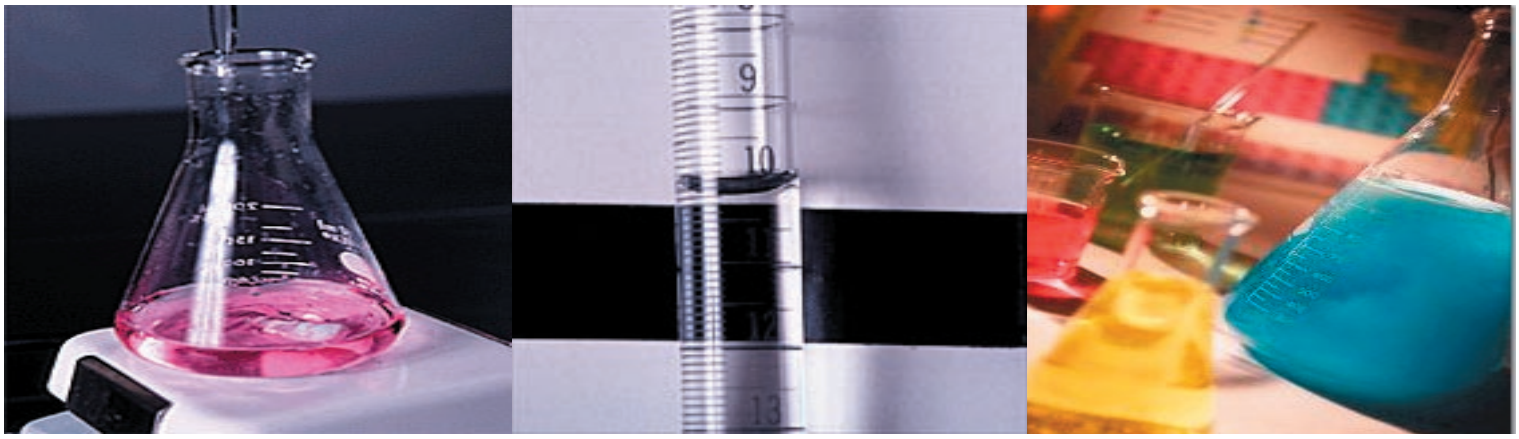


TECH TIPS

Issue #8 June 2006

Water Analysis Explained

One of the most common samples submitted for evaluation is water. The main question concerning the water analysis is what does this mean, and what potential issues exist with this water type? This is an explanation and rough guide to interpreting and understanding the Standard Water Results.

JohnsonDiversey

pH

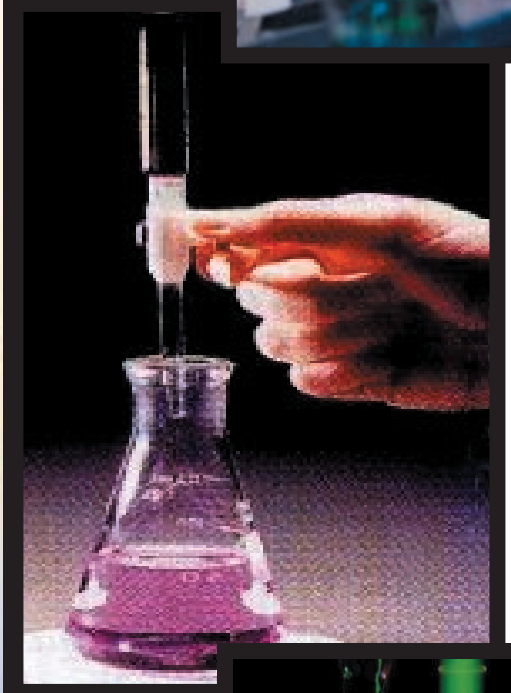
The pH scale ranges from 0–14, and is a measure of the acidity or alkalinity of a substance. Substances that have pH values of less than 7 are considered acidic, and substances that have pH values greater than 7 are considered alkaline. Typical pH values of water supplies are within the pH range of 6.5–8.5. Acidic water supplies increase the potential for corrosion, and may solubilize trace amounts of metal from distribution lines. Alkaline water supplies may adversely affect the efficacy of sanitizer solutions.

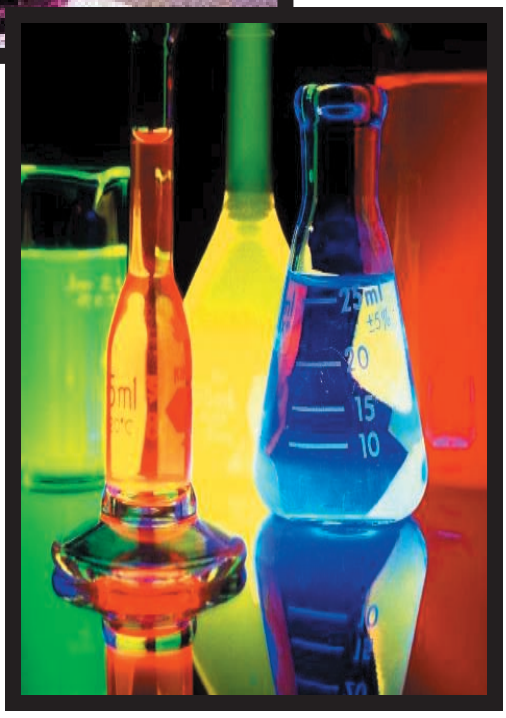
Specific Conductance

Conductivity is the measure of a materials ability to conduct an electrical current. The conductivity of the water is often utilized to determine the mineralization or Total Dissolved Solids (TDS). The TDS include water hardness, sulfate, chloride, alkalinity, and metals (copper, iron, etc.). High conductivity indicates elevated TDS, which has potential for encrustation or scale formation on equipment surfaces. The typical conductivity of potable water is less than 500 microhmos/cm.

Alkalinity

Alkalinity is a measure of the buffering capacity or the ability of a solution to neutralize acid without changing the pH. Alkalinity in the water controls and maintains water pH. Alkalinity is determined through titration procedures with acid of known strength. The volume of acid required to bring the water sample to a specific pH value reflects the alkalinity of the water. Water alkalinity is typically expressed as milligrams per liter (mg/L or ppm) of Calcium Carbonate ($CaCO_3$). Water pH values greater than 8.3 indicate that the alkalinity contribution is primarily in the form of carbonate (CO_3^{-2}) or hydroxide (OH^{-1}). This form of water alkalinity is described as P Alkalinity or Free Alkalinity. Total Alkalinity is the measure of all alkalinity from carbonate (CO_3^{-2}), hydroxide (OH^{-1}), and bicarbonate ($H\ CO_3^{-1}$). Total alkalinity is determined from the amount of acid required to reduce the pH of the water to less than 4.5. At pH values less than 4.5 there is no carbonate (CO_3^{-2}), hydroxide (OH^{-1}), or bicarbonate ($H\ CO_3^{-1}$) present in the water. Highly alkaline water may require the use of additional product during acid cleaning processes. Typical Total Alkalinity values range from 20 to 200 mg/L $CaCO_3$.





Water Hardness

Water that contains minerals such as calcium and magnesium is considered hard water. Water Hardness can adversely affect the cleaning solutions, conveyor lubricants, and sanitizers. Hard water will react with traditional fatty acid conveyor lubricants and form insoluble complexes that will obstruct distribution lines, nozzles, and tips. Film and scale formation can also be attributed to hard water, and elevated product concentrations maybe required to prevent accumulation on equipment surfaces. For more detailed information on Water Hardness please refer to Tech Tips Issue #5 (February, 2006). The guideline for water hardness is illustrated below.

Classification Range	(ppm $CaCO_3$)	(grains/gallon)
Soft Water	0.0 – 60	0.0 – 3.5
Moderate Water	60 - 120	3.5 – 7.0
Hard Water	120 - 180	7.0 – 10.5
Very Hard Water	> 180	> 10.5

Iron

Iron is the fourth most abundant mineral in the earth's crust and is present in most water sources. Iron is mainly present in the following forms: soluble ferrous iron and insoluble ferric iron. Ferrous iron is clear and colorless because the iron is completely dissolved in the water. When water containing ferrous iron is exposed to air or atmosphere, the water turns cloudy and a reddish brown and forms reddish brown sediment. This oxidized iron is the insoluble ferric iron.

Iron in water is not considered hazardous to health, but is a secondary contaminant which will cause an unpleasant taste and appearance of the water. Iron can accumulate on membrane surfaces causing fouling at levels of 0.1 ppm, and levels at 0.2 or greater may present issues with chlorinated products and peroxyacetic acid products. Iron levels in this range will degrade the chlorine and peroxyacetic acid in the product.

Iron levels in excess of 0.3 ppm may present issues with equipment staining.

Silica

Oxygen and Silicon are the two most abundant elements present in the crust of the Earth. Silica is an oxide of silicon and is present in all ground and surface waters typically in the range of 1-100 mg/L. Silica is also utilized in the manufacture of glass, ceramics, abrasives, concrete, cosmetics, anti-caking agents, and provides corrosion protection for soft metal safe alkaline cleaners. Silica is insoluble in water and has potential for filming at levels greater than 25 mg/L. Silica films are difficult to remove and require the use of Hydrofluoric acid solutions.

Nitrate and Nitrite

Nitrogen is an essential component for all living organisms. Nitrogen in the soil and water is converted by bacteria to form nitrate. Nitrate and Nitrite levels are indicators of contamination of the water. This contamination could be from sewage, high levels of fertilizer on soil, or animal wastes. The United States Environmental Protection Agency (EPA) limits for nitrate and nitrite nitrogen in drinking water are 10 and 1.0 mg/L respectively.

Chloride

Chlorides are very soluble and are typically present in water at concentrations less than 50 ppm. Elevated chloride levels in water increase the corrosion potential of water. Chloride concentrations at approximately 100 ppm or greater in acid wash conditions significantly increase the potential of pitting corrosion to stainless steel.

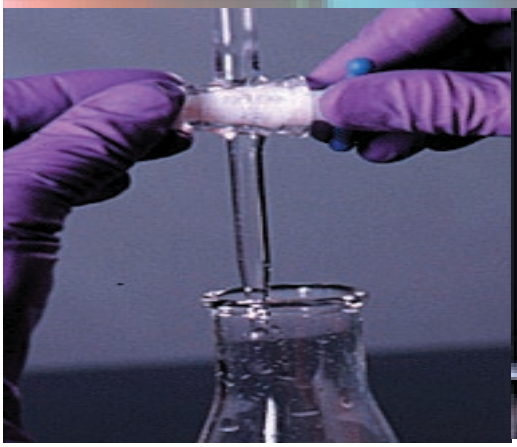
Sulfate

Sulfate is present in almost all natural water sources. Sulfate concentrations greater than 250 mg/L can affect the taste and odor of potable water. Sulfate is easily soluble in water and typically does not form films on equipment surfaces.

Phosphate

Phosphate is present in almost all natural waters as orthophosphates, polyphosphates, and organically bound phosphates. Excessive phosphate levels in water cause algae blooms in water which lead to decreased oxygen levels in natural water sources. No national or state criteria have been established for concentrations of phosphorus compounds in water. Phosphate levels greater than 1.0 mg/L may interfere with coagulation in water treatment plants.

Water is fundamental to cleaning. Knowing and understanding the composition of your water is essential for efficient and efficacious cleaning and sanitizing. Use the information presented here as a guideline. If you require further clarification, please contact your JohnsonDiversey Account Manager.



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