

SHAW'S SUPERMARKETS

A Comprehensive Environmental Commitment

PROJECT SNAPSHOT

PROJECTS

Comprehensive lighting retrofits, detailed tracking of energy use, and changes in truck design, among others

TECHNOLOGY

Energy management software and fluorescent lighting systems

CO₂ EMISSION REDUCTIONS

Roughly 34,500 tons per year

INVESTMENT

About \$6 million

LESSONS LEARNED

The first efficiency investments were by far the most cost effective. Now that the company has captured the "low-hanging fruit," it has to work harder to find inefficiencies, and payback periods are longer. However, the success of the initial programs has created a very positive attitude within Shaw's toward investing in energy efficiency.

FUNDING SOURCES

Shaw's capital budget and incentives from electric utilities



INTRODUCTION

The retail grocery business is highly energy intensive. Grocery stores are huge spaces that must be heated, cooled and lighted around the clock. The storage and display of frozen and refrigerated foods creates large cooling loads, even in winter, and the transportation of food from distribution centers to stores puts a fleet of large trucks in motion around the clock. In other words, behind every grocery store lies a great deal of fossil fuel combustion.

The management of Shaw's Supermarkets has long realized that energy reduction cuts pollution, while adding to the bottom line. Shaw's worked hard with utilities and others to improve its energy efficiency throughout the 1990's. Building on the success of initial investments, the company broadened its focus to include waste minimization and pollution reduction in all areas of its operations. Without actively publicizing its environmental efforts, Shaw's has quietly become one of the most compelling environmental success stories in the Northeast.

THE PROJECTS

Shaw's is involved in a wide array of energy efficiency and environmental programs, including recycling and waste minimization, the replacement of ozone-depleting refrigerants, and fuel-saving modifications to its truck fleet. The two project areas described here focus on the company's commitment to reducing greenhouse gases. The first is its customized energy sub-metering, monitoring and exception-reporting system. The second is its lighting system improvement program.

Computerized Energy Monitoring

Few if any supermarkets in the U.S. have saved as much energy through advanced energy monitoring systems as Shaw's has. In 1997, after successfully implementing a refrigerant leakage reduction program, the company began to work with its leak detection system provider to develop an energy sub-metering and monitoring program that would use the

same communications hardware and reporting mechanisms. Prior to this effort, the only way to find out about energy waste was by to identify trends on monthly bills. Because energy department staff reviewed a "whole house" bill, it was difficult to pinpoint exactly where the electrical inefficiencies were. It also was difficult to enlist the help of maintenance staff, since store managers had little information to offer them.

However, by installing state-of-the-art sub-metering equipment capable of monitoring up to 16 electrical circuits per store, Shaw's is now equipped with a toolkit that saves time, energy and maintenance costs. Based on daily energy downloads from the monitors, store managers receive "exception reports" that flag periods during which energy consumption is higher than expected. Predicted use is modeled using historical data, taking into account weather information for the particular time of year, and retail volume data for the time of day. "With this system," explains Kathy Loftus, Shaw's Energy & Regulatory Affairs Manager, "we are able to diagnose a problem quickly, and either make a correction remotely through the energy management software, have store management take care of it, or dispatch maintenance personnel with a graphical representation of the problem."

The resulting load profiles permit Shaw's to target potential energy efficiency strategies like decommissioning refrigeration systems, implementing more aggressive controls for anti-sweat heaters¹ and air conditioning systems, and developing custom lighting schedules. The company also is able to test the claims made by manufacturers of energy efficiency products, and then use that information to design systems more efficiently. Here are a few examples of anomalies that it has identified:

- Screw compressors, generally more efficient than traditional compressors, are not as efficient in Maine's climate.

- A heat-recovery system using hot water from compressors increased in efficiency after the company made minor modifications.

- The manufacturer's recommended set points for anti-sweat heaters caused the units to operate longer than necessary.

Shaw's has cut costs further by identifying and correcting control failures and lighting system overrides that previously would have gone undetected (this is illustrated graphically in the discussion of lighting retrofits, below). These actions have generated additional savings estimated at between one and two million kWh a year.

All told, Shaw's new energy monitoring systems reduce electricity use by 23 million kWhs a year, while avoiding nearly 17,500 tons of CO₂, as well as 71 tons of SO₂ and 24 tons of NO_x.²

In addition to energy monitoring, Shaw's has taken the relatively simple step of changing thermostat setpoints. By allowing stores to remain warmer in summer and cooler in winter, the company saves additional energy. The energy monitoring system quickly alerts store managers in the event of overcooling or overheating.

As originally authorized by management, the sub-metering and monitoring project for 110 stores carried a price tag of slightly over \$2 million, an internal rate of return of 27 percent and a simple payback³ of about four years. It was assumed that about five percent of the total cost would be provided by utility companies in the form of end-use energy efficiency program rebates. In the end, the project cost was lower – a bit less than \$2 million – because the company negotiated a lower installation price, with utilities contributing incentive payments that were three times greater than originally estimated. In the end, incentives accounted for more than 17 percent of the total project cost, and lowered the simple payback to just over two years.

Lighting Retrofits

Shaw's has been retrofitting lighting systems since 1991, when it took advantage of existing utility incentive programs to convert several back room and perimeter area systems. At the time, sales area lighting consisted of metal halide fixtures, thought to be the most efficient for that application. Since 1996, however, the company has designed and retrofitted its continuous rows of uniform fluorescent fixtures with highly efficient T-8 lamps and electronic ballasts. The company also installed them in its refrigerated cases after the ballasts were improved to work well in cold environments. In addition to lowering lighting use, this has cut refrigeration loads by reducing the amount of heat generated inside the cases. Finally, Shaw's has installed state-of-the-art lighting in its distribution centers, including "hi/lo dimming" systems that automatically lower lighting levels when aisles are empty.

Lighting retrofits are very attractive investments for Shaw's. They can cut electricity use in half. To date, the company has spent more than \$4 million on them at 60 stores, for a per-store cost of about \$65,000. It consistently has found that these investments pay for themselves in three to four years, offering internal rates of return of up to 30 percent. Utility incentives have helped with up-front costs, while making for more attractive rates of return. In some cases, they have reduced payback to less than three years.

Shaw's estimates that it is saving roughly 20 million kWh per year as a result of the lighting retrofits it has done. These savings avoid more than 15,000 tons of CO₂, 62 tons of SO₂ and 21 tons of NO_x each year.

The chart below illustrates the results of a lighting retrofit in one Shaw's supermarkets. The red peaks on the bars during the early weeks of the retrofit record electricity use by the construction crews that performed the work overnight, when fewer lights normally are on. Beginning the week of May 17, the store's daily electricity use fell by an average of nearly 50 percent.

THE RESULTS

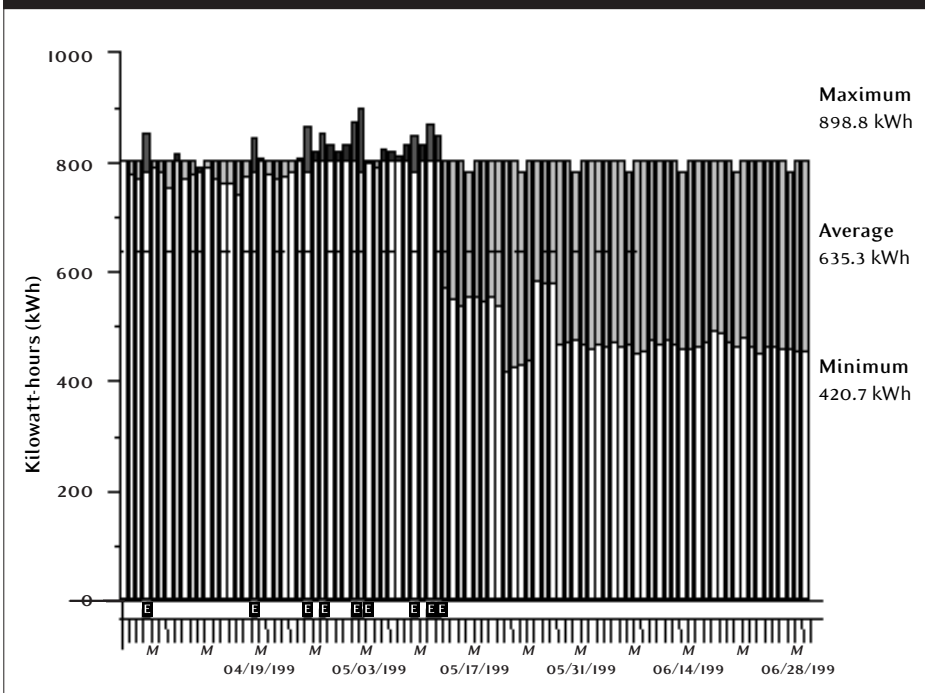
Looking at Shaw's energy monitoring systems and lighting retrofits together, the company is reducing CO₂ emissions by more than 32,500 tons per year. This is similar to a cut in oil consumption of nearly 60,000 barrels per year or the removal of over 4,500 typical passenger cars from the road. The company also has reduced SO₂ emissions by nearly 133 tons, and NO_x emissions by some 45 tons.

Encouraged by these impressive results, Shaw's is going beyond electricity savings. The company has initiated a program to modernize its vehicle fleet. It is focusing on achieving more efficient engine ratings and better aerodynamics, and installing electronic speed limit controls. About 20 new trucks are purchased each year, and a number of existing trucks retired. As a result, the Shaw's fleet annually achieves an increase in overall efficiency of about 0.2 mile/gallon. The company estimates that to date it has gotten an additional 17 million miles out of its fleet for the same amount of fuel. It also has a tire-recapping program, and has voluntarily discontinued use of the ozone-depleting refrigerant R-12 by replacing or converting 95 percent of its refrigerated trailers with newer units that use HCFCs.

LESSONS LEARNED

Initially, the lighting retrofits offered paybacks of two to three years, and more rebate dollars were available from utilities. This made retrofits particularly attractive business decisions. Due to the success of these programs and Shaw's environmental commitment, the company has continued the retrofits, and designed high-efficiency lighting into new stores, even when rebates have been lower and the economics less compelling. At a time when competitive pressures force retailers to spend more on sales-generating measures, Shaw's continues to see considerable benefit in earmarking capital for energy efficiency and environmental investments.

RESULTS OF A SHAW'S SUPERMARKETS LIGHTING RETROFIT



Energy savings from a lighting retrofit at a Shaw's supermarket are shown here. Electricity use dropped dramatically after May 17, when the work was completed. The baseline, at about 800 kWh, represents store use prior to the retrofit.

FUTURE COMMITMENTS

Shaw's has been working with architectural and engineering firms to incorporate daylighting technology, more sophisticated air conditioning controls, solar-powered condenser systems and sustainable construction practices into its buildings. In addition, the company continues to investigate the use of natural gas micro-turbines to offset peak electricity requirements, and renewable resources to meet some of its energy needs. To further reduce miles traveled by its vehicles, it is reviewing driving patterns and working on network optimization.

COMPANY PROFILE

The roots of Shaw's supermarkets date back to the 1850's and to a small grocery store in Portland, ME. The store was opened by George C. Shaw, and its specialty was exotic tea. In 1919, Shaw's company was bought by the Brockton Public Markets grocery chain. Both stores grew throughout the century, and by the time

Brockton adopted the Shaw's name in 1978, the company had opened retail operations throughout New Hampshire and eastern Massachusetts. In 1987, England's largest supermarket company, J. Sainsbury, acquired a controlling interest in Shaw's.

Today, as a subsidiary of J. Sainsbury, Shaw's operates 183 stores in Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island and Vermont. The company also operates two major distribution centers in Massachusetts and one in Maine. Based in East Bridgewater, Massachusetts, Shaw's employs nearly 30,000 people and serves more than four million customers each week.

Because electricity represents a significant percentage of a grocery store's total operating costs, Shaw's has focused for many years on decreasing its electricity use. The company also has worked on reducing resource use and increasing recycling as ways to further cut costs and minimize environmental impacts. The company's interest in superior environ-

mental performance got a major boost from J. Sainsbury, noted for its commitment to environmental improvement in the U.K. Now guided by a comprehensive environmental policy, Shaw's has pledged to maintain "the highest standards of environmental management in all areas of our business and to constantly seek to improve on the standards. Shaw's also expects all of its suppliers to reflect these standards in their businesses."

This comprehensive environmental policy distinguishes Shaw's from many other businesses – even those with a strong focus on reducing energy use. Shaw's commitment extends to changes that do not contribute as directly to the bottom line as energy efficiency. For example, it has phased out ozone-depleting refrigerants. Although some of the replacement refrigerants are less efficient, they are far less harmful to the earth's ozone layer.

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¹ Anti-sweat heaters are electric heaters that prevent condensation from forming in specific areas of refrigerated cases.

² All emission reductions cited here are calculated based on New England regional marginal emission rates, provided by ISO New England. See Appendix A for a discussion of these calculations.

³ Simple payback is calculated using constant (i.e., today's) dollars.

CLEAN AIR-COOL PLANET CASE STUDY RATING

This case study reduces CO₂ emissions equivalent to the following:

Avoiding the consumption of 165 barrels of oil per day. (1 barrel = 10 barrels of oil)



OR Taking 4,641 vehicles off the road per year. (1 car = 300 vehicles)



Assumptions: 1,093 lbs of CO₂ per barrel of oil. Vehicles are average passenger cars (approximately 20 lbs CO₂ per gallon of gasoline - 22.5 miles per gallon, averaging 16,000 miles per year)