Department of Administration
210 Martin Luther King Jr Blvd
Madison, WI 53703

Total Costs: $18,080
Current Funding: $0
Funds requested: $18,080

Title : Increased Water Softener Efficiency
Location : Dane County Job Center, Lyman Andersen Building, Juvenile Shelter, Dane County Detoxification Center, Consolidated Food Service

1) Detailed description of proposed project

Introduction

This project will involve the replacement of water softening systems in six Dane County facilities, thereby reducing Dane County's consumption of rock salt (sodium chloride), saving energy, reducing water use, and joining with county partners to reduce chloride contamination of Dane County's lakes, streams and wetlands.

Water softeners in five of these Dane County facilities discharge their regeneration water, and its increased concentration of chlorides, to the Madison Metropolitan Sewerage District (MMSD), and ultimately because wastewater treatment does not remove sodium or chloride, to Badfish Creek and Badger Mill Creek.

Reduction of chloride contamination is an important focus of Dane County and many partners. Our freshwater streams and lakes contain low levels of naturally occurring salts, including chloride. These salts are essential to the aquatic organisms that live there. However, high concentrations of chloride are harmful to aquatic plants and animals.

As chloride is a significant threat to freshwater ecosystems, it is addressed in wastewater discharge regulations. Chloride cannot be removed using standard wastewater treatment technology; therefore, chloride that arrives in wastewater passes through treatment plants and enters natural water bodies as treated effluent. However, MMSD still needs to meet limits for chloride levels to comply with its discharge permit. MMSD could invest in technological upgrades to meet chloride limits, but all potential treatment options are expensive, ranging from $400 million to $2.3 billion (net present value). This cost would be reflected in increased sewer bills to rate payers. As an alternative to expensive technological solutions, MMSD is investing in pollution prevention efforts to reduce chloride at the source.

Part of MMSD's pollution prevention strategy is offering rebates for projects that reduce chloride contributions to the sewer system, such as water softener improvements. These rebates are tied to the demonstrated amount of salt that recipients can reduce per month. Rebates are also available for elution studies to evaluate the current performance of large softeners.

MMSD is a partner in this project, as they have already committed funding toward improving the efficiency of the five water softening systems that are the focus of this project., conditional on the documentation of the actual salt reduction achieved by the project.

The Dane County Office of Lakes and Watersheds (Land and Water Resources Department), a partner with Facilities Management (Department of Administration) in this project, plans to incorporate a water softener chloride reduction focus into its existing community engagement program, thereby leveraging additional chloride reductions by promoting household water softener efficiency upgrades by Dane County residents. Our message to the public on this issue would be reinforced by our ability to point to our own facility-wide water softener upgrades contained in this proposal.

1) Detailed Description of the Proposed Project

The softening systems in each of these six facilities have deficiencies that allow for reductions in chloride discharge to the drain. Many are very old and are not capable of reaching the efficiencies of modern softening systems that have low salting capabilities. Resin also experiences a 1-2% loss in efficiency according to the manufacturers. Hence a unit that is 15 years old could potentially be 30% less efficient than a new unit even if it is well maintained. The replacement of all of these softeners with new high efficiency equipment will decrease Dane County's salt consumption.

In two of these facilities the softeners are grossly oversized for the demands of the building. When units are oversized they use the resin bed very inefficiently during the regeneration cycle which causes premature resin fouling and degradation. The reserve capacity is also more than is needed which simply is a waste of salt due to the volume of brine per regeneration cycle. Both of these conditions can be remedied by downsizing the units to more accurately condition to the actual flow rates of the individual facilities. In the Job Center and Lyman Andersen buildings the units will be downsized by ½ or more to increase efficiency.

I have attached literature on the softeners that are being proposed. The savings as quoted by the manufacturer claim a savings in salt of 40-60% over the traditional water softeners currently found in our facilities. I have calculated the savings on this upgrade at a 30% level to be more realistic with what will actually be recognized.

Total salt consumption for all six buildings is approximately 25,000 lbs per year delivered in 50 lb bags. With a 30% savings, Dane County will purchase 150 fewer bags of salt totaling 7500lbs and protecting 1.5 million gallons of fresh water from chloride contamination. The immediate cost savings for salt purchasing will be $1,049 per year using the delivered price of $7.91 per bag.
There will be additional cost savings recognized with the reduction in salt consumption as well. Fewer salt deliveries from vendors in Madison and trips by county personnel to purchase salt should save roughly 130 miles of trucking which will translate into operational fuel and emissions reductions. By using less salt overall there obviously will be a reduction in time spent filling brine tanks by staff especially at CFS where the usage is the highest.

2) How the project, if carried out, will meet the county's sustainability principles
Notes related to several of Dane County's sustainability principles are found below. This project supports multiple categories of action included in the Dane County Government Sustainable Operations Plan, especially goals the county has for its operations, management, and

policymaking in a more sustainable future. Specific categories of action this project supports are in the areas of water, waste, and outreach and education.

- Sustainability Principle: Reduce and eventually eliminate county government's contribution to fossil fuel dependence and to wasteful use of scarce metals and minerals;
- How this project will help meet this principle: it will reduce rock salt use, reduce energy usage to mine the rock salt and transport it to Dane County, and savings associated with water utility and wastewater treatment plant not having to treat 45,000 gallons of water per year. Rock salt used in Dane County softeners is supplied locally by Kreger Salt Sales, and the source of the rock salt they supply is from multiple out of state vendors.
- Sustainability Principle: Reduce and eventually eliminate county government's contribution to encroachment upon nature and harm to life-sustaining ecosystems (e.g., land, water, wildlife, forest, soil, ecosystems);
- How this project will help meet this principle: the proposed project will reduce salt use and aid in reducing chloride impacts on Dane County lakes, streams, wetlands and groundwater.
- Sustainability Principle: Reduce and eventually eliminate county government's contribution to conditions that undermine people's ability to meet their basic human needs.
- How this project will help meet this principle: It will help reduce the potential impact of sodium in drinking water on human health.

The United States Environmental Protection Agency has established a Drinking Water Equivalency Level (DWEL) of 20 mg/L for sodium in drinking water as guidance to protect drinking water quality. The vast majority of City of Madison wells meet the current DWEL criteria. Of the 22 active wells monitored by Madison Water Utility, only three exceed 20 mg/L.

Despite the above wells exceeding the current DWEL the amount of sodium consumed from drinking water is relatively minimal and not expected to lead to any adverse health impact, even for individuals on a sodium-restricted diet. (Source:"Sodium in Drinking Water" August 14, 2009 by City-County Public Health (http://www.cityofmadison.com/sites/default/files/city-of-madison/water-utility/documents/sodiuminwater.pdf

This project, along with other work by partners to reduce chloride use, helps to prevent sodium levels reaching higher levels and becoming more of a health issue.

3) How the county might build upon the sustainability outcomes of the proposed project.

Project partners, including the Wisconsin Salt Wise partnership, will leverage additional chloride reductions by promoting household water softener efficiency upgrades to Dane County employees and homeowners countywide and by highlighting the county's commitment to reducing salt use in its own facilities.

In areas of Dane County not served by MMSD or other wastewater treatment plans, reducing chlorides in water softener discharge water will help to protect groundwater supplies.

Information about chloride reductions and how water softener efficiency can assist with that will be posted on the Dane County Office of Lakes and Watersheds web site (www.danewater.com), promoted to the Dane Stewards listserv, and through communications with the Dane County Watershed Network and social media. We will also work with the Dane County Executive's office to share household water softener efficiency recommendations with all 2500 Dane County employees.

Our recommendations to the public and to employees will be much more credible because we will be able to describe how water softeners at Dane County facilities are being upgraded to a more sustainable condition.

The information below is an example of our proposed outreach to county employees and the public to leverage additional sustainable actions by homeowners.

Approximately 100,000 water softeners are tributary to MMSD's Nine Springs Wastewater Treatment Plant. The following steps can greatly decrease your water softener's salt output:

- Optimize water softeners (our household softening study found that, on average, this can reduce salt use by 27%). Local water quality professionals provide this service.
- Replace older or inefficient softeners - when replacing a softener with high efficiency softeners, the same study found 48% savings on the amount of salt used. Some existing models can be particularly wasteful on salt and water use. Timer based softeners (which regenerate after a certain time period vs. gallons used or hardness readings) have not been allowed by Wisconsin's plumbing code for over 15-years - if you have one, look into replacing it!
- If you're in the market for a new water softener, look for a dual tank system and/or a softener that exceeds 4000 grains of hardness removed per pound of salt used. MMSD has worked with our local water quality professionals to develop a list of Best Practices to help you get an efficient new softener. Link is http://www.madsewer.org/Portals/0/ProgramInitiatives/ChlorideReduction/2015SofteningBestPractices.pdf

- Check to see how your softener is calibrated. Some softeners are preset for the highest hardness setting at the factory. This setting may be as high as 30 grains. Reset the hardness actual hardness, generally between 16 and 22 grains.
- Soften only the hot water in your home. This reduces the demand for soft water and therefore reduces the amount of salt that is getting into our local waters.
- When you add salt, look at the water level. About 18-inches of water in the bottom of your salt tank is right, if the water is higher, you could be wasting salt and water during each regeneration. If you see higher water, call in a water quality professional – a small repair could keep you from buying and hauling unnecessary salt to your softener.

4) **How your department intends to track and measure the outcomes of the project, such as cost savings, energy reductions, maintenance reductions, etc., if funded, and who will be responsible for measurement and verification.**

Quantities of salt currently being purchased for each facility are known to the best abilities of all involved parties. Post install consumption will be recorded to assure savings is being recognized at or above the levels benchmarked in this project description. Todd Draper in Facilities Management will be responsible for keeping documentation on project savings.

5) **Budget Sheet: Include all costs of achieving the objectives of the project.**

Cost of systems purchase install and setup- $15,000
Administrative costs- $1,440
Contingency @ 10%- $1,640
Total amount requested - $18,080
Total MMSD rebates - $250 *
Project payback based on salt purchase alone and not allowing for inflation – 17 years

*Waiting for a response from MMSD on whether or not the monthly salt reductions can be combined for the five facilities served by MMSD. If allowed the application for rebate will be submitted.