



# **Minnesota Grocers Association Refrigerant Leak Detection & Energy Optimization at Grocery Stores**

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**UNIVERSITY OF MINNESOTA**  
**Driven to Discover<sup>SM</sup>**

# Background

## Why Refrigeration?



**Synthetic gas mixes, air quality**

**1998 - Montreal Protocol, ozone**

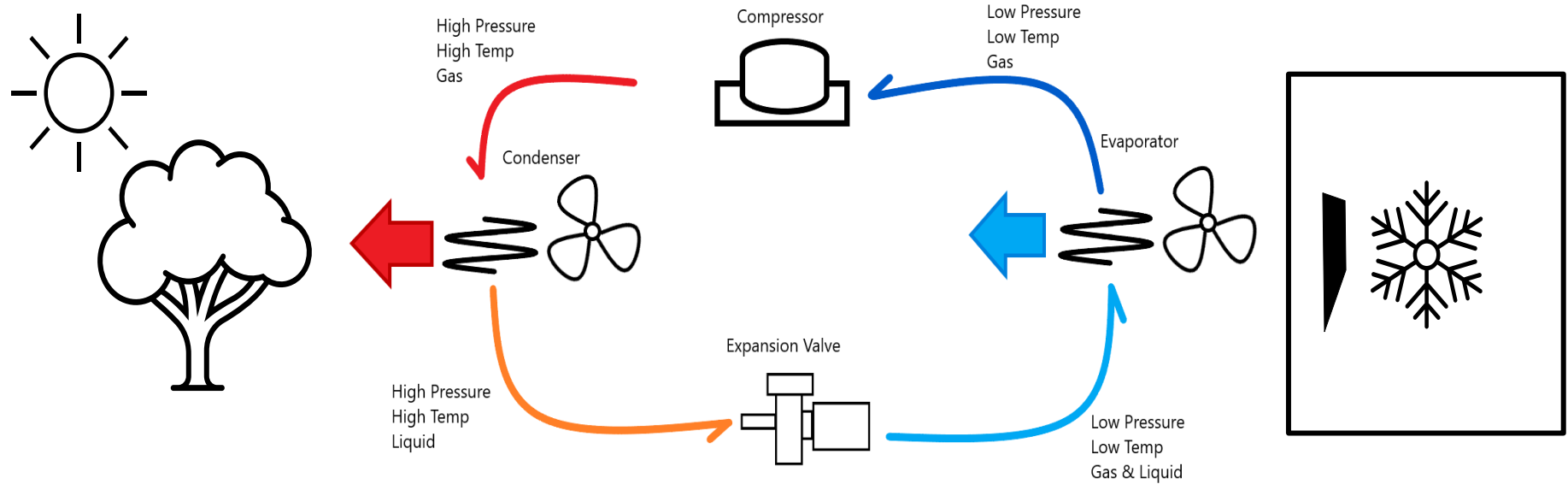
**2019 - Kigali Amendment, GWP**

**EPA 'GreenChill' & MPCA**

**MnTAP 2021 Intern Best Practice Guide**

**2022 Partnered with Minnesota Grocers**

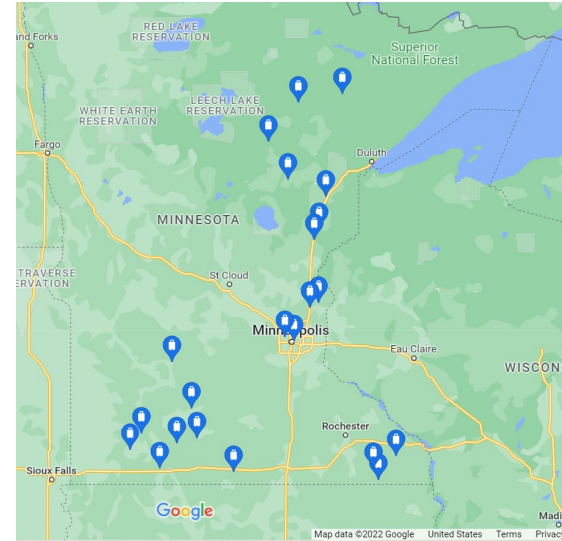
# Basic Refrigeration System



# 22 Store Visits

**Bruce's Foods - Wyoming**  
**Brink's Market – Chisago City**  
**Daggett's Fresh Foods - Hinckley**  
**Chris' Food Center - Sandstone**  
**KJ's Market – Moose Lake**  
**Ukura's Big Dollar - McGregor**  
**Roadside Market – Hill City**  
**Nashwauk Market - Nashwauk**  
**Eveleth Foods**  
**Almsted's Market - Crystal**  
**B&D Market - Olivia**

**Adam's Grocery – Como**  
**Preston Foods**  
**Harmony Foods**  
**Rushford Foods**  
**Maynard's Mountain Lake**  
**Maynard's Fulda**  
**Maynard's Westbrook**  
**Maynard's Lakefield**  
**Schutz Family Foods – Sleepy Eye**  
**SuperFair Foods – St. James**  
**Juba's Blue Earth**



# Leak Testing

No leaks found

EPA GreenChill estimates 25% leakage

- Regular Maintenance

Project Transition from Emissions  
Tracking to Energy Audits



# Visit Summary

## Assessment Scope

- |                        |                      |
|------------------------|----------------------|
| ✓ Leak Testing         | ✓ Condenser Dust     |
| ✓ Insulation           | ✓ Fan Fatigue Cracks |
| ✓ Corrosion            | ✓ Evaporator Ice-Out |
| ✓ Sight Glass Readings | ✓ Damaged Gaskets    |
| ✓ Refrigerant Mix      | ✓ Case Airflow       |



## End of Visit Deliverables

- |  |   |
|--|---|
| • Recommendations and Cost Savings Estimates | • Refrigeration Rebate Opportunities with Cost Benefit Analysis |
| • 2021 Best Practices Guide                  | • MPCA Grant Info   |



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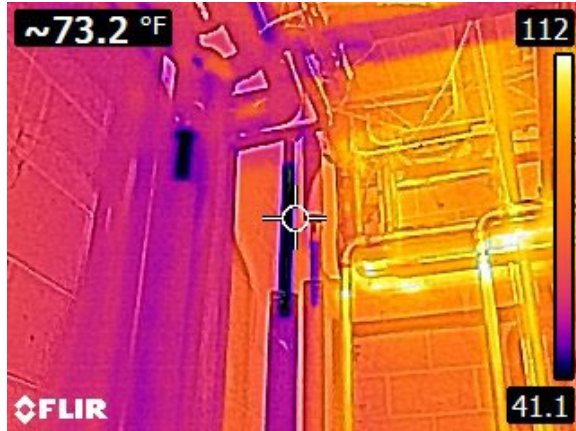
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# Insulation



Unwanted Heat Absorption  
Less Efficient Cooling

Yearly Energy Savings: \$3/ft  
One Time Insulation Cost: \$4/ft

102 feet → 3,500 kWh, \$350 savings

Calculated using Insulation Institute's  
3E Plus Software



# Condenser Cleaning

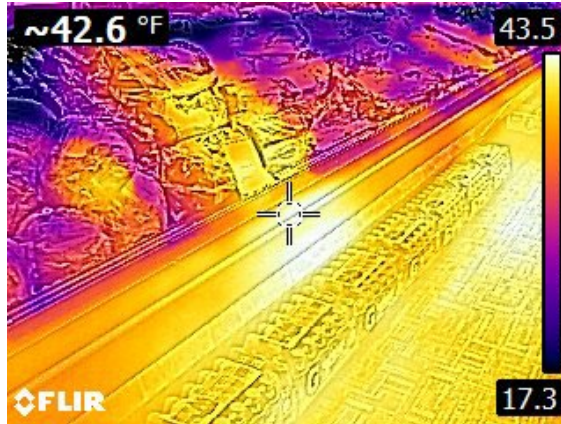
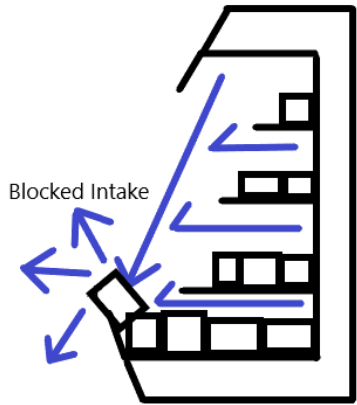


- Blocked Airflow
- Increased Compressor Workload

**2021 South-Town Estimates  
3,000-15,000 kWh/yr with upkeep**

**9000 kWh/yr x 8 stores =  
72,000 kWh/yr potential savings**

# Case Airflow



 **Blocked Air Curtain**  
**More Input Energy (Set Temp)**

**2021 South-Town Estimates**  
**500 kWh per foot per year**

**7500 kWh based on point-in-time**  
**observations**

# Solutions

Recommendation	Annual reduction (kWh)	Total cost	Annual savings	Payback period	Status
Condenser Cleaning	72,000	-none-	\$7,200	Immediate	Implemented
Insulation Repairs	3,500	\$400	\$350	14 months	Recommended
Case Airflow	7,500	-none-	\$750	Immediate	Recommended
Gasket Replacement	27,000	\$6,000	\$2,700	2 years	Recommended
Evaporator De-Icing	70,000	\$600	\$7,000	1 month	Recommended
Total	180,000	\$7,000	\$18,000		

\*cost savings calculations based on \$.10/kWh figure

# Personal Benefits

- Technical Experience
- Project Management
- Office Environment
- Professional Skills
- Career Aspirations

