Measuring Water Softener Impact on Septic Systems

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A water softener task force met last November in Alexandria, Va., to discuss whether a need exists to research what effect softened and regenerated water from water softeners may have on onsite systems. The 30 stakeholders also identified and prioritized what types of research would be necessary.

The germ for the workshop started when the Water Quality Association, representing the water softener industry, met with the National Onsite Wastewater Recycling Association to establish the facts. The variables were so numerous that the organizations sought reinforcements. A task force was formed and facilitated by members of the U.S. Environmental Protection Agency and Water Environment Research Foundation.

So, what is exciting about all of this? NAWT was invited to give the pumpers' perspective. To learn what that was, I posted a survey on the COLE Publishing forums, asking about conditions pumpers saw in septic tanks and absorption areas that they attributed to water softeners. The attribution was based on the problem going away once the water softener was disconnected from the onsite system.

WHAT WE LEARNED

What kicked my excitement into high gear was hearing researchers present scientific explanations that corroborated the pumpers' anecdotal evidence.

The 30 responses I received fell into five categories, listed in order of frequency:

1. Hydraulic overloading from the backwash cycle or water softener leaking. Most leaks average 200 gpd, but we once clocked one at 700 gpd, and we couldn't notice or hear it.

2. Disruption of settling in the septic tank. The argument is that salt water is denser than water, allowing more solids to prematurely clog the effluent filter and float out of the tank. However, a presentation on "Monovalent & Divalent Cations and their Effect on Settling" by John T. Novak, Ph.D., P.E., Virginia Tech, explained the relationship that sodium, calcium and chloride ions have on settling. The sodium ion has a single or monovalent charge and the calcium ion has a double or divalent charge. When the ratio of monovalent charges to divalent charges is imbalanced, it

effects settling. Novak conducted his research at wastewater treatment plants, but the basics are identical.

3. Chemical and biological upsets such as no scum layer or a scum layer that looks like and has the consistency of milkshakes with no stratification in the septic tank. Scientists in the group confirmed that salts can emulsify grease, keeping it suspended in the tank and, therefore, able to reach the drainfield in the effluent.

4. Structural deterioration of distribution boxes and concrete baffles. Pre-sentations revealed that sodium could increase the production of sulfides and hydrogen sulfide, which reacts with oxygen to form sulphuric acid. It is sulphuric acid that erodes the concrete in the upper reaches of the tanks and d-boxes.

5. Clogging of the soils or peat and sand filters, which is logical if more grease and solids are leaving the tank.

One thing the presenters stressed during the first day is that they are not worried about salt affecting the biology in the tank. The ocean is far saltier and its microorganisms are thriving. The bottom line: Bugs don't mind salt at these concentrations, and can adapt to saltier environments.

Illumination

What made a light bulb go on in my head was the presentation by Joe Harrison of the Water Quality Association. He said we think only of the effect of regeneration water. What we don't think about is the result of the water softening process. By replacing calcium and magnesium ions — the elements that cause hard water — with sodium from the water softening salt, we've increased the sodium in all water drawn in the house and discharged to the septic tank.

We need to ask what effect the additional sodium has on the septic tank and soils? Scientific studies have shown sodium binds clay soils together more tightly, but does the element reach the drainfield in a concentration high enough to affect the soil? Lacking research to answer those questions, some states ban water softeners in homes with an onsite system. Other states require open discharge or bypassing the septic tank and plumbing straight into the drainfield. Still others require the regeneration water be plumbed to the septic tank. Manufacturers like Orenco Systems Inc. and Delta Environmental Products Inc. will void their warranty if regeneration water enters the advanced treatment system.

On the second day, we broke into six groups to determine the research needs for septic tanks, drainfield soils, and aerobic treatment units. I was with two scientists and a regulator, and was the only pumper there. The groups came up with 30 areas of research, which we consolidated into 15 areas, then prioritized them through a vote. As you'll see, the areas are all interconnected and difficult to separate, making studies harder to focus.

The winners, listed with some parameters and qualifiers, were:

1. Conduct a field survey that analyzes the compounds in septic tanks and the condition of the tanks with and without water softeners. Although organizations are starting to collect information for databases that the task force may be able to retrieve, how many tanks must be inspected to obtain significant results? With about 28 million onsite systems in the country, sampling a significant number will be difficult.

2. Characterize wastewater by evaluating the quality of septage leaving the house. I emphasized that septage differs from home to home, making such a study difficult. Even different brands of water softeners cannot produce regeneration water with identical characteristics. So, we'd have to look at the characteristics of wastewater from the house, characterize it with and without water softening equipment, then analyze the quality of the effluent.

3. Determine the effect of regeneration water on soils. Scientific studies confirm that adding calcium improves drainage in clay soils, while sodium impairs drainage. How do the chlorides, magnesium, iron and many other compounds in regeneration water effect soils?

4. Settling. Is the ratio of sodium and calcium ions in regeneration water imbalanced enough to effect settling in the septic tank?

5. What effect does septic tank effluent, with and without regeneration water, have on soils?

Cooperation

Everyone arrived at the workshop with the attitude that if they knew the facts, they could fix the problem. It isn't complicated. If water softeners should use potassium chloride instead of sodium chloride, that can be done. If regeneration water messes up settling in the septic tank, can we resolve this by changing the geometry of the tanks or changing the chemistry of water softening equipment?

I think this workshop will evolve to where we see a request for proposals from water research foundation. A report of the meeting is posted at www.werf.org and www.nawt.org.