BTO Program Peer Review

Retrofitting Doors on Open Refrigerated Cases

BBA Refrigeration Project Team

William Goetzler
Navigant Consulting, Inc.
wgoetzler@navigant.com (781) 270-8351
April 4, 2013

Images courtesy of REMIS AMERICA, LLC.
Technology Overview

Background and Motivation

- Adding doors to open cases (retrofits) greatly reduces cold air loss – 50-80% load reduction
  - Load reduction = system energy savings
- Food retail is a very energy-intensive application
  - Typical supermarket: 2 to 3 million kWh/year per store
  - Refrigeration is the largest energy consumer (~50%)
- Open cases spill cold air (see figure), requiring added refrigeration energy and ambient reheat
  - Typical store - roughly 50% of display cases are open medium-temperature – large potential retrofit market
  - Additional non-energy benefits include increased shopper comfort, increased product life, and reduced product losses
Problem Statement:

- BBA members expressed concerns over barriers to implementation
  - Uncertainty over technical requirements – what steps must be taken?
  - Reported disparities between anticipated and actual energy benefits – project results not consistent with expectations from design/planning stage
  - Cost concerns – food retailers very sensitive to capital costs
  - Perceptions that door retrofits may hurt product sales

- Many of these barriers result from knowledge gaps
  - Poor retrofit performance often due to inadequate planning or improper execution
  - The need for system-wide changes in conjunction with retrofits is often overlooked
  - Financial impact and payback are often misunderstood
Impact of Project:
• Goal: break down existing knowledge gaps and barriers to implementation
  – Shift industry attitudes towards the technology
• Large potential for energy and cost impacts
  – 2.5 TWh annual national energy savings technical potential
  – $5-10K annual energy-cost savings for a typical supermarket

Project Focus:
• Primary target – supermarkets, pharmacies, convenience stores
  – Many owned by chains with national/regional presence and large energy footprints
• Broad applicability
  – Technology available to a wide range of stores – independent, chain, large, small
  – Far lower cost than case replacement
• Member-driven initiative
  – Project guided by refrigeration project team (RPT) member needs
• High energy savings at modest capital cost
Approach:

• Develop and disseminate best practices guide (now online*) to reduce technical barriers
• Demonstrate cost/performance benefits (~4-6 year payback) in the field
• Promote technology and practices through multi-party collaboration

Key Issues (Potential Risks of Approach):
• Guide may not be fully utilized – mitigate through collaboration with BBA members and other partners
• End-users face internal project hurdles such approval from marketing – reduce risk by facilitating communication and supplying supporting data

Distinctive Characteristics:
• Extensive stakeholder collaboration – table of participants below

<table>
<thead>
<tr>
<th>Retailers</th>
<th>Walmart</th>
<th>Target</th>
<th>Whole Foods</th>
<th>Supervalu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suppliers</td>
<td>Hill Phoenix</td>
<td>Hussmann</td>
<td>Zero Zone</td>
<td>Remis America, LLC</td>
</tr>
<tr>
<td>Trade Organizations</td>
<td>RSES</td>
<td>The HVACR Training Authority</td>
<td>The NEWS</td>
<td></td>
</tr>
<tr>
<td>Utility/ Efficiency Groups</td>
<td>Sema Energy utility</td>
<td>CEE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Accomplishments and Progress

Accomplishments:

• DOE published the Guide for the Retrofitting of Open Refrigerated Display Cases with Doors* in November 2012

• Major industry publication, ACHR News, will run a series on the guide spring/summer 2013

• Developed Excel-based retrofit project cost/benefit and payback period calculator

• Working with Refrigeration Service Engineers Society, a major trade organization, to showcase guide
  – Potential feature in RSES newsletter
  – Interested in adaptation of guide into Service Application Manual for use by field staff

Accomplishments and Progress, Cont.

Progress on Goals:
• Achieved goal of publishing guide
• Initiated deployment and promotion phase

Awards/Recognition:
• Industry, utilities, and efficiency organizations have responded enthusiastically to the guide

“I think this is going to be an excellent measure to add to our incentive program.” – Ahmed Abdullah, Southern California Gas Company

“What a timely topic for our readers. We would like to present this information in a series of 3 to 4 articles.” – Peter Powell, ACHR News

“You folks did an awesome job with this guide! This is clearly another step toward successful implementation of the national energy plan. You should be proud!” – Carl Roberts, Zero Zone
**Project Plan & Schedule**

- **Met all original project milestones to date**
- **Original project initiation March 2012; plan included development and publication of retrofit best practice guide. Published Nov. 2012; project focus shifted to deployment**
- **Current and future work consists of deployment and promotion activities with a number of project partners.**

### Summary

<table>
<thead>
<tr>
<th>Task / Event</th>
<th>FY2012</th>
<th>FY2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Name: Retrofitting Doors on Open Refrigerated Cases</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2 Milestone: Project initiation based on RPT member input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q3 Milestone: Perform background research and present initial draft to RPT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4 Milestone: Deliver draft report to DOE for review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1 Milestone: Publish final report to DOE website</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Current work and future plans

- Host webinar on technology featuring manufacturers and end users
- Collaborate with industry organizations to publicize guide
- Work with utilities to develop incentive programs

### Legend

- **[ ]** Work completed
- **Active Task**
- **Milestones & Deliverables (Original Plan)**
- **Milestones & Deliverables (Actual)**

<table>
<thead>
<tr>
<th>Milestone</th>
<th>FY2012</th>
<th>FY2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2 (Jan-Mar)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q3 (Apr-Jun)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4 (Jul-Sep)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1 (Oct-Dec)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Project Budget: $100K in FY2012; $150K in FY2013
Variances: None
Cost to Date: Approximately $125K (FY2012-13)
Additional Funding: None

<table>
<thead>
<tr>
<th></th>
<th>FY2010</th>
<th>FY2011</th>
<th>FY2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOE</td>
<td>N.A.</td>
<td>DOE</td>
<td>DOE</td>
</tr>
<tr>
<td>Cost-share</td>
<td>N.A.</td>
<td>Cost-share</td>
<td>Cost-share</td>
</tr>
<tr>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$100k</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N.A.</td>
</tr>
</tbody>
</table>
Partners, Subcontractors, and Collaborators:

- Project was initiated through the BBA Refrigeration Project Team, at the suggestion of Retailer Energy Alliance members
  - Members include Target, Wal-Mart, SUPERVALU, Whole Foods, and others
  - Provided input, guidance, and feedback throughout the process.

- Best practice guide developed with input from numerous stakeholders, including major refrigeration equipment manufacturers and installers
  - DC Engineering
  - Hill Phoenix
  - Hussmann Corporation
  - REMIS America, LLC and REMIS GmbH
  - Zero Zone, Inc.

- Trade organizations, industry publications, end users, and utilities are all collaborating with the team on deployment and promotion activities
  - RSES, ACHR News, SoCal Gas, CEE
Technology Transfer, Deployment, Market Impact:

• Desired project impact: increase awareness, technical understanding, and implementation of retrofit technology by end users
  – Provide adopters with reliable information to fill knowledge gaps
  – Collaborate to reduce barriers, increase market acceptance, and push retrofits towards standard practice
• Positive initial response to guide indicates interest and desire for action

Communications:

• Published guide to DOE website for public use
• Held webinar on 2/14 with end-user and industry presenters, >50 attendees
• Discussed guide and deployment with members at four RPT meetings
• Aforementioned coverage in *ACHR News* and RSES publications
Next Steps and Future Plans:

- Promote guide and best practices through publications
  - RSES – over 11,000 members
  - ACHR News - over 100,000 subscribers

- Raise awareness of technology through partnerships
  - Work with utilities to distribute promotional materials to their customers
  - Leverage industry organizations to reach thousands of potential adopters
  - Selectively initiate dialogue with specific large potential end users

- Partner with utilities to implement incentives to reduce first costs
  - Currently working with Southern California Gas Company to develop rebate – would be one of the few utilities to offer gas rebate for retrofits
  - Program readiness package has been submitted, received positive response from SoCal Gas, will be reviewed and submitted to CPUC

- Showcase technology by documenting field studies/demonstrations
  - Developing case study using data from Fresh & Easy stores in California