

# How To Treat Acid Well Water



Effective Solutions for Problem Acid Well Waters

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# How to Treat Acidic Well Water



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On private water systems, one of the most common causes of pipe and fixture 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).

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.

Corrosion is a natural process involving chemical or electrical degradation of metals in contact with water.

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.

Acidic waters are typically low in buffering calcium minerals, but are high in dissolved carbon-dioxide gas, which can cause the low pH or acidity.

Calcite neutralizer tanks with natural crushed and screened pure calcium carbonate easily neutralize acidic waters from 6.0 to 6.9. Below 6.0 a blend of calcite and 'Corosex®' is recommended.

Common systems used to treat low pH:

- Calcite Neutralizer
- Calcite & Corosex Blend Neutralizer
- Upflow Neutralizer
- Soda Ash Feed Pump Injection System
- Phosphate Feeders

**Questions to Ask When Choosing a Neutralizer:**

- What is the pH, hardness, total dissolved solids and alkalinity of my water?
- What is the flow rate of my well water?
- Should I use a calcite neutralizer or soda ash feeder to correct the pH?



Backwashing calcite neutralizer. The backwash keeps the calcite free of sediment and from getting solid and hard.

Simple up-flow neutralizer does not use backwash control. May channel or solidify if not properly maintained.



Section of corroded copper pipe. This customer had pinhole leaks in the copper piping caused by acidic water.

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Clean Water Systems has many thousands of satisfied customers worldwide since 1985. We are dedicated to provide our customers high quality water treatment systems at the lowest cost.

## Test Your Water

Test your water for:

- pH
- Alkalinity
- Hardness (calcium carbonate)
- Total Dissolved Solids

If you are experiencing rust staining, test for iron in the untreated well water to determine if the iron is from the well or from inside pipes or water heater.

If you are seeing blue or blue-green stains a simple copper test can be done on the untreated water to see if there is copper occurring naturally in the ground water. This is very unusual and most cases of copper staining are from corrosion of the copper piping.

### Langelier Saturation Index

Using the above test results for pH, alkalinity, calcium carbonate hardness, and total dissolved solids, enter the water temperature and these values into a Langelier Saturation Index calculator (easy to find online) and see if the water is corrosive or not. A negative number of less than 0 indicates the water is corrosive. Generally the lower the pH, the lower the hardness and alkalinity, and the higher the total dissolved solids will mean the water is more corrosive.

## Perform a "Toilet Tank Inspection"

Unless your toilet tank is new or has recently been cleaned your toilet flush tank can be a wealth of useful water quality information! Simply lift the cover and look in. **If you see blue stains, or blue green deposits this indicates copper pipe corrosion.** If you see rust stains or rust deposits this can indicate iron pipe corrosion or there may be iron naturally occurring your well water.

A toilet tank check combined with a water analysis gives you a good idea of what is occurring in your pipes and fixtures.



Corroded galvanized pipe nipples from acid water. This water had a pH of 6.2 and required complete replacing of the iron pipes in the home.



Blue water from a plumbing system with corroding copper pipe. Blue stains and blue water are an indication of copper corrosion.





## Check for Pipe Corrosion and Scale Build-up

Unless your home is new, it is important to check for pipe corrosion scale build-up in the piping. Fortunately this is not difficult to do by using one of the following methods:

- Check for signs of blue stains in fixtures, blue stains in toilet tanks, which can indicate copper corrosion, and/or test water for copper.
- If you have galvanized iron pipe, look for signs of rust and rust-colored scale in the toilet flush tank.
- If possible, inspect the exterior of pipes and valves, to see if you see any signs of pinhole leaks or corrosion by-products which can be crusty, bluish, white or salty looking or rusty. If you are having any plumbing work done on your house, inspect any sections of the pipes that have been cut to see if there is any scale build-up or signs of corrosion.



This copper looked fine from the outside. Inside it was being eaten away by the acidic water and eventually sprung pinhole leaks, causing extensive damage to the customers home. We cut away a section of it, above.

## Identify Pipe Sizes

It is useful to know the size of your incoming pipes. For instance, say you decide you want to install calcite neutralizer for your house. They come in different pipe sizes, such as  $\frac{3}{4}$ " pipe, 1" pipe etc. Generally, you want to make certain you get a system that will not restrict the water flow or pressure, so if you have a 1" pipe, you would want a calcite neutralizer that has 1" pipe connectors. Knowing what size piping you have solves this problem.

It is easy to check the size of your pipes. First, check on the pipe itself, often it will be labeled or written on the side. If not, the string method which measures the circumference is probably the best way to determine your pipe size. Circumference is the distance it takes to go around the pipe once.

Remove any insulation from the pipe. Using a piece of string about 6" long (or a cloth tape measure) wrap the string around the pipe once and measure to the nearest  $\frac{1}{8}$  of an inch. Once you have found the circumference, use the chart below to find your pipe or tube size.

### Pipe Circumference to Pipe Size Chart

#### Copper Pipe or PEX tubing

2.75" (70mm) =  $\frac{3}{4}$ " pipe  
3.53" (90mm) = 1" pipe  
4.32" (110mm) = 1  $\frac{1}{4}$ " pipe  
5.10" (130mm) = 1  $\frac{1}{2}$ " pipe

#### Flexible Polyethylene Pipe

2.96-3.33" (75-85mm) =  $\frac{3}{4}$ " pipe  
3.74-4.24" (95-108mm) = 1" pipe  
4.90-5.57" (124-141mm) = 1  $\frac{1}{4}$ " pipe  
5.70-6.28" (145-160mm) = 1  $\frac{1}{2}$ " pipe

#### Steel Pipe or PVC Plastic Pipe

3.25" (83mm) =  $\frac{3}{4}$ " pipe  
4.00"(102mm) = 1" pipe  
5.00"(127mm) = 1  $\frac{1}{4}$ " pipe  
6.00"(152mm) = 1  $\frac{1}{2}$ " pipe

## Determine Your Well Pump Flow Rate

Your well pump can pump water up to a certain maximum flow rate, in gallons per minute. For example say you could fill a 5 gallon bucket in 1 minute. This is a flow rate of 5 gallons per minute or 5 GPM. If the water filled up a 5 gallon bucket in 30 seconds, the flow rate would 10 GPM. Knowing how many gallons per minute your water system can pump is critical to picking the right type of water treatment system, and it is easy to determine.

This method works for most well pumps. If your pump turns on at one pressure (typically 30 or 40 PSI) and off at a higher pressure (usually 50 or 60 PSI) this method will work for you. All you need is a 1 or 5 gallon bucket and a clock or timer:

1. Open any hose bib or faucet until pump turns on.
2. Close hose bib or faucet and let pump fill up pressure tank until it turns off.
3. Using a 1 or 5 gal. bucket, open faucet, collect and measure all water discharged until pump turns on.
4. When pump turns on, immediately close faucet and start timing pump cycle\*
5. When pump turns off, record pump cycle time to refill pressure tank in seconds.
6. Divide the number of gallons collected in Step 3 by the number of seconds in Step 5.
7. Multiply the answer from Step 6 by 60.
8. The answer in Step 7 is the average pumping capacity of the pump in gallons per minute (GPM).

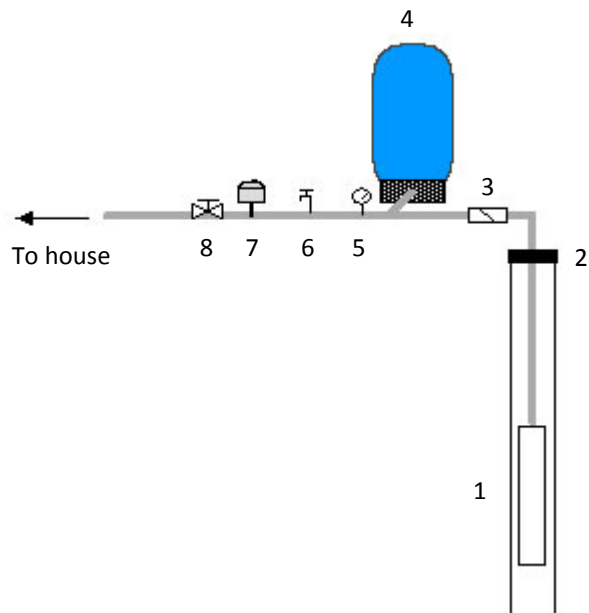
### Systems with Variable Speed “Continuous Pressure Pumps”

Note some well pumps are what they call ‘continuous pressure pumps’. They don’t turn on at one pressure and off at another. These types of pumps are “variable speed”, meaning that they run slow at first, and then faster as the pressure drops in the pipes. For continuous pressure systems, you need to consult with the pump installer or look at the pumps documentation to see what your flow rate is.

### Pressure Tank with Submersible Well

**How It Works:** Submersible pump in well (1) is controlled by pressure switch (7). When pressure in pressure tank (4) drops below a preset level (typically 30 or 40 PSI) the pressure switch turns on well pump. Well pump continues to run until pressure in pressure tank builds up, and pressure switch reaches maximum pressure setting. The pressure tank contains a pre-charged air bag to moderate pressure in the piping system.

- 1 Well pump submerged in water
- 2 Well head with sanitary seal
- 3 Check valve (may be submerged in well and not visible)
- 4 Pressure switch
- 5 Pressure gauge
- 6 Pressure tank



## Calcite & Calcite-Corosex Blend Neutralizers

Neutralizer 7000-SXT Down-flow

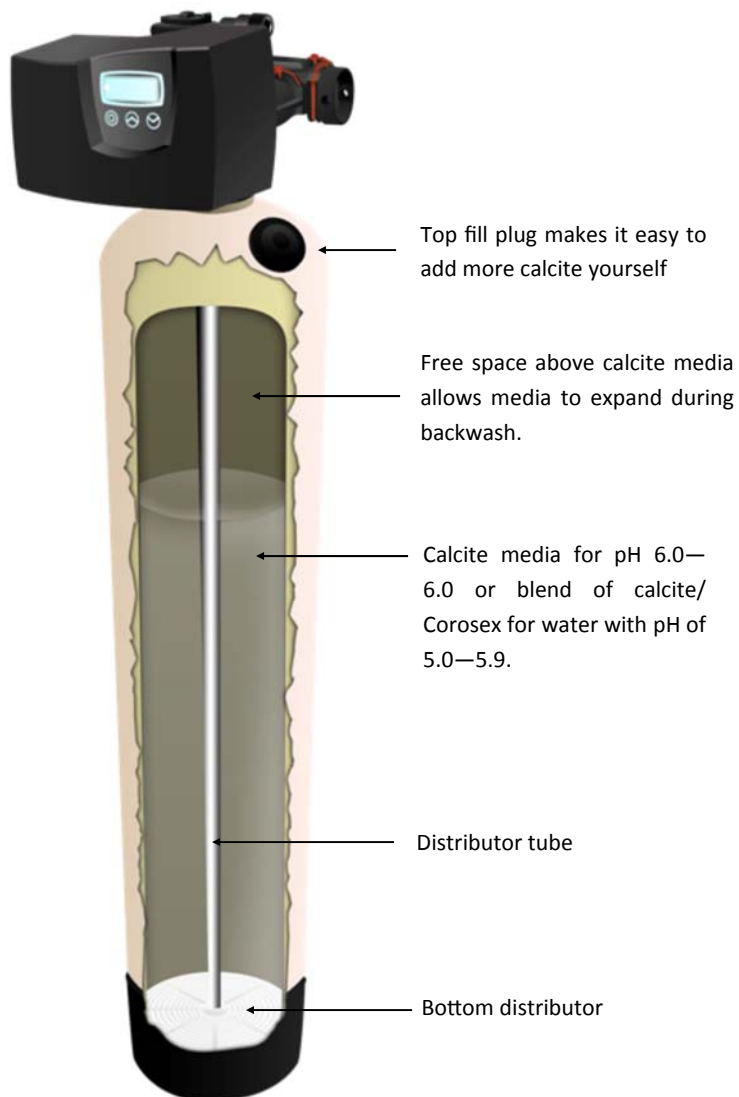
One of the most convenient methods to raise pH, hardness and alkalinity is to use a calcite neutralizer filter. These filters will typically raise the pH of the water to 7.0 to 8.0 and add 30 to 100 ppm of hardness depending on the alkalinity and water hardness.

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.

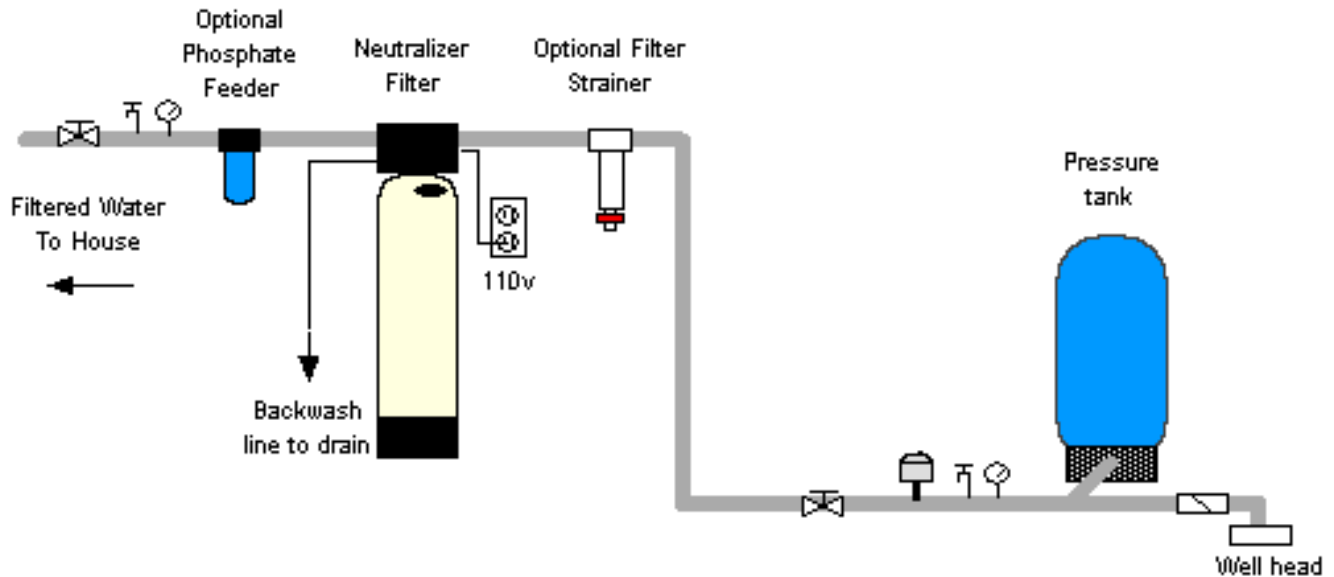
Both down-flow and up-flow neutralizers are used. In an up-flow neutralizer the water flows down the center distributor tube and up through the calcite media. In a down-flow neutralizer, the water flows from the top down and then up the distributor tube. Down-flow neutralizers are backwashed either manually or automatically to keep the media clean.

Generally down-flow neutralizers that have a periodic automatic backwash are much easier to maintain and tend to work better for residential well water systems.









- Neutralizes pH from 5.0 to 6.9 range up to 7.0 to 8.0 range
- Low maintenance. Filters out sediment.
- Adds calcium + alkalinity

## Typical Neutralizer Installation on Well with Submersible Well Pump



### Key

-  Water piping
-  Check valve
-  Pressure gauge
-  Hose bib
-  Pressure switch
-  Gate or ball valve

Notes: Install after pressure tank. Water enters on right side of bypass valve as you face the system; follow arrows on bypass valve. Follow inlet and outlet arrows on filter for proper installation. Connect 1/2" flexible tubing from backwashing control valve to a drain. If the distance to the drain is more than 20 feet use 3/4" or 1" tubing. Drain backwashes under line pressure and can be up to 30 feet away and up to 6 feet above the top of the tank if necessary. If you install a hose bib & ball valve after the neutralizer filter as shown, it will make it easier to service and test the water at a later date.

To heal copper pipe corrosion faster, or for pinhole leak problems, use the option phosphate cartridge after the neutralizer. Follow all local plumbing and electrical codes.

### When to use a Pre-Filter Strainer

If your well contains sediment, sand or grit it is a good practice to install a pre-filter ahead of the neutralizer. The best kind to use is a flushable strainer where there is no filter cartridge to change. The filter screen can be flushed without turning the water off.

### When to use a Phosphate Feeder

If you have copper pipes that are already significantly corroded, a phosphate cartridge after the neutralizer can stop copper corrosion faster and heal developing pinholes in the copper pipe.

Phosphate works by combining with the calcium and magnesium introduced by the neutralizer to form a microscopic layer of calcium phosphate. This seals off corrosion sites in the pipe and also acts to soften the effects of the slightly harder water that the calcium in the water creates. The phosphate can be used temporarily for the first year until the copper pipes if desired, or the feeder cartridge can be changed once per year.



Pre-Filter strainer with flushable screen



# Up-flow Neutralizers

Upflow neutralizers are simply a tank of calcite and/or corosex where the water flows up through the calcite media. No backwashing occurs.

This type of neutralizer does not offer any filtration or sediment removal like standard backwash neutralizers afford, and the media inside the upflow neutralizer can become fouled if there is any sediment, iron, manganese or sulfides in the water, which does not occur with backwash types.

The biggest problem however is channeling around the calcite. This is where the water flows up the side of the tank and the media does not dissolve properly, sediment or iron fouling of the calcite, and the formation of balls or solid blocks of calcite or corosex inside the tank.

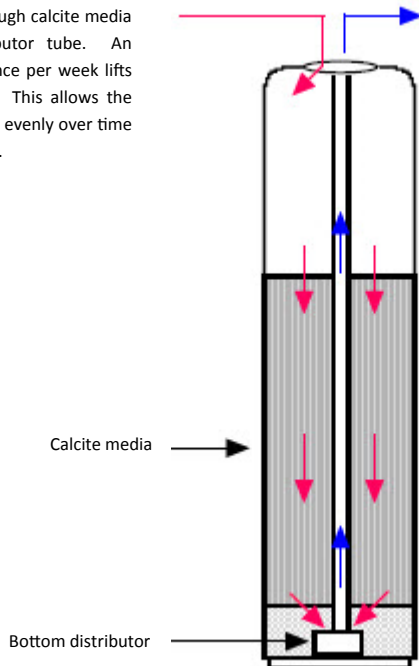
In some up-flow neutralizers, the calcite mineral can actually enter the household piping, causing a lot of problems. Some up-flow neutralizers come with this screen built-in, however, if your water has any iron or bacteria in it, this screen will need to be cleaned periodically.

For most residential applications, backwash neutralizers work better and allow the calcite media to dissolve over time more evenly. They are worth the extra cost and small amount of backwash water required. Backwash type neutralizers work better because the media is periodically flushed with water (usually once every one or two weeks) which keeps the media in good shape and prevents channeling.



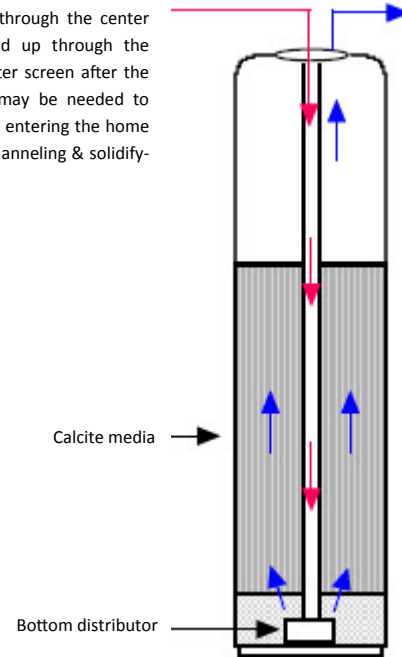
**Downflow Type With Backwash Control**

Water flows down through calcite media and up center distributor tube. An automatic backwash once per week lifts and cleans the media. This allows the calcite to dissolve more evenly over time and prevent channeling.



**UpFlow Type No Backwash**

Water flows down through the center distributor tube and up through the calcite media. A filter screen after the upflow neutralizer may be needed to prevent calcite from entering the home plumbing. Some channeling & solidifying may occur.



## Phosphate Feeders

These cartridge feeders come with one PCC Series phosphate cartridge from Pentek. The cartridge is a by-pass feeder meaning that some of the water flows around the cartridge so as not to slow down flow or reduce pressure.

The cartridge contains food grade hexametaphosphate crystals that dissolve slowly in water to inhibit scale and rust build-up. The housing is a Pentek #10 housing with 3/4in. inlet and outlet and comes with a mounting bracket screws and a filter wrench. NSF Certified for drinking water.



Phosphate cartridge and housing. Cartridges last for 6 to 12 months

### What are phosphates?

Phosphates are water treatment chemicals used to solve specific water quality problems resulting from inorganic contaminants (iron, manganese, calcium, etc.) in ground water supplies and also to maintain water quality (inhibit corrosion, scale, bio-film, reduce lead and copper levels) in the distribution system.

Orthophosphate and polyphosphate are two general types used in water treatment along with many different phosphate compounds that exist for use in the water treatment process. Ortho and polyphosphates work together, stabilizing water quality and minimizing color, scale, deposits, corrosion, and chlorine demand in drinking water systems.

Orthophosphate based additives are classified as corrosion inhibitors and as such react with dissolved metals (e.g. Ca, Mg, Zn, etc.) in the water to form a very thin metal-phosphate coating or it reacts with metals on a pipe surface to form a microscopic film on the inner surface of the pipe that is exposed to the treated water.



Liquid phosphate is injected in very low levels of 2 to 10 parts per million. The phosphate reacts with calcium in the water to form a microscopic coating.

## Neutralizers Vs Soda Ash Feeders

If the pH of the water is 5.0 to 6.9 and the calcium hardness is less than 150 ppm, generally the calcite neutralizers are preferable for most homeowners. A once per year addition of the calcite is all that is typically required. The soda ash feeders require new solution added every 3—6 months.

**If your pH is 5.0 or less, a soda ash feeder is preferable** because a calcite neutralizer might not raise the pH to the 7.0 on a consistent basis. When the pH is less than 5.0, the amount of calcium and magnesium required from a calcite neutralizer might make the water too high in hardness, requiring a water softener, so a soda ash feeder works better.



Auto Backwash Calcite Neutralizer



Stenner Soda Ash Injection Pump & Solution tank

## Comparison of Calcite, Calcite-Corosex, & Soda Ash pH Neutralizers

Type	Media Used	Minimum pH Range Recommended	Removes Sediment?	Adds Calcium and Alkalinity
<b>Calcite</b>	Calcite (made from crushed white marble - pure calcium carbonate)	6.0	Yes	Yes
<b>Calcite-Corosex Blend</b>	Calcite 80% to 90% + Corosex 10% to 20% as a blend (made from pure magnesium oxide, a natural mineral product)	5.0	Yes	Yes
<b>Soda Ash Chemical Feed Pump</b>	Soda Ash (sodium bicarbonate, a pure grade used for drinking water).	4.0	No	No

### Q. Will calcite (or calcite-blend) neutralizers make the water so hard that a water softener is needed?

A. The calcite and calcite-blend neutralizers work by adding calcium to the water, and it will increase the calcium hardness of the water, making the water 'harder'. However, most acidic well water is soft to begin with, and after passing through the neutralizer, will be harder, but still not hard enough to warrant a water softener.

Generally if the water is less than 170 mg/L or 10 grains per gallon, most customers can avoid having to use a water softener. If your water is 3 grains/gallon to begin with, after the neutralizer it might be 5 to 7 grains per gallon, as the neutralizers will add 3 - 4 grains per gallon on average. You can always add a water softener later if you find you want one, but we generally do not recommend a water softener be installed. If you are having white spotting on fixtures and you want a water softener, you could install them both at the same time, but its better for the elimination of copper corrosion, if you wait 3 - 6 months to give the neutralizer a chance to stop the copper corrosion before adding the water softener.

# Soda Ash Feeders

Soda Ash Solution Tank with Metering Pump

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 a few minutes of mixing time after soda ash solution has been injected. Often a small contact pressure tank, also called a retention tank, is used.

For home wells the soda ash metering pumps are wired to turn on and start pumping soda ash solution, when the well pump turns on and off. In this case, the injection point of the soda ash solution is before the well pressure tank.

If the soda ash injection point is after the pressure tank, a proportional system is used. A flow meter controls the metering pump and controls the metering pump proportional to the flow of the water.

Soda ash is bought dry, usually in 50 lb bags and mixed with soft or pure water in the solution tank. When a saturated solution is achieved (approximately 4 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.



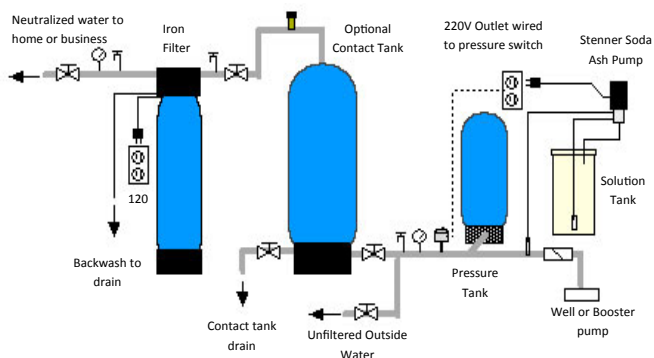
Soda Ash Heavy-duty tank with automatic mixer. Keeps soda ash solution dissolved. Saves time in mixing powder.



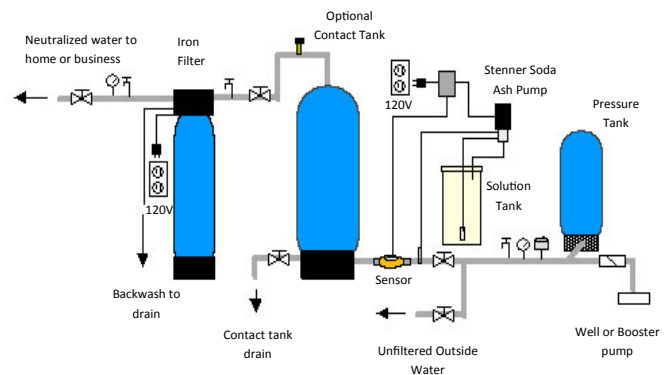
Powerful electric mixer mounts on top of heavy-duty tank. Runs on a timer or run manually to keep soda ash solution mixed.

- Neutralizes pH from 4.0 to 6.8 range up to 7.0 to 8.0 range
- Fully adjustable
- Precisely control pH
- No extra calcium hardness added to water

Soda Ash Injection controlled by existing well pressure switch. Most common method used. Lowest cost.



Soda Ash Injection controlled by Flow Meter "Proportional Feed". Allows chlorine injection point to be after pressure tank, or at point of use or entry to home.



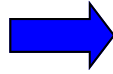
# Neutralize Acidic Well Water CHEAT SHEET



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## 1. Do The Basics

- Test Water Chemistry
- Check Well Water Flow Rate
- Check for Pipe Corrosion
- Toilet Tank Check
- Determine Diameter of Pipe



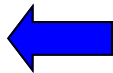
## 2. Choose Neutralizer

- Calcite neutralizer—downflow or upflow?
- Standard Calcite pH 6.0 to 6.9 Or
- Calcite blend if pH is 5.0— 5.9
- Use pre-filter strainer if sediment or grit present
- Use phosphate cartridge for copper pipe corrosion?
- Soda Ash system— if pH is less than 5.0



## 4. Quality Control

- Set up Maintenance Schedule +
- Clipboard with Check List
- Test Well Water Annually



## 3. Installation

- Buy Direct + Install Yourself OR
- Buy Direct + Hire a Plumber for Installation OR
- Buy from Water Treatment Dealer
- Follow Check List for Best Installation Practices

Questions? Email us at [info@cleanwaterstore.com](mailto:info@cleanwaterstore.com) or call toll-free 888-600-5426 or 831-462-8500