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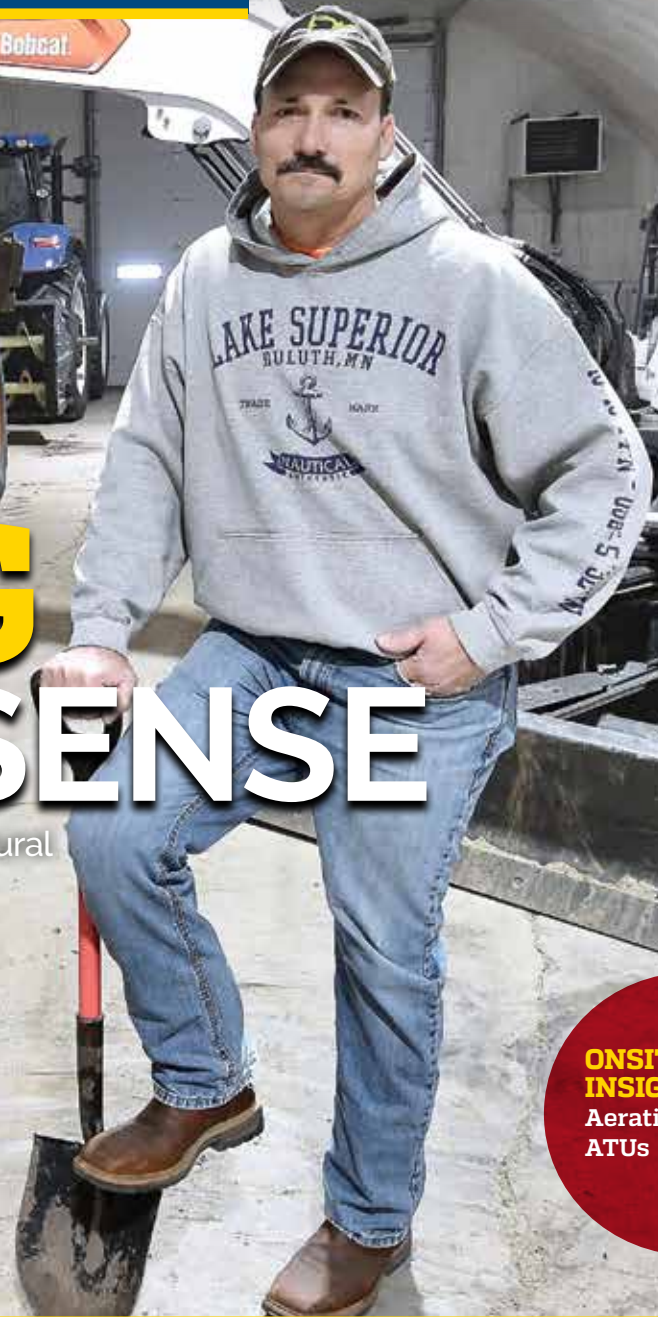
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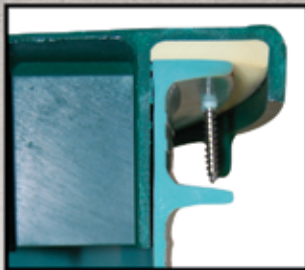
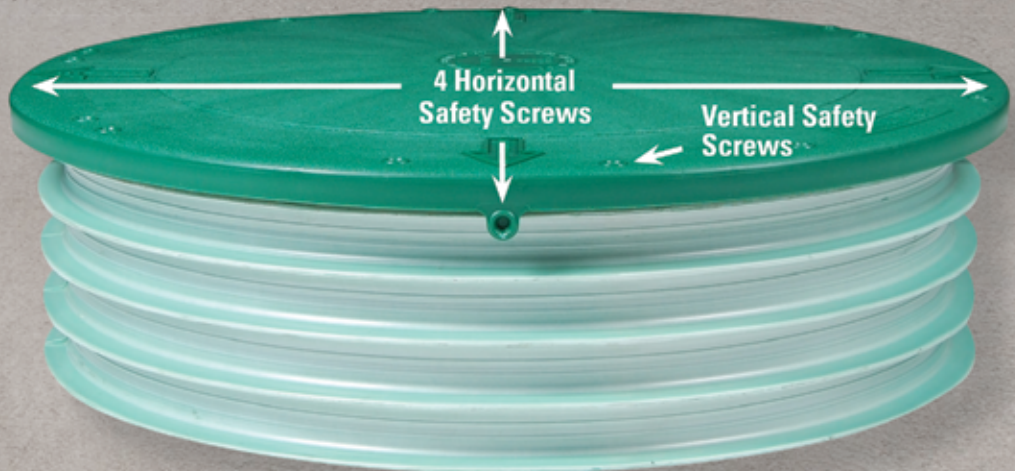


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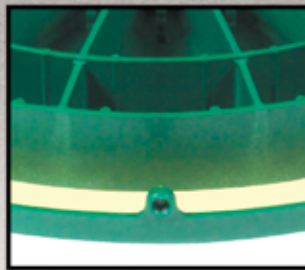
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INSTALLER PROFILE:
Seeking Common Sense

By Ted J. Rulseh

ON THE COVER:

Working on behalf of his customers in rural North Dakota, installer Terry Novak is always on the hunt for the most practical solutions for failed onsite systems. Novak is shown in his shop, including a Bobcat E50 mini-excavator and Bobcat 650 skid-steer. (Photo by Larry Biri)

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Jim Kneiszel



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One Constant Is Our Mission to Serve Onsite Installers

As I pass the torch to a new editor, I am reminded the job is all about networking and learning together for the benefit of all

When I put out my first issue as editor of *Onsite Installer* in April 2013, the decentralized wastewater industry was in a state of flux. Perhaps many of you recall the challenges of running construction-related small businesses at that time. We had just emerged from the Great Recession, a period of turmoil brought on by a real estate crisis. After a period where home and commercial construction had ground to a halt, new wastewater infrastructure was just starting to come back.

As installers brought crews back to work on new systems, there was a growing interest in new technologies to more effectively treat wastewater and reduce the environmental impact of septic systems. New products and methods continued to emerge to allow development outside the confines of municipal sewer lines and on lots previously thought to be substandard for wastewater treatment. It was a fascinating time of change and I was glad to become a part of it.

Today, I look back exactly 11 years later and feel fortunate to have spent this time telling the stories of the fine practitioners of the onsite industry. It has been my great honor to have met and worked with so many professionals who I would be confident entrusting to build and maintain my own septic system.

But it's time for me to move on.

It has been my great honor to have met and worked with so many professionals who I would be confident entrusting to build and maintain my own septic system.

This magazine launched 20 years ago under the editorial leadership of Ted J. Rulseh, who made — and continues to make — important contributions to the wastewater trade publishing world. In 2013, Ted, at age 60, stepped down from his editor's role at *Installer* to spend more time with his family, on his fishing boat and writing several books. He continues to be seen in this magazine as a contributor.

I'm facing the same situation as Ted, who was my first boss in the journalism field 43 years ago and whom I continue to work with today. I'm 65 years old this month and hoping to spend a little more time in other pursuits, including volunteering, traveling and camping. My wife, Judy, and I just bought a small travel trailer and want to visit and hike through as many Midwest state parks as we can get to. While I expand leisure time, I will remain involved in the wastewater industry as editor of *Pumper* and *Portable Restroom Operator* magazines.

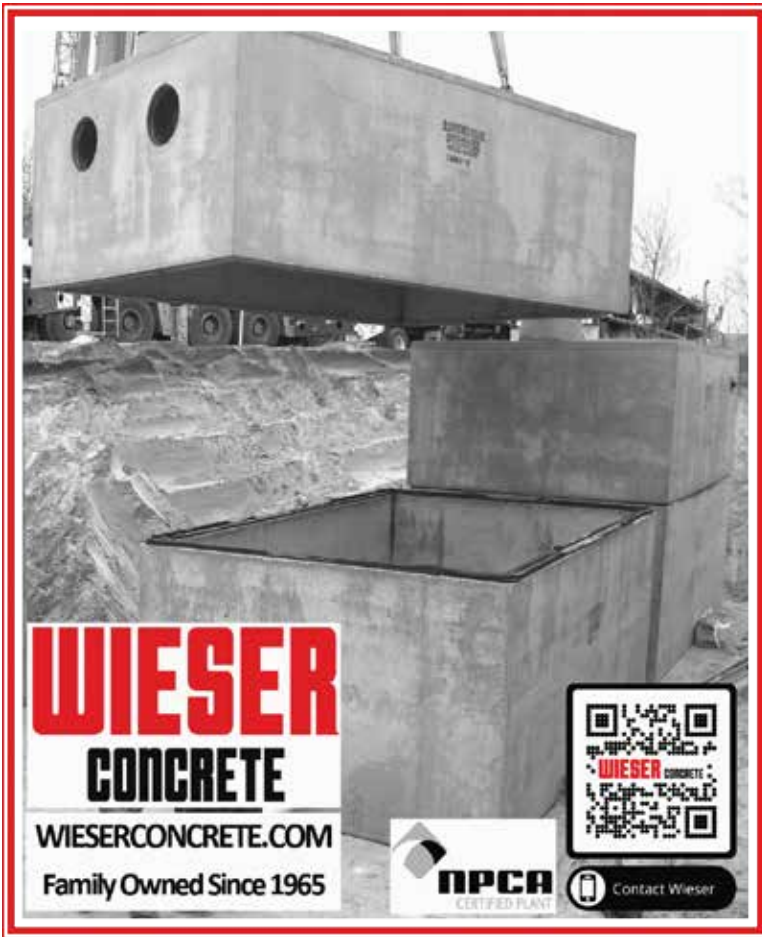
WELCOME TIM

Just as Ted served as a talented and capable journalist covering the wastewater industry, it's gratifying to know I'm turning over the reins to another professional who has already written for *Onsite Installer*. Starting with the May issue, your new contact will be Tim Dobbins, a fellow COLE Publishing editor. Tim is presently editor of the newest COLE magazine, *DCR*, or *Disaster Cleanup & Recovery Contractor*. Tim has been providing System Profile features and Product Spotlight stories for *Installer* for a few years and is developing a greater understanding of the challenges our contractors face.

Please extend to Tim the same warm welcome and spirit of cooperation you offered me when I started out. I carry many fond memories of the great community of installers who have shaped the direction of this magazine, providing educational value and sharing their small business acumen for the benefit of all in the industry.

Many of us met and formed personal relationships through what was previously called the Pumper & Cleaner Environmental Expo and now known as the WWETT Show. First in Nashville, then in Louisville and later Indianapolis, you were so kind and helpful to me during Education Day seminars, walking the show floor and during social times at meals and in the evenings. I appreciated the camaraderie and learning from the best in the business.

I also have enjoyed rewarding relationships with the wastewater educators at the University of Minnesota Water Resource Center and University Extension. The lineage of this program's contributions to COLE Publishing readers started with the original Septic System Answer Man, Roger Machmeier, through his column in our *Pumper* magazine. I'm sure many of you remember Roger, who was followed by the dynamic education duo of Jim



Anderson and David Gustafson, who wrote the Basic Training column in *Installer* for many years and were classroom fixtures at the WWETT Show.

Recently Jim and Dave stepped away and their duties have been turned over to Sara Heger, also of the U of M, who continues to provide insightful content through her Onsite Insights column. It has been an honor to work with these industry trailblazers.

MANY THANKS TO YOU

Over the years, many of you have been gracious to volunteer your time to help me meet the goals I had for this magazine: contractors helping contractors improve the onsite industry. Through our profile stories, installers have explained how they run a successful small business. You have freely given tips on how you lead a work crew, what tools you find most valuable in the field, and share how you overcome design and excavation challenges.

In parting, I ask you to continue on in this mission. Keep working with Tim to continually improve the content of the magazine. After all, it's not just *our* magazine at COLE Publishing, it's *your* magazine. Just like you've been able to contact me over the past 11 years, you will be able to reach out to Tim by writing to editor@onsiteinstaller.com.

I would like to end my tenure at *Installer* the way I started out. To quote the last line of my introductory editor's column so many years ago: *By sharing success stories, you're serving to build the professionalism of the entire industry. And that's what Installer is all about.* □

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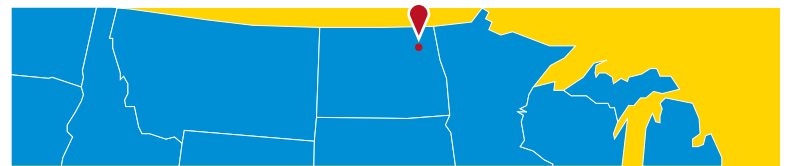
Septic system repairs are a hardship for low-income rural residents in North Dakota. Terry Novak advocates for responsible solutions.

By Ted J. Rulseh

One thing North Dakota installer Terry Novak hates about his job is delivering bad news to low-income rural property owners about their failing septic systems.

Often, repair or replacement is financially out of reach for the owners, especially those who are elderly and on fixed incomes. “These are nice people who will invite you in for chicken dinner while you’re working,” says Novak, owner of Novak Backhoe in Lankin, in the state’s northeast corner. “You feel terrible. We need to find some way to get funding for these people.”

He often uses the term “common sense” in advocating for ways to help people correct septic system problems. Such advocacy is part of the agenda for the North Dakota Onsite Wastewater Recycling Association, of which he is a founding member.



Novak Backhoe Lankin, North Dakota

- Owner:** Terry Novak
- Founded:** 1995
- Employees:** 1, with a part-time helper as needed
- Service area:** 6 rural counties
- Services:** Onsite system design, installation and pumping, general excavation
- Affiliations:** North Dakota Onsite Wastewater Recycling Association (founding member)



“We all want to save our water systems for our kids and grandkids,” says Novak. “We have aquifers out here and we don’t want to damage them. But we have to be realistic for these people. We’re trying to work with the state and do things the way we should, but there has to be some common sense. It can’t always be by the book.”

Novak works in six rural counties, installs about 10 new complete systems a year, and performs numerous repairs that range from minor fixes to replacing septic tanks or drainfields. He pumps tanks for some

◀ Terry and Yolanda Novak are shown reviewing some plans at the Novak Backhoe office. (Photos by Larry Bir)



◀ Working in rural North Dakota, Terry Novak has to take on a variety of excavation work, including this culvert installation for an area township. On this job, the crew is using two CASE machines, a 590 Super L backhoe and a 210B trackhoe. (Courtesy of Novak Backhoe)

▼ Equipment maintenance is very important to Novak, shown here greasing a CASE backhoe.

200 individual customers and for about 90 homes on a cluster system in the community of Forest River. He also keeps busy with general excavation.

FARMING BACKGROUND

Novak was born and raised near Lankin (population about 100) on a livestock farm. At age 18, he entered a partnership with his father, Ron, and a brother, Curt. In 1995 they bought a rubber-tire backhoe for digging rocks out of their fields.

Then they started doing excavation for townships, upgraded to front-wheel-drive backhoes and added a dump truck. That led to septic system jobs. “As times change and demand increased for all areas of excavation, we added a tracked backhoe,” Novak says. “Then the installation business grew, and we added a mini-excavator and a skid-steer.”

The business kept evolving, and 15 years ago, the brothers bought a grain elevator. That turned into a specialty feed business and later cleaning of certified seed for area farmers during winter.

A disabling illness suffered by his brother changed the family and business dynamics. Novak now operates the business with his wife Yolanda, who does the books and handles permits, licensing and other administrative work.

Older daughter Breanna is a supervisor in radiology at a Grand Forks hospital; younger daughter Brogan is a loan analyst in Grand Forks. Older son Blaine is an instructor in genetics and nutrition at North Dakota State University. Younger son Bryce farms the family land, is in a farming partnership with a brother-in-law and helps in the onsite business.

The pumping business started as Novak began installing more drainfields and first needed to clean the septic tanks. “In this remote area, there were only a handful of septic tank cleaners,” Novak says. “We bought a septic truck so we could pump tanks and not have to schedule around someone else.” The truck is a 2012 Peterbilt with a 3,400-gallon stainless steel tank fabricated by Presvac Systems and carries a Presvac 740 vacuum pump.



“We’re trying to work with the state and do things the way we should, but there has to be some common sense. It can’t always be by the book.”

Terry Novak

PREFERS PLASTIC

Go-to machinery includes a 2012 CASE 210B trackhoe, a 1998 rubber-tire CASE 590 Super L backhoe, a 2022 Bobcat E50 mini-excavator, and a 2018 Bobcat S650 skid-steer.

Septic tank replacements are a substantial part of the business. “In this area, a lot of the concrete septic tanks that were installed in the 1970s are starting to collapse,” Novak says. “This year I’ve run into two of them where the top just collapsed down in.”

He generally replaces failing tanks with 1,000-gallon plastic tanks (Infiltrator Water Technologies) fitted with risers and clean-outs. “They’re



▲ Novak works in his shop with his excavation equipment flanking his vacuum truck used for septic service, a 2012 Peterbilt from Presvac Systems.

HE'S A BACKHOE HERO

Terry Novak and his backhoe helped save a life one frigid December day in 2019. A worker became trapped in a grain bin containing 15,000 bushels of corn.

Workers were augering corn at the time and the man was walking on top of the grain, not knowing that a frozen crust had formed and there was a void below. The crust broke, the man fell straight down and the corn collapsed around him. Novak, a member of Lankin Fire Department and Quick Response, estimates the man was buried 25 feet deep.

"I had my backhoe in cold storage, and it was one of those 20-below mornings in North Dakota," Novak recalls. On receiving an emergency call from the grain bin's owner, he went to work starting the backhoe: "I tried it three times, and the fourth time it finally took off."

Meanwhile Novak's son Bryce, also a first responder, rushed to the scene. When Novak arrived the owner was trying without success to break the bin open with a tractor loader. Novak used his backhoe bucket to tear a hole in the metal bin, and first responders began digging with shovels.

"I was afraid to dig in there because you don't know what you're going to come back with in your bucket," Novak says.

After more than an hour, hope was fading among the rescuers. "By that time probably 50 or 60 first responders were there with shovels," Novak says. "Everybody was digging, and I was pulling grain out, when finally somebody spotted a hand. They shoveled him out and he survived. He was in there for two hours."

The bin owner had kept ventilators going to feed air into the bin. The man, able to hear all the yelling and machinery noise, managed to stay calm and breathed through his teeth. He was taken away on a stretcher and transported to a hospital by ambulance, but his only injury was a dislocated shoulder.

"When they hauled him off it was completely silent," Novak recalls. "I get goosebumps to this day thinking about it. Until you witness something like that, it's unbelievable the emotion."

easy to work with, and plastic tanks basically last forever. You can't drive over them, and they have limitations on depth of bury, but these days they're making them really nice and heavy. They are reinforced, and they are very sturdy tanks."

The preference for plastic extends to drainfield media in the form of chambers (also Infiltrator).

"We just do conventional drainfields with the occasional lift station where the septic tank is too deep," says Novak. "Chambers can handle the big flushes of water. You can drain your bathtub, run the dishwasher, do a load of laundry, take a shower. We've been installing them for 15 years and never had one come back that has frozen or has gone bad. They're neat and clean."

There's also less disturbance of properties than with the hauling of crushed rock for drainfield: "People want a new system, but they don't want the yard disturbed. We pride ourselves on being neat. When we finish a project, it's hand-raked and looks nice."

MONEY MATTERS

Novak's challenges have less to do with soil and site conditions than with property owners' finances. "The demographics in this area are older people," he says. "There are young families moving in, but they will probably build a new house and pay for a new system as part of a mortgage."

"Elderly people may plan on moving off of the farm in five years, and paying \$18,000 for a new septic system is hard for them to swallow, financially and mentally. Realistically, in a few years someone might buy the farmstead, tear the house down and farm the land. Then you have an expensive drainfield that goes unused. Or the owners are on a fixed income and simply don't have the money to put in a new system."

When pumping tanks, he has seen "some nightmares."

"There is sewage surfacing. They're using a buried steel fuel tank as a septic tank. It's rusted, it's shot and they're leaking water," Novak says. "On a couple of them I've seen, the tank is clearly leaching out, and they have their well close by."



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“Elderly people may plan on moving off of the farm in five years, and paying \$18,000 for a new septic system is hard for them to swallow.”

Terry Novak

◀◀ Novak pumps out a septic tank using his Peterbilt truck built out by Presvac Systems and carrying a Presvac 740 pump.

✔ The Novak Backhoe crew is on location installing a residential system using a pair of Bobcat machines, the E50 mini-excavator and S650 skid-steer. (Courtesy of Novak Backhoe)



In less blatant cases, shortcut fixes may be technically possible, but legally out of the question: “For grandma who’s 85 and lives by herself, I’d like to do a Band-Aid for a few hundred dollars to get her by. But under state regulations, I can’t. I have to put in a new system.”

Some limited low- and no-interest loan programs are available, but they still leave the owner with a substantial amount to finance. There have been discussions about using some revenue from the state’s Bakken oil fields to help fund septic system replacements. “I’ve talked to a few state senators and representatives,” Novak says. “They say they’re working on something, but it has been five years and nothing has come down.”

Meanwhile, costs for equipment and supplies are accelerating, especially since the COVID-19 pandemic and its related supply-chain issues. A fitting that cost \$8 before might now cost \$25. “A septic system in 1975 cost probably \$2,000 for a drainfield and a tank. In the old days they could just dig a hole and throw some rock in it. That ship has sailed.”

BANDING TOGETHER

One aim of the state association is to work with policymakers toward affordable solutions for troubled systems and for public money to offset the cost of system replacement for people in need. Two years ago at an installation seminar, a group of contractors got together and discussed mimicking in North Dakota much of what the National Onsite Wastewater Recycling Association does on the national level. They held a few initial meetings and tried to recruit at least one member from each corner of the state.

The organization started in 2021 and now has nearly 100 members: “We’re learning as we go. We’re looking at working with extension offices to help educate the public. We plan to create some kind of outdoor seminar where we set up a system above ground and piece it together so that people can see what a new system consists of.”

The association’s members also would like to see more uniformity in code requirements as opposed to different rules in different counties or districts. “We’re trying to get one code so anyone can work anywhere in the state,” Novak says. “We’d still be inspected. We want to protect our groundwater. We just all want to be on the same playing field.”

“There are people quitting the industry because of all the different regulations. I have friends in the business, and with all the hoops we have to jump through, they don’t need the headaches. We should all be able to work together. In the end we’re all after the same result.” Now that his children are on their own, Novak has joined the association board as acting secretary, “with the passion of injecting some common sense, being fair and still being aware of environmental concerns.”

Novak Backhoe works mostly with the Grand Forks Health District on permitting. The process starts with making an application at the county level. County personnel forward the application to the state, and permits are usually issued in about two weeks.

Novak meets with the property owner to discuss the location of the drainfield. A state inspector then visits the site to take soil core samples and size the drainfield according to the size of the household. A state official also does an inspection during the installation, or afterward, but before backfilling.

“We take a lot of pictures to document the way we installed it,” Novak says. “We send the pictures to the land owner. We always install inspection pipes at the beginning and end of each chamber run. When I go to pump



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a tank, I'll lift the caps on those to see how far the water is progressing in the chambers. That helps with designing in the future because we can see how systems we put in 10 years ago are acting now."

A GROWING SECTOR

Pumping quickly became an important line of business for Novak Backhoe: "Right now there are only two pumpers licensed in Walsh County where I live. One is about 30 miles away. We're friends and we give each other business."

Novak empties his truck in wastewater lagoons in small cities in the area. When winter conditions make those sites inaccessible, he land-applies on a piece of property he owns that is relatively high in elevation and doesn't accumulate heavy snow. He does this only after notifying state officials and getting permission.

"One of my favorite things to do is cleaning out tanks," Novak says. "It's on a regular rotation. And if people have trouble and you go there on a late evening, if you make their bathroom facilities work on the weekend instead of coming on Monday, you've made a friend for life." 

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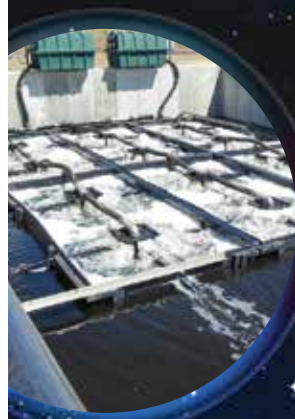
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SYSTEM PROFILE



Updated System Requires Long Run to Surface Discharge

Complex North Carolina child care center project relies on a neighbor easement to the reach dispersal point in a pond a half-mile away

By Peter Kenter

◀◀ A pair of dual-compartment tanks from Shoaf Precast with Orenco Biotube effluent filters and lids and risers before being backfilled. A worker in the background cuts pipe with a DEWALT reciprocating saw. (Photos courtesy of Full Circle Environmental)

In 2008, the nonprofit Turning Point Community Development Corporation opened on the property of a former car dealership in Henderson, North Carolina, to provide a much-needed community center offering preschool and educational programs for children.

However, an application to become a licensed child care center required a septic system inspection. The site's existing septic system was declared noncompliant by the Vance County Health Department because the original septic tank was installed across property lines.

Turning Point engaged Agri-Waste Technology to design a customized, compliant wastewater system. Following a site evaluation, AWT proposed a wastewater system that would collect, filter and disinfect the facility's wastewater prior to discharging the treated effluent to a surface water body.

However, the only reasonable destination for effluent discharge was a small existing pond located about a half-mile away on an adjoining property owned by a solar farm. Turning Point addressed this challenge by negotiating an easement with its neighbor to allow placement of the discharge line and use of the pond.

AWT's design utilized a septic tank and recirculating tank with dual aerobic filter treatment units that work in a parallel arrangement. After passing through the UV system effluent is discharged, in a demand dose arrangement, to the pond.

AWT provided Turning Point with a list of AWT-recommended installers. Turning Point selected Full Circle Environmental in Clayton, North Carolina, to install the system.

Site conditions

The wet soils of the site, a former car lot, were unsuitable for traditional drainage. The soil around the buildings was heavy, expansive clay, making excavation challenging.

System components

Serving about 30 children and associated staff members, the hydraulic flow for the site measures under 1,000 gpd so treatment capacity was set at 765 gpd by the county. Major components of the system are:

- 1,500-gallon dual-compartment precast concrete septic tank (Shoaf Precast) with Orenco Biotube effluent filter and two 24-inch risers (Orenco Ultra-Rib PVC) and fiberglass lids (Orenco).



◀◀ AdvanTex Pods are set and bedded.

▼ AdvanTex AX20 pods were bedded on pea gravel to achieve required elevation in relation to the recirculation tank as well as proper compaction beneath the tank.



- 1,775-gallon dual-compartment precast concrete recirculation tank (Shoaf Precast) with two 24-inch risers (Orenco Ultra-Rib PVC) and fiberglass lids (Orenco).
- Two Orenco AdvanTex AX20 Pods.
- Orenco UV-125/31-P UV disinfection unit.
- Orenco PF500511 4-inch submersible effluent pump.
- Model 151 Dose-Mate 1/3 HP pump (Zoeller Pump Co.).
- Orenco VeriComm AXB1 Simplex Control Panel.

All Orenco products were supplied by AQWA, located in Wilson, North Carolina.

System operation

The system is gravity fed where possible, with slopes achieving a minimum of 1% through a pipe system consisting entirely of Schedule 40 PVC. Wastewater runs approximately 30 feet from the main building through 4-inch drainline to the septic tank for primary treatment. Effluent flows by gravity from the septic tank where it passes through an effluent filter and enters an adjacent recirculating tank.

From the recirculating tank, effluent is pumped approximately 8 feet through a 2-inch supply line to the first of two AdvanTex AX20 aerobic filter treatment pods installed in parallel, with each pod capable of processing 500 gpd. Effluent from the first treatment pod returns to the recirculating tank. Effluent from the second pod flows through an Orenco RSV3Q splitter valve and either returns to the recirculation tank or continues to the UV system.

Sufficiently treated effluent leaves the recirculating tank and enters a single-bulb Orenco UV Disinfection Unit, housed in a vault built from a

System Profile

Location: Henderson, North Carolina

Facility served: Turning Point Community Development Corporation community center

Designer: Agri-Waste Technology

Installer: Full Circle Environmental, Clayton, North Carolina

Type of system: Dual Orenco AdvanTex AX20 Pods with UV treatment and surface water discharge

Site conditions: Heavy clay

Hydraulic capacity: 765 gpd

24-inch Orenco Ultra-Rib PVC Access Riser. UV-treated effluent is pumped into a 1.25-inch effluent discharge line, which runs 2,000 feet to the outlet pond. The end of the line transitions to 10 feet of 4-inch drainline and a 4-inch TUF-TITE Speed Leveler, before effluent makes a final journey through a screen to an excavated swale in the pond bank.

Installation

Full Circle Environmental specializes in complex installations and has worked frequently with AWT. President Zach Woody also frequently calls on AWT to design systems his company installs.

“The key to this installation was careful planning,” Woody says. “We made four or five site visits prior to beginning construction to ensure all site limitations were considered and a well-developed construction plan was implemented alongside AWT.”

SYSTEM PROFILE



◀◀ Septic and recirculating tank risers and AdvanTex AX20 pods appear above grade as installation nears completion.

▼ A Full Circle employee places locator tape in the trench containing the system's lengthy final discharge line.



“The key to this installation was careful planning. We made four or five site visits prior to beginning construction to ensure all site limitations were considered and a well-developed construction plan was implemented.”

Zach Woody

While the three-acre site offered generous working space, Full Circle had to work within the schedules set for the center, taking extra care to avoid times and areas where children were playing. The contractor brought a crew of six workers to the site.

Woody employed an E85 compact excavator, an E50 compact mini excavator, and a T590 compact track loader, all from Bobcat, to move dirt. A Vermeer RTX 450 ride-on tractor was used to excavate the drainline trench to the pond.

“The heavy clay on the site was unsuitable for backfilling and we performed a lot of dewatering,” says Woody. “During construction we also encountered buried asphalt and concrete and trash pits.”

Soil from the site was replaced with both No. 67 (3/4-inch) and No.78 (3/8-inch) pea gravel topped with imported, screened topsoil.

The excavation for the septic tank and recirculating tanks was dug to about 13 feet. Tanks were placed on a bed of gravel and buried with a minimum of 12 inches of soil cover. Tank risers extended a minimum of 6 inches above ground.

The AdvanTex AX20 Pods were bedded on gravel about 6 feet from the septic and recirculating tanks, and then buried to allow for 3- to 6-inch exposure. All discharge and supply lines were buried to approximately 36 inches with allowance for gravity drainage.

The site's three-phase power supply was adjusted to single phase at the system control panel to accommodate the range of electrical equipment required by the new septic system.

Full Circle excavated the trench for the lengthy drainline to about three feet. The swale at the effluent pond is constructed from a 2-by-6-foot installation of Class B riprap on No. 57 (1-inch) gravel for final aeration.

The entire project required about two weeks to complete. AWT is taking on the maintenance contract for the system.

Innovative approach

“Sometimes people don't know that there is the potential for a system like this,” says Kevin Davidson, vice president of engineering at AWT. “While it's expensive, it can bring a lot of value to small commercial or residential property owners faced with a failing wastewater system.”

Chalis Henderson, executive director of Turning Point, agrees.

“AWT and Full Circle provided us with a very innovative system, and we're able to accomplish our goals and meet the needs of the community because of it,” she says. “People don't understand all that goes into operating a facility and a community program, but even down to the septic system, those things matter.” □

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Shades of Sherwood Campground in Zumbota, MN

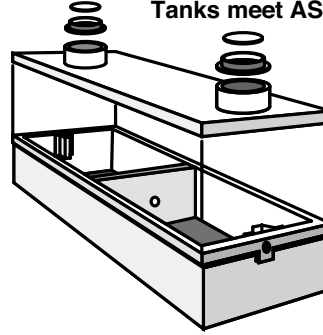
2- 38,000 gallon septic tanks, 20,000 gallon pump tank,
 5 each 20,000 gallon recirculation tanks
 and 3 each 7,700 gallon pump tanks were installed

2 Compartment

Commercial Sizes - Gallons

2,000 - 3,000 - 5,000 - 6,000 - 8,000
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Large-Scale and Commercial Treatment Systems

By Craig Mandli

ATU

Anua Synergy BioCoir QuadMod

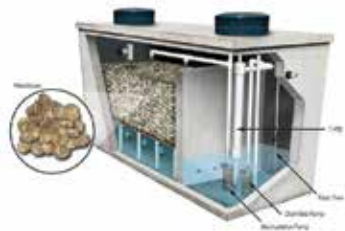
The Synergy BioCoir QuadMod from Anua is focused on the small commercial market. Systems are a recirculating media biofilter that utilize coconut coir housed in a preassembled pod. Pretreated effluent is time-dosed over the coir media using helical spray nozzles for uniform distribution. After passing through the media, effluent travels to the bottom of the pod and the flow is split, with 80% returning back into the treatment stream and 20% to the final dispersal point. They are designed for both burial and portability by featuring an I-beam steel frame that allows the unit to be picked up and moved. Measuring just over 19 feet long, 7.38 feet wide and 3.42 feet tall, QuadMod systems are designed to fit in standard shipping containers for worldwide transport. 336-547-9338; www.anuainternational.com



COMMERCIAL TREATMENT SYSTEMS

Eliminite Commercial C-Series

The Commercial C-Series system from Eliminite is designed to provide reliable treatment with emphasis on total nitrogen reduction for high-strength waste applications such as worker camps, RV parks, restaurants, ski and golf resorts, breweries, mines and agricultural operations. It may be used with locally sourced tanks and components. MetaRocks treatment media is designed to withstand a variety of high-strength waste-loading scenarios, particularly where clogging and odor control are major considerations. The system is scalable and may be adapted to suit specific phasing requirements, site constraints and unique demands. 888-406-2289; www.eliminite.com



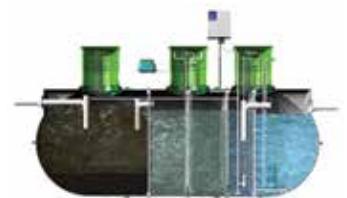
Jet Inc. Commercial Systems

Commercial wastewater treatment extended air plants and newer MBBR plants from Jet Inc. are modular, can treat varying strengths and flows from 1,500 to 300,000 gpd and allow for phase build-out. This makes it possible for convenience stores, motels, shopping centers, service stations, factories and subdivisions to be constructed far from municipal treatment options. These systems may also be used for pretreatment before discharging into central systems to reduce overall system load. The time-tested plants utilize a variety of controls and treat wastewater through an aerobic digestion process that enables microscopic living organisms to transform wastewater into a clear, odorless liquid. 800-321-6960; www.jetincorp.com



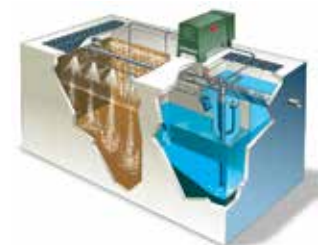
MicroSepTec EnviroServer ES

The MicroSepTec EnviroServer ES (Extended Storage) is designed for residential and commercial applications. It utilizes pre-engineered, prefabricated MBBR technology. In residential settings, it combines various processes to remove contaminants to ensure safe disposal or reuse of water. The system is designed to be compact, easy to install and low-maintenance, making it suitable for homes and small communities. It also offers efficient wastewater treatment solutions for businesses, commercial buildings and larger establishments, with its extended storage capacity allowing processing of higher volumes of wastewater. 877-473-7842; www.microseptec.com



Norweco Modulair

The Modulair package wastewater treatment system from Norweco is a reliable, maintenance-free method of wastewater treatment available for commercial, industrial or small municipal applications. With system capacities ranging from 1,500 to 500,000 gpd, plants are pre-engineered to accommodate current and future treatment needs. They employ the extended aeration treatment process to



quickly and efficiently oxidize organic compounds in the most cost-effective manner. Systems can be easily enlarged or modified and have the flexibility for any treatment requirement, including pretreatment, AFE, ASH, tertiary, disinfection, denitrification and phosphorus removal. Nonclog Evenair diffusers reduce plant maintenance and the Air-lift surface skimmer simplifies maintenance. Heavy-duty reinforced precast concrete tanks provide durability and long life to each plant. Systems are installed and serviced by local, licensed, factory-trained distributors. They are sold complete, including delivery, tank setting, equipment installation, startup and service. 800-667-9326; www.norweco.com

Orenco AdvanTex AX-Max

AdvanTex AX-Max wastewater treatment systems from Orenco are containerized, fully plumbed units sized for larger commercial and municipal applications. Units come in a variety of configurations, measuring up to 42 feet long by 8.5 feet wide. Systems can be installed in single or multi-unit arrays, either above ground or buried to grade. They use an attached-growth treatment method to produce clear effluent with significant nutrient reduction, suitable for reuse or surface discharge after disinfection (per local regulations). One unit can process up to 5,000 gpd of raw sewage or 15,000 gpd of primary-treated effluent. Units reduce nitrogen to 90% or more, depending on configuration, and provide reliable performance with a part-time operator. Units are easy to ship and set, and have been installed in a variety of soils and climates. 800-348-9843; www.orenco.com



CONTROL PANELS

SJE Rhombus EZ Series In-Site CL

The EZ Series In-Site CL data logging control panel from SJE Rhombus offers wireless Bluetooth connection for smart devices. There is no need to open the panel for configuration, viewing status or downloading data using the EZ Connect Mobile App. The Bluetooth smart module eliminates the need for a PC to enable safe and secure access in all weather conditions. The panel utilizes the C-Level sensor for continuous level monitoring and records up to 4,000 system events, including pump run times, pump cycles, alarm conditions, HOA settings, power outages and service calls. The In-Site software formulates system data for you, creating reports quickly and easily so system conditions can be identified and corrected. Single-phase simplex or duplex models are available. The panel can be easily converted to demand or timed dose in the field. 888-342-5753; www.sjerrhombus.com



SPI 50B019-120-240 DD

The 50B019-120-240 DD control panel from SPI is a duplex timed-dosing panel for residential or commercial applications. It can be used with 120- or 240-volt power, and accommodates two dosing pumps controlled by a repeat-cycle timer. It has a durable, weather-resistant, NEMA 4X polycarbonate enclosure with SST latches; large, easy-to-access terminal block; circuit breakers for the pumps and control circuits; a rugged externally mounted, UV-resistant alarm light; audible alarm and run-mute-test switch with UV-resistant sealing boot; definite purpose motor contactors; alternating relay; and pump hand-off-auto switches. Compressor hookups are available. Wiring schematic and detailed connection diagrams are provided, as well as mounting feet for the enclosure. It is UL-listed. 419-282-5933; www.septicproducts.com

Zoeller Pump Pivot

Pivot control panels from Zoeller Pump employ microchip technology and logic to allow for a long list of standard features. The panel is capable of detecting, reacting and notifying of problems with float switches. It can also detect bad components like contactors, overloads and seal fail circuits. This means a warning is provided before the failure results in property damage. It has a simple interface and can be modified for most applications. 800-928-7867; www.zoellerpumps.com



FILTER MEDIA

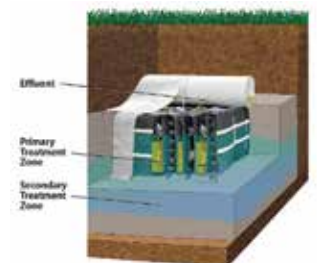
E-Z Treat Re-Circulating Synthetic Media Filter

E-Z Treat manufactures NSF 350 water treatment reuse applications throughout the United States. The biological-based treatment system Re-Circulating Synthetic Media Filter produces high-quality effluent to accommodate a wide variety of flows for residential and commercial sites, whether subsurface or surface discharge. 703-753-4770; www.eztreat.net



Eljen Geotextile Sand Filter

The Eljen GSF, or Geotextile Sand Filter system, is designed to provide treatment and dispersal in the same footprint with easy installation and minimal maintenance. It is used for commercial and residential applications. Utilizing a two-stage pretreatment process, the geotextile modules apply filtered septic



PRODUCT FOCUS

tank effluent to the soil, increasing the soil's ability to accept effluent and increase the long-term acceptance rate. Its design provides increased surface area for biological treatment that greatly exceeds the module's absorption area. Open-air channels within the module support aerobic bacterial growth on the module's geotextile fabric interface, surpassing the surface area required for traditional absorption systems. The system is tested and certified by NSF to NSF/ANSI Standard 40. **800-444-1359; www.eljen.com**

Infiltrator Water Technologies ECOFILTER Pump Vault

The ECOFILTER Pump Vault tank filtration system from Infiltrator Water Technologies reduces biological loading and clogging, prolonging the life of downstream drainfields and other treatment systems. Quick to install in new or existing tanks, the vault is a completely integrated system for pumping effluent from single or double compartment tanks. It draws effluent from the clarified zone of the tank to minimize suspended solids passing through the pump system. The easy-access design maximizes the filter surface area and simplifies filter inspection and maintenance by enabling filter cartridge removal without pulling the pump or vault. Featuring a dual compartment housing for simplex or duplex applications, the product is constructed of high-density polyethylene with UV inhibitors for longevity and the float stem bracket allows easy removal and adjustment of the float assembly. Customizable for nearly any project need, the unit is suitable for S.T.E.P. collection systems and effluent treatment. **800-221-4436; www.infiltratorwater.com**



PUMPS



Crane Pumps & Systems envie3

The envie3 air-filled motor series dry pit submersible pump from Crane Pumps & Systems can run in wet applications and in dry pits. These pumps outfit Barnes' and Deming's nonclog and chopper wet ends with a

premium efficient/IE3 motor that can run in both vertical and horizontal configurations. The closed-loop glycol cooling system allows for easy maintenance and installation in demanding applications. For easy serviceability, the horizontal installation options include a cart system, which creates a back pullout option as well as a fixed bracket configuration. Install horizontally for a smaller footprint. Vertical installation configurations include a metal and concrete stand that allow for 360-degree rotation for conveniently adapting to existing piping, including tangential discharge pumps. **937-214-9008; www.cranepumps.com**

Franklin Electric Little Giant Pit+Plus

The Little Giant Pit+Plus package from Franklin Electric is designed to provide an all-in-one solution for light-duty wastewater management. Each package includes a rotomolded polyethylene basin — the pit — combined with the user's choice of Little Giant pump. The addition of the 1 hp grinder pump option joins the already available 4/10 and 1/2 hp sewage pump choices. The basin is available in two sizes: the 24x24 JR or 20x30 SR. The Little Giant 16G Series 1 hp grinder pump has a cutting mechanism modeled after the unique design used in larger Franklin Electric models. The heavy-duty 1 hp class F motor provides power to prevent flushables and other debris from clogging and causing downtime. **844-250-4982; www.littlegiant.com**



Liberty Pumps ProVore

The ProVore grinder from Liberty Pumps is designed for use in applications where addition of a bathroom or other fixtures below sewer lines requires pumping. It has the same V-Slice cutter technology used in the Omnivore Series. Powered by a 1 hp motor, this smaller grinder is designed to operate on a standard 115- or 230-volt circuit, requiring only a 20-amp breaker. No special wiring is needed. The pump comes with a 2-inch vertical-style discharge and a standard leg pattern matching the LE Series. This allows for easy retrofit into existing systems. Compact factory-assembled systems are available in simplex and duplex versions: the ProVore 380 and ProVore 680. **800-543-2550; www.libertypumps.com**



Polylok PL-CPE4A

The Polylok PL-CPE4A is a submersible, 4/10 hp, 115-volt, single-phase effluent pump with a 2-inch NPT vertical discharge. It has a maximum head of 38 feet and a maximum flow of 56 gpm. The pump is designed with a 3,450 rpm oil-filled permanent split-capacitor motor and has an amp rating of 6.6 for 115 volts, a cast iron housing and volute with a cast iron vortex impeller capable of passing 3/4-inch-diameter solids. The stainless steel shaft is supported by two single-row, oil-lubricated ball bearings. The shaft seal is an inboard design with a secondary Exclusion V seal. It has a 20-foot UL/CSA-listed power cable suitable for submersible service and fitted with a three-prong plug. The unit is supplied with an integrated clip for the included piggyback mechanical float switch and used for automatic operation. **888-765-9565; www.polylok.com**



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The MultiTank from Roth North America can be used for water cistern, pump, holding, rainwater or septic tank applications. This is possible due to its inner layer of FDA-approved virgin HDPE, two inside layers of polyethylene for improved stability, plus one outer layer of black and UV-stabilized polyethylene. Features include CSA, NSF and IAPMO certification, a COEX-4 multilayer co-extrusion process, a low-profile design for less digging and avoiding high water tables, lightweight construction, a multiport inlet/outlet convenient for field piping, the ability to enter and exit the tank on the ends or sides, two 24-inch manways to provide easy access for maintenance and service, a cylindrical shape requiring no water for backfill, a threaded riser system and watertight, seamless construction. 866-943-7256; www.rothmultitank.com



UV DISINFECTION

Premier Tech Water and Environment Ecoflo Biofilter

The Ecoflo Biofilter with integrated UV disinfection from Premier Tech Water and Environment comes with all components pre-assembled and the float preset. On site, the UV unit is set in place and wires are connected. Certified under BNQ standard NQ-3680-910, the pressurized UV system complements the Biofilter's treatment performance. It is tested for cold climates and regulated for maximum exposure time for year-round disinfection of less than 2 CFU/100 mL. Premier Tech's team changes the UV bulb during annual maintenance visits. 800-632-6356; www.premiertechaqua.com



WASTEWATER REUSE SYSTEM

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For car washes, the main challenge has always been water conservation. By recapturing and treating water on-site, commercial car washes use about 65% less water and also drain their detergents into city sewer lines, not storm drains — which can lead to waterway contamination. FLXX Concrete Tanks from Front Range Precast provide all-in-one treatment and storage systems, ensuring water is used multiple times before being drained correctly into city sewers. The company's latest system, installed for Beacon Construction in Mead, Colorado, utilizes three 2,000-gallon FLXX tanks to treat and store water on-site. 800-783-3207; www.flxx.com



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California Approves Regulations For Converting Wastewater Into Drinking Water

By Betty Dageforde

The California State Water Resources Control Board approved regulations that would allow water agencies to develop treatment procedures to convert wastewater into drinking water — direct potable reuse — as reported by many news outlets.

“These regulations ensure that the water produced is not only safe, but purer than many drinking water sources we now rely on,” said Water Resources Control Board Chairman Joaquin Esquivel. The regulations comply with California’s Safe Drinking Water Act.

The proposal has been in review for over 10 years, undergoing expert panel analysis, scientific review, public input and the development of safety standards, and was approaching the state-mandated completion by the end of 2023.

The state’s goal is to recycle and reuse 800,000 acre-feet of water per year by 2030, with \$8 billion earmarked to modernize the state’s water infrastructure.

This decision also helps address the state’s water shortages arising from continuing drought conditions.

Florida

As reported by *Florida’s Voice*, Rep. Peggy Gossett-Seidman, R-Highland Beach, and Rep. Lindsay Cross, R-St. Petersburg, introduced a bill that would create an emergency database to report contamination in state waters.

Residents would be alerted of contamination found at beaches, the Intracoastal Waterway, coastal estuaries, canals and public swimming areas regarding toxins that include fecal indicator bacteria-laden wastewater and chemicals. Sources of contamination could be anything from leaking septic tanks to malfunctioning treatment plants.

Under this bill, water safety alerts would be transferred from state agencies to the Department of Environmental Protection. A website with digital messaging would notify users to reports of water contamination.

“The complex reporting system between cities, counties and states is ineffective and outdated,” Gossett-Seidman said in a press release. “We need one central reporting method. Too often the public discovers the waters are contaminated days after they went to the beach.”

Idaho

While homeowners in Blaine County are subject to legal requirements for installing new septic systems, the Onsite Wastewater Management Program established in 2007 regarding inspection and management of existing systems was discontinued only two years later for lack of funding during the recession.

But hopes for reinstating the program continue to be brought up at city

planning meetings and public hearings. It has surfaced again with two recent applications for 24-home subdivisions, reports the *Idaho Mountain Express*.

Bob Erickson, a former environmental health specialist, who worked with the county on the original 2007 plan, expressed his concerns regarding the lack of oversight, based on his 26 years’ experience with the South Central Public Health District. Erickson emphasized that most residents don’t know much about their systems and he didn’t believe a homeowners’ association was an appropriate governing body for managing wastewater issues.

The concerns center on the growing population and the problems with relying on homeowners to oversee something they’re generally unfamiliar with, potentially causing contamination to water sources from failing decentralized wastewater systems.

Louisiana

A proposed ordinance requiring septic system inspections every three years at a cost of \$100 has been essentially defeated, reports Nola.com. The St. Tammany Parish Council voted to delay a vote on the ordinance “indefinitely.”

“To postpone indefinitely is a joke,” council member Rykert Toledano said. “This, to me, is the most important and needed legislation that we can look to pass in our parish. This problem should have been addressed 30 years ago.”

Sewage pollution from septic systems on the north shore is a serious problem, according to experts who had previously addressed the council. In some subdivisions, small PVC pipes trickling sewage can be seen dotting drainage ditches.

Critics were concerned about costs. While Parish officials said there would be some money available for people who needed their septic systems replaced, residents believed the costs to fix problems would be too high for the parish and its residents to bear.

Massachusetts

As reported in *The Enterprise* news outlet, the Mashpee, Massachusetts Board of Health was set to vote on a regulation requiring innovative/alternative septic systems for certain projects within 1,000 feet of wetland areas. Current regulations are 300 feet. The board will also vote on proposed fines for unlicensed or unpermitted septic system installations.

In addition, Health Agent Zackary J. Seabury said the Massachusetts Department of Environmental Protection’s new Title 5 septic system regulations, originally scheduled to start in January, have been postponed until July. The regulations will require I/A systems in new construction.

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New York

As reported by several news outlets, Gov. Kathy Hochul announced \$479 million in grants for critical water infrastructure projects, including the first funding awarded through the \$4.2 billion Clean Water, Clean Air and Green Jobs Environmental Bond Act of 2022. Hochul's team said the funding is projected to save ratepayers an estimated \$1.3 billion and create 24,000 jobs.

An additional \$30 million is being made available to targeted counties through the state's septic system replacement program for homeowners and small business owners.

Virginia

Many Culpeper County residents are eligible for reimbursement of 50% to 80% of the expense of pumping, maintaining, repairing or replacing septic systems, depending on the needs of their system, reports the *Culpeper Times*. The Culpeper Soil and Water Conservation District grant program continues to expand its funding to help reduce bacteria pollution in local streams. Repairing or replacing dysfunctional septic systems helps reduce *E. coli* levels.

Pumpouts are recommended every three to five years and inspections are encouraged for older systems. If repairs are indicated during an inspection, owners are eligible for additional payments.

British Columbia, Canada

The town of Midland recently voted to stop accepting septage from nonresidents, reported *Midland Today*. In a 60-page report on the Wastewater Treatment Centre septage receiving station presented to city council from Tatham Engineering Limited, it was noted that between 2017 and 2022 only 12% of the septage loads originated in Midland.

"The recommendation will mean that Midland users are no longer subsidizing other residents from other municipalities," said Deputy CAO Andy Campbell, executive director of infrastructure and environment. "If the wastewater plant only receives septage and hauled waste from within Midland, the volume is such that it can be handled without having to fully upgrade the equipment."

Water and wastewater manager André Pepin added that funds from reduced operating costs will be allocated to wastewater infrastructure and maintenance projects at the wastewater treatment plant.

The announcement came as a surprise to many who rely on the facility, and leaves them scrambling for alternative disposal sites, especially as land application cannot be performed during winter and early spring.

Nation

In 2005 a partnership was created between the U.S. Environmental Protection Agency and eight private and public sector organizations, including the National Onsite Wastewater Recycling Association. Today the partnership has 25 members.

Those members gathered at EPA headquarters last December for a signing ceremony renewing the agreement titled U.S. EPA MOU Partnership for Decentralized Wastewater Management. Renewal is required every three years.

The partnership recognizes the importance of decentralized systems in the treatment of wastewater, promotes efforts to improve and manage these systems, and works to increase collaboration among members and the onsite wastewater industry. □

"Rules and Regs" is a monthly feature in *Onsite Installer*™. We welcome information about state or local regulations of potential broad interest to onsite contractors. Send ideas to editor@onsiteinstaller.com.

Large-Scale and Commercial Treatment Systems

By Craig Mandli

Sequencing batch reactor enables camp to make plant upgrade



Problem: Camp Akita, a 1,200-acre camp in Ohio operated by the First Community Church, faced a critical challenge in 2013. The existing 8,000 gpd precast extended aeration plant, built in 1979, required replacement. The camp operated year-round, providing entertainment, food, and lodging for up to 200 people. Complicating matters, the discharge stream was considered an exceptional water body, demanding compliance with Ohio EPA's Best Available Demonstrated Control Technology for any new wastewater treatment plant.

Solution: EarthTek emerged as the chosen partner. Their Sabre SBR bid offered a 16,000 gpd package sequencing batch reactor treatment plant. This solution included a 20,000-gallon buried fiberglass treatment tank, two 8,000-gallon buried FRP SBR tanks for secondary treatment, mechanical filtration, ultraviolet disinfection, effluent flow monitoring, post-aeration and composite sampling for activated sludge treatment. The solution addressed the stringent BADCT requirements, provided flexibility with separate SBR tanks for seasonal variations, employed durable buried fiberglass tanks, and proved cost-effective compared to alternatives. Since its operation in the summer of 2014, the upgraded wastewater treatment plant consistently produced effluent meeting regulatory discharge permit limits: 10 mg/L BOD₅, 12 mg/L TSS, 1 mg/L ammonia as nitrogen, and 125 count/100 mL *E. coli*.

Result: This successful implementation ensured Camp Akita's continued commitment to environmental compliance and sustainable operations. 800-972-9940; www.earthtek.com

Systems helps make constrained residential lot usable



Problem: A homebuilder was challenged with providing onsite treatment and disposal for a proposed three-bedroom dwelling on St. George Island in Florida where a protected wetland takes up much of the lot and requires a 75-foot setback. The 1-acre lot only had a total available tank and drainfield area of 392 square feet, while only 25 feet separated the property from a neighbor's irrigation well. A tight triangular area at the corner of the lot was deemed the only logical spot for a treatment system.

Solution: The onsite installer chose a FujiClean Model CEN5 with a design capacity of 500 gpd. The system is designed to provide high-quality treatment and dripline dispersal for nitrogen removal and drainfield reduction. It offers one-tank treatment, with a 540-gallon pump tank and dripline irrigation field providing 225 square feet minimum dispersal area. At-grade access ports do not detract from the unique dwelling, while a quiet blower (<40 dB) is in sync with the serene surroundings. The lightweight tank (705 pounds) is easy to maneuver into location. One 3/4-inch air line hookup minimizes excavation requirements.

Result: The system fit into the small footprint, allowing construction of the home. 207-406-2927; www.fujicleanusa.com

Camp treatment system employs durable, efficient air pumps



Problem: Camp Chen-A-Wanda in Thompson, Pennsylvania welcomes thousands of children and support staff each summer. Managing wastewater, especially full-service commercial kitchen waste, is a challenge for any seasonal camp. In 2022, a commercial aerobic pretreatment system, consisting of 18 Anua PuraACE reactor pods, was installed replacing the camp's outdated septic system to meet current demand. The systems demanded air pumps equipped to handle the large waste stream of 15,000 to 25,000 gpd.

Solution: The systems utilize 18 HIBLOW HP-200 alarm units. Their linear diaphragm technology mitigates noise levels (important in a camp setting) while providing flows of approximately 950 gpm. The pumps are energy efficient, running on 250 watts. The manifold system allows for continual flow if one of the pumps stops working.


Result: To date, other than replacing the filters, all HIBLOW air pumps are in perfect working condition. The PuraACE reactor pods have been a major upgrade for the camp, reducing BOD levels from 1,200 to 160 pounds per day. 734-944-5032; www.hiblow-usa.com

Compact disinfection system used for latrine project



Problem: Dr. Roger Giesen's charitable Global Freedom Project contacted SludgeHammer about a latrine project for a Haitian community devastated by a hurricane. The company planned a wastewater system Giesen could transport to his clients as baggage on a commercial flight.

Solution: SludgeHammer designed the latrine so the treatment tank was built into the foundation of the building that the community assembled themselves. Giesen showed up at SludgeHammer with a duffel bag, packed the SludgeHammer and components and flew to the site.

Result: SludgeHammer received a video of the system. The water was clear, reportedly without odor, and the effluent flowed to a nearby plantain farm, providing fertigation for crops. 231-348-5866; www.sludgehammer.net 

Exploring Aeration Methods in an Aerobic Treatment Unit

Mechanical or diffused aeration designs and bubble size are important factors in effectively disbursing oxygen on onsite systems

By Sara Heger

To maintain aerobic conditions, large quantities of oxygen must be provided. If the influent to the ATU has an ultimate BOD of 100 mg/L, then 100 mg of dissolved oxygen per liter of influent must be provided to satisfy the oxygen demand. The primary function of the aeration system is to transfer oxygen to the liquid at such a rate that dissolved oxygen never becomes a limiting factor.

Oxygen is only slightly soluble in wastewater. Natural aeration cannot meet the demand of this high-rate unit process in a saturated environment. Therefore, oxygen transfer must be engineered into aerobic treatment units to maintain a minimum residual of 1 mg of dissolved oxygen per liter of wastewater.

The movement of oxygen from the gas phase (bubble) to the liquid phase (in solution) is absorption. There is a concentration gradient between the atmosphere and the wastewater. This gradient is created when there is a difference in the equilibrium concentration in the two phases.

The desire to obtain equilibrium drives the transfer of atmospheric oxygen into the wastewater.



▲ A Cromaflow sequencing batch reactor from Cromaglass Corp. using submersible pumps to provide air and mixing with a venturi system receiving air through intake pipes from the atmosphere. (Photos courtesy of Sara Heger)

Bubbles formed deep within the chamber will have more pressure to drive the oxygen transfer and more contact time with the air-water interface.

OXYGEN TRANSFER

The saturated concentration of dissolved oxygen changes with temperature, barometric pressure, salinity and the concentration of wastewater impurities. Designers of ATUs strive to maximize the contact interface (surface area) between the gas and liquid phases to maximize the opportunity for oxygen transfer.

Aeration units are evaluated on the mass of oxygen transferred per unit of air introduced to the wastewater. Standard oxygen transfer efficiency refers to how efficiently the dispersed oxygen combines with wastewater for the aeration process to occur. The oxygen transfer efficiency of aerators is the result of two factors:

Surface area: A mass of many small bubbles has a much larger cumulative surface area than a few larger ones. This increased surface area allows for a higher rate of oxygen transfer as the air and wastewater come into contact across the surfaces of the bubbles.

Speed: Smaller bubbles rise at a slower rate than larger ones. This slow rate of speed results in a greater amount of contact time between air and wastewater and permits more oxygen to be distributed throughout the wastewater column. The increased time for oxygen transfer results in greater transfer efficiency.

The goal is to maximize the mass of O₂ transferred per unit of energy consumed by the device. Combining mixing with aeration is the most common method of maximizing energy efficiency. Turbulent mixing is required to maximize the opportunity for microbes to encounter both soluble organic compounds and dissolved oxygen. If steady-state conditions can be maintained, the oxygen transfer rate is equal to the rate of consumption by the microorganisms.



▲ A BioMicrobics ATU with a blower pushes air into the airlift, producing recirculation of oxygenated water throughout the submerged media.

◀◀ A Nibbler ATU with a blower providing the airflow for coarse-bubble aeration.

AERATION METHODS

For most ATUs, the actual SOTE is proprietary information. Manufacturers market-specific ATU models based on organic and hydraulic loading. The aeration device is rated for a given unit to provide sufficient dissolved oxygen for the given range of input oxygen demands (organic loading). Aeration is provided by one of the following methods:

Mechanical aeration - introduction of air via mechanical means.

This is a mechanical method of injecting air into orifices in pipes and plates. Streams of air transfer oxygen and provide vigorous mixing of

tank contents. Surface mixers or subsurface mixers with draft tubes where air is drawn down a hollow shaft and sparged into the fluid are also used. As the shaft spins, a venturi-type effect creates a vacuum down the shaft and injects air into the wastewater.

The mixing devices must balance the need for agitation, while minimizing the shearing of the floc. The bubbler or stirrer keeps the wastewater agitated so solids cannot settle out, floating materials stay mixed, and poor settling conditions in the clarifier can result. With mechanical aeration, you generally get vigorous mixing and oxygen transfer.

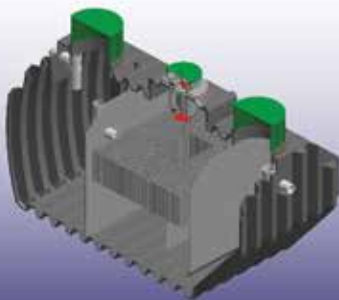


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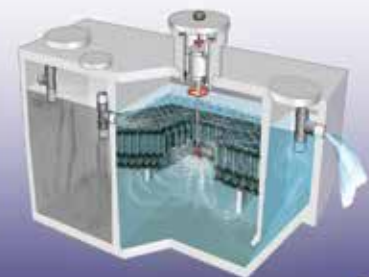
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ONSITE INSIGHTS

The systems are relatively simple and low-cost. The downside is that the mixing and oxygen transfer may not be consistent throughout the tank; they have a low SOTE, resulting in more strain on the blowers and higher operating costs due to higher maintenance needs.

Diffused aeration - introducing air bubbles under pressure into a treatment unit using a compressor, blower, and diffuser.

Submerged devices, typically disks or tubes, inject air into the effluent. The smaller the bubble, the greater the oxygen transfer rate into the effluent. Additionally, bubbles formed deep within the chamber will have more pressure to drive the oxygen transfer and more contact time with the air-water interface. There are various classes of diffusers based on the diameter of the bubble:

- Coarse: 2 – 8 mm
- Fine: 0.2 – 3 mm
- Micro: < 0.2 mm

Coarse bubbles have the advantages of being less likely to foul, creating vigorous mixing, being durable, and having relatively low maintenance requirements. The larger holes of coarse bubble diffusers mean they are less likely to be fouled with bacteria or biosolids. This results in less back pressure on the blower, which creates wear and tear.

The larger bubbles have more volume, displace more wastewater and produce more power for mixing. Biosolids are kept in suspension and are

▶▶ A Delta Ecopod ATU with an external aerator connected to a main supply air manifold that distributes the air to a coarse bubble aeration grid supplying the aeration needed and scouring the media.



less likely to form unwanted sludge. There are downsides to coarse bubble diffusion, which relate to the large bubble diffusers having a SOTE of less than 1%. Even though they have increased vertical mixing power, coarse bubble diffusers disperse less oxygen into the wastewater for less efficient aeration, typically achieving 50% or less the efficiency of fine bubbles. The amount of compressed air is greater and requires more power to achieve similar results.

MIXING IS VITAL

The smaller bubbles produced by a fine-bubble diffuser can accomplish the same amount of oxygen transfer with about half as much air as a coarse bubble diffuser would require. Fine-bubble diffusers also use less energy, but there are some downsides to fine-bubble diffusers. They are more likely to become clogged with bacteria and organic waste.

If sludge builds up on the diffuser, it impairs the function and reduces the aeration efficiency. It also creates back pressure, which increases wear and tear on the blowers. There is often more maintenance with fine-bubble diffusers due to increased fouling. While efficient for aeration and oxygen transfer, the smaller bubbles produced by fine-bubble diffusers are poorer at mixing. Their smaller volume than coarse-bubble diffusers mean they cannot displace the same amount of liquid.

Mixing is vital for keeping biosolids in suspension so they cannot settle in the water and form sludge, which makes the treatment process less efficient and is costly and time-consuming to remove. Mixing is also necessary for bringing microorganisms into contact with solid organic matter to break it down. Fine-bubble diffusers provide less power to facilitate this process.

Fine bubbles are the smallest option available with diffusers and are mostly used with membrane bioreactors in the septic system industry. These diffusers have the highest SOTE and require less energy. The downside is that they have the highest risk of fouling, are more expensive, can create back pressure when fouled, and may create mixing challenges as the bubbles rise too slowly.

THE BOTTOM LINE

There are many options when it comes to how to get air into an ATU, with various advantages and disadvantages. Efficiency, upfront and long-term costs, maintenance and electrical costs must be considered. □

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PRODUCT NEWS

PRODUCT SPOTLIGHT

MBR treatment system aimed at customers in drought-ravaged areas

By Tim Dobbins

Drought-prone areas need to handle water a little differently than areas where it's abundant. Technology for water reuse is vital for the sustainability of the resource.

BioMicrobics developed the BioBarrier, a wastewater treatment system that uses a membrane bioreactor specifically for water reuse with the intent of offering customers in areas of frequent drought a solution.

"That was the intended audience anyway," says Joseph Rebori, manager of inquiries and engineering for the company. "But we saw that commercial property owners who were unable to tap into municipal sewer systems needed decentralized, onsite wastewater treatment and were willing to look at membrane bioreactor technology due to its high-performance capabilities."


Rebori also says that aside from its intended use and traction with commercial properties, the BioBarrier MBR is most commonly used by installers dealing with significant limitations like small drainfields, close proximity to a water body, poor soils, or areas that require a high level of treatment before discharge.

"Rebuilds or renovations on existing properties is a prime example," Rebori says. "The lot size is established, but let's say the house/business is too small in its current footprint and the owners need or want to build a larger structure. We

see a lot of this especially on lakes, where a lake house may have been a two-season structure, but then the owners want a four-season, larger structure."

There are two versions of the BioBarrier available, varying in size for different applications. The standard models can treat ranges of 500 to 3,000 gpd, while High Strength BioBarriers are capable of ranges from 1,500 to 9,000 gpd. If higher Total Nitrogen reduction than the standard offerings provide is needed, BioMicrobics offers versions to accommodate.

Installation involves placing the membrane modules inside the septic tank, plumbing the module effluent tubing to the outlet tank, and air piping from the blower to the module. "The membrane module is installed through the riser in a tank that is already set," Rebori says. "The membrane component is the size of a carry-on suitcase. It fits through a manhole so it's pretty easy to handle." Once that's done, installers just need to hook up electrical components.

Rebori says the BioBarrier has been well-received with the installer community. "We see that MBR technology may be unfamiliar technology to installers at first, but when they see it in action, they immediately want to know more about it," he says. **800-753-3278; biomicrobics.com** 



"Being part of the community is huge.

One winter Rick brought a skid-steer and plowed out a little hockey space for the kids on the soccer field at the school. Doing those simple community tasks goes a long way."

Tammy Bovay

RT Septic & Water Systems

Sturgeon County, Alberta

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Infiltrator expands ECOPOD-NX line

Infiltrator Water Technologies has expanded the ECOPOD residential advanced wastewater treatment product line with the ECOPOD-NX. The ECOPOD-NX is a moving bed bioreactor that incorporates an airlift assembly for recirculating the wastewater; the combination of the MBBR disc media and recirculation process enables the system to achieve 80% total nitrogen reduction. The ECOPOD-NX has been certified to NSF/ANSI 40 and NSF/ANSI 245 Standards. The ECOPOD-NX is available to treat residential wastewater flows of 500 gpd; larger sizes are in development. **800-221-4436; www.infiltratorwater.com** 



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Island Life in the Pacific Northwest Creates Wastewater Challenges

Jason Kramer must transport waste off Lopez Island and take a ferry to network with others in the Washington On-Site Sewage Association

Compiled by Betty Dageforde

In Snapshot, we talk to a member of a state, provincial or national trade association in the decentralized wastewater industry. This time we visit a member of the Washington On-Site Sewage Association.



Jason Kramer
owner

Business: A1 Septic on Lopez, Lopez Island, Washington, one of the San Juan Islands north of Seattle

Age: 49

Services we offer: I started with pumping and then added inspections. That led to doing upgrades and repairs. I also do commercial pumping. And I'm working on my designer certification as my retirement plan.

Years in the industry: Eight years. I used to be a county road crew guy and I worked a couple of evenings a week for a company driving and emptying pumper trucks. We live on (Lopez Island) and have to take the trucks off-island for emptying. I worked there for a couple of years then decided to get into pumping. I found a truck in California which turned out to be great. You pay by the foot on the ferry and this truck was as big as I could get and stay under 30 feet long, and I can still get down all the driveways with it. It's a 2001 International 9100 with a 3,600-gallon steel tank and National Vacuum Equipment Challenger pump.

Association involvement:

I've been in the Washington On-Site Sewage Association for six years.

Benefits of belonging to the association:

Most of what I take advantage of is training and networking, getting to know the people in the industry. It really has been invaluable to me. And they do a lot of great stuff with legislation and trying to emphasize the importance of clean water and our role in it.

Biggest issue facing your association right now:

Trying to recruit the next generation is challenging. There aren't a lot of new people coming into it. But I think the classes WOSSA is bringing onboard are going to attract people because of the way they're doing it. They're keeping it interesting. If younger people can get introduced to the industry, I think WOSSA will be able to keep them interested. And they're also doing a lot of scholarships, which is exposing the next generation to the industry.

Our crew includes:

My old road crew boss, Tim Arnold, retired and now drives my tanker truck, a 1989 Freightliner customized by Erickson Tank & Pump with a 6,000-gallon stainless steel tank and Masport Cobra pump. We store septage in the tanker until it's full, then Tim takes it off island for emptying a couple of times a week.

Typical day on the job:

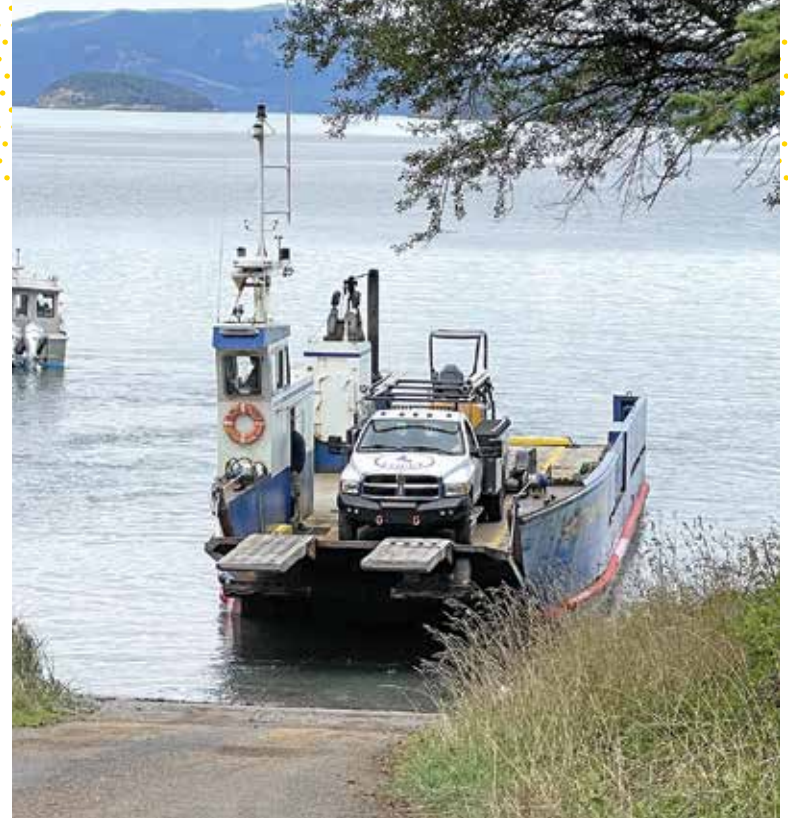
My alarm goes off at 4 a.m. and I'm in my office by 5 to do paperwork. Then at 7:30 a.m. I work for the village sewer district, about 20 hours a week, which pays for my health benefits. It's a sewer lagoon treatment plant with 200 houses on the system. I had never worked at a sewer district before, but they needed somebody and this district has septic tanks at all the houses so I was able to be a benefit to them. And the training I get there complements my business. By 11:30 a.m. I'm working my business and will typically work until dark, usually 60 to 100 hours a week. One of my favorite parts of the business is marketing so I take pictures and post those on Facebook.

The job I'll never forget:

When I pumped out my first RV, I bought an adapter to go under my truck and hook to the RV. It was a difficult connection because of the angle so it wasn't sealed just right. I didn't have anybody to teach me so I had to learn everything the hard way. I cracked the valve open a little bit on my vacuum

➤ Heading out to service the outer islands with a 2005 Ram 3500 built out by Erickson with a 400-gallon aluminum tank and Masport pump. (Photos courtesy of Jason Kramer)

✚ A 1989 Freightliner from Erickson Tank & Pump with a 6,000-gallon stainless steel tank and Masport Cobra pump used to transport collected waste to an off-island disposal site.



hose, then opened up the RV black tank. It hammered and sprayed straight into my eyes. It was horrible. But I rinsed my eyes out and went back and figured it out.

My favorite piece of equipment:

My service truck has all my tools and everything I could possibly need for any emergency. I also recently picked up a new 400-gallon aluminum tank. I had Erickson build it. It's really nice because I can do RVs and portable restrooms, and on proprietary systems I can pump out the trash tank as part of the service, if it needs it, instead of going home to get the pumper truck. The truck is a 2005 Ram 3500. I bought it a couple years ago and put a lot of new stuff on it, from steering linkage to cab lights, pipe rack, wheels, tires. I still need to figure out a freshwater system. It has a Masport pump. I'm bolting that to the truck because there's a shelf at the front of the service bed because of pass-through storage, so I couldn't have it bolted to the vacuum tank. The tank is removable with forks and I have cam locks on the hose to hook the tank to the power unit.

Most challenging site I've worked on:

There was a job where I had to back down a narrow driveway and then the tank was 100 feet away and as steep as you could get without needing a rope to pull yourself up with. Between running the hoses down the hill, climbing back up, then pulling the hoses up, it took me about an hour and a half to pump that tank. I don't think it had ever been pumped.

The craziest question I've been asked by a customer:

"The drainfield is not draining, can't you just dig it out and rebuild it?"

If I could change one industry regulation, it would be:

As service providers we need to be able to work on electrical stuff — replace floats and pumps — instead of trying to find an electrician because it's always an emergency when it happens. That's been the most challenging thing for me. I'd like to be able to get a special electrical license so we could do the work. It's not difficult work.

Best piece of small business advice I've heard:

Never stop learning. I listen to podcasts and I'm always looking at WOSSA or NOWRA (National Onsite Wastewater Recycling Association) classes. One reason I like working at the sewer district is there is a lot of learning — and they're paying for it.

If I wasn't working in the wastewater industry, I would:

Probably be working on a road crew, playing with those Tonka Trucks.

Crystal ball time - This is my outlook for the wastewater industry:

I'm hoping we can get more people in the industry who care about what they're doing. Some people are in it because it's an easy way to make money, not because they care. I'd love to see that change. It seems that's the way everything's been going, especially since COVID. But that's where marketing comes in. The more marketing there is for jobs and job fairs the better, especially if we get the bigger companies to be part of it, getting that knowledge out there. □

Would you like to see someone in your state or provincial wastewater trade association profiled in Snapshot?

Send your suggestions to editor@onsiteinstaller.com.

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Recycling Association
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OHIO

Ohio Onsite Wastewater Association;
www.ohioonsite.org; 740-828-3000

OKLAHOMA

Oklahoma Onsite Wastewater Association,
918-727-7113

OREGON

Oregon Onsite Wastewater Association;
www.o2wa.org; 541-389-6692

PENNSYLVANIA

Pennsylvania Association of
Sewage Enforcement Officers;
www.pa-seo.org; 717-761-8648

Pennsylvania Land Improvement
Contractors of America;
www.pennsylvanialica.com;
724-866-1082

Pennsylvania Onsite Wastewater
Recycling Association;
www.powra.org

Pennsylvania Septage
Management Association;
www.pasma.net; 717-763-7762

TENNESSEE

Tennessee Onsite Wastewater Association;
www.tnonsite.org

TEXAS

Texas On-Site Wastewater Association;
www.txowa.org; 409-718-0645

Education 4 Onsite
Wastewater Management;
www.e4owm.com; 713-774-6694

UTAH

Utah Onsite Wastewater Association (UOWA);
www.utahonsite.org;
385-501-9580

VIRGINIA

Virginia Onsite Wastewater
Recycling Association;
www.vowra.org; 540-377-9830

WASHINGTON

Washington On-Site Sewage Association;
www.wossa.org; 253-770-6594

WISCONSIN

Wisconsin Onsite Water
Recycling Association;
www.wowra.com; 888-782-6815

Wisconsin Liquid Waste
Carriers Association;
www.wlwca.com; 888-782-6815

NATIONAL

Water Environment Federation;
www.wef.org; 800-666-0206

National Onsite Wastewater
Recycling Association;
www.nowra.org; 978-496-1800

National Association of
Wastewater Technicians;
www.nawt.org; 800-236-6298

CANADA

ALBERTA

Alberta Onsite Wastewater
Management Association;
www.aowma.com; 877-489-7471

BRITISH COLUMBIA

British Columbia Onsite
Wastewater Association;
www.bcossa.org; 778-432-2120

WCOWMA Onsite Wastewater
Management of B.C.;
www.wcowma-bc.com; 877-489-7471

MANITOBA

Manitoba Onsite Wastewater
Management Association;
www.mowma.org; 877-489-7471

Onsite Wastewater Systems
Installers of Manitoba, Inc.;
www.owsim.com; 204-771-0455

NEW BRUNSWICK

New Brunswick Association of
Onsite Wastewater Professionals;
www.nbaowp.ca; 506-455-5477

NOVA SCOTIA

Waste Water Nova Scotia;
www.wwns.ca; 902-246-2131

ONTARIO

Ontario Onsite Wastewater Association;
www.oowa.org; 855-905-6692

Ontario Association of
Sewage Industry Services;
www.oasisonario.on.ca; 877-202-0082

SASKATCHEWAN

Saskatchewan Onsite Wastewater
Management Association;
www.sowma.ca; 877-489-7471

CANADIAN REGIONAL

Western Canada Onsite Wastewater
Management Association;
www.wcowma.com; 877-489-7471

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