RTU Best Practices Webinar: Target, Whole Foods Market, Efficiency Vermont

Tues July 14th 2-3pm Eastern Time
Advanced Rooftop Unit Campaign (ARC)

High Efficiency RTU solutions:
- High-efficiency RTUs
- Advanced RTU control retrofits
- Quality Installation and Quality Maintenance

Results to date:
- 208 ARC partners
- 40,000+ high-efficiency RTUs
- 4 Trillion BTUs annual savings
- $37 million annual savings

www.advancedRTU.org
Robert King P.E.
Senior Manager Engineering
RTU Replacement: Optimized System Strategy
RTU System Replacement Strategy

- Replace all RTUs on building at one time based on age and condition
- Re-Engineer System
- Optimize design for updated ventilation, lighting and humidity load
Optimized Engineering

- RTUs engineered for current load
- Optimize for whole building.
  - Select ventilation strategy
  - Remove redundant RTUs
  - Upsize/downsize
  - Rebalance
Replacement strategy

- Remove 4 units
- Reallocate tonnage
- Add humidity control
- Distribute ventilation
- Rewire controls
Custom Curb Adapters

- Reduce pressure loss
- Reduce height and weight
- Simplify installation

AES ADAPTER CURB INSTALLATION:

1. REMOVE ALL CONNECTIONS TO EXISTING RTU PRIOR TO LIFTING.
2. CAREFULLY REMOVE EXISTING RTU (DO NOT DAMAGE ROOF CURB).
3. INSTALL OWNER FURNISHED NEOPRENE GASKETS TO ALL EXISTING ROOF CURB FLANGES AND RAILS.
4. PLACE NEW ADAPTER CURB OVER EXISTING ROOF CURB AS SHOWN. SEAL ALL AIR IMPACTED SURFACES SUCH AS GAPS BETWEEN MOUNTING SUPPLY/RETURN RAILS.
5. ATTACH ADAPTER CURB TO EXISTING ROOF CURB WITH 14×3/4" LONG SELF TAPPING SCREWS (W/ GASKETS).
6. INSTALL OWNER FURNISHED NEOPRENE GASKET TO ADAPTER CURB FLANGES AND SUPPLY/RETURN AIR RAILS.
7. INSTALL NEW RTU PER MANUFACTURER’S RECOMMENDATIONS.

RTU ADAPTER CURB INSTALLATION DETAIL (TYPICAL)
RTU System Replacement Results

- Implemented strategy at 34 stores in 2014 with average capacity reduction of 67 tons (22%) per store

- Largest single store capacity reduction was 109 tons (41%)

- Annual energy savings for program is 12 million KWH or $1.3 million

- Program size will continue to grow as RTUs across the chain age.
Additional Benefits

• Address and correct ongoing store HVAC issues

• All work on roof – no store disruption

• Complete test and balance of RTU system to ensure optimal performance

• Control rewire increases EMS reliability

• Better comfort for team members and guests
Whole Foods Market and Advanced Roof Top Control Retrofits
Mike Ellinger

Global Maintenance and Refrigeration Coordinator
Whole Foods Market, Inc
2006-Present
mike.ellinger@wholefoods.com
Basis for projects

The basic fundamentals for the projects were driven by our energy goal. We are committed to a 25% reduction in energy use by the end of 2015. Internal hurdle rates require us to meet a 3 year ROI for project funding.
Replace or retrofit?

Determining factors to replace or retrofit were based on several items:

- Age of RTU
- Condition of RTU
- Type of refrigerant
- Amount of time left in lease
- Type of controls that are existing
Advanced RTU Control Retrofits

- 7 sites with 42 units in California, Arizona and Hawaii
- 771 tons of capacity
- 299 fan hp
- 1,109,000 estimated kwh savings to date
- Partnered with Transformative Wave Technologies on first sites in order to gain information for analytics that were shared with DOE
Advanced RTU Control Retrofits

Unit 02 Equipment Report

Unit 02

Selected System

UNIT 02
Location Served: Unit 02
Make: Carrier
Model: 48PGDC28-D-60-BB
Serial Number: 2406590013
Tons: 25.00
Indoor Fan Kw: 3.87
Comp 1 Kw Rating: 0.00
Comp 2 Kw Rating: 0.00

Unit Status

Mode: Energy Saving
Schedule: Occupied
Space Temperature: 71.9 °F
Occupied Heating S/P: 72 °F
Occupied Cooling S/P: 74 °F
Comfort Status
Fan Status
Heating Command
Mech. Cooling Command
Economizer Cooling
Advance Cooling
Ventilation Mode
Outside Air Damper: 12 %
Outside Air Volume: 5 %
CO2Sensor: 556 ppm

Space Dewpoint: 46.3 °F
OSA Dewpoint: 49.9 °F
Econ. Allowed

Fan Speed: 40 % Fan Power: 0.45 kW

Supply Air Limit: Normal
Drive Status: Normal

Details
Variable Speed Fan Retrofits

• More than just a standard VFD, CATALYST Lite is a powerful energy efficiency upgrade kit that converts constant volume HVAC systems from single-speed to variable-speed, reducing fan energy use by an average of 70%.

• Integrates with our existing building controls

• Controls motorized dampers in economizer mode

• Monitors unit for air flow deficiencies
• 141 sites with a total of 855 units installed to date
• 4,155 fan hp
• 10,938,000 estimated kwh savings a year
• Estimated to be less than a 1.5 year payback with utility rebates
Variable Speed Fan Retrofits

- Less than 200 units remaining
- Project included gathering all rooftop unit data for asset management purposes
- Transformative wave managed the utility rebate process for us as well
High Efficiency Roof Top Units

• Currently 3 sites retrofitted with Carrier Ultra High Efficiency units in Oregon and Florida
• Total of 18 LC units as of today
• Working with Pacific Northwest National Laboratory on units being installed in Portland, Oregon for data monitoring
• Estimated 100+ high efficiency units installed to date
Advanced RTU Campaign

Stephen Booth PE, CEM
July 14, 2015
Efficiency Vermont

- The Vermont Energy Investment Corporation (VEIC) is a non-profit organization with a mandate to reduce the environmental and societal impact of energy use.
- The Efficiency Vermont contract is administered by VEIC.
- Efficiency Vermont is an Efficiency Utility with a goal to reduce the growth of electrical energy use in the State of Vermont to limit the need to build new power plants to serve the State.
Complex Owner/Tenant Relationship

INS: Occupant

GSA: Lessor

Pizzagalli reality: Property Manager

Elman Investors: Building Owner
Varying Motivations by participants

- **INS**: better occupant comfort, and universal control
- **GSA**: better system efficiency in-line with their mandates
- **Pizzagalli Reality**: replace older equipment that was becoming a maintenance problem
- **Owner**: to keep the GSA happy - within reason
HVAC is performed by 79 stand-alone York “Sunline” rooftop units

- Lower roof units installed in 1990
- Upper roof units installed in 1994
- 68 units served the INS spaces
- 66 units were replaced in this project
Equipment Efficiency

10.0 SEER: Existing

13.8 IEER: Current CEE Tier II

18.0 IEER: RTU Challenge

20.3 IEER: Installed

(10 ton unit used for comparison)
Executive Summary: As a result of this project the facility will realize annual savings of:

- 289,300 KWh/year in electrical energy, or 9% of the total building usage.
- 118.4 KW in electrical demand, $41,200 per year.

Economics:

- $178,000 Incremental cost
- 4.3 year simple payback before incentive
Year Over Year Energy Consumption

- January 2014: 200,000 KWh
- February 2014: 250,000 KWh
- March 2014: 150,000 KWh
- April 2014: 300,000 KWh
- May 2014: 225,000 KWh

- January 2015: 200,000 KWh
- February 2015: 250,000 KWh
- March 2015: 150,000 KWh
- April 2015: 300,000 KWh
- May 2015: 225,000 KWh
How it Happened:

Have a strong relationship with the local property manager and a firm understanding of their concerns (better control of the building, fewer comfort complaints from occupants, less maintenance).
Know the space and the tenants (in this case the tenants advocated for the RTU upgrade to the building owner and the GSA).
Be able to both present strong numbers supporting the RTUs (ROI, simple payback) and speak to maintenance and tenant comfort benefits. Promote how this upgrade will advance the owner’s goals (Energy Star rating, maintaining a desirable tenant, etc).
Work with their preferred manufacturer and contractor (with this project the manufacturer, contractor and efficiency utility rep worked as a team to move this project forward).
Be persistent.
Work to overcome the customer’s technical and financial barriers.
Contact Information

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