

# Septics & Salt: Results From the Septic Study

By Pauli Undesser

Septic study results show systems working together efficiently

If you attended the WQA Aquatech USA 2013 tradeshow in Indianapolis in April, you heard about many exciting topics, but probably none that have been in the works for as long as the septic study. After more than 10 years in the making, the Water Quality Research Foundation published results from the Environmental Impact Study that was funded to investigate the effects residential ion exchange water softeners may have on the performance of onsite septic tanks.

Presentation of results and discussions were conducted by the primary investigator, Dr. John Novak of

the Virginia Polytechnic Institute and State University; Dick Otis, past president of the National Onsite Wastewater Recycling Assn. (NOWRA); and Nancy Deal of the North Carolina Div. of Public Health. These experts in their respective fields provided a range of technical and political perspectives on the study results and issues at hand. This article is my perception of the information that was presented.

For background purposes, note that residential water softeners often are used in homes that use wells or other water sources with high hardness,

because of either aesthetic concerns or the potential detrimental effects of the hardness on water heaters and appliances. Onsite wastewater treatment is also frequently used in rural locations. Thus, they often coexist in many areas.

Because the waste from the water softener regeneration process can contain a fairly high salt concentration, its disposal into onsite wastewater treatment systems has been a topic of debate and was the focus of this study. To this point, research has not indicated that softener discharge is problematic for septic tank performance, but limited anecdotal reports have pointed fingers.

Figure 1. BOD<sub>5</sub> Results From Column Studies

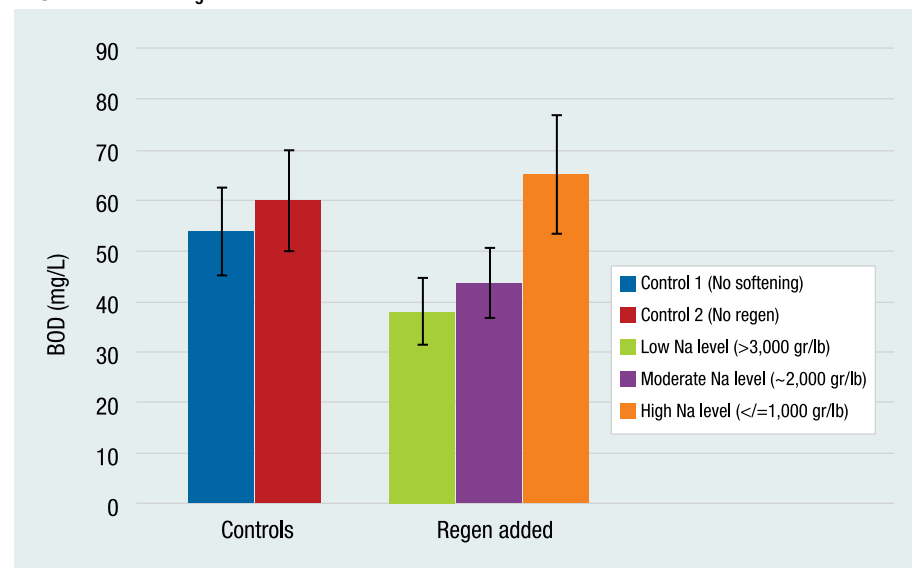
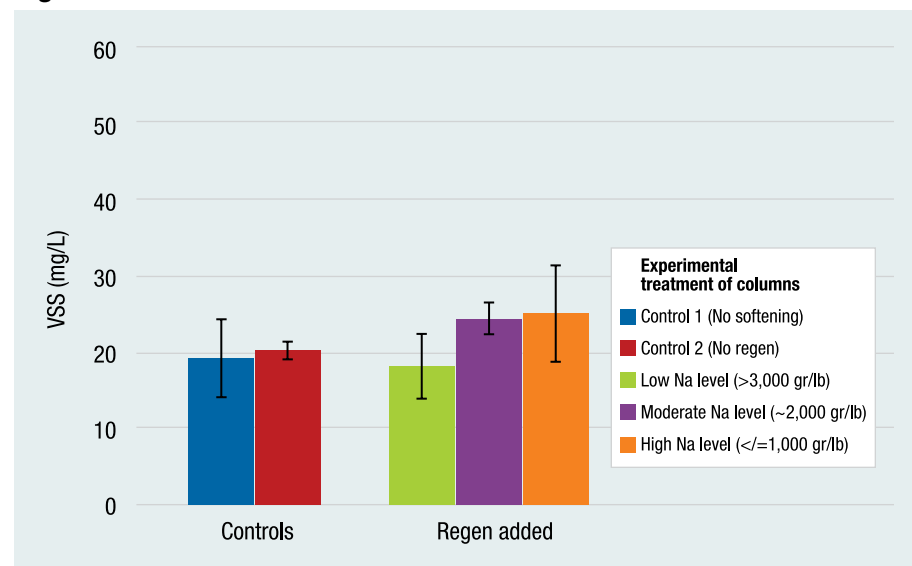


Figure 2. VSS Results From Column Studies



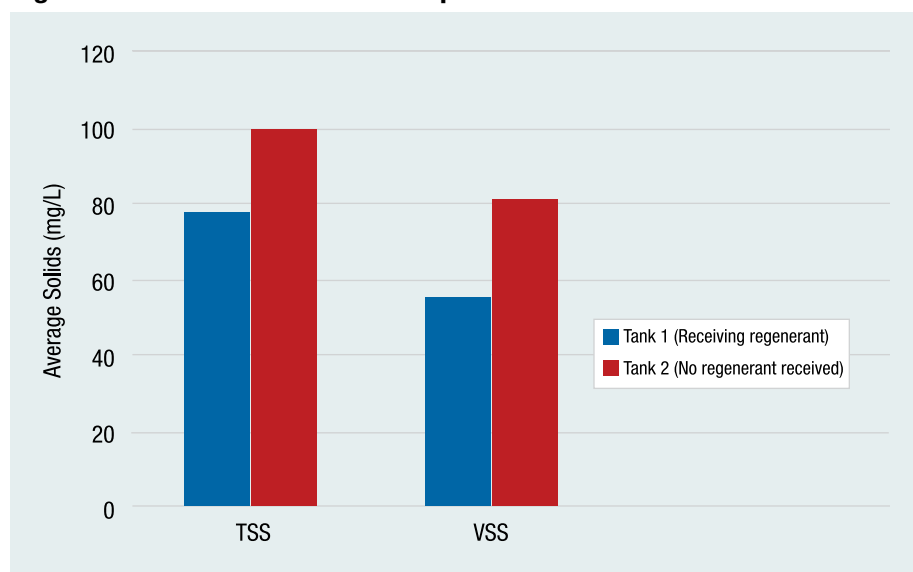
## Technical Perspective

From a technical perspective, Novak presented the study setup, results and discussion. It was reported that the addition of regeneration waste containing calcium and magnesium with lower levels of excess sodium has been found to help in the settling of solids and therefore produces a better-quality effluent from an onsite-operated septic tank. The amounts of sodium, calcium and magnesium are similar to the concentrations found in regenerant discharges from an efficiently operated water softener, such as a demand-initiated regeneration (DIR) unit.

Figures 1 and 2 are excerpted from the full report to show this key finding. The column labeled “low sodium level” had a lower five-day biochemical oxygen demand (BOD<sub>5</sub>) and lower level of volatile suspended solids (VSS) in the effluent compared with the other columns—that is, without any regenerant or higher levels added to the column.

The results from these columns showed that a softener operated at a salt efficiency better than 2,000 grains per lb leads to an efficiently operated septic tank. An efficiently set DIR unit fits the needs of rural households, providing softer water inside the house using lower levels of sodium chloride for recharging the unit and leading to an efficiently operated septic tank and

**Figure 3. Solids Results From Septic Tanks at New York Test Site**



discharge fields. Diversion of regeneration wastes from such units could be unfavorable to the effluent quality, as noted by the increased BOD<sub>5</sub> of the second column compared with columns three and four, which received low and moderate levels of sodium from softener regenerant.

Excerpted from the full report, Figure 3 illustrates the results from two septic tanks operating side by side at an apartment complex in New York state, one receiving the softener regenerant and the other not receiving it. The graph supports the conclusion that adding the regenerant to the septic tank yields lower total suspended solids and VSS in the effluent. Furthermore, it indicates that diversion of regeneration wastes away from the septic tank may result in poorer-quality effluent.

The addition of regeneration wastes that contain large concentrations of excess sodium can, however, be detrimental to solids settling and therefore produce a lower-quality effluent. Such higher concentrations can result from an inefficiently operating softener (less than 1,000 grains per pound) in relation to the excessive use of salt for the removal of hardness.

### NOWRA Perspective

Otis reported that water softeners have been implicated in impairing septic tank performance since the 1960s; however, the reports have been anecdotal and wildly scattered. Studies and research have been conducted over the years, but results were inconclusive.

Because of the lack of consensus over what should be done to eliminate this problem, some septic system manufacturers have been promoting

the diversion of water softener regenerant around the septic tank. This solution convinced some states and counties to require that softener discharge not be allowed in septic tanks. Promoting the diversion of regenerant from septic tanks only addresses the symptom instead of the cause, however, and it has unintended consequences when beneficial divalent cations are removed from the system,

**Table 1. Query on Regulations Prohibiting Softener Use With Residential Septic Systems**

	Regulations in Place		No Regulations in Place	
	Documented Evidence	Anecdotal Evidence	Documented Evidence	Anecdotal Evidence
Poor solids separation	1	2	2	2
Premature screen fouling	0	1	2	1
Drain field malfunction	0	2	1	1
Advanced treatment malfunction	w0	2	1	1
Concrete deterioration	1	1	0	0
Soil problems	1	0	0	0
<b>TOTAL</b>	<b>3</b>	<b>8</b>	<b>6</b>	<b>5</b>

but sodium alone continues to flow into the septic tank.

It was noted that the Water Quality Assn. (WQA) and NOWRA both are affected by the issue at hand. While WQA's interest lies in providing safe and effective water treatment, NOWRA's interest lies in providing safe and effective wastewater treatment. The two associations convened the Water Softener Effects on Onsite Systems Symposium in December 2005. From there, improved communication led to the creation of a task group to ensure continuing discussions. The groups met again in 2007 to develop mutual goals to move research forward.

The Water Environment Research Foundation/U.S. Environmental

Protection Agency Research Needs workshop, held in November 2009, established a direct collaboration between WQA and NOWRA to address problems and solutions. It led to the production of "Guidance for the Use of Water Softening and Onsite Wastewater Treatment Equipment" (M. Byers, J. Harrison, A. Blodig).

Most recently, NOWRA provided technical assistance throughout the research project. Technical representatives provided education about septic tank functions, developed sampling criteria, collected samples for field studies, participated in technical meetings, and reviewed data and reports.

NOWRA concurs with the report that preliminary results show that excess sodium appears to overwhelm the positive impact of divalent cations; that the ratio of cations in the regenerant appears to regulate performance; and that when regenerant is diverted, softening appears to cause some deterioration of tank performance. However, it was made clear in the presentation that performance comparisons of column studies to actual operating septic tanks are difficult.

This study was designed to learn solely about the effects cations might have on septic tank performance, but septage characteristics of operating septic tanks vary widely under actual use. Thus, future studies are needed to collect statistically relevant data from operating residential septic systems to determine how best to control acceptable performance and to confirm the favorable impact that cations from softeners may have in the real world.

### Regulatory Perspective

Deal provided a broad perspective of the current softener discharge regulation scene surrounding softener/septic overlap. A survey was conducted at the request of WQA to

learn about the status of regulations governing the use of water softeners in conjunction with onsite systems. An informal e-mail survey was conducted through the State Onsite Regulators Alliance listserv. The survey reached to 50 U.S. states, one Canadian province and two tribal groups. In total, 28 responses were received. Examples of results gathered are provided below.

In response to the question, "Does your state (province or tribe) have statewide regulation(s) related to use of water softeners in conjunction with septic systems serving residential sources?" nine entities responded "yes" (one with local regulations), while 19 responded no (two with local regulations).

Table 1 displays responses to the question, "If your state prohibits use of softeners with residential septic systems or requires that regeneration water discharge be diverted away from the septic tank, what is the basis of this law, rule or policy?"

In summary, the results and perspectives presented at the WQA Aquatech USA 2013 convention are particularly revealing, because they suggest that well-operated softeners at efficiency ratings greater than 3,000 grains of hardness removed per pound of salt used will not harm—and could even aid—septic systems. As it happens, properly set efficiency-rated DIR units (currently the most commonly installed type of device) fit the needs of most rural households, providing softened water inside the house using less sodium chloride and water for recharging the unit, and leading to an efficiently operated septic tank and discharge field.

Field studies would be necessary to confirm these results, and WQA will continue to communicate with NOWRA and regulators on this issue. In the meantime, WQA has created a tool kit and fill-in-the-blank spreadsheet to help members communicate with regulators and minimize potential issues. These resources can be found in the member's section of the WQA website, [www.wqa.org](http://www.wqa.org). *wqp*

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