Webinar on Door Retrofits for Open Medium-Temperature Refrigerated Display Cases

February 14, 2013
Introduction

The purpose of this webinar is to provide BBA Retailer Energy Alliance members and other interested parties with the opportunity to learn about door retrofits for open medium-temperature refrigerated display cases.

• DOE has organized this webinar session based on previous input from members, and as a follow-up to the publication of its *Guide for the Retrofitting of Open Refrigerated Display Cases with Doors.*

• Representatives from the supplier and end-user communities will be speaking today:
  • From REMIS AMERICA, LLC: Erin Dolan, Sales and Marketing Coordinator, and Rick Waldron, Product Manager.
  • From Target Corporation: Paul Anderson, Refrigeration Engineering Group Manager, and KC Kolstad, Senior Mechanical Engineer.

• Each presenter will give a roughly 30-minute presentation, followed by about 15 minutes for open question and answer.
The material presented in this webinar is based upon the expertise and interpretations of the presenters and their employers. It does not constitute a view on behalf of the U.S. Department of Energy.
Open Refrigerated Display Case Retrofits

Erin Dolan – Sales and Marketing Coordinator
Rick Waldron – Product Manager

REMIS AMERICA, LLC.
Savings Potential

• 164 feet open multi deck covered with doors:
  – 64,683 kWh saved annually
  – 83,638 pounds CO\(_2\) saved annually

• For 155 stores:
  – 10,025,803 kWh saved annually
  – 12,963,859 pounds CO\(_2\) saved annually

*These stores utilize night curtains approximately 7 hours per day*
OEM Published Data

• **Manufacturer A:**
  – Multi deck Dairy case with doors: 256 BTUH/FT @ +28 evaporator temp
  – Multi deck open dairy case: 1079 BTUH/FT @ +28 evaporator temp
  – 823 BTUH/FT saved.

• **Manufacturer B:**
  – Multi deck case with doors: 242 BTUH/FT @ +32 evaporator temp
  – Multi deck open dairy case: 1358 BTUH/FT @ +26 evaporator temp
  – 1116 BTUH/FT saved.

• **Manufacturer C:**
  – Multi deck case with doors: 268 BTUH/FT @ +34 evaporator temp
  – Multi deck open dairy case: 1398 BTUH/FT @ +24 evaporator temp
  – 995 or 1130 BTUH/FT saved.
Ohio Retailer

RemiSafe Hinged Doors for Multi Deck Cases
with LED lights

<table>
<thead>
<tr>
<th>Planned Linear feet of Case to be enclosed with Remis Doors</th>
<th>104</th>
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<tbody>
<tr>
<td>KWH per LF per Day at 41° F</td>
<td>3.83</td>
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<tr>
<td>KWH Daily Consumption</td>
<td>398.32</td>
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<tr>
<td>KWH Per Year</td>
<td>145,386.80</td>
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<tr>
<td>Total Annual Electrical Cost</td>
<td>$17,446.42</td>
</tr>
<tr>
<td>Adjusted KWH used per Year after Installation</td>
<td>27,478.11</td>
</tr>
<tr>
<td>Adjusted Total Annual Electrical Cost after Installation</td>
<td>$3,297.37</td>
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<tr>
<td>Total Dollar Savings in electricity</td>
<td>$14,149.04</td>
</tr>
<tr>
<td>Percent KWH Savings</td>
<td>81%</td>
</tr>
</tbody>
</table>

**ROI in years without rebates or incentives**  2.30

Based on KWH at $0.1200

Incentive amount from utility (estimated)*  $8,136.25

*Note: there is no guarantee that a utility rebate will be applicable.

**ROI in years with incentive included**  1.73
Glass Door Retrofits

- Save Energy
- Reduce Carbon Footprint
- Maintain Merchandise Visibility
- Improve Product Quality
- Consistent Case Temperatures
- Reduce Food Spoilage
- Warmer Aisles
- Longer Shopper Dwell Times
European Experience

- REMIS GmbH
  - 35+ Years Refrigeration Technology experience
  - Over 10,000 Retail Stores with REMIS Products in Europe
Typical Applications

• Initial retrofits were:
  – Dairy
  – Beverage
  – Beer

• Secondary retrofits:
  – Deli
  – Packaged Produce
  – Fresh Meat
Application Exceptions

• per customer:
  – Produce cases with misting systems not recommended
  – Bulk produce cases when mixed with packaged produce
    • Varies by retailer
• could retrofit, but may require new ends (replace contoured ends with box ends) or extensions to the case top:
  – 3 or 4 deck meat
  – 1, 3 or 4 deck produce
• A site visit might be required to confirm if the second category can be retrofitted or not
• We cannot retrofit any low temperature cases
Installation Process

**NIGHT ONE:** 36’ lunch meat and 40’ dairy
- Removal of existing lighting and any nose bumpers.
- Installation of bottom nose tins.
- Installation of frames.
- Installation of upper mounting brackets and upper interior close off profiles.
- Installation of canopy lighting and associated wiring.
- Testing of lighting.
- Hanging, aligning and adjusting of glass doors.
- Replace canopies and any removed nose bumpers.
- Remove painter’s cloths. Clean up

**Night two:** 80’ beer
- Removal of existing lighting and any nose bumpers.
- Installation of bottom nose tins.
- Installation of frames.
- Installation of upper mounting brackets and upper interior close off profiles.
- Installation of canopy lighting and associated wiring.
- Testing of all lighting.
- Hanging, aligning and adjusting of glass doors.
- Replacement of canopies and any removed nose bumpers.
- Remove painter’s cloths. Clean up

**Night Three:** 12’ salad, 12’ dairy and 44’ dairy
- Removal of existing lighting and any nose bumpers
- Installation of bottom nose tins.
- Installation of frames.
- Installation of upper mounting brackets and upper interior mounting profiles.
- Installation of canopy lighting and associated wiring.
- Testing of all lighting.
- Hanging, aligning and adjusting of all glass doors.
- Replacement of canopies and any removed nose bumpers.
- Remove painter’s cloths. Clean up
- Clean store work areas thoroughly and remove any and all refuse from premises
- **Final inspection:** Walk floor with store management; provide instruction in operation of glass doors and maintenance/cleaning processes.
- Management sign-off and satisfaction survey along with warranty information
Issues Affecting Retrofits

- Fascia
- Corner Cases
- Rear Load Dairy
- Columns
- Cases that require top extended (i.e. meat)
Recommended Adjustments

for multi deck cases after doors are added:

• Warm the cases 4 to 5 degrees.
• Adjust the defrost setting from 4 to 6 per day to 1 or 2 per day.
• Adjust the superheat setting on adjustable expansion valves or replace non adjustable expansion valves with ones that have a smaller orifice size.

for island cases after covers are added:

• Warm the cases 5 to 7 degrees.
• Adjust the defrost setting from 1 or 2 per day to 2 or 3 per week.
• Adjust the superheat setting on adjustable expansion valves or replace non adjustable expansion valves with ones that have a smaller orifice size.
• Reduce the air flow to no more than 80 FPM by changing or modifying the fan blade.
Photos
Questions for the presenter?
Open Refrigerated Display Case Retrofits

Paul Anderson – Refrigeration Engineering Group Manager
KC Kolstad – Senior Mechanical Engineer

Target Corporation
Medium Temperature Doors

DOE Webinar
Inability to Plan and Document Existing Conditions May Negate Any Energy Savings and May Increase Maintenance and Repair Expenses
Medium Temperature Doors

Installed Doors on Minneapolis and Los Angeles Area Stores

• Length of Door Installation Ranged from 60-100 feet of Open Multi-Deck per Store
• Covered All of the Fresh Categories
Installation

Worked Over Night
- 50% complete on 1st Night
- 100% complete after the 2nd Night
- Anticipate Unforeseen Conditions
Installation

What Changed:
• Case Setpoints
• Defrost Frequency
• Case Superheat
  (Expansion Valves Re-Adjusted)
• Lighting

What Didn’t Change:
• Suction Risers
• Compressor Oil Level
• Medium Temperature
• Compressor Capacity
• Expansion Valves
• HVAC Set Points
Tested Higher Market Dewpoints
Refrigerant Charge

Remember...

• Refrigerant Charge is Contained In:
  1. Condenser
  2. Receiver
  3. And Liquid Lines

• Retro-fitting doors on an Existing Store will not change any of these components and therefore will NOT change the refrigerant charge in the system

• There are opportunities in new construction for enhanced efficiencies
System Performance

Before

Door Installation

After

Return Air 1
Return Air 2
Discharge Air (Control)
EEPR

Percentage

Degrees F

08/07 08/08 08/09 08/10
08/12 08/13 08/14 08/15 08/16

On
Off

B01 20 PRODUCE - DEFROST
Energy – 60 Feet Open Multi-Deck

Energy Usage of Medium Temperature Compressor Rack

![Graph showing energy usage vs. daily average outside air temperature for before and after doors. The graph compares daily energy usage (kw-hr) against daily average outside air temperature (F). The data points are divided into two categories: Before Doors and After Doors. The graph illustrates the significant reduction in energy usage after the doors are closed.]
Energy – 60 Feet Open Multi-Deck

Minneapolis Weather BIN Data

Hours at Temperature vs. Temperature (°F)
### Minneapolis BIN Data

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<thead>
<tr>
<th>Temperature</th>
<th>Hours at Temperature</th>
<th>Before Doors (kW-hr)</th>
<th>After Doors (kW-hr)</th>
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**Sum**: 57,752

**Difference**: 31,044

### 54% Energy Reduction
Energy Usage of Medium Temperature Compressor Rack

Before Doors

After Doors
### Minneapolis BIN Data

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**Sum** 102,311  57,513

**Difference** 44,798

### 44% Energy Reduction
# Target’s Metrics for Total Cost of Ownership

<table>
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<tr>
<th>Metrics</th>
<th>Status</th>
<th>Highlights</th>
</tr>
</thead>
</table>
| Uptime (Guest Impact)    | ![Green Arrow] | Zero documented demerchandising events  
Positive and Negative feedback from Guest |
| Capital Investment       | ![Red Arrow] | Higher equipment and installation expense  
Utility Rebates may be available |
| Maintenance and Repair   | ![Red Arrow] | Maintenance and Repair costs projected to be  
approximately $1k/yr./store over a ten year period |
| Energy (kW*hr)           | ![Green Arrow] | Approximately $4k/year cost savings (refrigeration only) |
| Sustainability           | ![Green Arrow] | Net carbon reduction of CO₂e/store/yr.                                    |
| Store Operations         | ![Red Arrow] | Approximately $700/year incremental cost to stock and clean doors        |
Conclusions

- Significant Reduction in Energy
- Other Key Performance Indicators Negatively Impacted
- Refrigerant Charge Reduction on New Systems Only
- Consider as an Option for Refrigerant Retro-fits
- Realize that you may not be able to change HVAC Settings
Questions for the presenter?
Conclusions

Additional items:

• Ideas for future webinars?
• Webinar topic suggestions can be emailed to Collin.Weber@Navigant.com

Thank you for your time and participation.