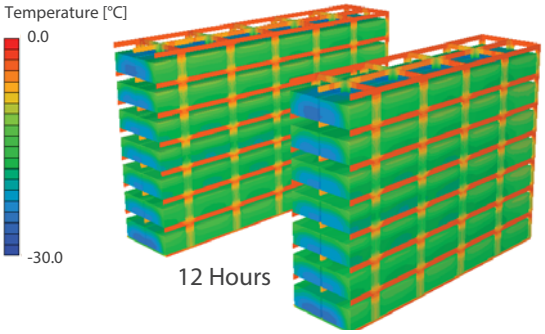
Simulation results

Cut views:

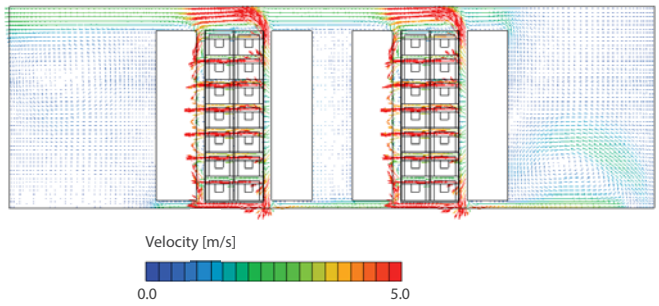
Cutting plane passes through middle of the freezer contents.

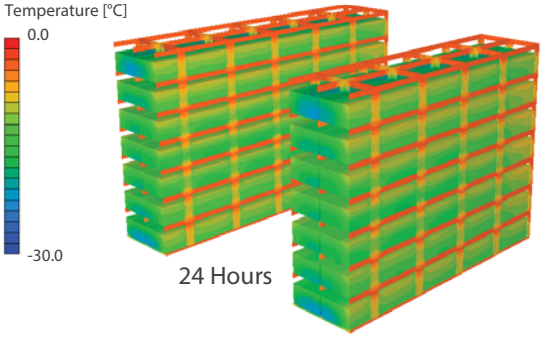


Temperature contour:



Velocity vector:





Notes

A thermal simulation using scSTREAM shows that the temperatures of the Objects are mostly below -10 °C even after being stored for a whole day in the -3 °C freezer. Further design changes may be necessary to achieve proper warming.