by Jon Steele

Do YOU have demons in your water well?

It's a long way from turning water into wine but you can actually turn bad well water into good well water. If your water system has a well water source, and if the water coming out customers' taps has a yellow color or other tint, then I think it's time to focus on cleaning up what I refer to as "well water demons." What are they? Iron, manganese or sulfate-reducing bacteria can really wreak havoc with your water quality.

Jon Steele
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There are hundreds of different types of these bacteria, all causing the same problems for the water utility and the customers served by the system. What problems do these bacteria cause? For starters, taste and odor! Next, it's a potential loss of production from the well. There's only one remedy - and it's easy. Kill them and flush them out.

The clean up process

Flushing alone is simply not going to correct the problem. Flushing won't eliminate bacterial infestations in water wells. Some of the bacteria will linger, only to repopulate later. Treating the bacterial infestations is something that can often be accomplished by local water system personnel.

What's required? First, a batch of chlorine solution with a little wetting agent. This mix is a deadly solution for bacteria. The problems associated with this type of bacteria infestation are bad taste, discolored water, stained laundry, oily film on tea or coffee made with the water, slimy film on toilet tanks or bowls, or water that smells of septic or rotten eggs. This foul smell comes from hydrogen sulfide gas that is produced during the life cycle of the bacteria. These types of bacteria should not be confused with pathogenic bacteria such as E. Coli or Coliform that are considered potential disease carrying. Although repugnant, the iron, sulfate and slime bacteria are more of a nuisance; they are not a health threat as are E. Coli or Coliform bacteria.

Treating the well at Beverly required 20,000 gallons of 1000-ppm chlorine solution and 15 quarts of liquid soap as a wetting agent.

KRWA worked to help the City of Beverly clean up two wells. Beverly is located in Lincoln County in central Kansas and serves a population of only 130 people on 90 water services. The city had just completed an overhaul of the distribution system; USDA Rural Development funded that project. Water quality however was so poor that one well wasn't even being used and the main well was losing capacity and not keeping up with demand. This didn't make sense to folks – why spend all that money on a water system that still produced bad water?

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Associates sponsored by KRWA last summer. After the session, Clayton, Richard and I discussed a project to disinfect and flush their well. I warned them it was not a difficult task but it would require time and some patience.

Hearing Robert Vincent's presentation on rehabilitation of water wells sparked a real desire and commitment to give it a try. Following that training session on July 15 at Salina, I met with the city several times to discuss strategy and how best to acquire the necessary materials for the project. We developed a plan of action. We would begin with the well having the most obvious problem. The well had not been used for several years. Water from the well was foul smelling with a lot of discoloration. Treating the well would require 20,000 gallons of 1000-ppm chlorine solution and 15 quarts of liquid soap as a wetting agent.

The process

Steps taken included:

1. A local fire tanker truck was used to mix the solution and pump the chlorine solution into the well.

2. The solution was then surged back and forth from the tank into the well for two full days. The surging of the pump creates a mixing and washing action to penetrate and dislodge the slime and biofilm that are associated with bacterial growth in the well and surrounding formation.

3. Next, we allowed the solution to remain in the well over the weekend.

4. The next week we pumped it to waste. It takes a lot of pumping to flush out this much wetting agent but it does a nice job of assisting the chlorine to reach the slime.

5. We checked for chlorine residual. There was a residual indicating to us that the chlorine demand (to kill bacteria) was not completely used and that the well was clean.

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It is critical in the operation and maintenance of water wells that the utility maintains the original design specifications on file. The original capacity needs to be known so it can be compared wth today's operations.

Test results on first well

Always conduct a pumping test before and after the cleaning to determine change in pumping rate and water quality. I always run an inorganic analysis and pump test before and after the rehab job. The main concern is whether iron and manganese levels were reduced.

The first well at Beverly had a manganese level of .75 mg/l; iron was a sky-high 3.25 mg/l. The suggested limit is .05 mg/l for manganese and .3 mg/l for iron. After the cleaning process, the iron tested at .05mg/l and the manganese was .23 mg/l. This was a remarkable reduction. Capacity did not increase as a result of the treatment. The well has since been placed in service and the public has noticed a change in the water quality.

Second well poses problems

The next candidate well for clean up at Beverly was the city's main water well. The major problem was loss of yield. We weren't sure if it was due to a biological problem or a scaling problem. The well was drilled in 1960 and yield was down to less

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Rodine 50 is not designed for use in potable water wells! The well drillers and chemical suppliers need to pay attention. This practice needs to change. This is a quote from Technical Process Bulletin on Rodine 50. (Rodine 50 is a nonfoaming liquid inhibitor for use in conventional muriatic pickling or cleaning operations of mild and unreactive steels. Rodine is not suitable for use for critical equipment cleanouts. Rodine 50 is an effective inhibitor for pickling prior to electroplating).

than fifty gpm from the original design of 200 gpm. If the well pumped more than 50 gpm, it pumped air. A chlorination process similar to that used on the other well resulted in very little change in capacity. Iron content dropped from .15 mg/l to 0 and manganese dropped from .20 mg/l to none. That was remarkable.

Inhibited or not?

Having treated Beverly's main well with no improvement in production, we decided the problem of low capacity to be more of a scaling problem. We decided on a treatment with acid. This was quite an experience. We inhibited 400 gallons of muriatic acid with Rodine 103. This was stabilized with 100 lbs. of citric acid. We wanted to do it right and not have to go back. If you ever attend a training session by Robert Vincent, you will likely recall his recipe for acid treatment of water wells. It always has as one component: Rodine Aqua Hib 100. I have heard him talk about it for years. What is this material? It's an inhibitor to protect the metal parts in a water well, specifically the cast iron bowl assembly.

I tried to purchase this material for our acid treatment. After what seemed like hundreds of phone calls to everyone from chemical suppliers to well drillers, purchasing the treatment product Aqua Hib 100 proved to be impossible. Twenty or so years ago, Rodine 100 was readily available. It seems though everyone is using acid that is already inhibited. Well, that sounded great so I made further inquiries. What I learned was that everyone is using Aqua Hib 50. But is Aqua Hib 50 food-grade, or safe in potable water wells?

During my research, I was able to reach Henkel Surface Technologies, a company that represents the Rodine line of inhibitors. From there I was able to contact the principal representative of the product line. Was that ever enlightening! George Boughton sent me technical bulletins on the different inbitors and their uses. **Rodine 50 is not designed for use in potable water wells!** The well drillers and chemical suppliers need to pay attention. This practice needs to change. This is a quote from the Technical Process Bulletin on Rodine 50. (Rodine 50 is a nonfoaming liquid inhibitor for use in conventional muriatic pickling or cleaning operations of mild and unreactive steels. Rodine is not suitable for use for critical equipment cleanouts. Rodine 50 is an effective inhibitor for pickling prior to electroplating).

So that leads us back to the Rodine Aqua Hib 100. Robert Vincent was correct. This product is specifically designed for potable wells. It is a powder and you have to mix it. A similar product, referred to as 103, is comparable to the 100. It however is in liquid form for ease of handling and comes in smaller containers. I talked to one supplier who just sold several drums of acid with the incorrect inhibitor to a city. The food grade product is the one that should have been provided.

The acid treatment on this well greatly improved pumping capacity. Originally, the pump would break suction at 50 gpm. Following treatment, the capacity increased to 142 gpm. It marked the end of another successful effort by KRWA to help water systems.

I encourage you to attend the KRWA conference. Talk to suppliers and other systems. Best of all, attend the sessions. The programs were mailed out in late January; the entire program is reprinted in this issue and it's also posted on the KRWA website, www.krwa.net. I am confident that you'll find the KRWA conference a very good investment of your time. There are many social and meal functions that KRWA works to make part of the overall conference.

Capt. Chlorine wins again!