Chlorination For Private Water Supplies

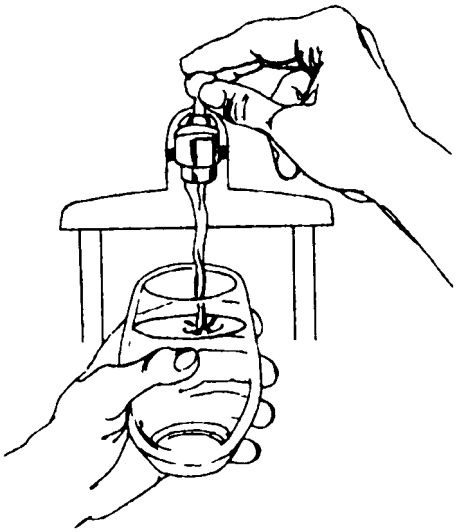
WATER: THE UNIVERSAL SOLVENT

It would be nice if all wells produced sparkling clear, good-tasting water straight from the ground, but this is seldom the case. Scientists sometimes refer to water as the *universal solvent* because it contains many dissolved substances. **Iron, manganese, sulfates, calcium, nitrates, fluorides, sodium, chlorides,** etc. are common in various ranges throughout North America. While some of these can be found at high levels and present no problem, others in even small quantities can be a nuisance.

Water supplies can also contain a number of different life-forms. **Algae, bacteria, viruses, and protozoan** can make their way easily into a water system. Some may be pathogenic, while others can affect the aesthetics of the water. Use of such water should be suspect unless the proper safeguards are in place.

The majority of municipal water systems (96%) incorporate chlorination as a key part of their treatment program. Chlorination provides the *sanitization* necessary to keep bacteria from contaminating the water supply, and the *oxidation* needed to filter out minerals. Trained professionals ensure that a safe, clean source of water is available 24 hours a day.

There are millions of residential well owners in the United States. **The owners of the wells are responsible for the quality of the water that enters their households, farms, and businesses.**



Some of this water needs little, if any treatment, but water quality surveys show that this is the exception to the rule. It is the well owner's responsibility to ensure the safety of the water supply.

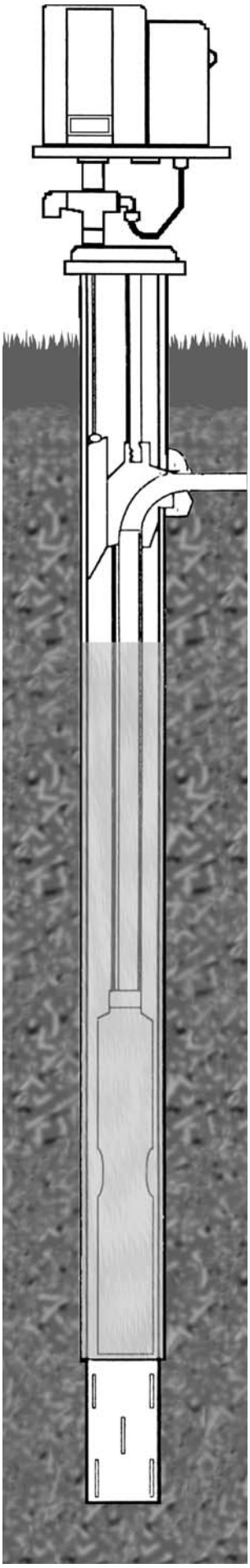
Starting in the well, Dry Pellet Chlorination is an effective treatment for many of these water problems, including:

- Contaminants, such as iron, manganese and hydrogen sulfide originate deep in the earths crust. Early treatment (in the well) prevents these contaminants from fouling pumps and plumbing.
- Bacteria require contact time in order to ensure that they are sanitized. Treatment in the well utilizes the well shaft as a holding tank to allow for this contact time.

Because it starts in the well, Dry Pellet Chlorination is very effective in treating nuisance well water problems, such as hydrogen sulfide, iron bacteria, iron, and manganese. Early treatment results in reduced maintenance and more efficient filtration.

WHAT IS DRY PELLET CHLORINATION ?

A dry pellet chlorinator is a device that mounts on the well and drops a compressed chlorine tablet down the well shaft into the well water. It is wired into the pump's electrical circuit and runs whenever the pump is pumping water, metering chlorine in proportion to water usage. An adjustment mechanism accounts for variations in pump sizes and water quality. As the pellet sinks to the bottom of the well and dissolves in the water, it releases chlorine that reacts with contaminants in the well. Dry Pellet Chlorination is effective in sanitizing various **living organisms** as well as oxidizing certain **dissolved solids** in water.



LIVING ORGANISMS IN WATER

Water is an ideal medium to support life, but the water we drink should be free of any biological contaminations, both for health and aesthetics purposes.

Coliform Bacteria

Coliform bacteria is the standard used in well testing. Coliform is present in many warm-blooded animals as a normal part of the digestive tract. Its presence in a water supply is an indication that animal or human waste is making its way into a water supply. Coliform bacteria has no detectable smell or taste. The coliform itself may not be a problem, but is an indicator that other pathogenic bacteria may be present. These bacteria can cause diseases such as typhoid, cholera, hepatitis, giardiasis, and dysentery. Although these are common in many underdeveloped countries, the lack of these diseases in the United States is largely attributed to the chlorinated water supply.

Because chlorine is a sanitizer, it will kill these bacteria if applied properly. In laboratory conditions, chlorine at 1 ppm residual takes 20 minutes contact time to achieve 100% kill of coliform bacteria. If the bacteria is exposed for less time or at lower levels, it may still be present when the water is consumed. By dropping dry chlorine pellets into the well, treatment is started at the earliest possible time, and in most cases, the 20-minute mark will be met. Testing is the only way to confirm the effectiveness of chlorination. If bacteria is still present, a higher level of chlorine or more retention time through the addition of holding tanks may be necessary.

Nuisance Bacteria

Iron bacteria is most noticeable by the slimy red coating it leaves in the water system. Severe cases can plug pumps and pipes, increase operating costs, and lead to premature pump failure. Low water pressure is a common symptom of severely plugged pumps and pipes. Water-conditioning equipment (softeners, filters) can become plugged easily, leading to frequent service calls and inconsistent operation. Stains on porcelain fixtures, (i.e. tubs, shower stalls, etc.) are common. On the farm, waterers can be coated with a red or black slime, which can discourage livestock from drinking and promote more bacteria growth.

Hydrogen sulfide is a by-product of a sulfur-feeding bacteria and is noted by its distinct smell. Rotten egg, sulfur, and sewer gas are common descriptions. It is also accompanied by black slimy build up that can cause many of the same problems as iron bacteria.

When chlorine is introduced into the water lines, it does the following three things:

1. Kills the bacteria causing the problem.
2. Oxidizes the iron into a filterable form.
3. Breaks loose the slimy deposits coating the system.

The amount that breaks loose depends on the level of the chlorine and the severity of the problem. The chlorine level may need to be lowered if excessive flushing of debris in pipes occurs.

Algae And Pond Scum

Shallow wells and water drawn from ponds may be contaminated with surface runoff and biological debris from both plants and animals. Ponds are particularly prone to this since they contain numerous forms of life that can be drawn easily into the pump. These contaminants can be filtered out physically, but the water should be sanitized for human or livestock consumption and for aesthetic and health reasons. Whether they are pathogenic or not can be determined only by a test, but these types of water sources are subject to many variables affecting their quality.

This water can be used for residential water supplies. Many cities use water from lakes, rivers, reservoirs, and shallow wells. **But like in the cities, this water should be chlorinated and filtered.**

DISSOLVED SOLIDS IN WATER

Total Dissolved Solids (TDS) are the sum of all solids that have been dissolved in the water and generally are expressed in *parts per million* (ppm). Many have little or no effect on water quality. **However, iron and manganese do.** Chlorine will oxidize these dissolved solids while having little or no effect on others.

Iron

Because 5% of the earth's crust is iron, it is no surprise that many wells contain it in various amounts. **It takes just a trace of iron to cause problems: as little as .2 ppm can stain plumbing, fixtures, and laundry.** In larger amounts, water can become rust colored and have a metallic taste. Iron can coat the insides of pipes with a hard, red scale, which reduces flow rates and plugs filter screens.

Because iron is found in different forms the treatment can vary.

- **Ferrous iron** is dissolved and appears clear out of the tap. At lower levels, it can be removed by *ion exchange* (water softening), but if iron bleed through occurs (red stains, rusty water, etc.), it may have to be oxidized and filtered.
- **Ferric iron** is oxidized (precipitated) and appears red out of the tap. It consists of particles in the 30- to 50- micron range and will pass through most water softeners. An iron filter will probably be needed.
- **Heme iron** is iron bound up with organic material (often referred to as *tannins*). It needs to be oxidized by chlorine to destroy the bond between the organic material and iron to precipitate the iron out of solution.
- **Iron bacteria** needs to be sanitized and the precipitated iron filtered.

Ferrous iron and iron bacteria occur most often. **By pretreating with Dry Pellet Chlorination, the different types of iron can be converted to ferric which can be filtered.** Adequate contact time is necessary, since the iron may not precipitate immediately, especially if it is bound up with tannins or iron bacteria. Generally, 30 minutes are thought to be sufficient. Over time, continuous chlorination will remove built-up iron deposits from plumbing.

Manganese

Manganese is characterized by black to grayish deposits, or black water with a metallic taste. Chemically, its treatment is similar to iron. Manganese appears in the same forms and exhibits the same problems. While not as common as iron, it will show up at much lower levels: .05 ppm is enough to cause problems. Dissolved manganese is slower to oxidize than iron so early chlorination is helpful. Unlike iron, any build ups in pipes are difficult to remove, so ignoring the problem can lead to more expense in the future.

DISSOLVED SOLIDS IN WATER (continued)

All of these problems start with the water in the well. By treating these problems with a dry pellet chlorinator, there are several advantages.

1. Treatment is started at the earliest possible time. This is important for both sanitizing and oxidizing reasons.
2. Maintenance of the well (pumps, screens, and pipes) will be reduced, since contaminants will not have a chance to build up.
3. Holding or retention tanks are usually not necessary.
4. One unit mounted on the well treats the entire water system.

COMMON QUESTIONS

1. What about the chlorine taste?

Dry pellet chlorinators can be set at the level desired by the homeowner. In some cases there will be no chlorine taste or smell. Carbon filters available at local home-improvement stores or at your water-conditioning dealer can remove excess chlorine.

2. Won't the chlorine drift away in the aquifer?

This is unlikely. Most aquifer flow rates are measured in either inches or feet per year. This is because the majority of aquifers are found in rock, gravel, or sand. When the pump starts to run, it pulls the surrounding water into the well casing. This flow of water into the well casing prevents chlorine from escaping into the aquifer. Because the chlorine demand and residual can be measured, and we know the dosage, we can determine if any measurable amount of chlorine is lost.

3. How much does it cost to chlorinate?

This depends on the quality of the water and the volume used. A family of four with average well water could spend $5-$10 a month on chlorine.

4. Will chlorine corrode my pipes and plumbing?

Municipalities and rural water systems use chlorine with little detrimental effect to their pipes and plumbing. Because dry pellet chlorinators can dose your well water at the same rate, you should experience no problems. Proper installation, monitoring, and maintenance are important.

B&B CHLORINATION
Albert City, Iowa
Greensboro, North Carolina
www.bbchlor.com
800-331-4808
800-645-0081