LONG ISLAND ENVIRONMENT

Stony Brook researchers developing alternative to expensive septic systems

Algae is visible on the surface of the water of Agawam Lake in Southampton in 2017. Researchers at Stony Brook University have developed a prototype septic system that removes nitrogen, which fuels alage blooms, more efficiently than existing systems, according to testing they performed Credit: Gordon M. Grant

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There are 360,000 older septic systems in Suffolk County, and about 35,000 on the North Shore of Nassau, most of them slowly leeching nitrogen into the groundwater and Long Island's streams, rivers and bays. But many homeowners hesitate to install newer, high-tech systems that reduce pollution, fearing high costs and torn-up yards.

Recently a team of researchers led by Thomas Varley at Stony Brook University's Center for Clean Water Technology developed an alternative that they say addresses both those concerns. Though it's only a single prototype, their retrofit system is relatively simple and inexpensive to install, and with less property damage. And it removes nitrogen more efficiently than existing systems, according to testing they performed over four months.

How it works

Most low-nitrogen septic systems — called innovative/alternative or IA systems — work basically the same way, explained Varley, a watershed manager at the Center for Clean Water Technology. There's one chamber that is aerated to stimulate naturally occurring bacteria, which convert ammonium in the wastewater into nitrates. That's the nitrification phase.The second chamber has no oxygen, which means the nitrates are converted to nitrogen gas — an odorless and essentially inert gas that can safely be released into the atmosphere (which is already made up mostly of nitrogen). That's the denitrification part. They all require electricity to run an aerator, and those parts must be periodically maintained.

WHAT NEWSDAY FOUND

- **A team of researchers developed** a retrofit for older septic tanks that removes nitrogen, and won seed money in Stony Brook University's product pitch contest.
- **The system can be installed** at a lower cost and with less property destruction than the advanced septic systems now available, and is highly efficient at removing nitrogen.
- **The invention is expected** to be piloted within a year and ready for market soon after it's approved for use by Suffolk County.

County and state grants cover much of the cost of a new septic system, which runs around $35,000. But a replacement usually involves digging up lawns, plantings and walkways, and the cost of restoring that landscaping can be substantial.

The Varley team's invention works on the same principle, but instead of removing the old tank, they convert it into a nitrification tank. For the second stage, the waste moves to a separate tank of wood chips, where bacteria grows and consumes the nitrates.

It's a retrofit that can be installed through a manhole cover — no tearing up the garden. It does require a low-energy electric blower, and if an old septic system is failing, removal and installation are a larger project.

The team's prototype at Stony Brook's wastewater research facility outperformed existing IA systems. A standard septic tank releases about 80 milligrams of nitrogen per liter, sometimes more, Varley said. Suffolk County's standard for an IA system is 19 milligrams per liter. The team's releases less than 10.

"We think eventually, that's the standard that will be adopted down the road," Varley said. "We're really looking to target below 10."

The team's creation recently won seed money through Stony Brook University's Brook and Beyond contest, which awards up to $50,000 for innovative projects with commercial potential. The contest in particular rewards proposals with social impact, and winners work with mentors to develop it for market.

"Thomas Varley's innovation really stood out from Day One," said Dominique Lee, a tech expert who has helped launch several companies and is one of the mentors for the competition. "This is something really special and that's going to be groundbreaking."

Based on his experience installing the prototype, Varley expects homeowners would pay roughly half what they'd pay for one of the seven IA replacements on the market now. "I believe that we will be able to install these with the covered grants and have no out of pocket," he said.

He hopes that within a year, he'll be able to start a pilot project on a few properties. Lee said she will volunteer to have her own East End property included in the pilot. "I believe in this innovation so much," she said. "It's incredibly smart and pragmatic."

Suffolk County officials, which have to approve systems that would qualify for grants, did not return requests for comments.

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