Target's Rooftop Unit Replacement Program

Overview

As a leading organization in the retail industry advancing energy efficiency, Target is always looking for new ways to save energy. Through its partnership with the Better Buildings Alliance's Advanced Rooftop Unit Campaign and the Interior Lighting Campaign, Target is pursuing several energy-efficiency activities. One of its most successful efficiency efforts is an award-winning rooftop unit (RTU) replacement program. Target has developed an optimized, re-engineered process that integrates several energy-efficiency measures such as reduced lighting loads, improved roof insulation, optimized ventilation, and more accurate load calculations. This approach provides the benefits of ongoing energy reduction, operations and maintenance reduction, and improved heating, ventilating, and air-conditioning (HVAC) performance by reducing equipment cycling.

Award-Winning Results

Target has completed this whole-building retrofit on 40 stores and thereby reduced the RTU cooling capacity by 69 tons on average (ranging from 15 to 175 tons). These outstanding achievements in RTU replacements were recognized with two awards from the Advanced RTU Campaign. The first award, "Largest efficiency gain for a single-building RTU replacement project," was presented for 60% installed efficiency gain with 41% (108 tons) capacity reduction achieved in a single store. The second award, "Largest efficiency gain for a multiple-building RTU replacement project," was presented for an average of 50% installed efficiency gain at

Target's approach to RTU replacement is saving money in stores.

Results	
Number of stores	40
Average RTU cooling capacity reduction	69 tons
Highest RTU cooling capacity reduction	175 tons
Expected energy savings	13 million kWh/year
Expected energy cost savings	$1.3 million/year

40 stores with a range of capacity reduction of 8%–41% with 760 total RTUs. This project resulted in an estimated savings of 13 million kWh/year, producing cost savings of $1.3 million annually.

Process Innovations

Most RTU replacements are "one-for-one," where the existing RTU is replaced with the same size unit that has the same or slightly higher efficiency. An engineered approach involves calculating the heating and cooling loads, rightsizing the new RTUs to match the loads (and possibly save capital), and evaluating one or two steps higher efficiency to improve performance and reduce life cycle costs. Target's optimized, re-engineered approach to RTU replacement is a holistic redesign of the HVAC system, which allows

To date, Target has received two awards for outstanding achievement in RTU replacement.

Organizational Profile	
Established	1962
Number of Facilities	1,934
Employees	366,000
Project Scope	Optimized re-engineering approach to RTU replacement

Additional Benefits

This optimized, re-engineering approach also provides several nonenergy benefits:

- Improved airflow distribution ensures good indoor air quality and even temperature distribution.
- Reused sensors from the removed RTUs control the remaining RTUs.
- Lower cubic feet per minute per ton allows more tonnage on existing ductwork, reduces fan energy, and improves dehumidification.
- Control system rewiring improves reliability with fewer RTUs.
- Variable-speed air supply with constant ventilation provides good indoor air quality with the lowest fan energy consumption.

Target to take advantage of highly efficient equipment and reduced internal loads, provide improved humidity control, redistribute equipment loads, and apply a more efficient ventilation strategy. The result of Target's aggressive load reduction is a decrease in installed capacity by 20% to 30%. In addition, Target's re-engineered HVAC system design improves airflow, increases reliability, and reduces operations and maintenance time and costs.
A typical new HVAC design includes fewer RTUs in the main sales area and dedicated ventilation units, which enables additional energy-saving features such as energy recovery ventilators and optimized economizer sequences (depending on the climate) to be included. Target also removes splices and improves reliability by rewiring controls for multiple temperature senors. Finally, the company uses custom curb adapters, which are easier to install, reduce pressure loss, and decrease equipment height and weight. This optimized, re-engineered approach to RTU replacement reduced the capital cost by up to 30% compared to one-for-one replacement and cut ongoing HVAC energy and operations costs by 40%.

Target will continue to use this approach throughout its portfolio; these replacements are planned for 60–120 stores each year. As always, Target is always looking for ways to further improve the process, improve performance, and reduce costs.

The Advanced RTU Campaign is a promotional program that is designed to encourage building owners and operators to take advantage of savings opportunities from high-efficiency RTUs. ASHRAE, the Retail Industry Leaders Association, the Federal Energy Management Program, and the U.S. Department of Energy Buildings Technology Office (through the Better Buildings Alliance) collaborate on this effort.