



*The Complete Guide to*  
***Iron Treatment***

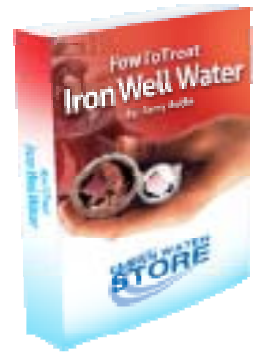
***Practical Solutions for Treating Iron In Well Water***

[www.cleanwaterstore.com](http://www.cleanwaterstore.com)

# Table of Contents

Welcome to "How to Treat Iron in Well Water" .....	3
How to Treat Iron, Manganese & Odors In Well Water.....	4
Questions to Ask When Choosing an Iron Filter:.....	4
Test Your Water .....	5
Check For Odors in Well Water & Water Heater .....	5
Perform a "Toilet Tank Inspection" .....	6
Odor Identification and Solutions Chart.....	7
Determine Your Well Pump Flow Rate.....	8
Pressure Tank with Submersible Well Pump .....	8
Check for Pipe Corrosion & Scale Build-up.....	9
Identify Pipe Sizes.....	9
Oxidizing Iron Filters.....	10
Comparison of Oxidizing Iron Filters .....	10
Air Injector Birm Blend Iron Filters Use Venturi-type air injectors to inject air.....	11
Typical installation of a air-injecting venturi-type Birm-Blend iron filter system: .....	11
Air Charging Iron Filters.....	12
Birm Blend Air Compressor Systems .....	13
Greensand Iron Filters.....	14
Manganese Dioxide Filters (MangOX©, Filox©, Pyrolox©) Intermittent Regeneration Type .....	15
Manganese Dioxide Filters (MangOX©, Filox©, Pyrolox©) Continuous Regeneration Type.....	16
Hydrogen Peroxide & Catalytic Carbon Systems.....	17
Iron, Manganese & Odors Well Water Treatment CHEAT SHEET .....	18

## Welcome to “How to Treat Iron in Well Water”



Our company [Clean Water Systems & Stores](http://www.cleanwaterstore.com) has been providing solutions for thousands of problem water wells since 1985. Over the years, we have been asked the same questions by homeowners, contractors, and well specialists dealing with tough problem water: “How can I determine which iron filter is best for my problem?”

We created this simple yet comprehensive guide to understanding the main types of iron filter systems available on the market, and which one will work best for your application.

If you have any questions about the material in this guide, or want to offer us feedback please contact us!

Toll-free: 888-600-5426 Email: [support@cleanwaterstore.com](mailto:support@cleanwaterstore.com)

Through our online support forum: <http://support.cleanwaterstore.com>

**Clean Water Systems & Stores Inc**

2806-A Soquel Ave

Santa Cruz, CA 95062



This guide is provided for educational purposes only. Well quality and conditions can vary widely. Clean Water Systems & Stores Inc. neither accepts nor assumes any liability associated with the information contained in this guide. No warranty or guarantees are extended. The material contained within this ebook is protected under International and Federal Copyright Laws and Treaties, and as such, any unauthorized reprint or use of this material is prohibited with the written permission of Clean Water Systems & Stores Inc. is strictly prohibited.

# How to Treat Iron, Manganese & Odors In Well Water



www.cleanwaterstore.com  
Clean Water Made Easy.

Iron is one of the earth's most plentiful resources, making up at least five percent of the earth's crust. In well water iron is usually found in a dissolved state and may appear clear when first drawn from the tap.

The maximum level of iron recommended in water is 0.3 mg/L which is same as saying 0.3 Parts Per Million or PPM. When the level of iron in water exceeds the 0.3 mg/l limit, the water may have a red, brown, or yellow color and stain laundry and fixtures. The water may also have a metallic taste and an offensive odor. Water system piping and fixtures can become restricted or clogged, and appliances such as water heaters, dishwashers and washing machines plugged with rust and sediment.

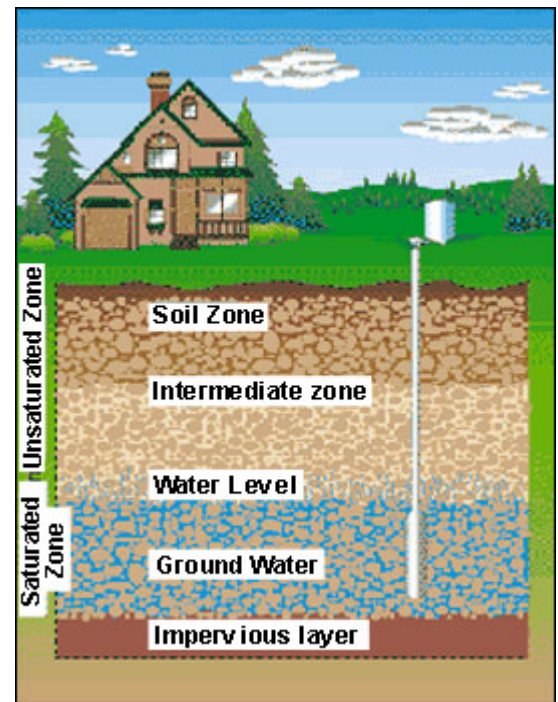
Iron gives water a disagreeable metallic taste. When the iron combines with tea, coffee and other beverages, it produces an inky, black appearance and a rusty, bad taste.

There are four main types of iron or conditions in which iron is found in well water:

- Soluble "Clear Water" Iron
- Insoluble Oxidized "Red Water" Iron
- Organic Iron
- Iron Bacteria

## Questions to Ask When Choosing an Iron Filter:

1. What type of iron do I have in my water system?
2. What is the flow rate I have available, to backwash the iron filter I choose?
3. Do I have manganese, hydrogen sulfide odor, iron bacteria or tannin in my water?
4. What is the pH (acid or alkaline nature) of my water?
5. According to the water test results, will the water treatment unit remove the total iron concentration?



DISCLAIMER: This guide is provided for educational purposes only. Well quality and conditions can vary widely. Clean Water Systems & Stores Inc. neither accepts nor assumes any liability associated with the information contained in this guide. No warranty or guarantees are extended. The material contained within is protected under International and Federal Copyright Laws and Treaties, and as such, any unauthorized reprint or use of this material is prohibited with the written permission of Clean Water Systems & Stores Inc.

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

If there is an iron problem with the water supply, the first step is to determine the source. Usually the source of the iron is from the groundwater, but in some case the well water maybe find, and the iron is coming from the corrosion of iron or steel pipes or other components of the plumbing system where the acidity of the water, measured as pH, is below 6.8.

A laboratory analysis of water to determine the extent of the iron problem and possible treatment solutions should begin with tests for iron, iron bacteria, pH, manganese, tannins, hardness, and total dissolved solids. Take the sample as close to the well as possible.

It should always include a pH test, which indicates if the water is acidic or alkaline. The ideal pH for iron filters to work properly is between 7.0 and 8.0, which is considered neutral and not acidic. With these results, you can identify if you need any type of water treatment, and what type of system to select, based on your water chemistry. **Avoid in-home water testing by water softener sales people during sales demonstrations.**

**For health-related concerns include a test for total coliform, e-coli (fecal coliform) and nitrate. If infants and children will be drinking the water, a complete mineral, metals and bacteriological test is recommend.**

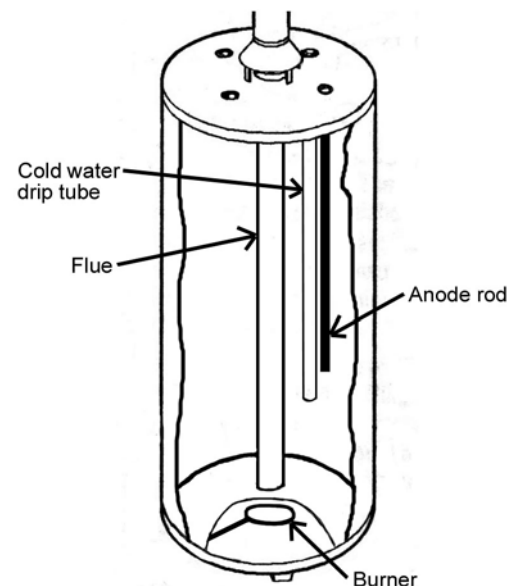
If the source of water is a public water system and you experience iron-related problems, it is important to contact a utility official to determine whether the red water is from the public system or from the home's plumbing or piping.

## Check For Odors in Well Water & Water Heater

Run a hose bib or tap as close to the well as possible and fill a 5-gallon bucket or other container and notice if there are odors. If you smell a "rotten-egg" odor, this is hydrogen sulfide gas. If water smells like oil or asphalt this can be from manganese. If water smells like cucumber or sewage this is usually a result of iron and/or sulfur bacteria.

Run the water hot water from each tap and notice if there is an odor in the hot water, that is not in the cold water. This indicates a problem with the water heater. Iron and sulfur bacteria can interact with the anode rod in water heaters, resulting in hydrogen sulfide gas only in the hot water. Changing the anode rod to an aluminum rod can often solve this problem.

It is recommended that you drain your water heater at least once per year. This will flush out sediment that may accumulate in the bottom and give you an idea of the sediment type and color , if any, are present.



Water heaters can accumulate rust and sludge. Iron and sulfur bacteria can create sulfur odors in water heaters.

## 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 slimy rusty deposits on the sides of the tank, and frothy bubbles in the tank water, this is a good indication of iron bacteria.



Symptom	Cause	Solution
White scale on float	Calcium hardness	Water softener
	Total dissolved solids	Reverse osmosis
Tank sides are white, but black, rust or sand is laying on the bottom	Decaying galvanized pipes	Replace pipes; correct corrosiveness of water
	Sand, rust or sediment in well water	Sediment and/or iron filter
Blue Stains	Acidic (low pH) water	Calcite neutralizer or soda ash feeder
Rust Stains	Iron	Iron filter (Birm, MangOX, Greensand, Pyrolox)
Furry, stringy red growths	Iron (and/or other) bacteria	Chlorination, aeration, ozone injection, hydrogen peroxide, followed by filtration
Furry, stringy gray or black growths	Sulfur (or other) bacteria	Chlorination, aeration, ozone injection, hydrogen peroxide, followed by filtration
Frothy, with bubbles	Iron bacteria	Chlorination, aeration, ozone injection, hydrogen peroxide, followed by filtration
Brown stains	Iron And/or Manganese	Iron filter that removes manganese (MangOX, Greensand, Pyrolox)
Black Stains	Iron And/or Manganese	Iron filter that removes manganese (MangOX, Greensand, Pyrolox)
	Ferric Sulfide (black rust)	Iron filter (Birm, MangOX, Greensand, Pyrolox)
Pink Stains	Airborne bacteria	Not water quality related; Clean with chlorine bleach

# Odor Identification and Solutions Chart

- Does the cold well water have an odor right out of the well, from an outside hose bib?
- If there is an odor to the water, do all the taps in the home have the odor? Are some taps in the house (such as upstairs, or from a particular bathroom or fixture) have greater odor than others?
- Does the hot water have the odor only, with the cold water having no odor?
- The best way to test odor is to use a tall drinking water glass or wine glass, and have at least two people perform the test by drawing the water and noting the odor.
- How would you characterize the odor? See chart below.

Odors	Source	Possible Remedy
Asphalt or oily odor	Manganese	Iron filter that removes manganese ( MangOX, Greensand, Pyrolox)
	Petroleum	Oil-sorb oil removal media with activated carbon; but in some cases its better to develop a new water source
Cucumber Odor	Iron or sulfate reducing bacteria	Disinfection with chlorine, hydrogen peroxide or ozone followed by filtration
Earthy or grass odor	Geosmin	Produced by actinomycetes, blue-green algae, and green algae.
Garlic odor or taste	Methane gas	Off-gas into an open storage tank, ventilate well and use caution in treating this problem; methane is flammable
Metallic Odor	Iron, manganese, or copper	Iron filter, or pH neutralizer if water is acidic
Pond or Algae Odors	Bacteria, organic matter	Disinfection with chlorine, hydrogen peroxide or ozone followed by filtration
"Rotten-Egg" Odor	Hydrogen sulfide gas	Disinfection with chlorine, hydrogen peroxide or ozone followed by filtration and/or aeration or air injection systems.
	Sulfur bacteria	Disinfection with chlorine, hydrogen peroxide or ozone followed by filtration and/or aeration or air injection systems.
Sewage odor	Leaking septic tank	Repair or re-locate septic tank or well
	Bacteria	Disinfection with chlorine, hydrogen peroxide or ozone followed by filtration

# 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.

It is easy! All you need is a 1 or 5 gallon bucket and a watch or clock. It takes just a few minutes:

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).

Click this link to our online calculator to make your calculations quicker and easier:

[http://www.cleanwaterstore.com/technical/water-treatment-calculations/body\\_flow\\_rate.html](http://www.cleanwaterstore.com/technical/water-treatment-calculations/body_flow_rate.html)

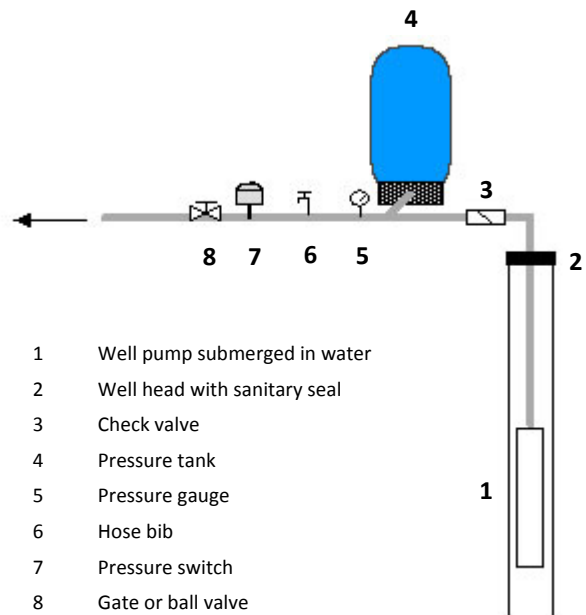
## Pressure Tank with Submersible Well Pump

**How It Works:** Submersible pump in well (1) is controlled by pressure switch (7). When pressure in pressure tank (4) drop below a preset level (typically 40 to 60 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.

A check valve (3) prevents water in pressure tank from flowing back down the well. The check valve may be located on top of the ground or it may be down in the well near the well pump and not accessible without pulling out the well pump.

It is important to have a hose bib (6) to drain the pressure tank and check untreated water. A gauge (5) shows current water pressure.

Modern properly constructed wells have a sanitary seal (2) which protects the well from potential surface contamination.





## Check for Pipe Corrosion & Scale Build-up

Sulfur odors can cause sulfuric acid to build-up in water and corrode piping and fixtures. 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.



## Identify Pipe Sizes

It is useful to know the size of your incoming pipes. For instance, say you decide you want to install an iron filter system 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 an iron filter 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

## Oxidizing Iron Filters

Iron filters oxidize the dissolved ferrous iron in water to an insoluble particle and trap the iron (rust) in the iron filter media. A periodic backwash cleans out the rust and flushes the filter media clean. Various types of iron filter media are available including Birm, Greensand, MangOX, Filox®, & Pyrolox®.

Oxidizing iron filters use either air, potassium permanganate, chlorine or ozone to aid the filter media in oxidizing the iron. Note that Filox®, MangOX®, and Pyrolox® are all solid manganese dioxide media which perform similar to each other.



### Comparison of Oxidizing Iron Filters

Iron Filter Type	Oxidizers Used	Maximum Recommended Iron Removed in PPM	Maximum Recommended Manganese Removed in PPM	Removes Hydrogen Sulfide?	Backwash Flow Rate Required GPM per Square Ft*	Weight Lbs per cubic foot
<b>Birm®</b>	Air	5	0	Low levels	10 - 12	45
<b>Greensand</b>	Potassium Permanganate, Chlorine, Ozone	5 to 10	2.0	Yes	12 - 15	85
<b>MangOX®</b> <b>Filox®</b> , <b>Pyrolox®</b>	Air, Chlorine, Ozone	5 to 15	5.0	Yes	15 - 25	120
<b>Catalytic Carbon</b>	Hydrogen Peroxide	15	5.0	Yes	10-12	35

#### The Importance of pH

If your well water has a pH of less than 7.0, it can be considered acidic. Iron filters don't work well if the pH is too acidic. Some iron filters can work down to a pH of 6.5 but generally its best to correct an acidic pH before it reaches the iron filter by using a soda ash injector or a calcite neutralizer to neutralize the pH.

#### The Importance of Backwash

The flow rate of your well can be measured in gallons per minute. If your well water flow is very low, it might not be able to backwash an iron filter adequately and the iron filter can become fouled with iron.

Iron filters automatically regulate the flow of the water as its backwashing the iron filter, so too high is not a problem.

# Air Injector Birm Blend Iron Filters

## Use Venturi-type air injectors to inject air

Birm is a trademark name of the Clack Corp and uses a type of granular filter media called "Birm". It is manufactured from a type of natural pumice mineral coated with manganese dioxide. As the water flows through the filter tank containing Birm media, a reaction occurs where the dissolved oxygen and the dissolved ferrous iron compounds form an insoluble ferric hydroxide. In plain English, as water containing iron flows through the media, if there is enough oxygen in the water, the Birm causes the iron to form rust, or solid iron particles. After these rust particles get trapped in the filter media, once or twice a week they are automatically backwashed out to drain, and the filter media is ready to filter again.

Birm is cheaper than other iron filter media such as Filox or MangOX, but it has several limitations. It does not remove manganese or hydrogen sulfide gas which are often found in well water containing iron. It cannot be used if the water is chlorinated, and it is quickly fouled by iron bacteria.

In most cases, Birm requires an air injector system to be able to work effectively. Birm will not work well if the pH is less than 6.9 – 7.0. Birm media generally needs to be changed every 3 – 4 years for most residential applications.

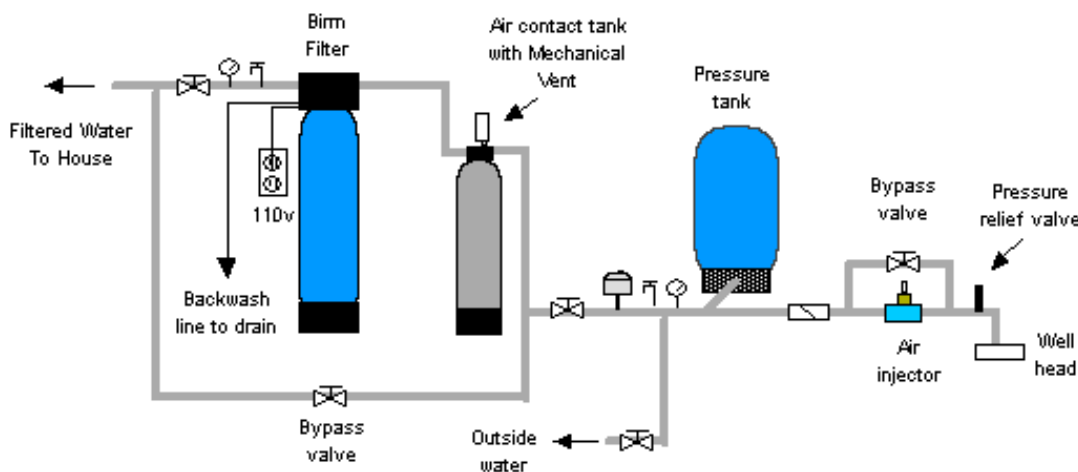
Birm is sometimes blended with other media such as FilterAg, Chemsorb, Calcite and/or Corosex. The FilterAg or Chemsorb media help remove sediment. If the pH is less than 7.0, Calcite (a type of natural calcium media) and/or Corosex (magnesium) is added to the media to raise the pH up to neutral (7.0–7.4) range.

Air Injector Iron Filter Terminator" brand



- Removes Ferrous & Ferric Iron
- No chemicals required, uses natural air injection
- Does not remove manganese
- Not recommended for hydrogen sulfide "rotten-egg" odor
- Not recommended when iron bacteria is present
- Untreated water cannot have chlorine, tannin, or oil in it
- Birm media is light, works on well with low flow rates

### Typical installation of a air-injecting venturi-type Birm-Blend iron filter system:



How It Works: An 1" NPT pipe size air-injector is installed after the pump before the well pressure tank. When the well pump runs, water flows past the air injector and air is drawn into the water.

The water flows through the air-vent tank where excess air is released before flowing through the iron filter tank. Some pressure drop will occur through the air injector, but if your well can produce at least 8 gallons per minute at 30 PSI then the pressure loss is usually not noticeable.

## Air Charging Iron Filters

The air charge iron filter, as a single tank system, is an efficient and cost effective system for the removal of iron and sulfur.

This type of iron filter maintains an “air pocket” in the top of the tank while the system is in service. As the water passes thru the air pocket, iron and sulfur are oxidized. Additionally, dissolved oxygen is added to the water. The iron filter media bed is then removes the iron and sulfur from the water.

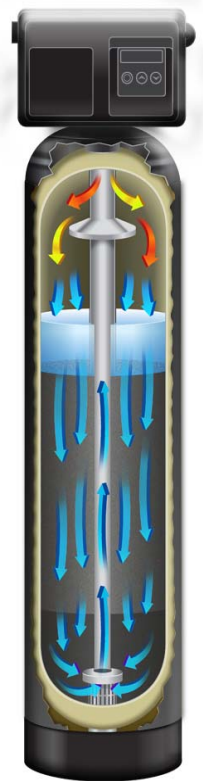
Air charge iron filters can generally remove up to 8 ppm Hydrogen Sulfide and up to 7 ppm Iron. A daily backwash will remove accumulated iron and replenish the filter media bed. The regeneration process also adds a fresh air pocket to the system.

These iron filter systems come equipped with a Fleck 2510SXT air injection control head that automatically backwashes the system daily to clean the media and flush everything down the drain. By utilizing a patented piston in the control valve, the iron filter is able to put the whole oxidation process inside one tank, keeping maintenance costs and down time to a minimum.

The filter media used inside these filters is a combination of iron filter media such as Birm or MangOX, and other media such as KDF and garnet.



Air Charging Iron filter system keeps a pocket of air in the filter tank to oxidize iron and remove odors



- Removes Ferrous & Ferric Iron
- Removes Manganese (MangOX version)
- Removes low to moderate levels of hydrogen sulfide “rotten-egg” odor
- Not recommended when iron bacteria is present
- Untreated water should not be chlorinated (unless MangOX media version is used)



Rear view of Air Charger  
2510SXT iron filter control



2510SXT control is fully automatic and easy to set.

**How it Works:** When the iron filter backwashes each night, air is drawn into the iron filter, creating a pocket of air at the top of the tank. As water enters the iron filter it passes through a layer of air.

During the backwash, accumulated rust is flushed out to drain. The media stays clean and pressure is restored.

# Birm Blend Air Compressor Systems

This type of iron filter uses a compressor to inject air into the water. This is a substantial improvement over the venturi-type air injector, because a much larger volume of air is injected.

This is more effective at eliminating sulfur odors and oxidizing higher levels of iron without the use of chemical oxidizers such as chlorine.

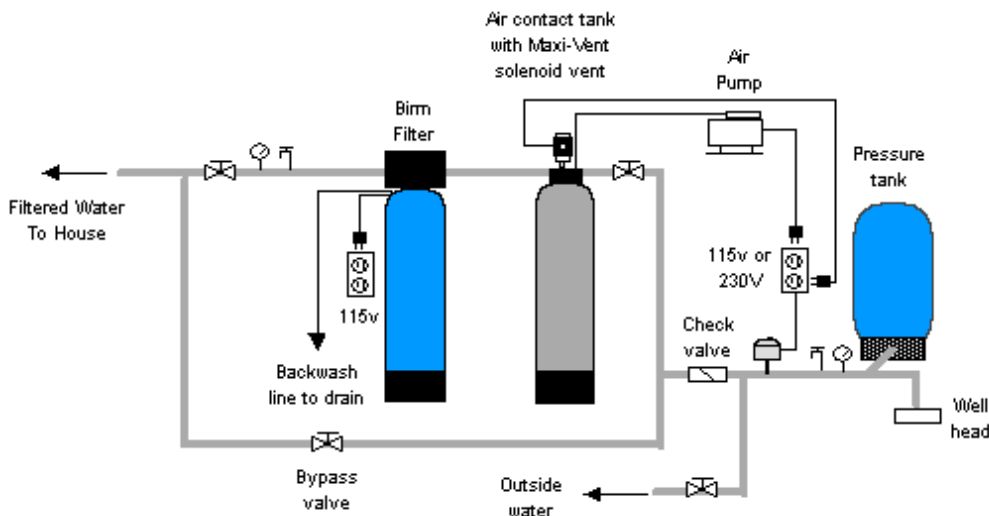
There is less pressure drop after the system with this type of iron filter because it does not rely on a venturi type air injector. Unlike air-injectors which can be clogged and need to be cleaned periodically, the air compressor produces a reliable and large volume of air to oxidize iron without chemicals oxidizers.

One result of the air compressor is that the water itself does become saturated with tiny air bubbles. Often when first drawing the water in a glass, the water may appear white, but it instantly clears as the air leaves the water.



- Removes Ferrous & Ferric Iron
- Does not remove manganese
- Removes low levels of hydrogen sulfide "rotten-egg" odor
- Not recommended when iron bacteria is present
- Untreated water cannot have chlorine in it

## Typical installation air-injecting compressor-type Birm-Blend iron filter system:



**How it Works:** The compressor injects the air in a special type of air-vent tank which allows some minutes of contact time for the oxygen to dissolve in the water, and also allow for venting of excess air and gasses.

After the water is aerated the Birm iron filter removes the oxidized iron, periodically flushing it automatically out to drain.

If the pH is less than 6.8 a Birm Blend filter using a combination of calcite and Birm can be used in the same tank. For levels less than 6.0 a separate neutralizer tank or a soda ash feeder is used.

# Greensand Iron Filters

Similar to Birm, the Greensand filter media has a special coating of manganese dioxide, which oxidizes iron, manganese and iron in water, upon contact with the filter media.

Unlike Birm, the coating is much stronger. Greensand is not affected by chlorination and works over a wider pH range. Greensand iron filters remove manganese and hydrogen sulfide.

To provide the oxidizing power to precipitate iron and manganese the iron filter is automatically cleaned and restored with potassium permanganate (a purple liquid) during each backwash cycle. As an alternative to using potassium permanganate powder, a chlorine injector pump is used ahead of the greensand-plus filter to regenerate the filter media. Greensand media generally needs to be replaced every 4 to 6 years.

In some applications where the water has hydrogen sulfide “rotten-egg” odor in it, and/or iron bacteria, it is best to chlorinate the water prior the greensand filter. The injection of chlorine (or hydrogen peroxide, or ozone) substantially increases the effectiveness of the greensand media, and allows it to work without the use of potassium permanganate and remove higher levels of iron and manganese.



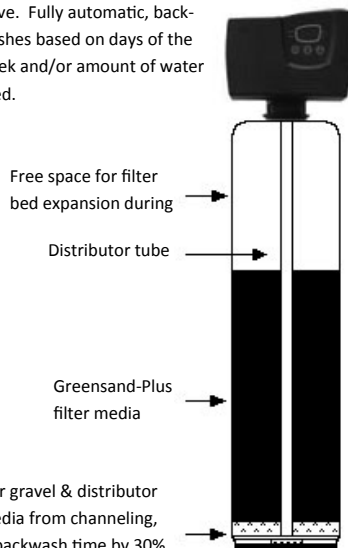
- Removes Ferrous & Ferric Iron
- Removes manganese
- Removes low levels of hydrogen sulfide “rotten-egg” odor
- Not affected by iron bacteria
- Works with chlorinated water.



What is “Potassium Permanganate”?

Potassium Permanganate (KMnO4) is a purple-black powder and powerful oxidizer. It is used with greensand iron filters to regenerate, clean and restore the oxidizing capability of the greensand iron filter media.

Fleck 7000-SXT backwash control valve. Fully automatic, backwashes based on days of the week and/or amount of water used.



Free space for filter bed expansion during  
Distributor tube  
Greensand-Plus filter media  
Base filter gravel & distributor keeps media from channeling, reduces backwash time by 30% saving water.

**How it Works:** Water flows in from the top down through the Greensand Media, removing iron, manganese and sediment., Filtered water flows down to the distributor screen, up the distributor tube, and out to the household piping. Once or twice a week, the Fleck 7000-SXT control valve timer starts a backwash and rinse, called a ‘regeneration’ cycle. This typically occurs in the middle of the night and is completely automatic.

During the regeneration cycle, the Greensand media is first backwashed thoroughly. During the backwash, water flows down the distributor tube and up through the Greensand media and out to drain, flushing out the accumulated iron and manganese and sediment.

After the backwash, some permanganate solution is sucked out of the permanganate tank, and the greensand is rinsed and regenerated restoring the exhausted media to a fresh state where it can continue to remove iron and manganese. The permanganate solution is rinsed out in two rinse cycles, and more water fills the permanganate tank and makes more permanganate solution from the permanganate powder that is in the permanganate tank.

Eventually the powder runs out, and fresh permanganate powder is added to the tank, typically once every 3—4 months.

# Manganese Dioxide Filters (MangOX®, Filox®, Pyrolox®) Intermittent Regeneration Type

Unlike Birm and Greensand which are coated with a manganese oxide coating, these types of iron filters use a natural mined solid manganese oxide ore in a relatively pure form.

The iron filters utilize an oxidation-reduction reaction and filtration process similar to Greensand, but at a much higher level of performance. MangOX for example contains greater than 85% manganese dioxide whereas Greensand contains around 1%. MangOX and other solid manganese dioxide media are very heavy and require a strong backwash flow rate to lift and clean the solid manganese dioxide mineral filter media.

An optional solution tank that contains chlorine bleach automatically cleans and restores the media in a process known as a “batch regeneration”, as opposed to continuous regeneration where chlorine is fed into the water continuously ahead of the filter.

These filters are automatically backwashed every 1 to 3 days to keep the heavy media from fouling. The MangOX media outperforms Greensand and Birm due to the purity of its particles combined with the superior oxidation, filtration capacity, and durability.

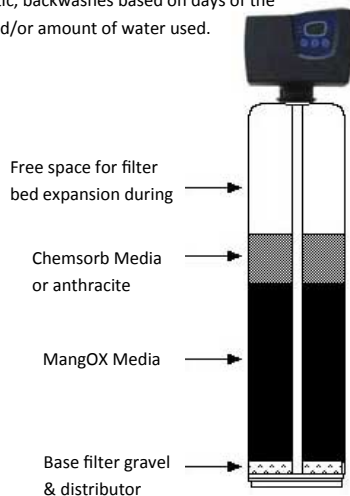
MangOX often lasts for 10 years or more, especially when used with a chlorine or ozone feed. It is the highest performing iron filter media and works great with chlorinated water, or regenerated intermittently with chlorine.



MangOX Filter with Optional Chlorine Solution Tank

- Removes Ferrous & Ferric Iron
- Removes manganese
- Removes low levels of hydrogen sulfide “rotten-egg” odor when chlorine or peroxide rinse is used.
- Not affected by iron bacteria when chlorine or peroxide rinse is used.
- Works with chlorinated water.

Fleck 7000-SXT backwash control valve. Fully automatic, backwashes based on days of the week and/or amount of water used.



**How it Works:** Water flows in from the top down through the MangOX Plus Media, removing iron, manganese and sediment., Filtered water flows down to the distributor screen, up the distributor tube, and out to the household piping. Once or twice a week, the Fleck 7000 control valve timer starts a backwash and rinse, called a ‘regeneration’ cycle. This typically occurs automatically in the middle of the night.

During regeneration, the MangOX Plus media is first backwashed thoroughly. During the backwash, water flows down the distributor tube and up through the MangOX media and out to drain, flushing out the accumulated iron and manganese and sediment.

After the backwash, the chlorine solution is sucked out of the solution tank, and the MangOX is rinsed and regenerated restoring the exhausted media to a fresh state where it can continue to remove iron and manganese. Any residual chlorine or peroxide is rinsed out to drain

Maintenance consists of adding 1 cup of household bleach or hydrogen peroxide to solution tank once every 1–2 weeks.

# Manganese Dioxide Filters (MangOX®, Filox®, Pyrolox®)

## Continuous Regeneration Type

Uses chlorine bleach to kill odors and iron bacteria and filter iron, manganese, and sulfide residues

This method is called "Continuous Regeneration". Unlike stand-alone greensand or MangOX filters which use permanganate, or chlorine to regenerate the media intermittently with each backwash, the MangOX media is "continually" regenerated.

Hydrogen peroxide is not recommended with manganese dioxide filter system due to the interaction between the peroxide and manganese which can leach manganese into the water. Chlorine or ozone works great however.

The chlorine feed ahead of the iron filter super-charges the media and allows it to remove high levels of iron, manganese and hydrogen sulfide. Coliform and iron bacteria are killed, and tannins are oxidized. This type of iron filter system handles the worst type of water reliably and effectively.

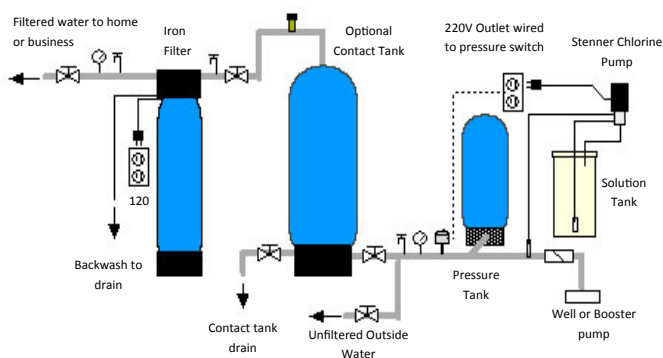
**How it Works:** A chlorinator metering pump automatically injects a small amount of chlorine ahead of the iron filter. The system can use either chlorine or hydrogen peroxide. The chlorine pump is installed so that when your well pump turns on, the chlorine pump turns on, and injects a small amount of chlorine bleach.

The chlorine (ozone can also be used) allows the MangOX-Plus filter media to remove high levels of iron, manganese & hydrogen sulfide. Iron bacteria are killed and the life of the Mang-OX media is extended up to 10 years. For most applications, no contact tank is needed, and the chlorine taste and odor is removed by the Mang-OX media.

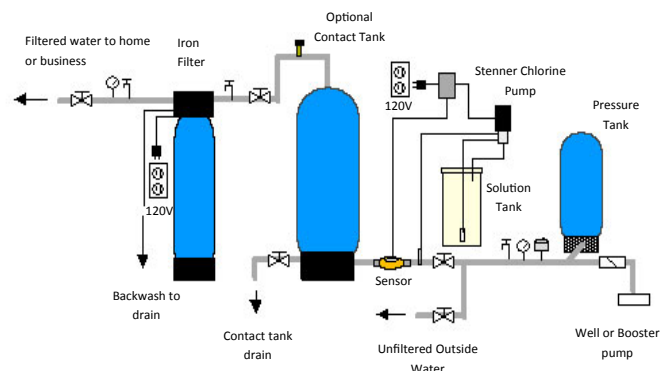


- Removes hydrogen sulfide "rotten-egg" odor
- Removes Ferrous & Ferric Iron
- Removes manganese
- Kills bacteria & disinfects water
- Oxidizes tannins
- No need to use potassium permanganate.
- Maintain a chlorine residual in piping system downstream to keep bacteria and odors from developing

Chlorination controlled by existing well pressure switch. Most common method used. Lowest cost.



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





# Hydrogen Peroxide & Catalytic Carbon Systems

Hydrogen peroxide (“H<sub>2</sub>O<sub>2</sub>”) is a powerful oxidizing agent, much more powerful than aeration, chlorine or potassium permanganate. Hydrogen peroxide decomposes into oxygen and water leaving no trace of chemical residues. For problem well water containing iron, iron bacteria, manganese and/or “rotten-egg” sulfur odor “H<sub>2</sub>S” (hydrogen sulfide gas) hydrogen peroxide systems are an excellent choice.

When peroxide is added to water a large amount of dissolved oxygen is released and a powerful oxidizing effect occurs. Coliform and iron bacteria are killed, and tannins are oxidized. This type of iron filter system handles the absolute worst type of water reliably and effectively. Peroxide oxidizes the iron, manganese and sulfur odors to a solid form that the catalytic carbon can remove. For many applications no contact tank is required, and the hydrogen peroxide is effectively removed by the catalytic carbon media.

**How it Works:** A peristaltic pump automatically injects a small amount of hydrogen peroxide ahead of an auto-backwash filter containing a special grade of catalytic activated carbon. The peroxide pump is installed so that when your well pump turns on, the peroxide pump turns on, and injects a small amount of peroxide bleach. Alternatively a proportional-feed system can be used.

For water very high in iron, hydrogen sulfide gas, or coliform bacteria, the optional contact tank is recommended.

Catalytic Carbon Filtration Systems remove any trace of peroxide and iron after the water has been treated with hydrogen peroxide

Hydrogen peroxide feed systems

Hydrogen peroxide 7% is not dangerous to handle and breaks down into oxygen and water



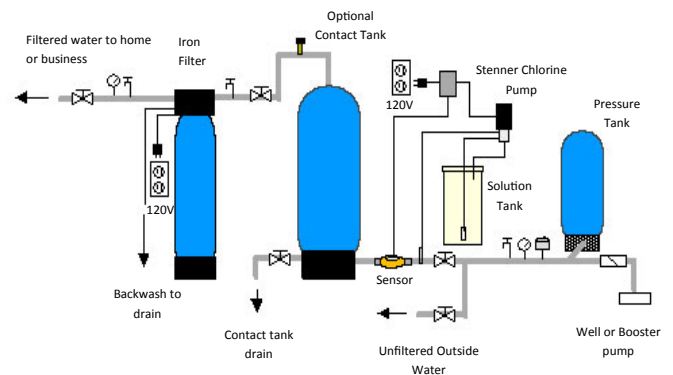
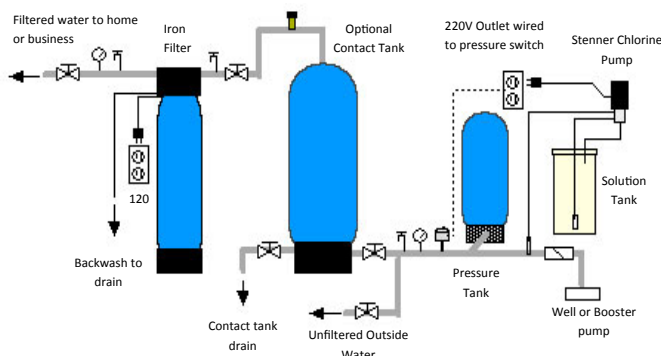
- Removes Ferrous & Ferric Iron
- Removes manganese
- Eliminates “rotten-egg” odor
- Kills bacteria & disinfects water
- Oxidizes tannins
- Low maintenance

Hydrogen peroxide proportional-feed



Peroxide injection controlled by Flow Meter “Proportional Feed”. Allows peroxide injection point to be after pressure tank, or at point of use or entry to home.

Peroxide injection controlled by existing well pressure switch. Most common method used. Lowest cost.



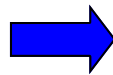
# Iron, Manganese & Odors Well Water Treatment CHEAT SHEET



www.cleanwaterstore.com  
Clean Water Made Easy.

## 1. Do The Basics

- Test Water Chemistry
- Check Well Water Flow Rate
- Determine Type of Iron
- Check for Odors
- Perform Toilet Tank Check
- Check Water Heater



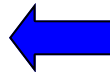
## 2. Decide on Goals

- Need to Correct pH or Not?
- Need to eliminate sulfur odors?
- Are Tannins present?
- Water also hard? Need to soften?
- Disinfected Water or not?
- Improve Water Pressure or not?



## 4. 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



## 3. Choose Iron Filter

- Air Injection Birm Blend Iron Filter
- Air Charging Birm Blend Iron Filter
- Air Compressor with Vent Iron Filter
- Greensand Iron Filter w/ Potassium Permanganate
- MangOX<sup>®</sup> , Filox<sup>®</sup> or Pyrolox<sup>®</sup> Iron Filter
- MangOX<sup>®</sup> , Filox<sup>®</sup> or Pyrolox<sup>®</sup> Iron Filter with Continuous Chlorine Feed
- Catalytic carbon with hydrogen peroxide feed
- Fine-Mesh Resin Water Softener



## 5. Quality Control

- Set up Maintenance Schedule + Clipboard with Check List
- Test Well Water Annually for Coliform Bacteria
- Test Treated Water Quarterly for iron, pH

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