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PROBLEM WATER?

The Effect of Water on Laundry & Linen Management

Water falls to earth as soft water. As it percolates through the ground, it dissolves minerals. When the concentration of dissolved calcium and magnesium salts becomes high enough, we call the water "hard." In the United States, 85% of communities have hard water.

Your engineering department or chemical supplies representative can test your water to determine the degree of hardness. Water hardness can fluctuate over a wide range, so test your water hardness monthly.

In addition to calcium and magnesium salts, water can contain other detrimental impurities such as iron, sulphur, silt, chlorine, or alkaline salts. When these impurities exist in high enough concentrations, water performance suffers.

Water hardness is measured in grains per gallon (gpg) of calcium carbonate.

A grain is a unit of dry measure (1 grain = .065 grams). 5 grains of calcium carbonate dissolved in 1 gallon of water equals 5 grains per gallon hardness.

Hardness is also measured in parts per million (ppm); each gpg = 17.1 ppm.

How does water hardness affect cleaning?

Some water hardness is removed by simply heating the water. This hardness is of little concern in the cleaning operation, but can leave a chalky film on equipment. This hardness is called temporary hardness.

Permanent hardness is not affected by heat and therefore is of great concern in the cleaning operation. Soaps and detergents must first react with the minerals in solution before any cleaning can be done. This consumes a portion of the cleaning product intended for washing, thus requiring more product to be added to achieve the same cleaning result.

Minerals in the water react with soap (alkaline salts of fatty acids) to form a precipitate called lime soap, soap curd, or soap scum. Lime soap discolors fabrics, causes odor problems, and deposits a sticky coating on washers and finishing equipment.

The use of natural soaps in the commercial laundry is greatly diminished today largely due to this lime soap problem.

Minerals in the water also react with synthetic detergents (surfactant based), but to a lesser degree. Anionic surfactants will precipitate some, cationic surfactants less, and nonionic surfactants almost none at all. Therefore use detergents high in nonionic surfactants in hard water conditions.

Hard Water Solutions

Most detergent manufacturers make various products designed to deal with water hardness. These contain sequestrants and chelating agents that bind up the hardness mineral salts so the detergents can perform as intended. Phosphates were the most popular sequestrant, until it was discovered that phosphates in surface water encouraged algae and plant growth to such an extreme level as to reduce fish and wildlife populations. Today, phosphate levels are limited by law, so other more expensive sequestrants are used. Hard water chemical products are used in the break and suds operations to help the cleaning solutions.

Rinse and softener operations use no sequestrant products and therefore still show some hard water performance problems.

Please Note:

- *The ability of chemicals to control hard water is limited.*
- *Better results are achieved at less cost by softening the water rather than using chemical control.*

Water Softeners

Calcium and magnesium salts can be easily removed from water by passing the water through a synthetic zeolite resin. The resin has been saturated with sodium ions, and as the water with the calcium/magnesium ions pass through the resin, the water loses the calcium/magnesium and gains sodium ions. This is called ion-exchange water softening.

The resin's ability to hold sodium or calcium/magnesium is not unlimited however, so the resin eventually loses all of the sodium ions and has no more ability to pull calcium/magnesium out of solution. The resin now needs regeneration, where a solution of salt water (sodium chloride) is passed through the resin, reversing the previous ion exchange. This leaves the resin charged with sodium ions, and the salt water charged with calcium/magnesium ions which is then discarded down a drain.

Water Problems from Other Impurities

Iron

Iron in very small quantities can cause discoloring of textiles. Usually a concentration of iron as low as .2 ppm will cause yellowing. Iron problems will be seen as one of three stains:

Overall yellow or orange appearance. Colorless ferrous iron dissolved in water oxidizes and becomes yellow ferric iron when it contacts air or chlorine bleach. Avoid the use of chlorine bleach. Use a detergent designed for iron-rich water, oxygen bleach, and an anti-rust sour.

Yellow or orange circular spots. These spots are usually caused by small particles of iron or rust that have been shed by a boiler or iron pipes. The

particles imbed into the fabric and the resulting ferric iron spreads out in a circular blotch. A simple particulate filter usually removes all of the particles as will most water softener resin beds.

Orange smudges. These "rust spots" are the result of damp textiles coming in contact with iron objects, usually cart framework or washer cabinets. Remove with rust removing pre-spotter and prevent reoccurrence.

When iron is present in the water supply, **avoid chlorine bleach**.

Acid or Alkaline Water Supply

Most water supplies are slightly alkaline. Some contain either bicarbonate salts or acid salts which may make the water either higher alkaline or even slightly acidic. Some municipal water suppliers regularly add alkaline products to the raw water to protect aging water lines. These factors are easily compensated for by your chemical service representative when he adjusts his dispensers.

Excessive Chlorine

We often see very high levels of chlorine in the water supply. This is especially true during times of low water tables and water line repair or construction. High levels of chlorine can react with the fabric sour, damaging textiles. Also, too much residual chlorine after the final rinse can cause yellowing and fabric damage in the finishing step. Chlorine can be removed with an in-line charcoal filter.

It is important to keep in mind that the more drastic the water irregularity, the higher the chemical cost is likely to be.

Benefits of Softened Water

Water heating cost savings of 22–29%. As hard water minerals precipitate and collect in the water heater or boiler, a thick mineral scale coats the heated surfaces. This scale reduces heat conductivity thus requiring more energy to produce each gallon of heated water.

Water heating equipment lasts 15–25% longer. The same scale buildup that decreases the efficiency of water heaters and boilers, also shortens their useful lives.

Lime soap residue in fabrics and equipment is eliminated. Any foul smell from lime soap is prevented, as well as lime soap graying and sticky-feeling fabrics.

Detergents work more efficiently. Better results can be achieved with 20% - 30% less detergent (this is the number one reason most water conditioning systems are installed)!

Fabric life can be increased an average of 26–39%. A ten-year study conducted by The Water Conditioning Research Council in conjunction with the YMCA of Chicago found that using softened water increases the useful life of various textile products considerably:

- Table Cloths 18%
- Towels 23%
- Bedspreads 25%
- Sheets 32%
- Pillow cases 39%

These savings were attributed to less chemicals being required in the washing process, and the elimination of residual hardness minerals in fabrics that can cut and wear fibers, reducing the useful life.

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