CHLORIDES AND WATER SOFTENERS

FREQUENTLY ASKED QUESTIONS ABOUT CHLORIDE

What Is The Issue?

The Wisconsin Department of Natural Resources issues a Wisconsin Pollutant Discharge Elimination System (WPDES) permit to the Village of Sussex Regional Wastewater Treatment Facility. Updated and reissued every five years, the permit includes limits on chloride discharged to the Sussex Creek. The interim limit is 500 mg/L, along with a target value of 420 mg/L to be reached in the future. Chlorides are not something we can treat at the plant; therefore we must concentrate on reducing chlorides at their source. Two main factors influence the chlorides in the water coming to the treatment plant: water softeners and road salting operations. The Village of Sussex is constantly trying to reduce the amount of road salt applied through the use of improved equipment and through conscientious application by the drivers of our plowing vehicles. Water salt softener usage, on the hand, is entirely up to our residents.

If the Village is unsuccessful in reducing the amount of chlorides in the waste water, the alternatives are an increase in facility and operational costs.

What Is It?

Chloride is one of two components of sodium, also known as table salt or rock salt. When salt dissolves in water, it separates in sodium (Na+) ions and Chloride (Cl-) ions.

Where Does Chloride Come From?

Small amounts of Chloride come from soaps, detergents, and other cleaning products. Some also comes from industrial and commercial processes. A significant amount of Chloride comes from self-regenerating water softeners.

OUR ENVIRONMENT

Why should I care about Chloride?

Our freshwater streams and lakes contain low levels of naturally occurring slats, including chloride. These salts are essential to the aquatic organisms that live there. However, high concentrations of Chloride are harmful to aquatic plants animals.

How does it get into the environment?

From the water softener, Chloride is flushed into the sewer where it goes to the wastewater treatment plant. Treatment plants are designed to remove particles, like grit and sand, and to biologically degrade organic waste, such as food and human waste. Once Chloride is dissolved in water, it cannot be removed by settling, or biologically degraded by standard treatment processes. Chloride that comes to the Village of Sussex treatment plant passes through the plant to the Sussex Creek and eventually the Fox River. About 7,500 pounds of salt pass through the Sussex plant to the environment each day.

Can The Treatment Plants Be Modified To Remove Chloride?

The technology to remove Chloride is available, but very expensive. It would involve microfiltration and reverse osmosis, which are the same treatment processes used to produce pure water used in laboratories. One community determined that it would cost about twenty cents to add a pound of Chloride at the water softener, and $5.00 to remove it at the treatment plant. Households can use up to 100 lbs. of salt a month in their water softeners.

Is Potassium Chloride A Better Choice Than Sodium Chloride For My Water Softener?
No. Although it consists of Potassium instead of Sodium, it still contains Chloride. There is no advantage to using Potassium Chloride as your softener salt in the Sussex area. In some of the drier parts of the western United States, crops are regularly irrigated with treated effluent wastewater. Certain crops are sensitive to sodium, and in those areas, they are promoting the use of Potassium Chloride over Sodium Chloride.

HARD WATER

What Makes Hard Water Hard?
Rainwater that falls is "soft". It does not contain any minerals. As it percolates through the soil, water dissolves minerals which can include calcium and magnesium. Water with substantial amounts of calcium and magnesium is referred to as "hard water".

How Do You Measure Hardness?
Hardness is measured in terms of grains per gallon (g/gal) or milligrams per liter (mg/L). If you were to evaporate one gallon of water that had a hardness of 5 g/gal, the residue would be equal to one – 5 grain aspirin tablet. Laboratories often record hardness as mg/L of hardness or parts per million (ppm). One g/gal hardness is equal to 17.1 mg/L of hardness. In the example above, 5 g/gal equals 85.5 mg/L hardness. Water that is 10 g/gal or more is considered very hard.

What is the Problem With Hard Water?
The minerals in hard water can be deposited as scale on pipes and in water heaters. They also chemically interact with soaps and detergents and make them less efficient. For example, it takes 50% to 75% less detergent to clean laundry in soft water than hard water.

Why Is My Water Hard?
The hardness of water from the Village of Sussex Water Utility is typically between 18 to 22 g/gal. Various minerals that are pumped from the Village's five active wells make our water hard.

WATER SOFTENERS

How Is Water Softened?
Home water softeners have two tanks; a mineral tank that contains the resin in the form of small beads, and a brine tank which holds the sodium chloride (salt) solution. As water flows through the mineral tank, the hard minerals, magnesium (Mg^{++}) and calcium (Ca^{++}) ions, replace sodium (Na^{+}) ions on the resin. This process is called ion exchange. The water that flows out is considered "soft" because sodium ions do not build up on pipes as lime or interfere with detergents and soaps.

What is the Regeneration Cycle?
Eventually, the resin reaches its limit as to how much calcium and magnesium it can hold. At this point, the resin is flushed with a strong brine solution from the brine tank. Because of its high salt concentration, the brine washes off the calcium and magnesium and replaces them with sodium. The minerals and brine wash go down the drain and into the sewer system. New salt must be added regularly to the brine tank to replace the salt that is used to regenerate the resin. The regeneration cycle can be initiated by a timer or by demand. A timer regulated softener regenerates the resin after a fixed amount of time regardless of ow much water is used. A demand initiated regeneration (DIR) softener either tracks the amount of water used or utilizes a hardness sensor to indicate the resin is near capacity and needs to be regenerated. A DIR softener is the more efficient softener in terms of salt and water usage.

ROAD SALT

How Much Chloride Comes From Road De-Icing?

Road salt used to de-ice streets is also a source of chloride. The road salt dissolves and enters the ground water; this ground water enters the Village sanitary sewer collection system through small cracks and joints on the sewer pipes.

WHAT CAN I DO?

- 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 hard as 30 grains. Reset the hardness to 20 grains.
- Soften everything except the kitchen cold and outside faucets. Generally, people prefer the taste of hard water over soft water, so the kitchen cold can be left unsoftened.
- Check the timer. When was it last adjusted: Many of us move into a house or purchase a water softener and never check it again. Children move out or other factors come into play that affects the amount of water we use. If your softener is regulated by a timer, you may be able to increase the interval between regeneration cycles without affecting the water quality. Increase the time by one day and see if there is any effect on dish washing and laundry during the next month. If hard water is coming through near the end of the cycle, it will take more soap to produce the desired amount of sudsing. When you have determined the time period when hardness is breaking through, set the timer back one day.
- If you are replacing your old softener, replace it with a softener that regenerates based on a meter or a sensor. The Benefits to you are a substantial cost savings from your salt and water usage reduction, with the added benefit that you are helping to protect our environment right here in the Village of Sussex.

DISCHARGE OF SOFTENER

Under the State of Wisconsin plumbing code the by-pass water from a softener may be discharged to a clear water sump pump or to the surface of the ground provided a nuisance from the discharge water is not created.

FOR MORE INFORMATION OR QUESTIONS:

Please contact the Village of Sussex Assistant Director of Public Works at (262)-820-3129 or via e-mail to jbaumann@villagesussex.org. Sussex area plumbers can also help answer questions about softeners and water softening.