

## Water Softeners and the Environment

*Bureau of Wastewater Management Staff Wisconsin Department of Natural Resources*

Do you use a water softener in your business or home? If your answer is "yes," this article contains information for you on how to optimize its usage, resulting in lower salt costs for you and benefits for the environment.

You can easily reduce high concentrations of salt which flow from your business or home to your septic system or your local wastewater treatment plant, and ultimately end up in neighboring lakes, streams, rivers, and groundwater. The cumulative effects of each homeowner's excess use of salt and resulting brine discharge can have toxic effects for aquatic plants and animals.

### **Why is Water Softener Salt a Problem?**

Based on estimates from the Salt Institute of America, in 1994 Americans spent approximately \$240 million to purchase 2.6 million tons of salt for use in water softeners.

The primary salt utilized in home water softeners is sodium chloride (NaCl), a naturally occurring and commonly used substance. NaCl normally breaks down into sodium (Na<sup>+</sup>) and chloride (Cl<sup>-</sup>). These elements are discharged to septic systems or to your local wastewater treatment plant via sanitary sewers. It passes through these systems and is discharged to groundwater or surface water, where the chloride may impact freshwater organisms and plants, from plankton to fish, by altering reproduction rates, increasing species mortality and changing the characteristics of the entire local ecosystem. In addition, as chloride filters down to the water table, it can stress plant respiration and change the desirability of our drinking water.

### **How Does a Water Softener Work?**

In many Wisconsin communities, people use water softeners to remove minerals from their water that cause hardness. An ion exchange process is the traditional method of removing hardness from water for household use. Hard water passes through a column of sodium charged resin, where hard water ions such as calcium and magnesium are removed from the water by exchanging places with the resin bound sodium ions. The water is then said to be "softened."

The resin is "exhausted" when it has given up all or most of its available sodium ions. The resin is then "recharged" with sodium ions during a process known as regeneration. During this process, the resin is washed with a concentrated brine solution (most often NaCl) that reverses the hardness removal process. The total regeneration cycle includes backwash, brine regeneration and final rinse. Of the three steps in the cycle, brine regeneration is the part over which a business or homeowner has the most control.

### **What Can I Do To Reduce Salt Usage?**

Soften only the water that needs to be softened. If you are building a new house, remodeling bathrooms or kitchens, replacing old plumbing or installing a new water softener, consider where your water needs to be softened. Work with your plumber to connect your water softener to only those areas that need softened water.

Places to "feed" softened water are:

- hot water heater
- laundry facilities
- dishwashers
- toilets (consider low flush models)
- showers

Places to bypass using the water softener include:

- outside water spigots for yard use
- cold tap drinking water lines.

By softening more water than what is really needed, you increase the cost of operating your softener (in terms of increased payments for salt and energy), and ultimately, more salt will enter the environment as a result of increased softener regeneration.

**Use Minimum Salt Dosages**

Water softener regeneration is most efficient at the beginning of the brine cycle. The higher the salt dosage in the cycle, the lower the regeneration efficiency. By setting your water softener to regenerate more frequently and using less salt for each regeneration, you may be able to increase your softener's regeneration efficiency, which could result in significant salt savings for you.

Consult with a qualified water softener representative for details on how to adjust your water softener to minimize salt usage while retaining enough softened water for normal household use.

**Switch Control Types**

Many water softeners use a timer typically set to regenerate once every 2 or 3 days depending on expected water usage and water hardness. By measuring actual demand on the water softener, "demand initiated regeneration," or DIR controls are much more efficient. These controls use either a flow meter or a hardness sensor to determine when to begin the cycle. The "payback" period from reduced salt usage can be as little as three years.

Check with your local qualified water softening representative to see what works for you. Even if a newer, more efficient water softener is not in your immediate future, you can still optimize the efficiency of your unit, saving money and the environment.

Reducing or eliminating NaCl pollution, at its source of generation avoids creating a more serious environmental problem. Please do your part if you can.