U S Chemical

Providing Exceptional Quality Since 1962

Understanding Water Quality Testing

DESIRED WATER QUALITY PARAMETERS

TOTAL DISSOLVED SOLIDS (TDS)	< 500 PPM
PH	6-8
SILICA	< 50 PPM
IRON	0 PPM
COPPER	0 PPM
MANGANESE	0 PPM
CHLORIDEES	< 50 PPM
SULFATES	< 200 PPM
BICARBONATE ALKALINITY	< 200 PPM

CALCIUM & MAGNESIUM HARDNESS	**GPG**	**CLASSIFICATION**
(GPG = GRAINS PER GALLON)	0.0-2.0	SOFT
(1 GPG = 17.1 PPM HARDNESS)	2.0-4.0	SLIGHTLY HARD
	4.0-7.0	MODERATELY HARD
SOFTENING RECOMMENDED FOR WATER ABOVE 7 GPG HARDNESS.	7.0-12.0	HARD
	12.0-20.0	VERY HARD
	20.0 AND UP	EXTREMELY HARD

U S Chemical performs water quality testing as a service for its distributors. This training brochure explains the significance of the results from a warewash or laundry environmental perspective. The water quality at a facility affects the choice of both warewash and laundry products and has a major impact on the results. Desired water quality parameters are above.

WATER QUALITY PARAMETERS EXPLAINED

Total Dissolved Solids (TDS)

TDS is a measure of all of the minerals present in the water supply. The measurement of bicarbonate alkalinity is often used to replace actual testing of TDS in indicating the likely problems caused by high levels of TDS, since bicarbonate alkalinity tests are easy to perform in the field. In a warewash environment, high TDS can contribute to problems with soil removal and poor rinsing. Where there is high TDS, detergents with good water conditioning can help with the wash and higher quality rinse aids can help with the rinse.

In a laundry environment, high TDS can contribute to problems with soil removal, graying, and soil redeposition. Where there is high TDS, breaks and built detergents with good water conditioning can help with the wash and higher concentrations of sour may be needed during the final rinse.

pH

pH is a measure of the relative alkalinity or acidity of the water supply. High pH water (over 8) usually has high TDS and/or bicarbonate alkalinity problems associated with it. The lower the pH, the less problems expected in rinsing in a warewash environment. In a laundry environment, the lower the pH, the less problems expected with mineral deposition in the fabrics, which can entrap soils and cause fabric damage and graying.

Calcium & Magnesium

Water hardness (lime scale) is made up of calcium and magnesium. Where there is heat, cold or alkalinity, water hardness will become insoluble and attach itself to surfaces. In a dishmachine, heat and alkalinity are present, so water hardness can cause problems. Where there is high water hardness, a mechanical warewash detergent with good water conditioning ability is needed. This will allow for chelation or sequestration of the hardness, which means that the hardness can be held in suspension and prevented from depositing onto the ware. Poor water conditioning ability of the detergent can lead to white films on glasses, plates, and flatware. Water softeners are often installed in foodservice operations to remove the water hardness so that it doesn't have to be dealt with in the dishmachine as well as throughout the kitchen. Softening water does not reduce the level of solids in the water. It only performs a chemical exchange so that precipitation doesn't occur due to heat, cold or alkalinity.

In a laundry machine, heat and alkalinity are present, so water hardness can cause problems. Where there is high water hardness, a break or built detergent with good water conditioning ability is needed. This will allow for chelation or sequestration of the hardness, which means that the hardness is held in suspension and prevented from depositing onto the fabric. Poor water conditioning ability of the detergent can lead to mineral buildups on fabric. This can cause graying of the fabric, odors in the fabric, or scale buildups on the laundry machine, and an increased usage of detergent to get good results.

Water softeners are often installed in laundry operations to remove the water hardness so that it doesn't have to be dealt with in the laundry machine. High water hardness often dictates that the built detergent be separated into a separate break and suds product. This allows for increasing the water conditioning by increasing the amount of the break without adding additional suds, which might not provide any additional cleaning. When testing the water at a laundry, both the hot and cold should be checked for hardness. Some facilities only soften the hot water.

Silica

Silica in the water supply can contribute to the formation of a nonremovable white film on glasses in a warewash environment. This nonremovable white film is called a silica film. Silica filming is accelerated by rinse temperatures over 185°F, high levels of silica in the water supply, detergent residues on glassware, and improper drying, where moisture is allowed to remain on the glass for prolonged periods of time. Silica also is found naturally in glass. Anything that attacks the surface of the glass (removing silica from the glass itself) can leave a hazy film that is nonremovable. Proper rinse aid selection helps control silica filming, but over time, especially in a high-temp machine, glassware surfaces will break down and become hazy. This is a natural occurrence for glassware and is not correctable.

Silica in the water supply is generally not a problem in a laundry environment. In a warewash environment, silica can cause nonremovable white films on glassware.

Iron

Iron can cause a rust colored or bluish residue on the walls inside the dishmachine. Chlorine will react with the iron in the water supply and precipitate out as rust. Low-temp dishmachines have this problem frequently because chlorine is always present in the dishmachine. In high- temp dishmachines, using a non-chlorinated detergent can help minimize the problem.

Iron can cause a rust colored or bluish residue on the walls inside the laundry machine as well. Concentrations over 0.1 ppm can precipitate out into the fabric causing staining problems.Water with high concentrations of iron may necessitate the use of an oxygen bleach instead of a chlorine bleach. Iron in the water dictates that a separate sour and softener be used so that a sour that inhibits iron, often called a sour and rust remover, is used. These iron inhibiting sours prevent the buildup of iron in the fabric. No liquid sour/softs inhibit iron. Iron buildups in fabric can lock in other soils causing graying, yellow, orange or brown stains. The iron in the fabric prevents soils from being removed that would ordinarily be removed. Some water softeners will trap iron temporarily.

Once a sufficient concentration has built up on the inside of the softener, large amounts will begin leaching back into the water. Some water softeners will remove iron. These softeners use a salt that has an added ingredient to remove the iron. This type of salt is usually more expensive than regular water softener salt, and generally well worth the money.

Copper and Manganese

Although these metals are part of a standard water analysis, they are rare. They don't generally cause problems in warewash, only in laundry. Copper and manganese react similarly to iron in laundry. Copper causes blue or green spots and manganese causes black spots. Both can lock other soils into the fabric.

Chlorides

Chlorides are salts that can cause corrosion of metal parts in the dishmachine and can cause filming and streaking problems on glassware. High levels of chlorides are usually caused by water softener malfunctions. Better quality rinse aids help control problems with naturally occurring chlorides.

Chlorides can cause corrosion of metal parts in the laundry machine. Once again, high levels of chlorides are usually caused by water softener malfunctions or a contamination of the fresh water supply with sea water. Otherwise, chlorides do not generally cause a problem in a laundry. On rare occasions, well water will have high chloride levels due to salt in the bedrock above the water table.

Sulfates

Sulfates are generally not a problem in warewash, although at high levels (over 200 ppm) they can cause rinsing problems similar to chloride problems.

Many sulfates are natural laxatives. This can cause an increase in incontinence in hospitals and nursing homes, which can cause an increase in diaper use and the staining problems associated with adult diapers and pads. When the sulfate level rises over 600 ppm, the laxative effect usually starts to become pronounced to the average person. Water with sulfates over 200 ppm usually has a bitter taste.

Bicarbonate Alkalinity

Bicarbonate alkalinity (bicarb) is inactive alkalinity naturally occurring in the water supply. It is an easy to perform field measurement of the total inactive alkalinity, which can be used to indicate how high the TDS is. The water supply picks up these minerals as water is filtered through the ground into the water table. Bicarbs are not removed by using a water softener. As the water table changes during the year, it is very common for the bicarb levels to change as well. Bicarbs tend to raise the pH of the water supply and can cause spots and filming problems when high bicarbs are a problem. Since high bicarbs are primarily a rinsing problem, the use of a mechaniccal warewash detergent with high water conditioning ability will generally provide only a marginal improvement in results.

In laundry, bicarbs can cause mineral buildups in the fabric that cause staining or lead to a rough feel. As the water table changes during the year, it is very common for the bicarb levels to change as well. High bicarbonate alkalinity levels (over 200 ppm) dictate that the sour/soft should be separated into a sour and a softener. This allows for additional sour to be used without increasing the amount of softener. Excessive softener usage can cause waterproofing of the fabric.

When souring fabrics, especially in health care, a pH of 5.5-6.5 should be achieved. At this pH, buildups in the fabric from bicarbonate alkalinity can be prevented and the pH is close to the pH of skin, which minimizes skin irritation. It also allows for fabric softener and sizing to properly adhere to fabrics.