

# pH



PH is the measure of acidity or alkalinity of a substance. When pH is balanced, it has a measure of 7.0 and the substance is considered neither acidic nor alkaline. When pH is tested to be below 7.0 (6.9 or less), water is considered to be acidic or corrosive. When water is tested to be above 7.0 (7.1 or more), water is considered to be alkaline.

## **Why is pH important?**

PH of water is hard to detect without a test. pH has no direct taste or odor and water that is low or high in pH is not a threat in of itself. Most people are unaware of the pH of their water until they detect one of the tell-tell signs of the effects of low pH. Water that has a low pH is considered to be acidic. The lower the pH, the more acidic and corrosive the can be. Homeowners with copper plumbing often experience blue-green stains in toilets, tubs, showers, sinks and other places that water contacts air. In these situations, acidic water corrodes and dissolves trace amounts of copper inside the plumbing and deposits these trace elements inside the house in places where the water contacts oxygen. When enough trace elements of copper are removed from plumbing, holes and other major damage is created. Those with pvc plumbing are not safe from the effects of low pH. Acidic water that comes into contact with *any* metal fitting can potentially cause corrosion. Remember, there are countless steel, copper and brass fittings in household appliances including faucets, hot-water heaters, washing machines, dishwashers and whirlpools.

## **Testing for pH is important...**

The pH of water can be low without producing the tell-tell signs of blue-green stains. Wells with acidic water are much more likely to produce rust colored iron stains even in a house with copper plumbing. Low pH, acidic water is considered more aggressive, meaning it is "hungrier" due to its increased ability to dissolve. Water wells in the southeast naturally contain metals such as iron and manganese. The acidic water dissolves the iron and manganese due to aggressive nature and carries it in a dissolved state until the metal is oxidized by air usually in sinks, tubs, toilets and washing machines. Here's the kicker, even though low pH can contribute to iron and manganese staining, these stains can occur even in neutral pH waters. Only a water analysis will determine the true pH of water. PH can be corrected, but an accurate measure of water's pH and mineral content must be taken to determine the best treatment method.

## **Is pH the only measure of corrosion?**

No, but it is the most likely cause of corrosion. There are many other causes of corrosion that work outside of or in combination with pH. If the pH and TDS of your water fall within acceptable limits and you still experience the effects of corrosion, contact Filter Tech of Georgia or your county extension service to have a complete water analysis performed on your water.

## **What is TDS and how does it effect corrosion.**

Total Dissolved Solids are the total weight of dissolved substances in the water including hardness, iron, manganese, and many other ions or contaminants. The unit of measure for TDS is expressed as Parts Per Million per unit of water. Low TDS is one of several factors that contribute to corrosive water (other factors include low pH, high temperature, and high amounts of dissolved oxygen.). Since water is the universal solvent and dissolves a trace of everything it touches, *water that is lower in Total Dissolved Solids has a higher capacity and (or more aggressive) ability to corrode anything in its path such as plumbing, fittings, faucets and appliances.* Be aware that low TDS (under 80 ppm) combined with low pH (under 6.5) creates water with highly corrosive abilities.

## **What causes low pH?**

First of all, almost statewide, Georgia has naturally acidic water with a low amount of hardness. (More about the relationship between hardness and pH in a minute...) PH is the measure of the balance of positive hydrogen ions and negative hydroxyl ions. Water that measures neutral (7.0) on the pH scale has an equal number of hydrogen ions and hydroxyl ions. Water that is low in pH has more hydrogen ions than hydroxyl ions. Though the major cause of acidic well water is the high amount of dissolved carbon dioxide gas (carbonic acid when combined with water) and the lack of natural hardness caused by bicarbonate alkalinity. Thus, waters high in hardness (calcium and magnesium ions) are most often higher in pH. In low hardness areas, the water is most often low in pH as well.

The pH scale runs from 0.0 (very acidic) to 14.0 (very alkaline) with 7.0 being neutral. When interpreting pH, keep in mind the logarithmic nature of the scale. For instance, a pH of 6.0 is 10 times more acidic than neutral (7.0) and a pH of 5.0 is 100 times (10x10) more acidic than 7.0. A pH of 5.8, very frequently seen in some areas of the southeast, is 20 times acidic than 7.0 ( $2 \times 10 = 20$ ).

## **What about high pH?**

Water with pH above 7.8 is rare in the samples we have tested in Georgia and neighboring states. PH values higher than 8.0 are rarely found in private wells and should be retested for verification. Call Filter Tech, Inc. for more information and treatment options.

## **How can low pH be corrected?**

There are basically two methods that Filter Tech uses to correct pH: Calcite/Corosex neutralizing filters or chemical feed.

*Calcite and Corosex* are granular filter media that are frequently used in filtration systems to neutralize (raise) a low pH. They can be used alone as a granular bed in filter tanks to remove contaminants and raise pH or they can be used in combination with other filter media to correct further water problems such as iron, manganese, hydrogen sulfide, bacterial iron and other water problems.

Calcite is actually calcium carbonate which is the main ingredient in limestone, chalk and marble. Corosex is a granular media that is slightly larger and flakier in appearance than calcite. Corosex is the trade name for magnesium oxide. As water flows through the cracks and crevasses in the calcite/Corosex bed, the free carbon dioxide reacts with calcium carbonate to produce soluble bicarbonate and the magnesia converts the carbonic acid to magnesium bicarbonate. These are chemical reactions that produce two results: a pH above 7.0 and calcium and magnesium hardness are added to the water. Thus, the disadvantage to calcite/Corosex filters is the addition of hardness to the product water.

Why use calcite/Corosex filters if they add something that homeowners usually want taken out? A few reasons: First, most well water in Georgia are naturally soft as well as acidic and actually need the TDS that the calcite/Corosex provides (See TDS). The amount of hardness being added to the naturally soft water is typically 3-4 gpg and is most often undetectable by the homeowner. Second, calcite/Corosex filters do exactly what they imply... filter. The water is forced through the cracks and crevasses of the granular media by water pressure. As the water passes through the tightly knit media, small particulates are removed -usually down to about 20-30 microns. Finally, calcite/Corosex neutralizing filters are less maintenance than other options.

Maintenance includes a yearly refill of the Calcite/Corosex media. Since the media slowly dissolves over time, it will need to be recharged with a calcite/Corosex mixture to keep the pH from falling below 7.0. Generally, the filter will need to be recharged every 1 to 1 ½ years depending on the water's pH, temperature, TDS and mineral content.

**Soda Ash** is often used in a **chemical feed system** to raise the pH level of water. A chemical feed system is comprised of several components: soda ash, water, solution tank, chemical feed pump, and mixing chamber (if needed). The soda ash is manually mixed with water inside the solution tank by the homeowner. The amount of soda ash is variable depending on the chemistry and temperature of the water but a good starting point is 4 ounces of soda ash per gallon of water in the solution tank. A 15 gallon solution tank would require 60 ounces or 3.75 lbs of soda ash as a starting point. Once the soda solution is mixed, it will be injected or fed into the water line by a chemical feed pump. Chemical feed pumps are specialized pumps that inject very small amounts of solution into the water line only when the well pump is running.

The advantage of using a soda ash feed system is that it does not add hardness to the water like the calcite/Corosex filter system. Another advantage is that chlorine can be added to the soda ash solution when disinfection is necessary due to bacterial contamination. The disadvantage of soda ash feed system is the regular maintenance it requires. Weekly mixing of the soda ash solution as well as frequent pH testing makes this system maintenance intensive. Even though a soda ash feed system does not add hardness to the water, it also does not filter small particulates from the water as does the calcite/Corosex filter.