

AWS Technical Report: Acid Water Conditions on Residential Water Wells

On private water systems, one of the most common causes of corrosion is from low pH, which can be defined as acidic water with a pH of less than 7.0 pH. Signs of acid water are corrosion of fixtures, blue staining (from copper pipes) or rust staining (from iron pipes).

Corrosion is a natural process involving chemical or electrical degradation of metals in contact with water. The rate of corrosion will vary depending on the acidity of the water, its electrical conductivity, oxygen concentration, and temperature. Acidic water with pH values in the range of 6 to 7 is more corrosive to the metals used in plumbing systems than alkaline water. Both ground waters (wells) and surface waters (such as spring water or creeks) can be acidic.

Common causes for acidic water are acid rainfall due to atmospheric carbon dioxide and other airborne pollutants, runoff from mining spoils, and decomposition of plant materials.

Acidic waters can be high quality and are typically low in buffering calcium minerals, but are high in dissolved carbon-dioxide gas, which can cause the low pH or acidity. Treatment is accomplished by neutralizing the water with the use of an [automatic neutralizer](#). These water filter tanks are filled with a blend of calcium and magnesium carbonates made from naturally occurring minerals, which dissolve into the water, making it less corrosive. Periodically, (once or twice a year for a typical residential application) more mineral is added to the filter tank.

In some cases, instead of dissolved carbon dioxide causing the low pH or acidity, the acidity is caused by mineral acids, either natural or from mining or other industrial wastes. Often the pH is very low, less than 5.0. Treating this type of water requires injection of soda ash or sodium hydroxide with a [metering pump](#), and generally, the neutralizing type mineral filters described above will not work well on this type of water.

If you have acid water (water less than 7.0 pH) and you are on a private water system, such as a well or spring, and you wish our technical staff to quote you a solution, it is important to supply us with an [accurate water analysis](#). You should also fill out an [online technical request form](#) so we can better assist you in recommending a solution.

Treatment Options: Calcite Media Neutralizers & Soda-Ash Feeders

If the pH is low, or the water is low in alkalinity or hardness, you can change the corrosive chemistry of the water by raising the pH, increasing the alkalinity and/or increasing the calcium hardness.

- Calcite neutralizers raise pH, hardness and alkalinity.
- Soda ash feeders raise pH and increase alkalinity but not hardness.



TYPICAL CALCITE NEUTRALIZER (SHOWN ABOVE, STAINLESS STEEL TANK ON THE FAR RIGHT) INSTALLED IN COMBINATION WITH AN IRON FILTER SYSTEM AND WATER SOFTENING SYSTEM



SODA ASH FEEDER - YELLOW SOLUTION TANK (DIMENSIONAL NEUTRALIZER MEDIA FILTER METERING PUMP NEAR WELL HEAD TANK (STORAGE TANK NOT SHOWN))

Calcite Neutralizers

One of the most convenient methods to raise pH, hardness and alkalinity is to use a calcite neutralizer filter. These filters will typically raise the pH of the water to 7.0 to 8.0 and add 30 to 100 ppm of hardness depending on the alkalinity and water hardness.

In neutralizer filters, acidic waters slowly dissolve the calcium and magnesium media on contact as the water flows through the filter, raising the pH of the water and increasing the alkalinity. This eliminates the effects of corrosive water chemistries and can help to prevent corrosion of piping and fixtures.

The size of the system is directly proportional to the flow rate of the water, in gallons per minute. The higher the flow rate, the larger the system required.

Soda Ash Feeders

Metering pumps are used to inject a small amount of soda ash (sodium carbonate) into the water, usually in conjunction with a contact tank. For best results, allow 10 minutes contact with the water for pH adjustment to occur.

For home wells, when the metering pumps are wired to turn on and start pumping soda ash solution, when the well pump is energized or running.

Soda ash is bought dry, usually in 25 or 50 lb bags and mixed with soft or pure water in the solution tank. When a saturated solution is achieved (approximately 1 pound per 5 gallons of water), a solution of between 50 and 500 ppm are injected, depending on the pH, alkalinity and flow rate of the water.

Follow-up Testing for Quality Assurance

The pH should be checked on-site and the metering pump adjusted after the system is installed and running. Routine weekly or monthly testing of the pH is recommended to make sure the treated water has the desired pH level.

If the piping in the home is copper it is also important to test for copper residuals to verify that the corrosion is slowing down or has stopped. A simple copper test, done on the water that is first drawn out of the tap will show if there is a copper residual still in the water, indicating corrosion. Over a period of six to twelve months the copper residual levels will slowly decrease in most cases, after the water has been treated.

If the Corrosion Doesn't Stop

In some cases the corrosion will continue even when the pH is neutralized. This can occur if the existing piping is severely corroded, or if there are other reasons or causes for the corrosion, in addition to the acidic water. If there are dissimilar metals connecting together, such as copper pipe and iron pipe joined together, corrosion can continue to occur. Other causes include high levels of dissolved oxygen, sulfate bacteria, high levels of dissolved solids and/or stray electrical currents coming into contact with the water stream.

The cause must first be isolated before a solution can be found, but if the water is acidic, the first step is to use an acid neutralizer to raise the pH, and track the copper residuals in the water, before using other solutions in combination with the neutralizer.