NOWRA & WQA Septic-Softener Symposium

Cleveland, Ohio—October 13, 2005

By Bob Boerner

A symposium focused on water treatment and its possible effects on on-site wastewater systems was attended by some 125 interested parties in Cleveland, Ohio on October 13th, 2005. The event was sponsored by the National Onsite Wastewater Association (NOWRA) and was held in conjunction with the Water Quality Association (WQA), who helped in arranging speakers and developing a productive agenda for the one-day symposium.

Over the last few years a growing number of regulators, often urged by the on-site Aerobic Treatment Units (ATU) manufacturers, have voiced concerns about water treatment wastes entering on-site wastewater systems and have suggested softener discharge bans in some states. Some of these recommendations have been enacted into state codes, but many of them have since been overturned or modified in light of the growing body of scientific evidence showing no harmful effects from softeners on either anaerobic (septic) or aerobic (ATU) systems. On-site operators have relied largely on anecdotal evidence to support ban recommendations.

The issue had become recurring and often heated enough that WQA actively sought out NOWRA to open up a dialogue on the subject. Over a number of months an outline for a Symposium on Septics and Softeners evolved, overseen and facilitated by NOWRA's Technical Practices Director, Matt Byers, Ph.D. and Jim Converse, Ph.D. of the University of Wisconsin at Madison, the co-chair of NOWRA's Education committee. WQA's Carlyn Meyer and Joe Harrison, P.E. also played important roles in helping move the project forward and in procuring speakers to present the water treatment

By Matthew E. Byers, Ph.D.

On October 13th, NOWRA aided by the WQA convened a symposium to address the topic of water softeners and septic systems. At issue was the perception that these two critical appliances may have certain incompatibilities. Speakers from both industries addressed the issue. From the WQA, or softener side, data was presented that supported a claim of no harm to the tank, system biota and receiving soil. From the on-site side, cases where systems were compromised due to the presence of water conditioning devices were presented. Research papers and testimonials comprised the morning session, followed by an afternoon session of discussion. There were at least 125 people present. Many people from the water conditioning industry attended and desired this meeting. Very few members of the on-site secondary treatment manufacturing industry attended.

Highlights of the symposium included learning that each industry provides equipment that is going to be used at the same site by system owners. This should not be a surprise to anyone. Thus, these industries must learn from each other how best to make this situation workable. Workable means the on-site system works in concert with the input stream and thus protects human health, protects the environment and is a good value for the consumer.

• It was learned through presentation and discussion that an inadequate amount of discussion had taken place between the two industries. Two levels of need will emerge: 1. Immediate communication to define what we already

By C.F. "Chubb" Michaud, CWS-VI

A joint symposium was held by NOWRA and the WQA to present documentation and discuss the issues on water conditioning's influence on the performance of on-site treatment systems. There are over 25 million on-site water treatment systems (septic systems) currently in use in the U.S. and it is reported that nearly 50 percent of all new homes have on-site treatment. There are over 25 million residential water softeners in use today and many are used at residences where there is also a septic system.

Many members of NOWRA claim that the brine discharge from a regenerating water softer discharging directly into the septic system disrupts the normal bacteria action, causes scaling, poisons the leach field (swells the soil and causes plugging), increases the density in the tank causing solids to float and overwhelms the system due to high flows during the regeneration cycle. They have proposed bans on the use of automatic softeners discharging into septic systems and have caused legislation to be enacted in several states to that effect. It should be noted that WQA has successfully defended the use of softeners in states with certain restictions.

WQA has maintained that none of this is true and presented numerous papers from well-designed and well-executed lab and field trials proving their case. In addition, it was shown by WQA presenters that the use of portable exchange softeners that allow only hardness-free water to pass to the septic system and then regenerate off-site could very well be detrimental to the proper operation of a septic system and the use of a French drain to bypass the regenerant brine directly to a separate drain field was

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industry's studies spanning a number of years.

The trend in the last decade or two has been for consumers to rely more and more on on-site systems to treat their wastewater as they populate areas well beyond the reach of municipal wastewater systems. Today in the United States about 25 percent of the total domestic wastewater treatment systems are on-site types and almost a third of new construction in this country includes them. Unfortunately, a good many of the systems are showing signs of failure for various reasons. Age, lack of proper maintenance, marginal or poor initial siting or design and possibly excessive or hard-to-digest substances introduced into the waste streams are pushing the systems beyond their abilities.

These failures and near-failures pose a significant risk to the environment and especially to water tables tied to the treatment systems. Untreated or partially treated wastes can potentially expose humans to harmful pathogens. They can also pollute watersheds and the life these systems support by overfeeding nutrients into the ecosystem, thus disrupting the normal biological processes which

Byers, cont'd.

know and thus, how to adjust each others' systems to make the whole work on site and 2. developing research needs based on a complete understanding through communication.

• Presentations dealing with the receiving soil environment appeared to indicate that soils generally could assimilate softener inputs.

• Some advanced treatment units were presented to be impaired by the use of water conditioning equipment. After much discussion, it was felt that softeners were and on-site systems could likely be adjusted to accommodate each other. Indeed, there may be cases where slugs of regeneration wastewater may cause calcium carbonate precipitation in units under aerobic conditions. Several solutions were proposed such as bypassing such a sensitive system, as well as time-dosing the regeneration waste into the system. Individual on-site treatment systems and devices likely have limits under which they can be operated. If a home is simply going to have a water softener, then the on-site system needs to be able to accommodate that input.

• Softener systems were described as hydraulically overloading on-site sys-

Michaud, cont'd.

both costly and impractical besides being totally unnecessary. NOWRA presenters offered only anecdotal observations and suppositions and did not back up any of their claims with hard science. Nonetheless, their observations (particularly hard scale formation) were real and not dismissed out of hand by WQA. Scaling problems seem to be limited to aerobic systems (none were reported with the anaerobic septic installations) and were even reported on aerobic systems *without softeners*. As one of the co-authors of a WQA paper, I pointed out that urea and other organics in household waste would be converted to ammonia during the digestion and raise the pH of the system within the tank. We added that softeners do not create calcium, but they do release it in higher concentrations than the feed water. In addition, we pointed out that softeners do not produce calcium carbonate but add only calcium chloride, which is extremely soluble. I then pointed out that the higher calcium concentration at higher pH would precipitate when aerated using air containing carbon dioxide and that the scaling was actually being caused by the aerobic system design rather than the softener discharge per se.

Unedited excerpts

Orenco Fact Sheet: Water Softeners and Wastewater Treatment Systems

What Is the Next Step?

When regulators consider whether to allow discharge of water softener brine to wastewater treatment systems, the burden of proof should be on the party that stands to profit from its position. Sales of wastewater systems will not change based on whether softener brine is a1lowed in them, but water softener sales may. Rather than asking wastewater system manufacturers to prove harm to the treatment system, water softener manufacturers should have to prove that the addition of their brine discharge to the waste stream does no harm. Although the Water Quality Association has advocated for the discharge of softener brine to wastewater treatment systems, its references are limited to *two* specific and *limited* studies. These should be carefully reviewed and their conclusions considered in context.

Need for Future Research

One thing that all parties to this controversy agree upon is that more research is needed. This research should include not only standard septic tanks, but also secondary and advanced treatment processes that are required to maintain high levels of treatment. Until that research is in hand, the onus is on the Water Quality Association to prove, in a manner consistent with protection of public health, that adding water softener brine to wastewater treatment systems, and accumulation of salts within the process, will not jeopardize the long-term performance or degrade any part of the primary or secondary Treatment processes, or the final effluent quality.

A Quantitative Analysis of the Impact of Salt on the Microorganisms in an Aerobic Wastewater Treatment System

By S. Husain and C. D. Litchfield

Conclusions

In the solar salt concentration range of 0 ppm-10,000 ppm there was no significant impact on microbial respiration. However, 50,000 ppm solar salt concentration retarded microbial growth and respiration and this was magnified by the addition of sodium lauryl sulfate. Typically home water softeners leach a maximum of 1,000 ppm brine and under backwash mode, may expose the aerobic microorganisms in the tank to up to 5-10,000 ppm brine for short periods. Thus, the length of time that the inoculum in this study was exposed to 5 to 10 times normal brine conditions was a worst case scenario, and yet there was no statistically significant differences in the metabolic activity of the microbial community. This means that it is unlikely that failures in domestic water treatment systems are the result of exposure to the brine from home water softeners.

tems. Discussion revealed the relative small quantities of water in softener recharge. Some softener water feed systems were described as possessing stuck valves, thus contributing large quantities of water to the on-site system. The remedy was simply maintaining the softener systems correctly and using better grades of salt.

• Modern softener systems include demand initiated regeneration units. These units are programmed to regenerate only when water use demands the regeneration. Thus, the number of regeneration cycles is related to actual water use. Number of cycles is directly related to the amount of regeneration water inputting the on-site system.

• Water chemistry such as calcium concentration and pH were described as important factors that could affect on-site system operation.

Proposed symposium follow-up

• Creation of a task group that will ensure that the WQA and NOWRA continue discussion.

• Creation of a summary paper from the symposium. This paper will be just a few pages describing highlights in detail. It will be reviewed by the presenters at the symposium as well as WQA representatives and some members from NOWRA Technical Practices Committee.

• NOWRA presence and continued discussion at the WQA meeting in March.

• Generation of guidance materials from the task group to assist practitioners in using both technologies at the same site with a high probability of success.

• Generation of a statement of research needs. Through discussion, both industries will reveal to each other what is known and thus, what remains to be described. Research will likely yield a description of limitations.

The symposium was successful in that it initiated an overdue meeting between these two industries. Both industries agreed that our collective goal is system functionality and satisfied customers.

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Another observation by aerobic system service representatives was that some aerobic systems with softeners seem to have more frequent filter plugging. Filters have recently been installed on the discharge of the septic system to keep solids out of the drain fields, which seem to be picking up paper fibers and 'salt crystals' (probably calcium and magnesium scale). There is a possibility that the bacteria responsible for the digestion of paper are adversely affected by the brine. No work was done by WQA presenters to address that concern.

The following papers were presented:

"Home Water Treatment System Discharge to On-Site Wastewater Systems" by Joe Harrison, PE, Technical Director WQA and Chubb Michaud; "Compatibility of Water Softeners and Residential Wastewater Treatment Systems" by Tom Bruusema, Gen. Mgr., NSF International; "An Installer's Observations on the Effects of Water Softeners on On-Site Wastewater Systems" by Gene Bassett, owner EC Bassett Construction; "A Quantitative Analysis of the Impact of Salt on the Micro-organisms in an Aerobic Wastewater Treatment System" by Salea Husain, George Mason Univ., Manassas, Va. and CD Litchfield; "Impact of Water Softeners on Septic Tanks—A Field Evaluation Study" by Christopher Kinsley, Ontario Rural Wastewater Centre, Univ. of Guelph, Ont., Canada, Anna Colla and Doug Joy; "Effect of Water Softeners on Septic Systems" by Robert Pickney (presented by Mike Hines); "Water Quality Changes in Conventional On-Site Wastewater Treatment Systems Associated with use of Sodium Based Water Softeners" by Marc Spratt, RLK Hydro, Inc., Kalispell, Mont. and Garry Grimestad; "Soil Infiltration and Percolation of Wastewater as Affected" by Water Softener Use by E. Jerry Tyler, Dept. of Soil Science, Univ. of Wisc., Madison.

In a spirit of cooperation, NOWRA and WQA will meet in the near future to see if modifications can be worked out in the softener regeneration cycle and/or the septic design to eliminate the tendency to produce scale in the aerobic systems. No other problems are being considered in aerobic systems or reported in the anaerobic systems.

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keep things in balance.

A growing trend in on-site wastewater treatment has been to redesign the old standard septic system (which relies on an anaerobic digestion process) to add aeration and oxidation processes and sometimes a disinfection step for the digested wastes in the newer ATUs. The benefits are faster and more complete digestion for waste streams, often accomplished in less space, but the systems are more complex than the older septics and often require more care and periodic maintenance to operate properly.

Most participants in the conference would likely agree that septic failures are often a product of multiple events but that it is difficult to isolate one particular culprit. Without necessarily having scientific proof regarding the role of water softeners, some of these ATU manufacturers have decided it best to simply ban water conditioning waste products from their systems, at the risk to the consumer of voiding the warranty on their ATU. The water treatment industry feels this type of ban is unfair to the consumer and that it can add unreasonable expenses to the cost of installing a water treatment system, potentially steering the consumer away from water treatment altogether, despite its many proven benefits.

The symposium provided a platform for both sides to air their concerns and opened a face-to-face dialogue on the issue. Conference participants presented a number of scientific papers, most showing little if any deleterious effects to on-site systems or their drain-fields. During the discussion, NOWRA members presented anecdotal evidence that softeners contribute to or cause septic failures under certain circumstances.

It became apparent that both sides have a good deal to learn about the others' technologies and designs and one positive outcome of the symposium was that a working taskforce between the two entities will be set up to explore the issues in more depth and hopefully develop some acceptable guidelines to better coexist. To that end, conferees supported the idea of joint inspections of varied septic tank failures in order to identify the various ingredients, dynamics and malfunctions that contributed to them.

A keynote of the meeting was that both industries are a part of the same chain of water use throughout a household and that there is a need to better integrate our systems to benefit the consumer and the environment. A good deal of this process will likely involve enhanced education and training of the parties involved in setting up these small-scale hydrological cycles. Both the water treatment and on-site wastewater parties will need to better focus on optimizing the performance of their respective technologies and to better educate the consumer on ways to optimize their use.

The WQA Septic Issues Task Force will continue the dialogue between the groups and will likely line up a joint meeting at the WQA in Chicago in March of 2006 to further explore the issue and advance communication between the two groups.

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