

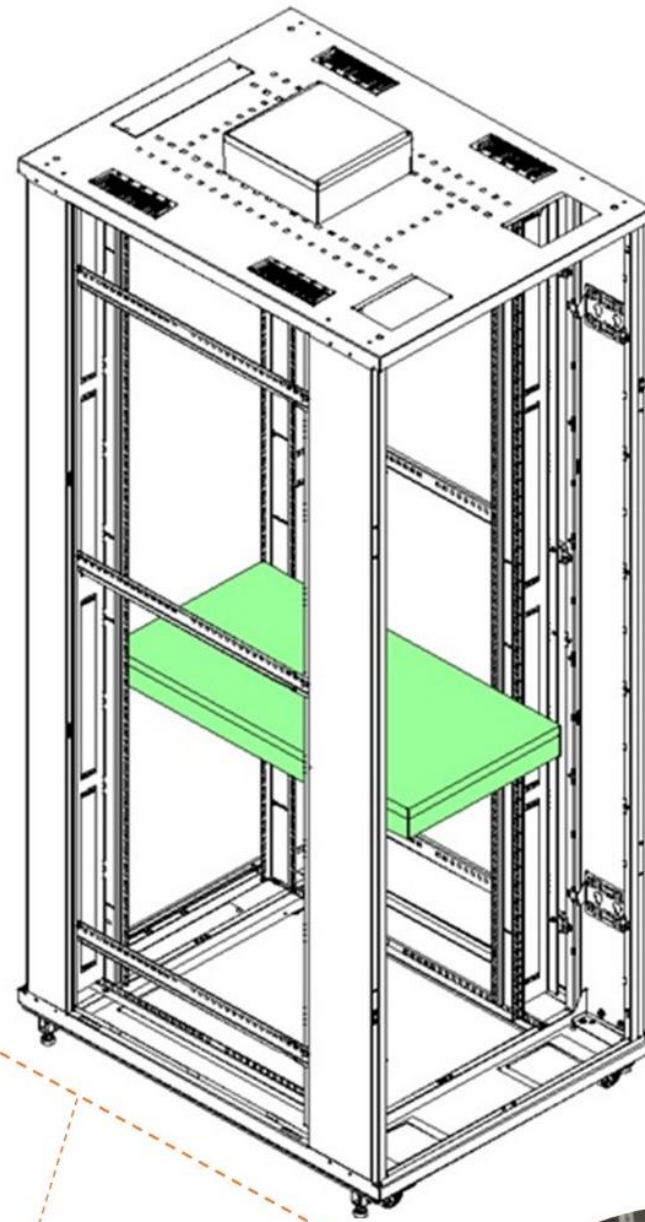
Master-Thesis Engineering, Energy and Environment

Radiator-based Latent Thermal Storage for Warm-Glycol Defrosting

Supermarket Cooling Network



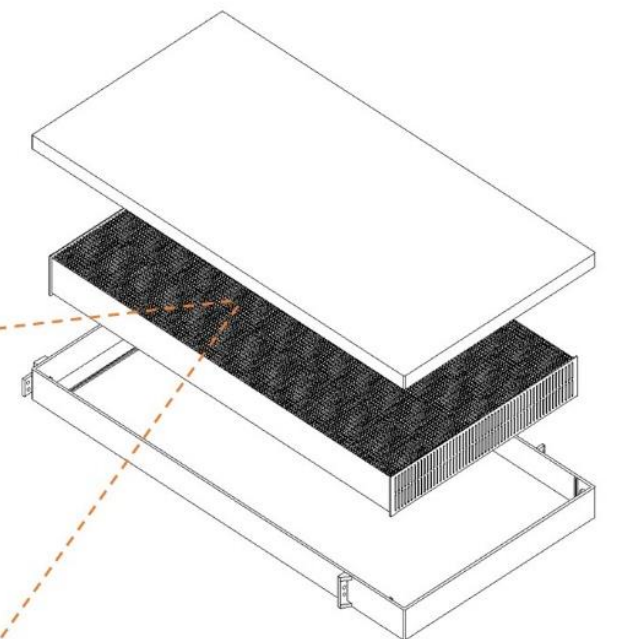
Modular Latent Storage System



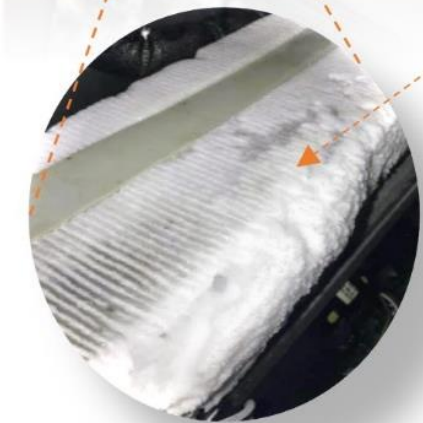
Technical Information

Temperature Range	10°C - 35°C
Power-Energy Ratio	>7.3 kW/kWh
Power Output	90-180 kW
Discharging Time	10 min
Defrosting Potential	20 m
Number of Latent Modules	12-23
Energy Density	up to 15 kWh/m ³

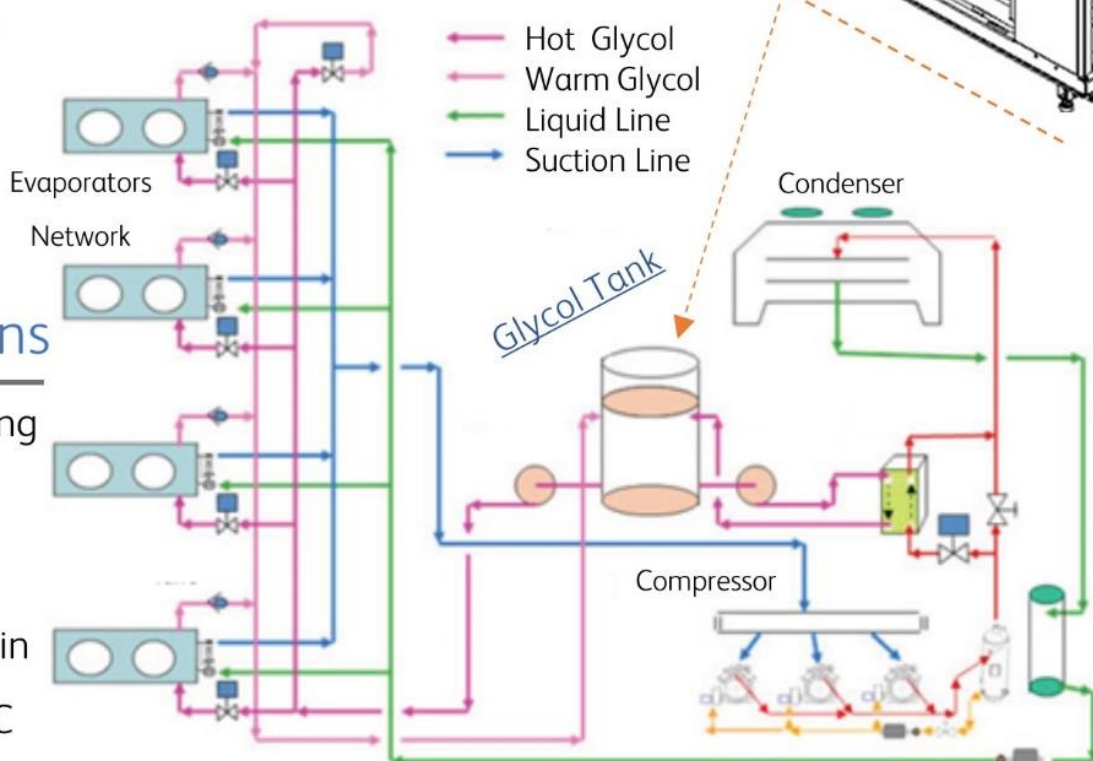
Latent Storage Module



Frost Formation



Warm Glycol Defrosting System



Defrosting Conditions

- Refrigeration Cycle Evaporating Temperature -5 °C
- Propylene Glycol Mix at 30%
- Defrosting Process Time 10min
- Defrosting Temperature 10 °C



Benefits

- Compact design
- Modular design – Scalability
- Cost effective – Integration of available parts in the market

Problem

It is possible to use radiators to design a modular LTS-R system substituting the glycol thermal energy storage tank in warm glycol defrosting applications?
What are the main design constraints for a potential prototype?
How should such a prototype look?

Solution Concept

This work contributes to characterize the thermal performance of two commercially available radiators implementing novel simulation tools in complex heat exchanger geometry.
Moreover, it investigates radiator physical configurations and constraints for their use as latent thermal storage systems.

The solution concept designed is a modular, compact, and cost-effective high-power latent thermal storage system reaching power-to-energy ratios up to 7.3 kW/kWh and an installed storage capacity cost of 487.8 CHF/kWh.

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