

Successful Water Conservation Projects

How Four Companies Saved Money Saving Water

Introduction

As part of its mission to help companies improve environmental performance, the Office of Technical Assistance and Technology (OTA) offers a range of services to help facilities improve water use efficiency, comply with relevant federal and state regulations, and reduce wastewater discharges. These services include on-site visits to facilities by OTA staff, workshops, and publications on best management practices designed to educate and connect companies to relevant resources. This case study highlights successful water conservation projects implemented by four Massachusetts companies with OTA assistance. Three of the companies are located in Marlborough, and the fourth is in Leominster. The water conservation projects significantly reduced the companies' water use and saved them money. The combined water reductions from these four companies totaled more than ten million gallons per year. The four companies also saved a combined \$156,000 annually due to reduced water use, fuel, and wastewater treatment costs. If other options are implemented, they could save an additional \$30,000. The payback period for all of these projects is less than three years.

Marlborough Water Conservation Audits

With funding from the U.S. Environmental Protection Agency (US EPA) and the Massachusetts Department of Environmental Protection (MassDEP), the Massachusetts Office of Technical Assistance and Technology (OTA) supervised eight water audits, performed in conjunction with three independent professional engineers. The confidential water audits were offered to facilities in the city of Marlborough at no charge to the company. The city of Marlborough had reached the limit on its wastewater treatment and discharge capacity, and reducing discharges (a consequence of reducing water use) was critical to reducing the costs of any future development in the city.



Marlborough's Wastewater Treatment Facility

The purpose of the project was to determine if providing subsidized audits to examine water use and identify potential areas for saving or reusing water would actually prompt reductions in water use. As a result of the project, more than half of the facilities reported undertaking or planning significant water conservation activities and others are investigating alternative options or seeking funding. Three companies have agreed to waive confidentiality in order to share information about what they have already accomplished and what they hope to achieve by implementing additional conservation measures. The facilities are:

- Rohm & Haas Electronic Materials (now a specialty chemical products division of Dow Corporation)
- The Massachusetts Container Corporation, a corrugated paper box manufacturer
- The Marriott Hotel

Rohm and Haas Electronic Materials (Dow)

Dow Chemical's Rohm and Haas facility is a premier specialty materials and chemical company. Dow sells some of its products in reusable containers called "totes", which are washed with deionized water after being returned to the facility from the customer and refilled with brand new chemicals. Before the audit, a Dow employee, Everett Olds, had proposed and carried out a successful pilot project that reclaimed the water from the tote-washing to reuse in the

same operation. Everett estimated the reuse operation would save about two million gallons of water per year. No capital approval had been given by management to proceed, however.



System for reusing water from container washing operations at Rohm & Haas (Dow), Marlborough

opportunity to reuse water in a bottle-washing operation. Glass bottles are washed prior to filling with product and must meet very high cleanliness standards (the totes are refilled with the same product, so the same level of protection against chemical cross contamination is not required). The company is pilot testing this proposal and will have to document the procedures for its ISO (quality assurance) certification and to ensure customer acceptance. Documenting the project will take some time, but it is expected to be successful. The project is estimated to cost about \$40,000 with an expected payback of two years and savings of about two million gallons of water per year.

Kmiotek also discussed an idea he had for taking “reject” water from a continuous deionization system and running it back into the system. Tomaselli confirmed that reuse of the reject water in this manner would likely be feasible. The project is estimated to save about one million gallons per year. Its projected cost is about \$20,000, with a two-year expected payback. Savings from these actions include: reductions in water and sewer discharge fees, savings in recovered chemicals, and expected improvements in operational efficiency.

Dow also noted that the success of the water reclamation project for totes has been widely communicated throughout the company; Dow’s other facilities throughout the world are now investigating if similar options are available to them.

As a result of receiving the water audit, Steve Kmiotek, the company’s Environmental Health and Safety Delivery Leader, and his team were able to obtain the capital they needed to implement the water reuse option. The audit results and the attention of the state served as a confirmation of the importance of focusing on water conservation opportunities. The company implemented the reuse system and will save close to \$20,000 per year. The payback period was less than 1.5 years on a \$25,000 capital investment.

Mike Tomaselli from Filters, Water and Instrumentation (FWI) performed the water audit at the Dow facility. During the walk-through, he identified a similar opportunity to reuse water in a bottle-washing operation. Glass bottles are washed prior to filling with product and must meet very high cleanliness standards (the totes are refilled with the same product, so the same level of protection against chemical cross contamination is not required). The company is pilot testing this proposal and will have to document the procedures for its ISO (quality assurance) certification and to ensure customer acceptance. Documenting the project will take some time, but it is expected to be successful. The project is estimated to cost about \$40,000 with an expected payback of two years and savings of about two million gallons of water per year.

“OTA’s expertise and support have been a critical success factor for these vital water conservation projects and the EH&S team here at Dow is appreciative of their support.”

Steve Kmiotek
Dow Chemical Company

Table 1: Rohm & Haas

| Water Reuse Project | Cost | Water Reduction | Annual Cost Savings | Payback Period |
|--|-----------------|--------------------------|---------------------|-------------------|
| Tote washing | \$25,000 | 2 million gallons | \$20,000 | 1.25 Years |
| Bottle washing* | \$40,000 | 2 million gallons | \$20,000 | 2 Years |
| Continuous deionization system** | \$20,000 | 1 million gallons | \$10,000 | 2 Years |
| Actual Reductions Achieved | \$25,000 | 2 million gallons | \$20,000 | 1.25 Years |
| Projected Reductions After Implementation | \$60,000 | 3 million gallons | \$30,000 | 2 Years |

* Project in pilot testing

** Undergoing company approval process

Massachusetts Container Corporation

Massachusetts Container Corporation (MCC), a subsidiary of Unicorr, manufactures displays, art, plastic corrugated and stock boxes and other packaging products. Facility manager Ed Santiago told OTA that, as a result of the audit, by OTA and Ambient Engineering's Ken Pyzocha, several actions had already been taken and more projects were being planned. One change that did not require any new equipment was color sequencing - the practice of planning printing jobs in order of darkness, beginning with the lighter colors. If color runs are planned so that they progress from light to darker colors, and like colors are run together, cleaning needs are greatly reduced. Reducing the need for washdown of printing equipment does more than reduce the use of water – it saves time, energy, and cleaning chemicals.



Flow meter installed by Massachusetts Container Corporation on hose used for equipment washing

A second water conservation project utilized relatively inexpensive equipment – simple water meters were installed on each hose used for washdown and other purposes. Employees were encouraged to use less water, and monitoring individual water use has led to reductions during the equipment washdown process. A third conservation measure that the company adopted was to install low-flow toilets; toilets that were 3.6 gallons per flush (GPF) have been

changed out to 1.6 GPF varieties, some with automatic flush sensors.

Finally, the facility began using treated wastewater from plant operations for equipment cleaning. The company is enhancing the treatment of this wastewater so it can be used in additional cleanup applications, and for making starch glue. The facility is also studying whether it can save water by converting from the continuous discharge of boiler blowdown water to a system that reuses the water and captures its heat.

Actions implemented by MCC have reduced water use at the facility by about 75 percent, from 2,000 gallons per day (GPD) to 500 GPD. The cost associated with implementing these changes is estimated by MCC to be less than \$7,000. The estimated savings in water and sewer charges amount to about \$3,600, yielding a payback of about 2 years. The company will also consider OTA's recommendation to investigate the potential for using rainwater for cleanup or other operations. The company's goal is to completely eliminate wastewater discharges.

Table 2: Massachusetts Container Corporation

| Water Reuse Project | Cost | Water Reduction | Annual Cost Savings | Payback Period |
|--|-------------|------------------------|----------------------------|-----------------------|
| Color sequencing, water meters, low-flow toilets, and wastewater reuse | \$7,000 | 366,000 GPY | \$3,600 | 2 years |

Marriott Hotel

The Boston Marlborough Courtyard by Marriott Hotel features more than 200 guest rooms, a restaurant, fitness center and 8,000 square feet of event/conference/meeting space. This Marriott facility, managed by Interstate Hotels and Resorts, had three washing machines installed in 1986 for washing linens and towels. OTA and co-auditor Laura Marcolini of Fuss & O'Neill both recommended upgrading the laundry operations to high efficiency washing machines that use less energy, water and chemicals. The hotel subsequently priced a replacement system at \$17,000. A few months after receiving the audit, one of the existing washing machines broke down. The repair cost was estimated at \$13,000. Management recalled that the audit had estimated a 200,000 gallon per year reduction in water use with a modern washing machine, and that this would produce an estimated savings of \$2,000 to \$3,000 per year in reduced water and sewer charges.



The replacement washing machine installed by Marriott

“We learned a lot from everything you sent us. Conserving water now comes up every day at morning staff meetings; it has to, if you want to change something. The water meter is read every day and water use is now tracked. The audits opened up eyes to a lot of issues, now people are aware that this is what you do”.

Mary Simone, Boston
Marlborough Courtyard by
Marriott Hotel

The company had a choice to spend \$13,000 to repair the machine or replace it with a new, modern machine that was more efficient for \$17,000. The potential savings from reduced water use would pay for the \$4,000 cost difference in less than 3 years.

The facility also replaced two urinals with low-flow models at a cost of about \$1,000. Hotel general manager Mary Simone told OTA there was a very strong positive response when she presented the water conservation projects at a regional meeting of Interstate staff.

Simone is also interested in the idea of using rainwater. The audit report identified options for reusing roof rainwater runoff for swimming pool make-up water after filtering, and for irrigation. A lack of capital due to low occupancy rates prevents the implementation of the full tank, pump and filtration system recommended by the auditor, but Simone told OTA she will investigate simpler options, such as rain barrel collection, even if they will not reduce large volumes of use. “Guests want to see that you are making the effort,” she said.

Table 3: Marriott Hotel

| Water Reuse Project | Cost Difference | Water Reduction | Annual Cost Savings | Payback Period |
|-----------------------------|-----------------|-----------------|---------------------|----------------|
| Washing machine replacement | \$4,000 | 200,000 GPY | \$2-3,000 | <3 years |

Additional Water Conservation Efforts

The fourth company in this case study was not part of the Marlborough project, but is here included as an example of how water conservation projects can make sense as a part of business planning, even in a location where there is no special focus from municipal, state and federal authorities, or subsidies for water audits.

Claremont Flock Corporation

Claremont Flock Corporation (CFC), located in Leominster, has produced flock from textile by-products since 1915, and has grown to become the largest independent supplier of flock in the world. Flock consists of fibers cut to precise lengths and custom dyed for specific applications which include apparel, automotive, carpet and paper manufacture. The company produces flock from a variety of fibers including rayon, cotton, nylon, polyester, acrylic and other specialty fibers, and dyes them to customer specifications.



The rinsing operation at Claremont Flock

OTA staff visited the facility and recommended:

- Installation of high-pressure low-volume nozzles at fiber-cleaning stations
- Investigation of water reuse from flock rinsing operations
- Requiring suppliers to deliver raw materials without exceeding certain limits on contaminants, to reduce the need for cleaning before dyeing and other processing steps

The company immediately installed the low flow nozzles, at a cost of about \$300 and 10-15 employee work hours. The company has estimated that installing efficient nozzles has reduced water use from about 27 gallons per minute (GPM) to about 8 GPM, a 70 percent reduction on some of its production lines. Reduced water use at the facility lowered discharge levels from 21 million gallons per year (GPY) to 12 million GPY. Each gallon costs about \$0.0075 in water intake and discharge fees, and, because the company heats the water, additional savings of \$0.0075 per gallon

are realized in avoided fuel costs. Annual cost savings amount to about \$130,000 in avoided water and fuel costs. According to the company, the high-efficiency nozzles with fixed openings not only cleaned more effectively, but also provided a non-fluctuating pressure. This enabled the company to make products with smaller width fibers, increasing their production capabilities.

According to Tony Caruso (Plant Manager) and Nick Rivard (Maintenance Supervisor), the company investigated rinse water reuse but did not find any cost-effective options. While communications with suppliers on limiting contamination in incoming raw materials presented challenges, they were able to obtain better quality raw materials as a result. This reduced water consumption both from washing and the use of chemicals, especially treatment chemicals used for meeting biological oxygen demand (BOD) limits.

“It was a minimal investment, and the savings are great. But we would have wanted to do this even without them – they improved the process”

Tony Caruso
Claremont Flock

Table 4: Claremont Flock Corporation

| Water Reuse Project | Cost | Water Reduction | Annual Cost Savings | Payback Period |
|--|-------------|------------------------|----------------------------|-----------------------|
| Installing high-pressure low-volume nozzles* | \$300 | 9,000,000 GPY | \$130,000** | Immediate |

* There is an additional labor cost of 10-15 hours staff time.

** Includes energy savings. Savings from improved process efficiency and product quality have not been quantified.

Contact Information

This case study is one in a series prepared by the Office of Technical Assistance and Technology (OTA), a branch of the Massachusetts Executive Office of Energy and Environmental Affairs. OTA, the Commonwealth’s center for technical information and assistance, promotes strategies and solutions that enable businesses to enhance their competitive position as they reduce the use of toxic chemicals and conserve energy, water, and materials, while ensuring that worker health and safety are sustained. For additional information about this or other case studies, or about OTA's technical assistance services, contact:

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