

Energy Efficiency in Supermarkets



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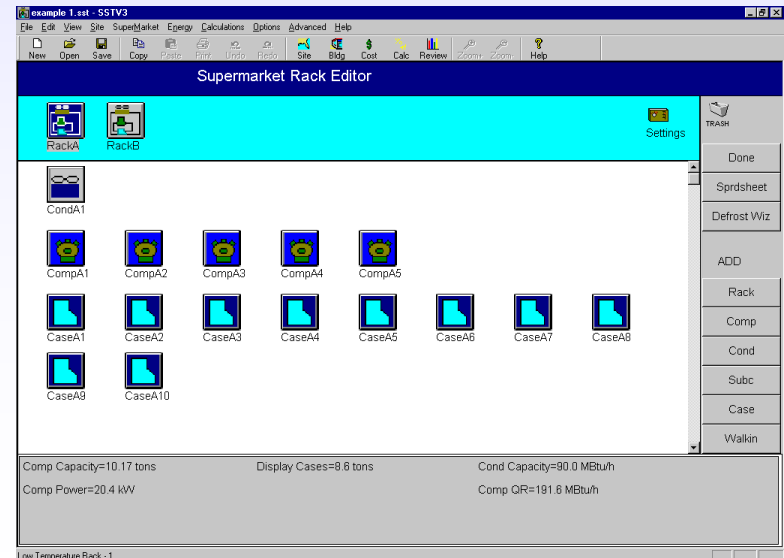


Overview

- Supermarkets are Unique
 - high energy use, unique systems, etc
- Using Simulations to Predict Savings
 - examples using SST
 - what's coming in the future (E+)
- Examples of Promising Improvements
 - floating head pressure, mechanical subcooling
 - Heat recovery, suction pressure reset

CDH Supermarket Experience

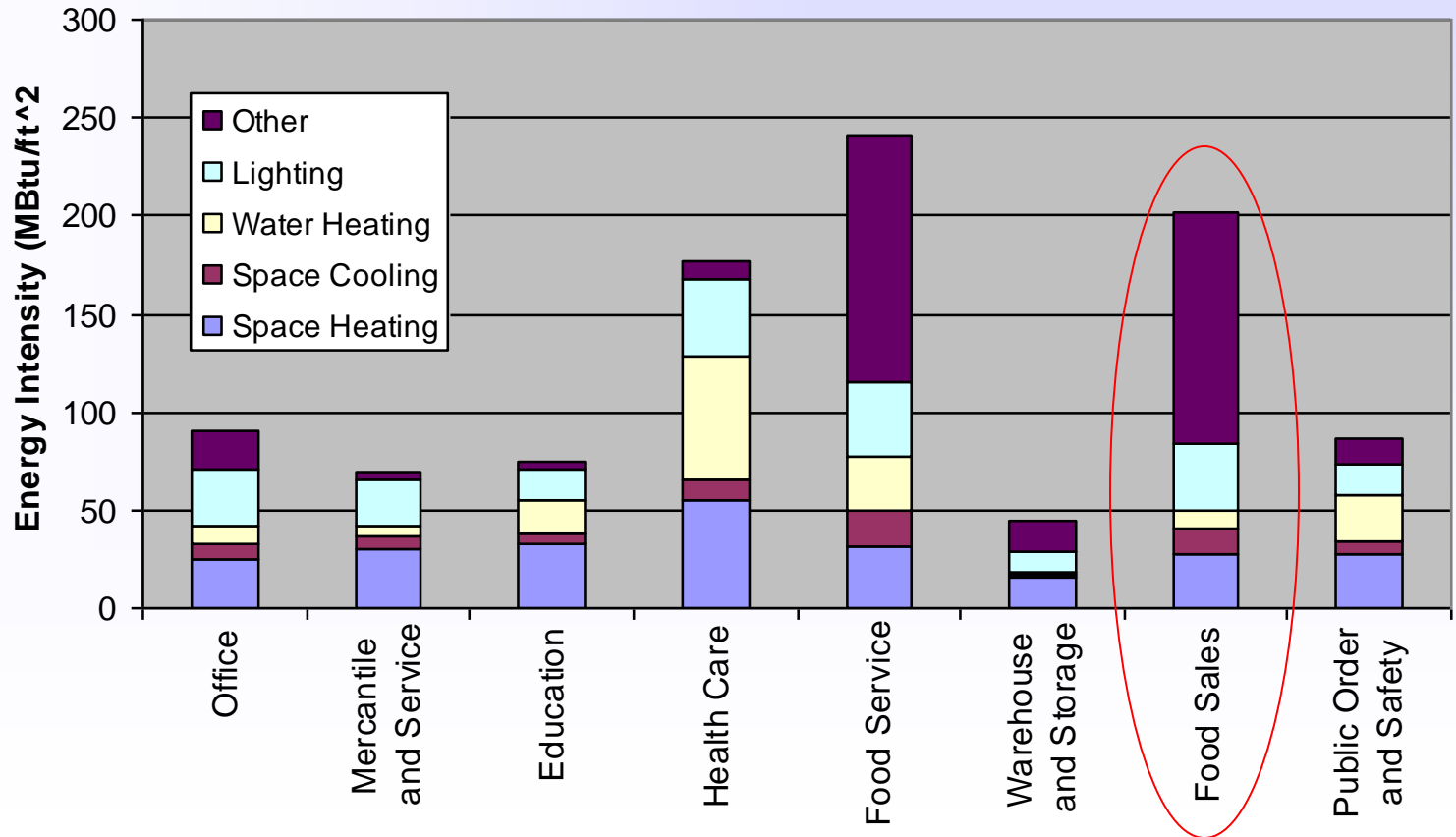
- Research Projects Evaluating Energy Efficiency
 - Combined heat and power (subcooling, heat recovery)
 - Dehumidification (desiccants, mechanical, etc)
 - Advanced refrigeration system concepts (defrost, controls)
- Developed Computer Simulation Tool (SST) to Predict Annual Energy Impacts
 - Developed for EPRI
 - Models Refrig/HVAC/Building interactions
 - Verified model with data from several supermarkets
 - Used SST to accurately predict energy and cost savings



Commercial Buildings are Not All the Same

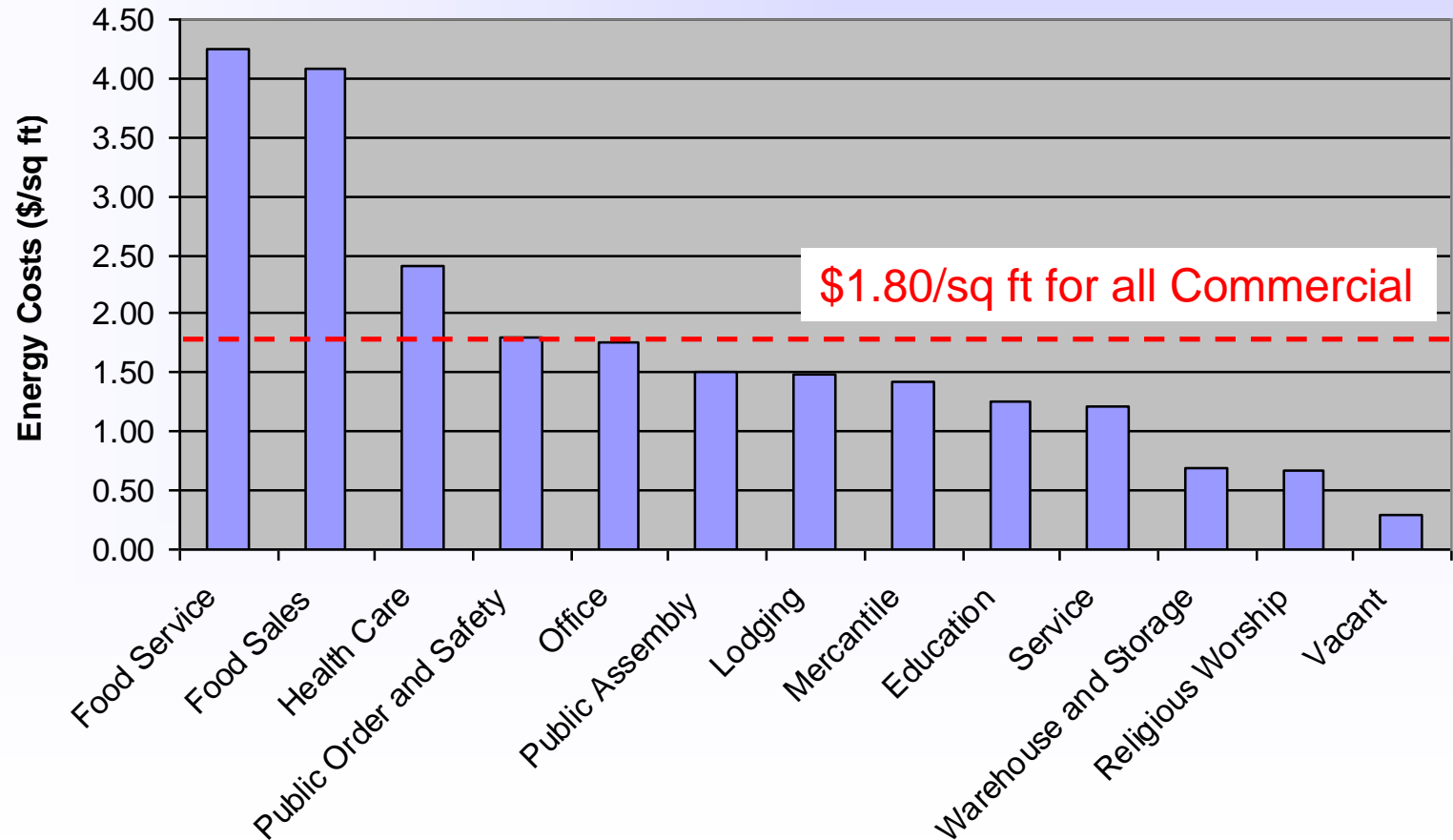
End-Use or
On-Site
Energy Use

Commercial Buildings - 1995 CBECS



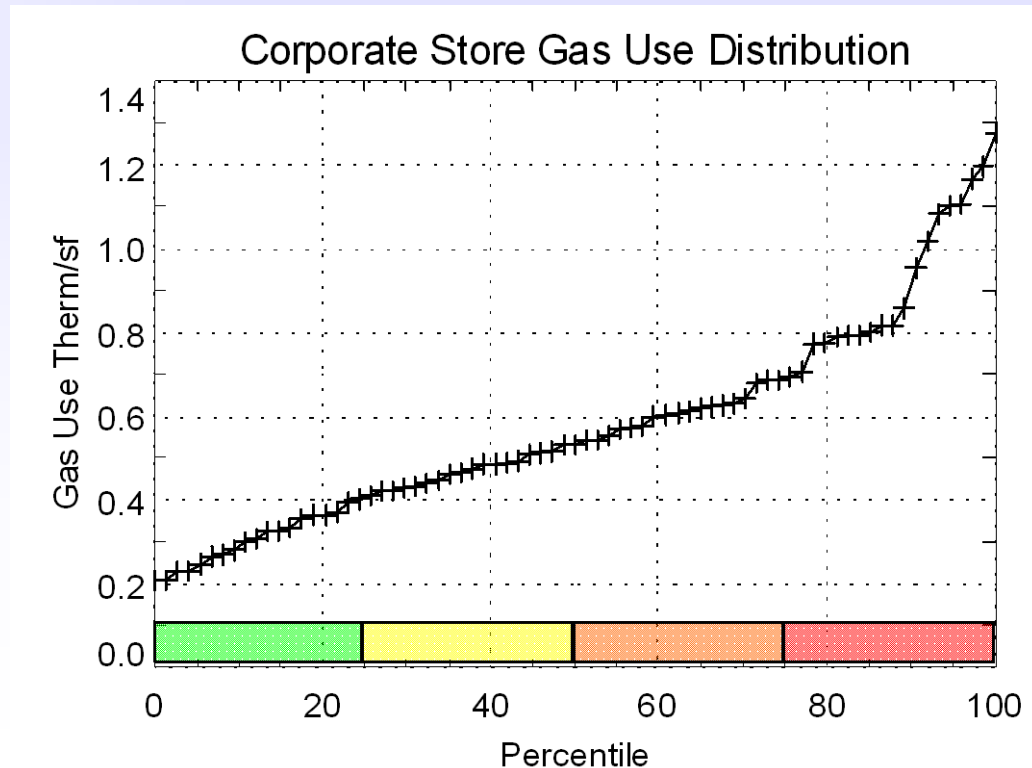
Energy Cost By Building Type

Commercial Buildings - 2003



Supermarket Benchmarking

- Have Worked with Supermarket Chains to Analyze and “Rank” Fleet of Stores
 - Identify problems and opportunities
 - Provides high level view of where efforts should be focused
 - Provides a basis for normal operation



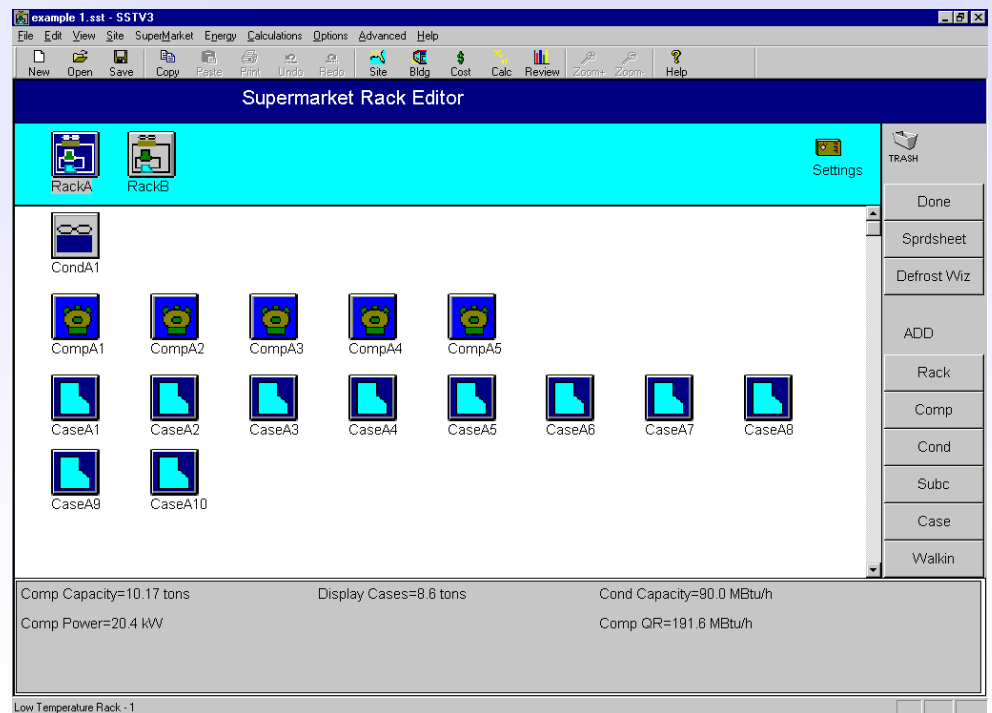
CHP in Supermarkets

- Supermarkets have consistent electric loads
- Significant heat loads due to case credits
- CHP can also meet other thermal loads:
 - Preheating air for gas-fired desiccant (Waldbaums, NY)
 - Absorption chiller for liquid subcooling (TX)
 - Fuel Cells with Abs. Chillers

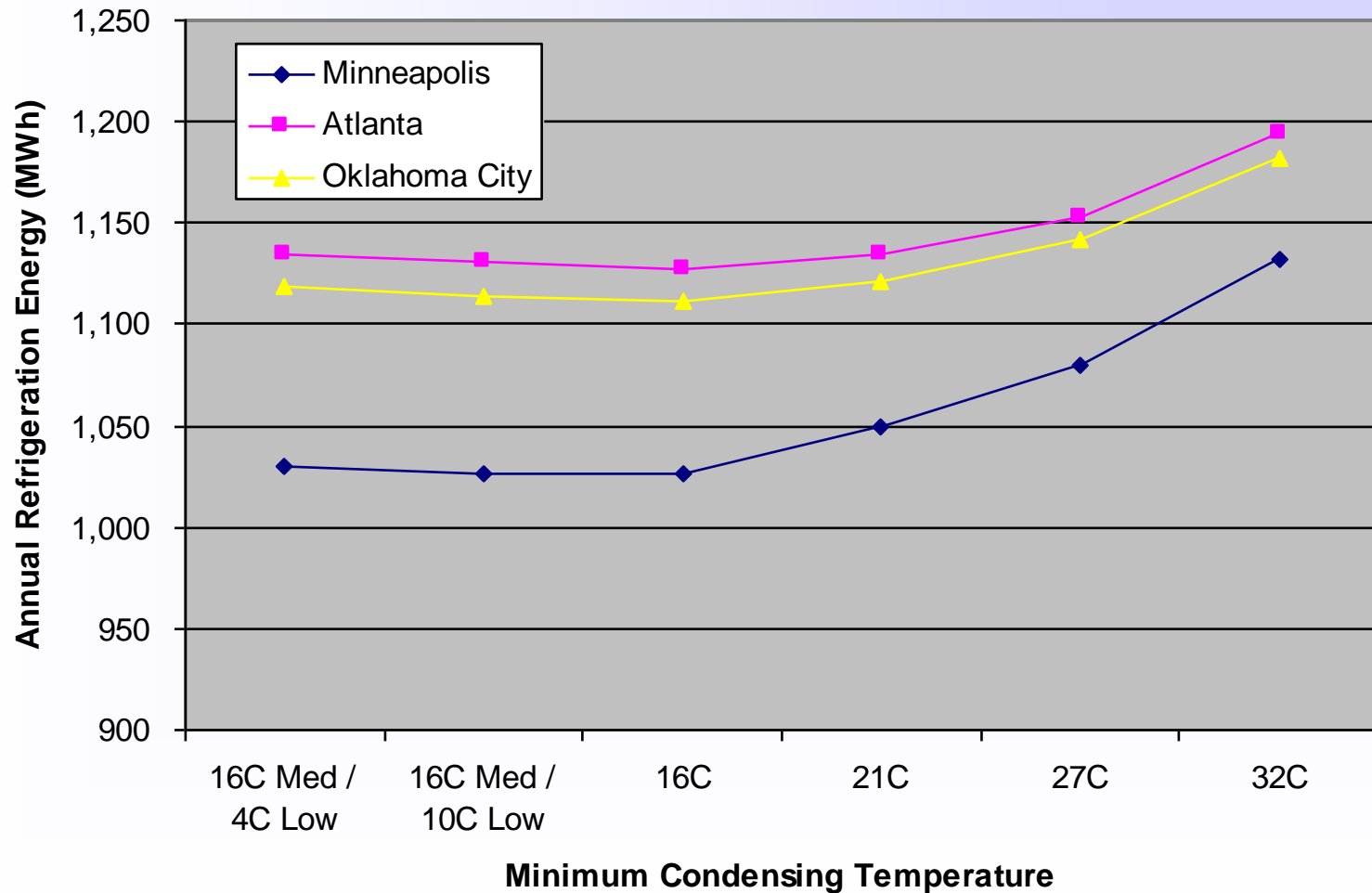


Supermarket Simulation Tool - SST

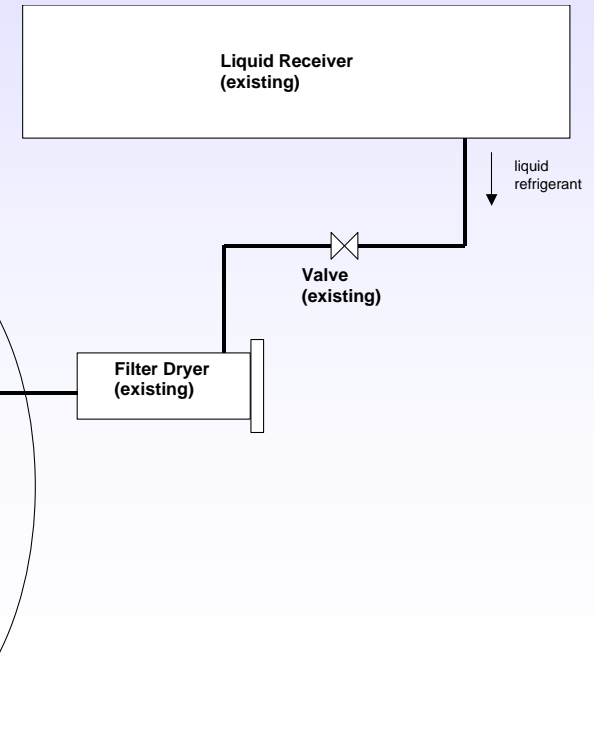
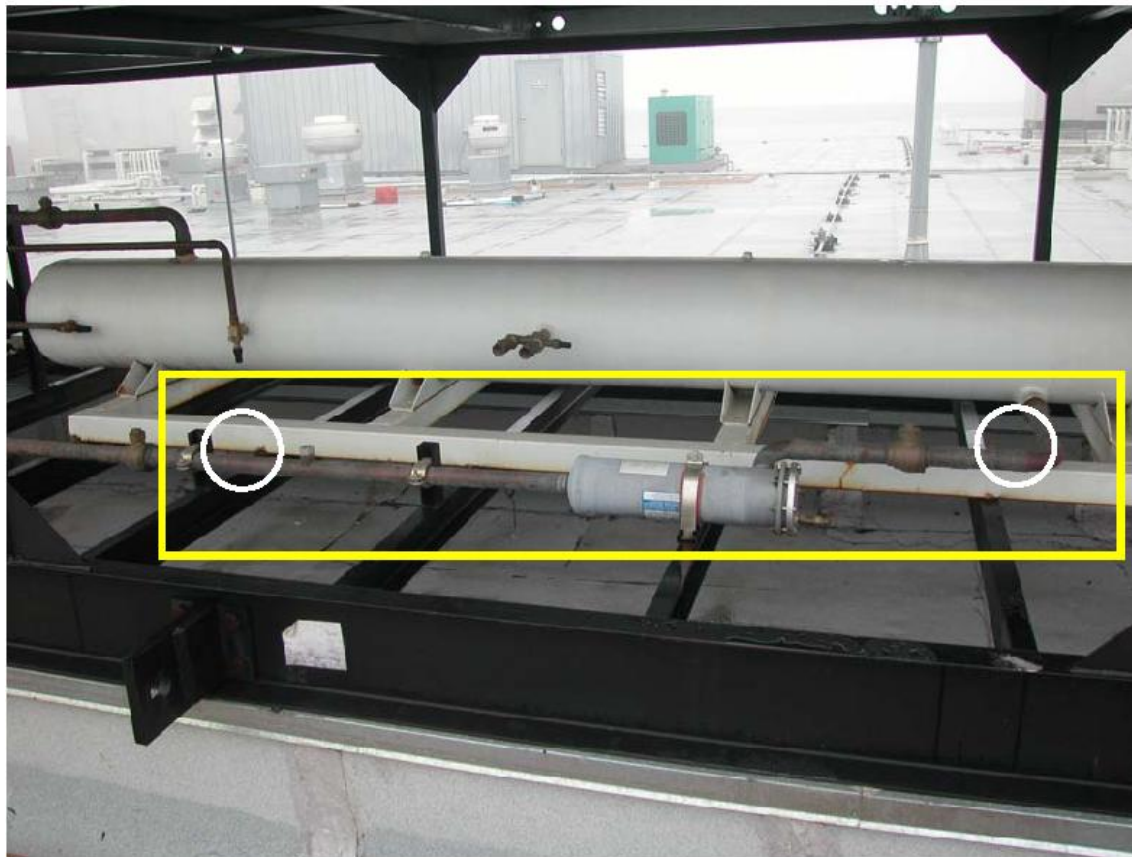
- A Windows-based hourly building simulation model that simulates modern supermarkets:
 - building envelope and internal loads
 - refrigeration systems
 - HVAC systems
 - water loop
- “Icon-based” software application



SST Analysis Example: “Floating” Head Pressure

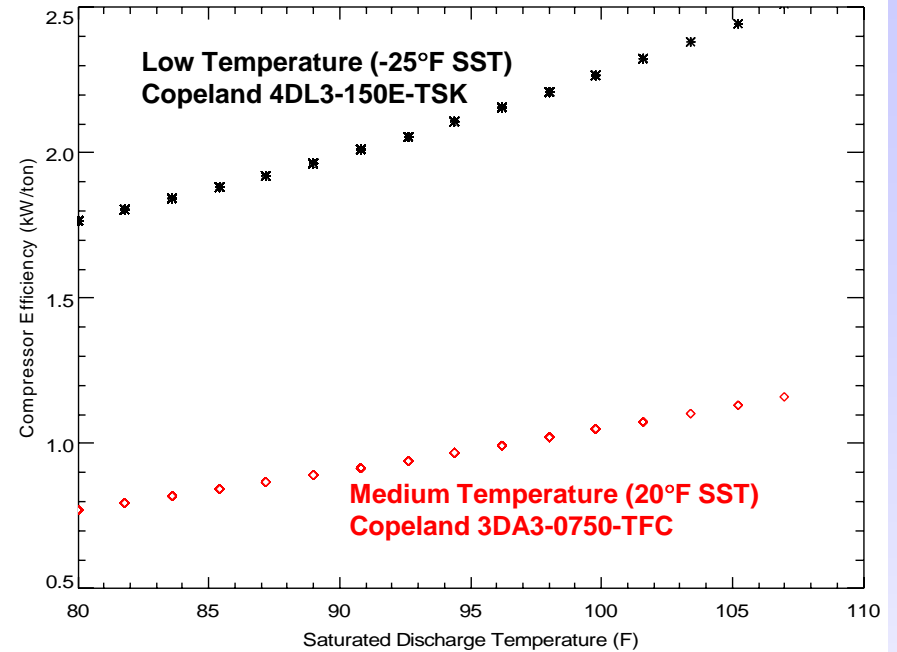
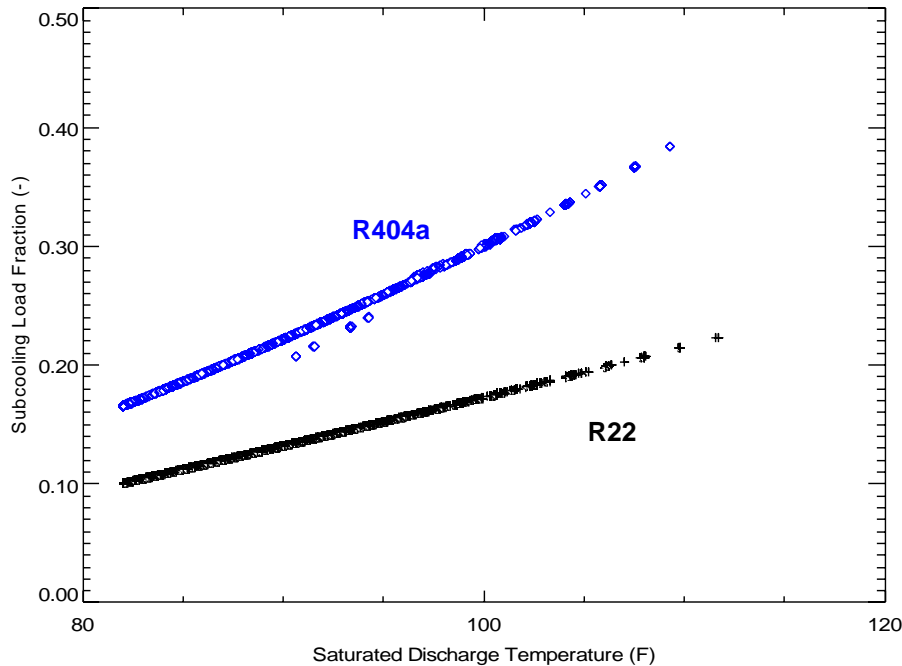


Subcooling with Chilled Water



Chilled water provided by Absorption Chiller

Benefit of Liquid Subcooling



Displaces 10-30%
of refrigeration load
from low-temp
compressors

Mechanical Subcooling

