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SOLUTIONS TO IRON PROBLEMS

An elevated level of iron is a common water quality issue for well owners. Iron makes up five percent of the earth's crust and in dissolved form occurs in most ground water. It is dissolved from the rocks and minerals that form aquifers. Generally the longer the ground water is underground and flowing through cracks and pores, the higher the iron concentration is likely to be.

Iron is a beneficial and necessary nutrient in most adult diets and the US Environmental Protection Agency (EPA) does not consider elevated iron concentrations in drinking water to be a health problem. Most people get their daily minerals and vitamins through the food they eat and not the water they consume.

The first step in solving an iron problem is to determine if the iron is in particle form (oxidized state) or dissolved (reduced state). The color of the water is a good initial clue for the presence of oxidized iron. Iron that is oxidized forms small "rust" particles that can give the water running out of a faucet a red, brown or yellow color. Oxidized iron must be removed with a mechanical filter that will catch the small particles before they pass into the home plumbing and/or other water conditioning equipment.

Dissolved ("clear water") iron in ground water may become oxidized once it is exposed to oxygen in the air. Agitating the water or adding oxidants such as clothes bleach or other home cleaners containing chlorine can accelerate this process. As the water becomes oxidized, it can stain plumbing fixtures and clothes. To help prevent problems with iron staining, the EPA has recommended an upper concentration limit of 0.3 parts per million (ppm or milligrams per liter [mg/L]) dissolved iron.

There are several treatment methods for dissolved iron. In many cases, they are similar to those used to remove manganese and/ or sulfur. For situations with iron concentrations up to 2 or 3 ppm, typical water softeners (using salt [NaCl] brine for regeneration) are likely to be effective. The sodium resins in these systems actually prefer the iron to the "hardness" elements such as calcium and magnesium. If the iron concentrations are greater than 5 ppm iron then the treatment must be specially designed to ensure that the "backwash" regeneration cycle is strong enough the remove and wash away the iron that is collected out of the raw water. Treatment with a water softener works best when the pH of the water is near neutral (pH = 7).

Higher concentrations of dissolved iron require more aggressive oxidation treatment with aeration, chlorine compounds or ozone. Each of these methods converts dissolved iron into ferric (oxidized) iron that can be trapped by a filter. In the first case, aeration adds oxygen to the water by vigorously blowing air into the water or by cascading the water over trays. The water is filtered at the end of the aeration process.

Ozone is a stronger oxidant than chlorine, but ozonation equipment is typically more expensive to operate because of higher electricity consumption. In either case, the raw water is placed in contact with either ozone gas or chlorine. Most residential systems use a solution of calcium hypochlorite or sodium hypochlorite rather than chlorine gas as the chlorine source for the treatment. Following treatment with ozone or chlorine the water is held in a tank to allow time for the oxidation process to be completed and then filtered prior to use. Chlorine systems may also include a treatment with activated carbon to remove residual chlorine before entering the domestic drinking water supply.

Another common method uses an oxidizing filter media known as "greensand." A bed of greensand comprised of manganese oxide coated resin pellets / beads provides both an oxidizing environment and filtering capacity. Oxygen is released from the manganese oxide coating to oxidize the dissolved iron in the raw water passing through the bed. The oxidized iron particles are trapped in the resin bed until removed during the backwash cycle when the manganese oxide coating is regenerated with potassium permanganate. The iron particles must be flushed out during the backwash cycle so that the resin bed does not become clogged. Greensand systems do not require high dissolved oxygen contents, but work best when the water pH is above 7.5.

Polyphosphate treatments do not remove iron (or manganese) from the raw water. They reduce staining by retaining these metals in solution and preventing oxidation. This method is only effective for levels of iron and manganese less than about 1 ppm and if the water will not be heated. Heating releases the metals and allows oxidation to occur.

Water quality problems are not always straightforward to solve. Be sure to get a written contract with your water treatment installer that specifies how any lingering water quality issues will be addressed, who will by responsible financially and what will be done if a water quality concern cannot be satisfactorily treated.