September
2009

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Badge of Professionalism

NEHA national onsite credential helps installers command respect

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Going National

Perhaps the time has come for the onsite industry to break out from the straitjacket of prescriptive local and state rules and practices

By Ted J. Rulseh

It seems everything in onsite is going national — except the industry as a whole. There's a national process (NSF Standard 40) for certifying aerobic treatment units and other small package treatment plants.

There's a national credential for installation professionals (National Environmental Health Association Certified Installer of Onsite Wastewater Treatment Systems). There's a national onsite association (NOWRA). There's a national group of regulatory officials (State Onsite Regulators Alliance).

There's a national Memorandum of Understanding between the U.S. EPA and a collection of onsite industry and water-quality partners. There's a national Consortium of Institutes for Decentralized Wastewater Treatment, which sponsors nationally applicable training curricula.

There even have been moves toward establishing national regulatory schemes (the NOWRA Model Performance Code and the U.S. EPA's Voluntary Guidelines). And yet the industry remains subject to a patchwork of state and county regulations and practices. Would anyone care to argue that this is doing anything besides holding the industry back?

So much the same

Common sense says there is no need for 50 distinctly different sets of state onsite regulations and who knows how many sets of rules at the county level. Why does that seem so obvious? Well, because no matter where you happen to be, water runs downhill, water soaks into a given soil the same way, and the process that goes on inside a treatment unit doesn't change.

Soil structure is soil structure, texture is texture, mottling is mottling, no matter where. And the knowledge needed to design a system and install it correctly doesn't magically change at the state or county line.

Sure, in different states you find different soils, different terrain, different land features. But BOD is BOD, TSS is TSS, coliforms are coliforms, and basic treatment principles always apply.

So we come down to the age-old question: Why can't everyone just get along? Well, in part because people are people. We hold certain loyalties to our ways of doing things, attachments to our political entities, and pride in things we've created. Regulators are no different. The mere fact that pride of authorship and territoriality aren't rational doesn't mean they aren't real.

So, no, we'll never see a time when regulators agree to set aside their states' or counties' traditions and preferences and adopt a single, national regulatory code for a national onsite industry. Not in my lifetime, anyway.

Where to start

On the other hand, there is a great place to start in that direction, and it's the NEHA national credential. As Brian Scheffe of Front Range Precast Concrete observes in this month's cover story, the credential carries weight. The exams come backed by peer review from experts from all over the country. There's a training curriculum behind it, built by recognized authorities in the onsite profession.

It is in every respect a national credential, in the same manner as Certified Health Technician, Registered Environmental Health Specialist/Registered Sanitarian, or Registered Hazardous Substances Professional.

Anyone who earns the basic or advanced onsite credential has learned the essentials of installing and has passed a rigorous exam. Anyone who keeps it has earned 12 credits of continuing education every two years.

There are moves afoot in some states not only to have state regulatory agencies recognize this credential but to make it mandatory. That may be a steep uphill slog, at least in some states, but practically speaking, where is the downside? I don't see it.

And the next step ...

The next step toward a truly national onsite industry would be universal recognition of NSF certification for treatment units. It's easy to understand states being picky about who gets to install advanced treatment technologies, and where, but it's hard to justify states rejecting technologies themselves, or having to approve them, one by one, state by state.

All this seems to do is limit homeowners' treatment choices and restrict the ability of qualified onsite designers and installers to match the right technology to a specific set of site conditions. Where is the benefit in that?

Universal recognition of the national installer credential and of nationally tested and certified treatment technologies would go a long way to elevate an industry and advance the professional practice of onsite treatment. ■

The industry remains subject to a patchwork of state and county regulations and practices. Would anyone care to argue that this is doing anything besides holding the industry back?

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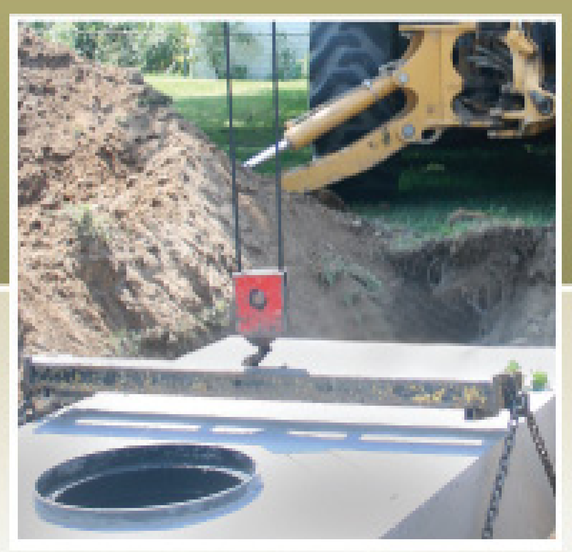

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Brian Scheffe, technical representative with Front Range Precast Concrete in Boulder, Colo., earned the Certified Installer of Onsite Wastewater Treatment Systems advanced credential from the National Environmental Health Association. As acting president of Colorado Professionals in Onsite Wastewater, he hopes NEHA credentialing becomes state law. (Photo by Lawlor Photography)

Badge of Professionalism

Installers find NEHA's national onsite credential helps them command respect from customers and stand apart from competitors

By Ted J. Rulseh

Terri Jakoubek knows the installation business she owns with husband Lloyd has an edge on competitors. That's not just because they have the knowledge that goes with nine years of running a company. It's also because they have something few other local installers can claim: a national credential.

Jakoubeks, owners of Raymond Contracting in Raymond, Neb., are among nearly 300 professionals who as of May 1 held the Certified Installer of Onsite Wastewater Treatment Systems credential, offered by the National Environmental Health Association (NEHA). The credential is starting to take off as it gains exposure at onsite industry events and as state and local regulators begin to embrace it as a voluntary or mandatory standard of professional excellence.

NEHA began work on the credential in 2004 and made it official in June 2006. As of May, 290 onsite practitioners were credentialed: 171 at the basic level and 119 at the advanced level, according to Heidi Shaw, NEHA credentialing coordinator.

Those with the credential represented 33 states — Alaska, Arkansas, California, Colorado, Delaware, Florida, Georgia, Hawaii, Iowa, Illinois, Indiana, Kentucky, Massachusetts, Maryland, Michigan, Minnesota, Missouri, Montana, North Carolina, Nebraska, New Jersey, New York, Ohio, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, Vermont, Washington and Wisconsin — along with Ontario and Puerto Rico.

No easy road

Alaska's credentialed installers include Dean Foxworthy, owner of Cornerstone Excavating on Kodiak Island. He earned his basic credential in 2007 and passed the advanced exam in 2009, in both cases at the Pumper & Cleaner Environmental Expo International. The quality of the tests impressed him.

"They were tough — much, much harder than the state credentialing exam," he reports. "I wasn't expecting them to be that hard. There was a lot of math, and even though math is one of my strong points, I had to do a lot of thinking to solve the problems and reach the right conclusions."

> **"The exams were tough — much, much harder than the state credentialing exam. I wasn't expecting them to be that hard."**
>
> **Dean Foxworthy**

Foxworthy is now the only nationally credentialed installer among half a dozen competitors on the island. He installs up to a dozen conventional systems per year in addition to his general excavating work, which includes digging for foundations, moving earth, and making sewer and water connections for home construction.

His commitment to quality installations includes regular attendance at the Pumper & Cleaner Expo and the Installer Academy,

Dean Foxworthy, owner of Cornerstone Excavating on Kodiak Island, Alaska, earned his basic and advanced NEHA credentials at the Pumper & Cleaner Environmental Expo International. (Photo courtesy of Cornerstone Excavating)

"[The NEHA credential is] purely voluntary at this point. There are 99 counties in Iowa, and five already require it ... From there, it's spreading. Several other counties are looking at it. Our goal would be to generate enough interest to approach the state legislature and ask them to make it a state law that all installers need to be credentialed."

Doug Bird

sponsored by the National Onsite Wastewater Recycling Association (NOWRA) in Las Vegas, Nev.

"If I'm going to work in this business, I want to stand out," he says. "I want to learn everything there is to know about systems and the proper ways of installing them. I want to be ahead of everybody else and do it correctly. I believe the NEHA credential is going to become one of the leading criteria for the nation. I think the states would benefit from recognizing it. It's something they should look at seriously."

Serious about the business

The Jakoubeks took the credentialing exam in December 2006 at the Installer Academy. The test was offered there at no charge after a training program given by the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT).

"We thought that while all that information was still fresh in our heads, we would go ahead and take the test and become credentialed nationally," Terri Jakoubek says.

The Jakoubeks have held the credential for two years and nine months. To renew it after two years, they had to complete 12 hours of continuing education, which they earned at the Installer Academy in 2007 and 2008.

"A part of our motivation was to put another feather in our hat for

Doug Bird, environmental health sanitarian for Bremer County, Iowa, earned his basic NEHA credential on behalf of the Iowa Onsite Waste Water Association. He hopes to encourage others to become credentialed and to make credentialing a state requirement for all installers.

About the Credential

The National Environmental Health Association developed the Certified Installer of Onsite Wastewater Treatment Systems national credential in a cooperative agreement with the U.S. EPA and in partnership with industry groups including:

- National Onsite Wastewater Recycling Association (NOWRA)
- National Association of Wastewater Transporters (NAWT)
- Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT)
- National Small Flows Clearinghouse (NSFC)
- State Onsite Regulators Alliance (SORA)
- National Sanitation Foundation (NSF)
- Local and state onsite regulators

The credential covers all forms of installation and is offered at basic and advanced levels. The credentialing exam is designed to test the knowledge, skills and abilities needed for successful onsite installations. Because the credential is national in scope, it does not cover state and local codes.

The basic level exam has 75 questions and takes two hours to complete. The advanced level exam has 125 questions and takes three hours. All questions are multiple choice. The content areas covered are the same for both levels — the advanced level includes more difficult questions. Topic areas covered are:

Plan assessment (10 percent of questions): Includes knowledge of site plans, basic surveying, topography and site features; knowledge of material requirements, standards and specifications, and soil profile descriptions; pump performance and treatment and dispersal technologies; and mathematical calculations.

Job staging (20 percent): Includes knowledge of installation plans, elevations and topography; ability to transfer designer plans to the site, reconcile variations, and identify conflicts; knowledge of equipment needs and limitations, materials and supplies, and soil characteristics; and ability to identify subcontractor and homeowner needs and potential conflicts.

Site development and installation (70 percent): Includes ability to recognize soil characteristics in the field; knowledge of specifications and installation techniques for system components; knowledge of electrical requirements, gravity and pump/siphon dosed system requirements, timers and remote monitoring, bedding, testing and pipe connection methodologies, and pump performance.

For the basic level exam, candidates must be at least 18 years of age and provide proof of high school graduation or GED. For the advanced level, candidates must meet the requirements of the basic level and provide a work history that contains at least two years' experience installing onsite systems. Both levels require 12 hours of continuing education every two years.

NEHA provides a list of the reference materials used in creating the exams. The basic exam costs $95 for NEHA or NOWRA members and $110 for nonmembers. The advanced exam costs $110 for members and $130 for nonmembers. For more information, visit www.neha.org.

Terri (top photo) and Lloyd Jakoubek, owners of Raymond Contracting in Raymond, Neb., are among about 300 people in the United States and Canada who hold the Certified Installer of Onsite Wastewater Treatment Systems credential from NEHA. (Photos by William Lauer)

our marketing program — letting customers know that we're serious about the business and that we have a great desire for education," Jakoubek says. "We believe we have more knowledge than the competition in our area, and we have proof of that with the credential."

While Nebraska installers must be state-certified, Jakoubeks feel they gained an edge by adding the national credential. "We mention it in all the literature that we provide to customers," Jakoubek says. "When we meet with customers, we often talk about it. Typically, the people are kind of excited. It lets them know that we are pretty serious and pretty passionate about what we do.

"When we meet with customers, we often talk about [the NEHA credential]. Typically, the people are kind of excited. It lets them know that we are pretty serious and pretty passionate about what we do."

Terri Jakoubek

"A lot of homeowners are knowledgeable because of all the information they can get on the Internet," she says. "We talk and they can relate. It just makes for a really good match. There are a lot of good installers in our area, but then there are those who are first and foremost excavators. Homeowners choose us nine times out of ten when they compare us with someone whose main job is excavating."

Toward advanced treatment

The Jakoubeks hold the basic installer credential and aspire to earning the advanced level to prepare for growth in advanced treatment systems. "In Nebraska today, there aren't a lot of non-conventional systems," Jakoubek says. "But once the state becomes more involved with advanced systems, we will have a leg up, because of the knowledge we will have gained. That's pretty exciting.

"Development outside the city limits is growing. I can't say the economy is great here, but we have been just as busy with new construction as in years past. As we see more development, we're going to run into situations where a gravity-flow, conventional system or a lagoon is not going to work.

"Right now, we have to get a professional engineer involved to do advanced system design," Jakoubek says. "But the Nebraska On-site Wastewater Association is working with the state to allow individual certified installers to do more advanced installations."

Advanced systems are by no means the exception in Brian Scheffe's world. As a technical representative with Front Range Precast Concrete in Boulder, Colo., Scheffe oversees installation of numerous systems that include aerobic treatment units, many with concrete tanks made by his company.

Scheffe earned the advanced onsite credential in April 2008 at the annual NOWRA conference. As acting president of Colorado Professionals in Onsite Wastewater, he promotes the credential to the state's installers. The association offers the exam at its annual conference, as does the Colorado Environmental Health Association.

Scheffe is impressed with the training curriculum developed by the CIDWT. "In my opinion, they are the most knowledgeable body of individuals in the onsite industry," he says. "So you not only have a good exam. You have a curriculum to effectively train people to take that exam and do well."

Conferring credibility

Scheffe sees the credential as a tool for third-party credibility. "When I give opinions to an engineer or designer, or when I give advice to a homeowner or excavator or any onsite professional, it lets them know that those opinions are not necessarily just mine — that they represent experts throughout

the country who agree that those are the best management practices available today," he says. "In line with that, the credential demonstrates that you have a good understanding of those practices.

"The two levels of credentialing allow some flexibility for different levels of risk on a site. For less risky sites, it may be fully acceptable to have someone install systems with the basic credential, but when you get into more challenging sites and more complex systems, you can set a threshold for when it becomes necessary to have that advanced level.

"It's also a peer-reviewed credential in that NEHA brought experts in from various regions throughout the country to piece that exam together," Scheffe notes. "And it has continuing education requirements built in. That makes it a good candidate for easy adoption by state and local regulatory agencies. They don't have to reinvent the wheel — there's a good credential already developed and available for them to put in place.

"CPOW is promoting it for now as a voluntary credential, but we hope to make its official adoption a part of our effort to revamp the onsite regulatory scheme in our state."

"When I give opinions to an engineer or designer, or when I give advice to a homeowner or excavator or any onsite professional, it lets them know that those opinions are not necessarily just mine — that they represent experts throughout the country who agree that those are the best management practices available today."

Brian Scheffe

To the next level

That's exactly the direction envisioned by Doug Bird, environmental health sanitarian for Bremer County in north central Iowa. He says his state could be on track toward making the credential mandatory for onsite installers.

Although he is not an installer, Bird took and passed the basic level credential exam on behalf of the Iowa Onsite Waste Water Association (IOWWA). "We were looking for something to offer installers as a means of certification," says Bird, an IOWWA board member. "I took the exam to see if it looked like something that could be workable for us. I took my experience back to the board, and we decided to proceed with encouraging installers to take the NEHA credentialing exams.

"Our association's long-term goal is to make the credential a requirement statewide. It's purely voluntary at this point. There are 99 counties in Iowa, and five already require it, Bremer County being one of them.

"From there, it's spreading," Bird says. "Several other counties are looking at it. Our goal would be to generate enough interest to approach the state legislature and ask them to make it a state law that all installers need to be credentialed in this manner."

As of May, 114 Iowa professionals held the credential. IOWWA helps its members by offering the exam locally and providing preparatory classes taught by David Gustafson and Sara Christopherson of the University of Minnesota onsite program. "We offer a day and a half of instruction before the exams, and I think that has really helped," Bird observes. "Our success rate on the exams given here in Iowa is about 95 percent.

"It has been well-received, even by contractors who work in counties that do not require credentialing. We have a lot of people just coming forward and getting it, and I think that's because it helps them show a level of professionalism in the industry. It's an indication that an installer has a certain degree of competency and is keeping up with continuing education and the latest technology." ■

Jim Anderson and David Gustafson are connected with the University of Minnesota onsite wastewater treatment education program. David is extension onsite sewage treatment educator. Jim is former director of the university's Water Resources Center and is now an emeritus professor, as well as education program coordinator for the National Association of Wastewater Transporters. Readers are welcome to submit questions or article suggestions to Jim and David. Write to ander045@umn.edu.

Know Your Soils

Texture and structure are the two basic variables that provide clues to long-term acceptance rate and other critical measurements

By Jim Anderson, Ph.D., and David Gustafson, P.E..

We have written before about soil characteristics, but recently we've received a variety of questions that revolve around identifying soil properties. So it appears we should address these issues again.

It is also important to do this because as part of a national project conducted by the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT) to develop educational materials for installers, we hear some people saying that there is too much emphasis on soils, and that installers only need to be able to read a plan and install what a site evaluator or engineer puts on it.

As we have pointed out several times, if something goes wrong with a system, you as the installer will be the first person called. For better or worse, you are the one who will be expected to fix the problem. Obviously the best fix is to avoid the problem altogether.

You can do this most effectively when you start excavating for the tank and the piping, because this is where you start getting a close look at the soil. The question then becomes: What should I look for?

Key characteristics

In the past we have stated the two most important properties to evaluate are soil texture for sizing the system and soil color to identify saturated soil conditions. There is really much more to know and factor into the soils and site when installing the system, but these are good properties to start with. We will discuss these and a few more characteristics in future articles.

Soil texture is the primary characteristic used to determine the long-term acceptance rate, and from this an allowable loading rate, which then can be used with the estimated daily sewage flow to determine how large a system has to be. (See the Minnesota sizing table.)

These loading rates are tied to the United States Department of Agriculture (USDA) classification for determining soil texture classes, the system used to classify soils mapped in the United States and the system that relates best to pore sizes and water movement.

Soil texture simply refers to the percent of sand-, silt- and clay-size particles. In the USDA system, texture refers only to particles less than 2 mm (0.01 inch) in diameter. Other soil particle classification systems are used for different purposes. These include:

- A system used by the Association of State Highway and Transportation Officials related to bases for road construction
- The Unified Engineering Classification System for Civil Engineering
- The OSHA soil classification for trenching.

Soil Sizing Factors Based on Perc Rates

percolation rate (minutes per inch)	soil texture	sizing factor (sqft/gal/day)	loading rate (gal/day/sqft)
faster than 0.1[a]	coarse sand	0.83	1.20
0.1 to 5[b]	medium sand, loamy sand	0.83	1.20
0.1 to 5	fine sand	1.67	0.60
6 to 15	sandy loam	1.27	0.79
16 to 30	loam	1.67	0.60
31 to 45	silt, silt loam	2.0	0.50
46 to 60	sandy clay loam, silty clay loam, clay loam	2.2	0.45
61 to 120[c]	silty clay, sandy clay, clay	4.2	0.23
slower than 120[d]		—	—

[a] Systems installed in or on these soils must be either mound systems *or* trench systems with at least 1 foot of clean sand between the distribution medium and the coarse soil of the trench bottom and sidewalls.

[b] Systems in or on these soils must use pressure distribution *or* must be divided into at least 4 parts, none of which is more than 25% of the total system area, and which are in series.

[c] Mounds must be used for systems on these soils.

[d] Systems installed in or on these soils are not standard.

How soil texture relates to system sizing. (Images from University of Minnesota Onsite Sewage Treatment Program, 2009 Subsurface Sewage Treatment Professional Manual, St. Paul, Minn.)

A dozen classes

There are 12 soil textural classes based on particles less than 2 mm in size in the USDA system. These are often represented by the USDA Soil Textural Triangle. Sand-size particles range from 0.5 to 2 mm, silt-size particles from 0.002 to 0.05 mm, and clay-size particles less than 0.002 mm. (See the textural triangle).

For soils that have rock fragments from larger than sand-size to boulders, there are modifiers as a part of the standard soil descriptions. (These modifiers can be found in a USDA publication, *Field Book for Describing and Sampling Soils*). The obvious question is: How do I determine those percentages?

It can be done in the laboratory by the hydrometer or pipette methods. Installers can do it in the field, by hand, using a method called soil texture by feel. (See flow chart to determine soil texture in the field.)

As we have pointed out several times, if something goes wrong with a system, you as the installer will be the first person called. For better or worse, you are the one who will be expected to fix the problem. Obviously the best fix is to avoid the problem altogether.

The method is also provided in ASTM "Standard Practice for Subsurface Site Characterization of Test Pits for On-Site Septic Systems," D 5921-96, published by the American Society for Testing and Materials. The state of Arizona and perhaps others have adopted this reference as their standard to determine soil characteristics in the field. (There are errors in other parts of this reference, so the standard should be used with caution.)

Determining texture by feel involves moistening a golf-ball-size sample of soil. The way it holds together and how it feels will enable you to estimate the soil textural class. For our purposes, a number of textural classes group together from the standpoint of how the system is sized, so this method is usually good enough to differentiate between these groups and gain a reasonably accurate estimate of the design loading rate.

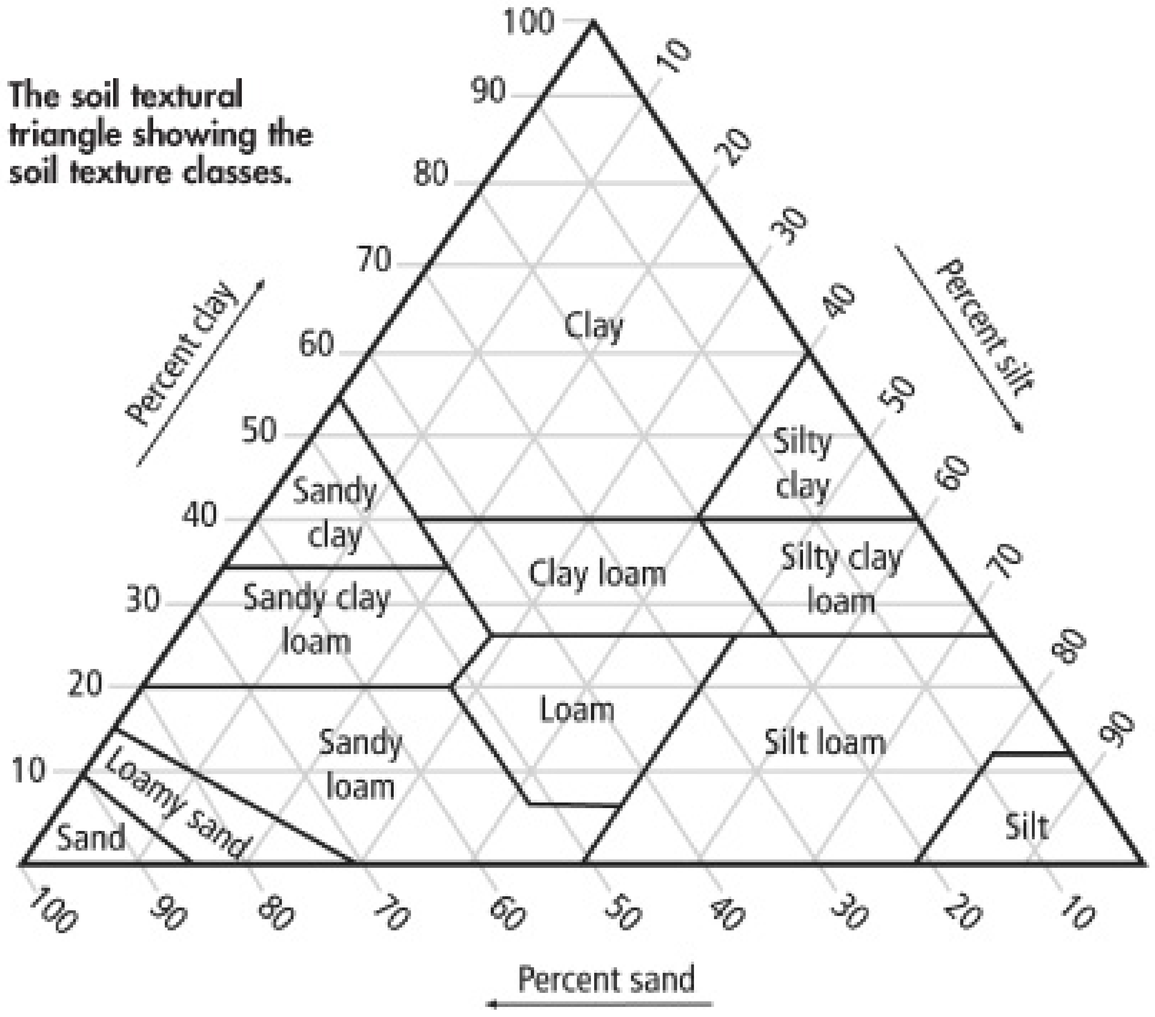
Looking for issues

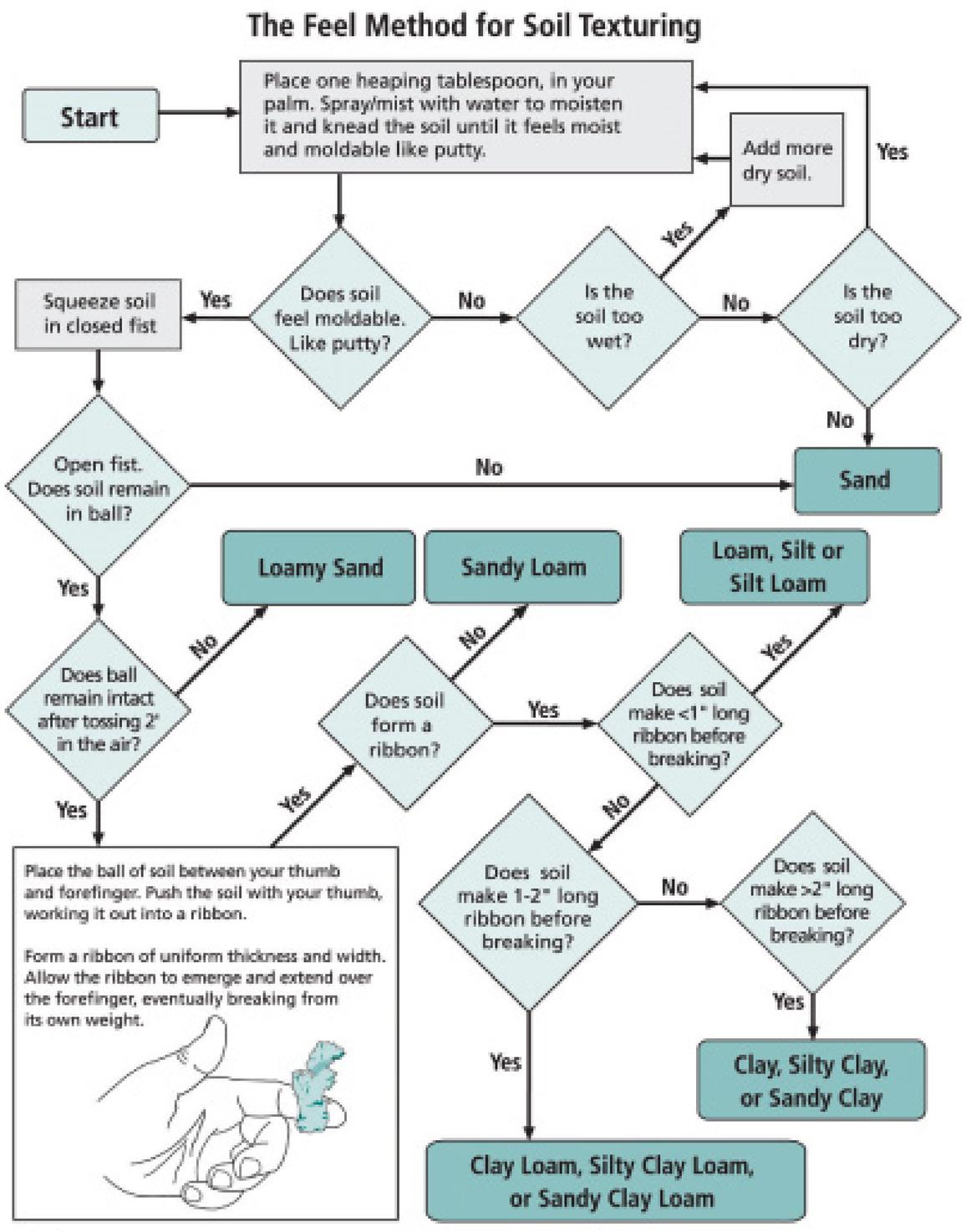
Knowing the soil texture allows you to check system design parameters for sizing to make sure the system is properly sized. It can also help you identify other potential issues with the soils. These include the potential for compaction.

We have discussed many times the need to avoid compacting fine textured or clayey soils to maintain their ability to accept septic tank effluent. Remember KIDD (Keep it Dry, D___), and KINN (Keep It Natural N____).

If there are large numbers of coarse fragments or stones present, there may be excavation problems. All of these are reasons to have a familiarity with soil texture and to have confidence that you can make sound determinations in the field. ■

The soil textural triangle showing the soil texture classes.





A flow chart for determining soil texture in the field.

Take-Out Order

A Massachusetts restaurant solves its onsite treatment problem with a trickling biofilter, aeration unit, and retrofitted recirculating sand filter

By Mark Cottrell

A clogging recirculating sand filter and effluent breaking out of the pressure distribution field in the parking lot of a Chinese restaurant in Middleton, Mass., forced the owner to shut down the system and call a pumper to handle 1,000 gpd of wastewater.

The owner hired Dan Ottenheimer, R.S., of Mill River Consulting in Gloucester, Mass., to find a solution. His investigation revealed that the sand filter's ruptured rubber liner was allowing 500 gpd of infiltration. He found no record of any regular maintenance other than pumping of the grease trap and septic tank.

Testing showed septic tank effluent BOD_5 at 1,500 mg/l. Consequently, Ottenheimer based his design on organic as well as hydraulic loading. His solution involved replacing the sand filter with an aeration unit, trickling biofilter, and pump chambers, reusing existing tanks, and rehabilitating the disposal field. The solution also enabled the restaurant to continue business during construction.

Site conditions

The 100-seat restaurant operates daily from lunch to late evening. As designed, the existing system handled the hydraulic load but not the organic loading, which clogged the sand filter. Some sources of non-grease-bearing wastewater flowed to the grease trap, and insufficient cooling of the grease occurred in the grease and septic tanks.

System components

Ottenheimer designed the system to handle 1,000 gpd. Its major components are:

A standard 40-foot-long shipping container at the back of the parking lot contains the Waterloo Biofilter SC-40 treatment unit.(Photos courtesy of D.F. Clark Inc.)

- Existing 3,500-gallon grease trap, 7,500-gallon septic tank, and 2,500-gallon recirculation tank.
- 1,000-gallon single-compartment monolithic pump tank. Tanks made by E. F. Shea New England Concrete Products Inc., Amesbury, Mass.
- Simplex 1/2-hp high-head effluent pump from Orenco Systems Inc., Sutherlin, Ore.
- Four Orenco FT Series 15-inch commercial effluent filters, one per tank.
- JET 3500 Series II aeration unit distributed by Clearwater Recovery, Rockland, Mass.
- 1,500-gallon pump tank with duplex 1-hp Myers ME100 effluent pumps.
- SC-40 self-contained Waterloo Biofilter treatment plant with operations room supplied by Clear Water Industries, Ipswich, Mass.
- Pressure distribution disposal field.

System operation

Kitchen and restroom wastewaters gravity flow through separate 4-inch PCV pipes to the grease trap and septic tank. Their size helps cool the water before it enters the recirculation tank, where it mixes with treated effluent to reduce the organic strength.

From the first pump tank, the pump demand doses 100 gallons to the aeration unit. In the bioreactor, a blower injects fresh air. During mixing, microorganisms aerobically reduce the organic strength and remove solids.

Effluent, now a colorless, odorless liquid, flows to the settling compartment, where remaining fine particles settle out and return to the treatment chamber. The aeration unit reduces median BOD_5 and TSS by 63 and 73 percent.

Effluent then flows to the second pump tank, where alternating pumps cycle every 16 minutes, pumping 60 gallons up 15 feet to the top of the biofilter. The foam

System Profile

Location:	Middleton, Mass.
Facility served:	Chinese restaurant
Engineer:	Dan Ottenheimer, R.S., Mill River Consulting, Gloucester, Mass.
Installer:	Dave Clark, D.F. Clark Inc., Ipswich, Mass.
Site conditions:	Failed existing system with clogged recirculating sand filter
Type of system:	SC-40 Waterloo trickling biofilter, Clear Water Industries
Hydraulic capacity:	1,000 gpd

filter media occupies 37 feet of the 40-foot-long shipping container and is separated from the operations room by a wall. Control panels in the room operate the system.

Effluent enters a manifold with seven nozzles that spray in a circular pattern over 3-inch foam cubes. As the liquid trickles down, microorganisms consume the organic components. Two low-amperage 4-inch fans circulate air through the foam pile to ensure aerobic conditions. The biofilter removes 90 percent of BOD and 89 percent of TSS.

Treated water drains from the bottom of the unit to the ratio box where half is recirculated and half is sent to the drainfield pump chamber. An 18-inch PVC pipe in the corner of the tank fits into a chamber and serves as a pump vault. (The top of the tank has a vented access port to the pump vault.)

Wastewater stands in the failed pressure distribution disposal field.

Treated effluent, with high dissolved oxygen, is pumped to the disposal field under the parking lot. Overall reductions for the entire system were 99.6 percent BOD_5 and 98.4 percent TSS.

Installation

Dave Clark of D.F. Clark Inc. in Ipswich, Mass., installed the system in two weeks. Most of it went behind the restaurant near the service entrance and trash containers. Vehicles had damaged the original drainfield cleanouts, and the laterals were capped and encased in concrete. Clark's crew installed new cleanouts at the ends of the laterals to facilitate annual brushing and flushing. They also rerouted the internal plumbing to send grease-bearing wastewater to the grease trap.

At first, the aeration unit's open top allowed leaves, twigs and trash to enter the waste stream. The debris clogged the biofilter's spray nozzles, resulting in uneven dosing of the media and frequent cleaning. "We inserted a SIM/TECH STF-100 effluent filter on the 2-inch force main feeding the biofilter, and that prevented further clogging," says Clark.

The wastewater stream takes about 13 days to enter the aeration unit. By then, it is anoxic. The odors, however, seldom affect patrons because of the unit's location. "We increased the recirculation rate from 50 to 67 percent to boost the dissolved oxygen content of the incoming wastewater," says Clark. "That decreased the concentration of odor compounds, as did an improvement in effluent quality within a few months."

Clark met with the restaurant owners to advise changes in cooking, cleaning and waste disposal practices. "We discussed how to limit the amount of grease and chemicals sent to the system, and they were very cooperative," he says.

Each treatment tank received an Orenco FT Series 15-inch commercial effluent filter.

"I also changed the float switch elevations to send 50 gallons of effluent to the absorption bed," says Clark. "This keeps it from surcharging with large infrequent doses." Eight months later, Clark rested the field for another three months, again due to effluent ponding. He turned on the pumps again, and the system then ran without further breakouts.

Maintenance

The owners agreed to monthly maintenance performed by a licensed wastewater treatment plant operator, grade 2 or higher. The service provider collects effluent samples at four locations, checks solids accumulation, cleans the effluent filters in the tanks, and inspects the pumps, float switches and alarms.

The operator cleans the effluent filter and the biofilter's spray nozzles and fans, greases the blower on the aeration unit, cleans the air filter, and checks solids buildup. Once a year, he flushes and brushes the distribution laterals. All this takes 90 minutes. The grease trap is pumped every month, and the septic tank once a year or when total solids levels reach 25 percent of its capacity. ■

A maintenance technician from Clear Water Industries monitors pump activity and alarms from the control panel inside the Waterloo Biofilter control room.

"We increased the recirculation rate from 50 to 67 percent to boost the dissolved oxygen content of the incoming wastewater. That decreased the concentration of odor compounds, as did an improvement in effluent quality within a few months."

Dave Clark

The air blower for the JET aeration unit is in the white box. Screens over the open grates on the tank help keep out leaves and debris.

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Machine Matters is designed to help readers get the most from excavators, backhoes, skid-steers and other mechanical equipment through proper maintenance, operation and financial practices. Readers are welcome to submit ideas for this column and can send them to Ted J. Rulseh, editor, by calling 800/257-7222 or e-mailing editor@onsite installer.com.

Six Steps to Lower Maintenance Costs

An expert explains how a scientific approach to managing your equipment service and repair expenses can put more money in your pocket

By Greg Northcutt

Preston Ingalls

Preston Ingalls' business is reducing equipment expenses by helping clients keep uptime high, keep maintenance costs low, and extend machines' useful life.

He's president and chief operating officer of TBR Strategies LLC, a maintenance and reliability consulting firm in Raleigh, N.C. The firm's clients around the world include those in the oil and gas, mining, manufacturing, aerospace and construction industries with annual revenues ranging from several million to several hundred billion dollars.

Ingalls and six other consultants work with and train equipment operators, mechanics and maintenance supervisors in developing more cost-effective maintenance programs. As a result, his clients reduce maintenance costs 25 percent to 50 percent or more. One construction client reduced maintenance costs by 52 percent with sound asset management practices.

"Whether you operate three or 300 pieces of machinery, the basic principles of minimizing equipment service and repair costs are the same," Ingalls says. And so, although he deals with big companies, his advice applies to onsite installation contractors, too. Here is a closer look at the cost-saving principles and how to apply them to your business.

"Running any size fleet is a science — not an art. If you treat it as a science, much is added to the bottom line. If you treat it as an art, someone else gets your profits. The choice is yours."

Preston Ingalls

1. Keep a sharp eye on expenses.

That requires accurate, detailed and up-to-the-minute records. Whether you use a computer or paper and pencil, it's critical to track maintenance costs. "You can't control what you don't know," Ingalls says. "Good records help you make good decisions. You should be able to determine in a short time how much you've spent on labor, parts and supplies for any machine since you've owned it — and be able to tell which machine is costing you the most money."

He suggests using a standalone computerized maintenance management system (CMMS). Besides tracking costs, you can use this tool to schedule preventive maintenance and manage any spare parts inventory.

A spreadsheet computer program, like Access or Excel, is an alternative. Such a program can do many of the same functions as a CMMS. "However, if you can find a CMMS with a dedicated database designed by someone with a maintenance background, it will be more robust," Ingalls says.

Ideally, any computerized record-keeping system should be able to connect with an accounting system. That way, you can use the information to determine overhead costs and to establish appropriate rates for your equipment charges. Of course, you can also record your expenses and schedule maintenance by hand — it just takes more time and effort.

2. Practice good preventive maintenance.

The single most important component of maintenance is inspection. "That involves knowing what you're looking for and ensuring that your equipment is within the manufacturer's specifications," Ingalls says. "For example, is the bucket or belt in the proper condition?"

Besides describing the correct specifications for various equipment components, you can use your owner's manual to create a preventive maintenance schedule. Ingalls advises basing your PM program on operating hours, rather than the calendar. The problem with servicing a machine every so many months is that the amount of time you use it can vary. Servicing an item every 30 days, for example, may mean you're over- or under-servicing it based on actual hours.

"Also, review the results of preventive maintenance checks periodically," Ingalls says. "You may find that you need to decrease the service interval, or that you can extend it, based on the condition of the service item."

3. Train your service and repair personnel.

Carrying a toolbox doesn't necessarily ensure that your mechanic has the skills to maintain your equipment properly. "Trial and error can be a very expensive way to learn how to do that," Ingalls says. He recommends using qualified mechanics who are trained in the correct procedures and practices needed to minimize downtime and the associated costs.

4. Train your operators.

Because they work directly with the equipment daily, operators are in an ideal position to identify problems and make minor repairs and adjustments. "Make sure your operators assume responsibility for their equipment and are properly trained in making daily and weekly checks and care for their machine," Ingalls says.

Equipment manufacturers offer training for maintenance supervisors and mechanics. They, in turn,

can train the operators. An experienced, knowledgeable equipment operator can also help a new operator learn such maintenance tasks as inspection and lubrication. "Memories aren't very accurate, so make sure the operator follows a checklist when doing this servicing, so that nothing gets overlooked," Ingalls advises.

5. Adopt predictive maintenance practices.

Regular lab analysis of engine and hydraulic oil is a good way to head off expensive problems. Normally, it costs $25 to $30. "By measuring the types and amounts of metals from worn or damaged engine components and other contaminants in the oil, analysis can indicate any corrective action that's needed," Ingalls says. "It can trigger action to eliminate contamination. Also, the results can help determine if you're changing oil more or less frequently than needed."

6. Spend your equipment dollars wisely.

Buying a machine with a lower price tag may end up costing you more in the long run than a higher-quality, more expensive one that lasts much longer. At the same time, though, it doesn't make economic sense to spend more than warranted to repair a piece of equipment. "Don't spend any more for repairs than the machine's residual value, what you'd get if you sold it today," Ingalls says. "For example, instead of replacing an engine, it may be smarter to apply that money to a new machine with better technology that will last longer."

Measuring success

To gauge how effective your maintenance program is, Ingalls suggests comparing your results to others in terms of a few key reference values:

Maintenance costs/estimated replacement value. This measure shows how much you are paying to keep your equipment running for a year in relation to what it would cost you today to replace it, either with the same equipment of similar age or, if not available, with a new machine. Maintenance costs include labor, material and overhead, but not fuel or depreciation.

Replacement value is not the same as what you paid for the equipment originally or its current depreciated value. For example, if your maintenance expenses for the past year total $5,000 for an excavator that would cost you $45,000 to replace, your maintenance cost/estimated replacement value would be $5,000 divided by $45,000 — or 11 percent

You can compare your figure to values reported in a study commissioned by *Construction Equipment* magazine, the Association of Equipment Management Professionals (AEMP) and the Construction Financial Managers Association (CFMA).

- World class (average for all industries surveyed): 2.5 to 3 percent
- Construction industry average: 11.6 percent
- Best in class (construction industry): 3.5 percent.

Preventive maintenance hours/total maintenance hours. Let's say your maintenance costs represent 4 percent of estimated replacement value. Is that enough to maintain your equipment properly? That's where this figure comes in. It shows how much time you spend for preventive maintenance compared to all equipment maintenance needs. Comparison values:

- World class: 60 percent
- Construction industry average: 40 percent
- Best in class: 52 percent.

Emergency repair hours/total maintenance hours. Another way to assess how well you are maintaining equipment is to compare the number of emergency hours (time dedicated to repairs that had to be completed within 24 hours) to total maintenance man-hours per year. The lower this figure, the better your maintenance practices. Comparison values:

- World class: 3 percent
- Construction industry average: 29 percent
- Best in class: 5 percent.

"Running any size fleet is a science — not an art," Ingalls says. "If you treat it as a science, much is added to the bottom line. If you treat it as an art, someone else gets your profits. The choice is yours." ■

"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.*

California Passes New Onsite Regulations

By Scottie Dayton and Doug Day

New onsite system rules, passed after many years of delays after the 2000 passage of AB-885, will affect 1.2 million households, according to an environmental impact statement. The regulations will require tank inspections every five years, along with other provisions that could cost some homeowners and businesses substantial money.

A new bill, AB-268, was introduced to repeal the new regulations but it failed in committee. The bill's lead author, assemblyman Ted Gaines, is working on another bill. "The proposed regulations, released in November 2008, will require residents who have a septic system to pay a $325 inspection fee," he says on his official Web site. "Residents would also be required to pay an additional $325 if there is a well on site. If the inspection fails, homeowners would be forced to pay up to tens of thousands of dollars to replace and upgrade their septic system."

Another bill, AB-580, has received bipartisan support to develop standards to lessen the impact and allow for adapting the rules for various regions of the state. The bill author, Alyson Huber, says in a news release from her office, "A statewide, one-size-fits-all approach is not the answer and would negatively impact rural homeowners and businesses. We need regional flexibility in these regulations to deal with the realties of a large and geographically diverse state."

Ohio

Todd Paulus, R.S., unit manager for the Stark County Health Department in Canton, Ohio, states that a bill in the state legislature revising Ohio's onsite regulations will not cost homeowners as much as $50,000 to install onsite systems, as some have recently claimed.

"A few who oppose the state's Home Sewage Treatment System Study Commission findings are attempting to invoke public outcry against the rules by overinflating the costs of these systems," he says.

"Stark County is using most of the principles in the proposed regulations, and our installation costs are $7,000 to $15,000. Occasionally, in the worst soils, a drip system will cost $18,000 to $20,000. Since January 2008, we've installed 333 systems. The average costs are $9,850 for new systems, $8,475 for replacements, $3,501 for alterations, and $8,438 overall."

In July 2007, Ohio rescinded its new onsite rules law that required some properties to replace conventional drainfields with mounds or pretreatment with low-pressure pipe drainfields. Counties were left on their own to determine what to do next.

Stark County opted to install less costly, less maintenance-intensive systems that still abided by most of the principles of the 2007 law. Besides conventional drainfields when soils permit, the county uses dosing siphons or Flouts, and some flood dosing instead of LPP. Furthermore, the cost of technology has decreased since 2007, and more options are available.

According to Paulus, the most debated principle in the proposed new rule requires a vertical separation distance for high seasonally perched water tables and harsh limited soil conditions. Approved procedures to reduce the distance would be to elevate or pretreat, or both. Opponents have objected to the additional expense of doing so.

Most soils in Stark County are moderate. Paulus admits that counties with worse soils may have a different perspective than his. "The average prices I mentioned included systems ranging from standard trenches and mounds to pretreatment with flood or LPP dosing," says Paulus. "Fewer than 2 percent are drip systems."

Connecticut

The Department of Public Health (DPH) Technical Standards for Subsurface Sewage Disposal Systems update became effective Jan. 1, 2009. The state Public Health Code Regulations, as referenced in the May Rules and Regs column, have not been revised.

According to Amanda J. Clark, R.S., environmental analyst 3 in the Environmental Engineering Program at the DPH, the minimum septic tank sizes are 1,000 gallons for three-bedroom, single-family; 1,250 gallons for four bedrooms; and 125 gallons more for each bedroom after four. The minimum distance between drainfields and property lines is 15 feet when the top of the bed is above grade. If a retaining wall is used, a 10-foot separation is permitted from the inner edge of the wall.

Proprietary leaching systems may be used in vehicular travel areas only if authorized by the manufacturer and supporting documentation is filed with the Commissioner of Public Health. Leaching trenches must have at least 12 inches of cover in vehicular travel areas. Precast concrete structures in vehicular travel areas must be H-20 load rated and require no additional cover. A summary of the updates is at www.ct.gov/dph/subsurfacesewage.

Florida

The Department of Health has issued a public notice of proposed changes to septic system regulations in the state. The changes address tank inspection procedures; operating permits; filters and components; land application of septage; drainfield repairs; portable restrooms; design, construction location and use of septic tanks, dosing systems, drip irrigation systems, performance-based treatment systems, aerobic treatment systems and mound drainfield systems; system abandonment; site evaluations; reports required; and availability of forms. Visit www.doh.state.fl.us/environment/ostds/rule.htm.

Hawaii

State officials in Hawaii are considering their options after research indicated that discharges from cesspools are polluting some of the best snorkeling areas. About 60,000 gallons of wastewater are produced by residents in two subdivisions near the Wai Opae tide pools, news reports say. Studies have found high levels of fecal bacteria in the ocean waters near the subdivisions, which have developed only half of their lots. Proposed solutions include installing individual septic systems at a cost of about $32,000 each, or a community sewer system at an estimated cost of $7.8 million.

Idaho

The state senate in February killed a bill calling for more stringent requirements for new septic systems. The proposal from the

Department of Environmental Quality to require larger drainfields came after an extensive rule-making process and years of debate. Opponents raised concerns about the added cost to homeowners and claimed that proponents couldn't prove that larger drainfields would protect the environment.

Iowa

Effective last July 1, all septic systems must be inspected before any sale or transfer of the deed of any building or business. Such septic systems do not have to meet current codes in order to pass the inspection, but they do have to meet the requirements included in their installation permit and must be operating properly.

The Department of Natural Resources also developed a certification program to make sure there would be enough inspectors. After applying for certification, people must complete a training course and pass a test. Applicants must have two years of experience working with septic systems. Certification costs $350 and is good for two years. Inspectors must have 12 hours of continuing education during each two-year certification period.

Maine

A bill to require a license for onsite system installers failed in committee in April. The license requirements would have included being a licensed plumber and being properly insured. The Committee on Business, Research and Economic Development killed the bill.

Mississippi

As of last July 1, septic systems in Mississippi must be approved by health officials before they can be used. Rural areas that use wells for drinking water are exempt. New regulations also have stricter requirements for the maintenance of some alternative systems. Homeowners can either contract for the maintenance or become certified to do their own work. ■

INDUSTRY news

September 2009

Oldcastle Precast to Offer Algaewheel Technology

Oldcastle Precast will offer Algaewheel's algal growth process technology as part of its decentralized wastewater treatment systems in the United States. Oldcastle will incorporate the "green" process in cluster housing, commercial, educational, institutional and other treatment applications.

Ohio Approves Puraflo Residential Wastewater System

The Ohio Department of Health and the state's Sewage Treatment Technical Advisory Committee have approved the Bord na Mona Puraflo Peat Fiber Biofilter wastewater treatment for 2-foot soil depth credit installations.

Orenco Systems Receives Safety Recognition

Orenco Systems Inc. of Sutherlin, Ore., designer and manufacturer of decentralized wastewater systems, has been recognized as a Safety Health Achievement Recognition Program company. SHARP encourages Oregon employers to work with employees to find and correct hazards, and develop and implement effective safety and health programs. ■

Getting to the Root

An accurate diagnosis of an onsite system problem can help a homeowner avoid considerable time, expense, and yard and landscaping disruption

By Zan Ewing, R.E.H.S.

Listening to onsite system expert Bill Stuth talk about "Repair and Recovery of Sand Filters" at an Oregon Onsite Wastewater Association annual conference a few years ago, I noted his advice.

"Don't rush into a system repair until you know the cause of the problem," advised Stuth, from the state of Washington, an onsite consultant, trainer and inventor of the Nibbler treatment unit.

That caused me to reflect on many septic repairs I have seen where the problem was other than the drainfield failing. Jumping to conclusions about the cause of a septic system problem frequently leads to wasted money, unnecessary yard damage, and less space available for other uses. It seems that when problems arise, the knee-jerk reaction with homeowners, installers and many regulators alike is: "Let's put in a new drainfield."

This septic system experienced problems because a trencher had dug through a drainfield line.

No effluent

An extreme case a colleague told me about illustrates this point. A system had apparently failed after only 10 years. The site was fairly well drained, and the standard system was permitted, inspected and approved on completion. The contractor hired to fix the problem got a repair permit for drainfield replacement without any real investigation.

After completing a major portion of the new drainfield, the contractor dug into a portion of the old drainfield and found the gravel virtually clean, as if it had never been used. Investigating further, he found that the "failed" drainfield had never received any effluent from the septic tank.

At this point, the contractor realized he had found the real problem. Digging upstream from the drainfield to the septic tank, he finally located it. Evidently, during system construction, or soon after, the effluent sewer line had sheared completely off at the tank outlet, probably during backfilling. For 10 years, the loose, well-drained backfill around the tank excavation had absorbed all the septic tank effluent without backing up.

Understanding the cause of a problem is the first and most essential step toward fixing it. Here, an inadequately supported tank fitting caused a blockage.

This illustrates the value in first taking a little time to troubleshoot and evaluate the septic system to determine the cause of the problem and proper course of action. The problem may be less complicated than you thought.

Just a blockage?

Many septic systems have been replaced that were not failing but merely had blockages or other minor problems that could have been corrected easily with a minimum of time, expense and impact to the property.

Another example: A few years ago I received a telephone call from a man telling me his system was failing, and he needed a new drainfield. The matter was urgent, he said, because an outdoor wedding was being planned for his daughter, and a new system had to be installed ASAP. According to the owner, the system was 16 years old and had five 100-foot drainfield lines; the problem lay at the first line.

I obtained the installation drawing from the county and then visited the site. The drainfield was located on a gentle 3 percent slope, and the top line was indeed surfacing. The disposal field was installed not with drop boxes but with the serial distribution and the up-and-over fittings popular some years ago. These fittings were plumbed in a serpentine fashion, tying the five lines together.

I told the owner that a drainfield on a slope like that virtually

couldn't fail on the top line. If it did fail, it would normally fail at the weakest point of the lowest line due to hydraulic pressure. The problem, I said, was likely something else.

I suspected that the difficulty may be with the up-and-over fittings at the end of the top line connecting it to the next lower line. Probing the line to where I thought the fitting was, I dug down and found that it had become disconnected, probably again during the original backfilling, and no effluent had passed this point to the lower lines.

I recommended abandoning the serpentine up-and-over fittings and replacing them with a series of drop boxes installed at one end of the system to connect the lines. I told the owner that the cost would be considerably less than he feared, and that there would be minimal damage to his yard. He thanked me for taking time to diagnose and fix the real problem, and he was happy to pay the modest cost of that extra work.

Lay of the land

To diagnose a septic system problem effectively, it is necessary to know where all the components are and what they consist of. A critical piece of information is the as-built drawing, done at the time of the installation. This should be available from the local agency that regulates the onsite program. It provides a lot of useful information for an accurate assessment of the system and problem.

The first clue of problems is probably the age of the system. A properly sited and installed septic system, installed in reasonably well-drained soil, should last at least 30 years. If the system is much newer, like the one described above, the problem may not be failure of the drainfield but something else.

Another clue might be found in the landscaping and irrigation layouts. Landscaping and irrigation systems typically come after the septic system is installed. Homeowners have often called, telling me that landscapers had just pulled up white pipe and gravel with their trenching equipment.

This can have a serious impact on the system, cutting off and damaging a number of the drainfield lines and thus shortening the life of the system. Often, this damage, if known, can be repaired and the lines reconnected, making the system almost whole.

The first clue of problems is probably the age of the system. A properly sited and installed septic system, installed in reasonably well-drained soil, should last at least 30 years. If the system is much newer, like the one described above, the problem may not be failure of the drainfield but something else.

Identifying the true cause of a septic system problem may avoid the cost of installing an unnecessary system. It requires a significant effort and experience to do this properly. Homeowners need to be educated on the value of this professional service, and we should never be reluctant to charge for it.

A preliminary investigation, carefully done, can save money, needless yard damage, and wasted space for future repairs. Most customers will gladly pay for it.

Zan Ewing is a registered environmental health specialist with 35 years in the industry as a regulator, installation contractor and consultant. He is past president of the Oregon Onsite Wastewater Association and a designer/consultant in Salem, Ore. He can be reached at ewingzan@aol.com. ■

NOTE: Because of an error in production, this article appeared in last month's issue of *Onsite Installer* with an incorrect second page. We are reprinting the entire corrected article here. We regret the error.

Living Solution

Engineered wetland systems provide an onsite alternative to municipal sewers for new middle and high schools in Greensboro, N.C.

By Scottie Dayton

Extending the city sewer to its new middle and high school buildings would cost Guilford County Schools in Greensboro, N.C., more than $4 million.

Seeking a sustainable onsite system, representatives met with Amber Farrelly, P.E., of B&F Consulting in Raleigh, N.C., and Dave Maciolek, P.E., of Worrell Water Technologies in Charlottesville, Va.

Their design, involving horizontal and tidal flow wetlands with a rotary-kiln-expanded slate lightweight aggregate, produced the largest subsurface reuse system in North Carolina. The recycled water irrigates three athletic fields, saving the schools from buying 5 million gallons per year.

Site conditions

Soils are clayey atop loamy sand (saprolite). The water table is 40 feet below grade. Saprolite's conductivity is 10 to 12 gallons per square foot per day. Its application rate is 0.2 gallons per day per square foot.

System components

Farrelly designed the onsite system and Maciolek designed the wetlands. The system handles 30,600 gpd. Its major components are:

Middle school

- 5,000-gallon concrete grease trap. Concrete tanks from Stay-Right Precast Concrete Inc., Franklinton, N.C.
- 12,000-gallon dual-compartment concrete septic tank with three 12-inch FT1254-36 effluent filters from Orenco Systems Inc., Sutherlin, Ore.

A concrete conveyor belt system delivers gravel to the 20,537-square-foot horizontal wetland. Sandbags hold the geotextile fabric in place. (Photos courtesy of Michael Halas, Spectrum Environmental Inc.)

High school

- 8,000-gallon concrete grease trap
- 14,000-gallon dual-compartment concrete septic tank
- 6,000-gallon dual-compartment concrete septic tank with three Orenco 15-inch FT1154-36 effluent filters. Septic tanks are in series.

Advanced treatment

- Two 25,000-gallon single-compartment 10-foot-diameter fiberglass equalization tanks in series with 6-inch flexible coupling bottom connection. Fiberglass tanks from Xerxes Corp., Minneapolis, Minn.
- 32- by 96-foot Living Machine tidal flow wetland with three cells from Worrell Water Technologies, Charlottesville, Va.
- 110- by 240-foot Living Machine horizontal subsurface flow wetland.
- Stalite PermaTill aggregate from Carolina Stalite Co., Salisbury, N.C.
- Model EFB-0102-AB screen and 4000-micron mesh filter basket from Hayward Industrial Products Inc., Clemmons, N.C.
- Effluent collection chamber and lift station with two 1/2-hp 230-volt single-phase effluent pumps.
- Two 25,000-gallon single-compartment, 10-foot-diameter fiberglass effluent tanks in series with 6-inch flexible coupling bottom connections
- 4,475 feet of 4-inch force main
- Two 6.8-acre drainfields. Drainfield #10 has six zones and Drainfield #11 has eight zones. Both have duplicate replacement zones.
- 400,000 feet of 1/2-inch Netafim Bioline tubing: 2 foot on centers at 0.62 gallons per hour for drainfields and 16 inch on centers at 0.33 gallons per hour for athletic fields.
- Radio controls and control panels from Custom Controls, Raleigh, N.C.

System Profile

Location:	Greensboro, N.C.
Facility served:	Northern Guilford Middle and High Schools
Designers:	Amber Farrelly, P.E., B&F Consulting, Raleigh, N.C.; Dave Maciolek, P.E., Worrell Water Technologies, Charlottesville, Va.
Installer:	Michael Halas, Spectrum Environmental Inc., Raleigh, N.C.
Type of system:	Living Machine system, Worrell Water Technologies; Bioline drip tubing, Netafim, Rochester, N.Y.
Hydraulic capacity:	30,600 gpd

System operation

Wastewater from the middle school gravity feeds through a 6-inch PVC sewer and from the high school through an 8-inch sewer to a manhole. An 8-inch pipe carries the wastewater to the equalization (EQ) tanks.

When the tidal cells call for water, pumps send effluent from EQ 2 through a screen and filter basket. It mixes with water from effluent tank 1 before entering the bottom of each independent cell, rises to within 6 inches of the aggregate's surface, and percolates down to a drain.

Once the drain is full, an electric solenoid valve opens, directing effluent into a 6-inch pipe running through the center of the horizontal cell. Liquid disperses outward over the aggregate to a weir on the return side. The overflow runs to an effluent collection chamber and lift station that pumps it to effluent tank 1.

Pumps in the first compartment of effluent tank 1 send the liquid to the UV treatment area in the second compartment, where it recycles to the front of the tank. Pumps in effluent tank 2 send the water through a filter and flow meter before it goes to the absorption beds and athletic fields. Disinfected water from tank 1 flows into tank 2 as its level falls.

The Stalite PermaTill aggregate in the tidal and horizontal cells has a 97 percent void ratio with 50 percent more surface area than sand or gravel for higher nutrient and TSS removal. With high hydraulic conductivity, it will not clog, yet it retains 8 percent of the moisture for growing plants and microorganisms. "Stalite is the shining star in this system and one reason why it runs so well," says installer Michael Halas, owner of Spectrum Environmental Inc. in Raleigh, N.C.

Installation

Spainhour and Sons Grading of Rural Hall, N.C., excavated, transferred materials, and prepared the subgrade. The crew excavated 75- by 20-foot-wide holes for the tanks in a hillside. "It took four days to dig them because the south face required massive benching," says Halas. After placing gravel, the crew positioned the deadmen, installed the tanks, and backfilled them with gravel. The tanks were then water tested for 24 hours.

The Stalite PermaTill aggregate in the tidal and horizontal cells has a 97 percent void ratio with 50 percent more surface area than sand or gravel for higher nutrient and TSS removal. With high hydraulic conductivity, it will not clog, yet it retains 8 percent of the moisture for growing plants and microorganisms.

Installing the horizontal cell took seven days. Halas' crew covered the shaped and compacted native soil with geotextile fabric. Then Landsaver Environmental in Richmond, Va., installed the 20-foot-wide lengths of 40-mil HDPE liner and sealed the joints. The liner was then water tested. Workers added another layer of geotextile fabric to protect the liner from 5-foot groupings of various-sized washed stone.

Reinforced concrete footers 18 inches deep supported the cinder block walls surrounding the tidal cell basin. After a mason set the courses and molded in the influent, discharge, and overflow penetrations, Halas' men applied the decorative stone veneer. They poured concrete floors in the cells, deburred the walls and floor, and covered the surfaces with geotextile fabric and the 40-mil liner.

A concrete conveyor belt system deposited 2 feet of washed stone and 3 feet of 5/16-inch washed Stalite PermaTill aggregate into the cells. The material does not compact and withstands 43,000 pounds per square foot of pressure.

Plants for the wetlands were harvested from the area and propagated on a nearby farm. "They had to winter over so they could be planted at the proper time," says Halas.

His crew cleared a wooded area for Drainfield #10. Each bed required 25 tractor-trailer loads of sand, with drip tubing installed 3 feet deep.

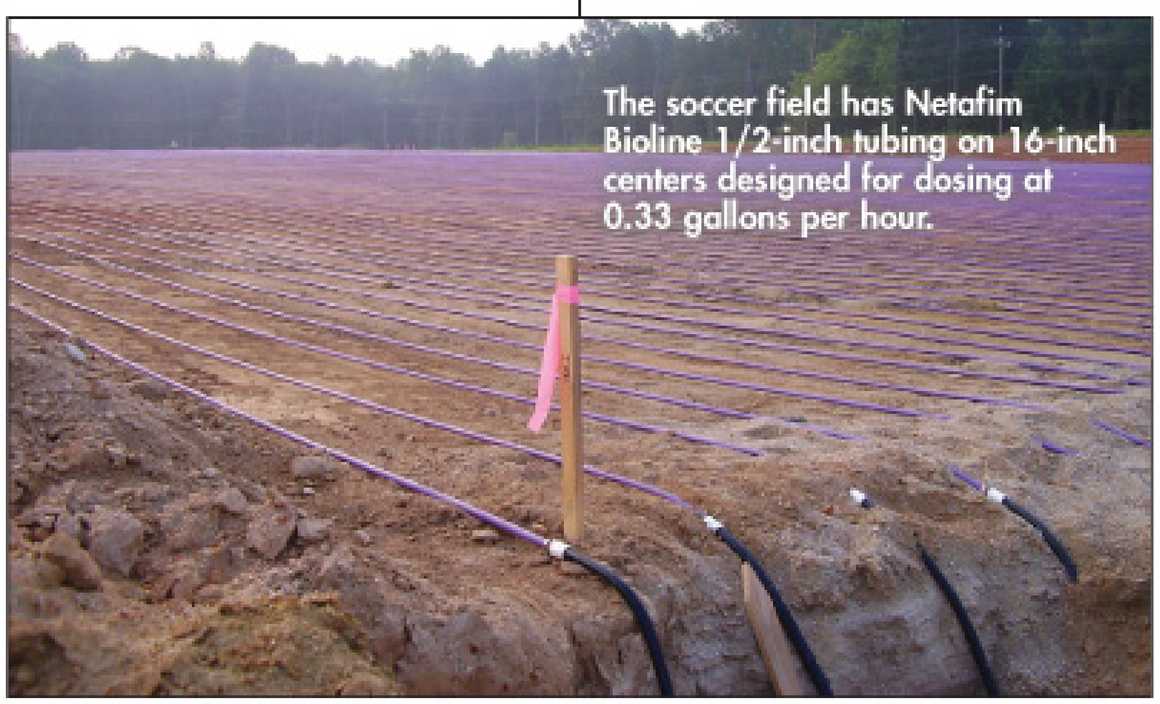
Spainhour and Sons excavated 4 feet for the athletic fields, then mined saprolite rock from different areas of the site for use as the drip irrigation system's treatment medium. Each field received 250 tractor-trailer loads of sand that Spainhour and Sons dredged from the Yadkin River 60 miles away, then screened.

Dosing the absorption beds and athletic fields is radio controlled because they are so far from the control room. Water from daily backflushing flows through the gravity sewer to the septic tank. Rainwater from a 308,000-gallon, 86- by 60-foot cast-in-place concrete cistern flushes the lines — and the toilets. Its top is a basketball court. The grass is a verdant, lush carpet on the athletic fields. "Everything works flawlessly," says Halas.

Maintenance

R. David Hicks LLC Environmental Consulting in Jamestown, N.C., operates and maintains the system, and uses a supervisory control and data acquisition (SCADA) system to monitor it. The effluent from the Living Machine has 0 to 0.5mg/l cBOD and TSS. A colder-than-normal winter caused no system shutdowns. ■

Workers from Spectrum Environmental Inc. level the Stalite PermaTill aggregate in a 32- by 32-foot tidal cell.



The soccer field has Netafim Bioline 1/2-inch tubing on 16-inch centers designed for dosing at 0.33 gallons per hour.

The football field is partially covered with sand dredged from the Yadkin River.

ASSOCIATION news

By Scottie Dayton

Onsite Installer invites your state association to post notices and news items in this column. Send contributions to editor@onsiteinstaller.com.

Taking Action

The Florida Onsite Wastewater Association assembled a task force to write a bill for next year's legislative session. It will offer alternative solutions to a springs protection bill that proposes every residence in a watershed be connected to a sewer and banning all onsite systems. FOWA's bill will also address a proposal in the spring protection bill to transfer the onsite program from the Department of Health to the Department of Environmental Protection.

Nancy Deal, a member of the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT), attended the FOWA Master Maintenance Day to photograph activities related to installing septic tanks. She will add the images to the National Installer Training Curriculum under development by the CIDWT.

Stephan "Alex" Clary, the eighth grader whose Wonder Worms project won first place at the Southwest Florida Regional Science Fair, went on to win first place in the Junior Division at the Florida State Science and Engineering Fair. His efforts earned more than $20,000 in college scholarships and prizes.

Wonder Worms hypothesized that the digestive tract of earthworms could destroy *E. coli* and fecal coliform bacteria found in onsite wastewater systems.

Iowa Professionals

Another 35 Iowa installers earned the Certified Installer of Onsite Wastewater Treatment Systems credential of the National Environmental Health Association, bringing the total to 114 in the state. Those passing the exam are offered the opportunity to become Iowa Onsite Waste Water Association certified installers. Four of the five counties requiring contractors to be certified require IOWWA certification.

Blake Rasing and Heather Adolfs received $500 scholarships from IOWWA. Blake, the son of Shari and Kenneth Rasing, finished his freshman year as a business major at the University of Iowa. Heather, the daughter of Ramona and Richard Adolfs, will study animal science and pre-veterinary medicine at Iowa State University.

Community Service

The North Carolina Septic Tank Association used fees charged for continuing education credits to fund and install an onsite system for a Habitat for Humanity home in Stokes County. Participants earned CEUs while providing a community service. NCSTA awarded $17,000 in scholarships this year.

Alternative Solution

O Instituto Ambiental (OIA) in Petropolis, Brazil, designed and installed 80 bio-digesters, one per four homes, to help the poor deal with sanitation problems. The digesters, using proprietary organic enzymes and bacteria, break down wastewater and turn it into burnable gas. The owners use the mud left over from the treatment process to fertilize crops, and return the treated effluent to the river. According to OIA, units cost $1,000 to $1,500 to set up. Visit www.oia.org.br.

CALENDAR OF EVENTS

Oct. 20-21

Delaware On-Site Wastewater Recycling Association Technical Conference, Dover Downs Hotel and Casino, Dover. Call Mike Cotten at 302/226-2844 or visit www.dowra.org.

Oct. 22-23

Ontario Association of Sewage Industry Services Rural Wastewater Treatment Expo, Hamilton. Call 877/202-0082 or visit www.oasisontario.on.ca.

Oct. 25-28

Virginia Onsite Wastewater Recycling Association Fall Conference, Koger Center, Richmond. Call 540/463-9623 or visit www.vowra.org.

TRAINING & EDUCATION

National Association of Wastewater Transporters

NAWT has these sessions:

- Oct. 9-10 – Waste Treatment Symposium, Orlando, Fla.
- Nov. 5-6 – Operation and Maintenance, San Luis Obispo, Calif.
- Dec. 3-4 – Installer Training, Sacramento, Calif.

Call NAWT at 800/236-6298 or visit www.nawt.org. For California classes, call the California Onsite Wastewater Association at 530/321-2207.

Alabama

Licensing classes are the joint effort of the Alabama Onsite Wastewater Association (AOWA) and University of West Alabama (UWA). Courses are at UWA-Livingston campus unless stated otherwise:

- Oct. 1-2 – Continuing Education, Montgomery
- Oct. 15-16 – Pumper
- Oct. 29-20 – Continuing Education, Mobile.

Call 334/396-3434 or visit www.aowa.org.

California

The California Onsite Wastewater Association is offering Inspector Training on Oct. 15-16 in San Luis Obispo. Call the California Onsite Wastewater Association at 530/321-2207.

Iowa

The Iowa Onsite Wastewater Training Center at Ankeny is offering Basic 101 on Oct. 20. Call Annette Adams at 515/964-6464 or visit www.iowwa.com.

Michigan

The Michigan Onsite Wastewater Training and Education Center at MSU Tollgate Center in Novi is offering these courses:

- Oct. 7-8 – Existing Systems Evaluator Training
- Oct. 29-30 – Soils.

Call Barb DeLong at 517/355-4720 for registration, e-mail Ted Loudon at loudon@msu.edu for course information, or visit www.egr.msu.edu/age/outreach.html.

Missouri

The Missouri Smallflows Organization is offering these CEU courses:

- Oct. 6-7 – Operation and Maintenance, Cape Girardeau
- Oct. 27-28 – Drip and Pump Panels, Liberty.

Call 417/739-410 or visit www.mosmallflows.org.

New England

The New England Onsite Wastewater Training Program at the University of Rhode Island in Kingston has these workshops:

- Oct. 1 – Innovative and Alternative Technology
- Oct. 8 – Bottomless Sand Filter Design and Installation
- Oct. 15 – Functional Inspections.

Call 401/874-5950 or visit www.uri.edu/ce/wq.

North Carolina

North Carolina Soils and On-Site Wastewater Training Academy has these courses at Raleigh unless stated otherwise:

- Oct. 1 – Introduction to Decentralized Wastewater, Boone
- Oct. 2 – Soils 220: Saprolite, Boone
- Oct. 6-8 – Subsurface Wastewater System Operator Training, Plymouth
- Oct. 13 – Introduction to Decentralized Wastewater, Greensboro
- Oct 14 – Subsurface Wastewater System Inspector, Greensboro
- Oct. 15 – Principles of Gravity System Design
- Oct. 16 – Advanced Design Lab
- Oct. 22 – Soils of the Mixed Felsic/Mafic Piedmont Region
- Oct. 23 – Soil Mineralogy, Salisbury.

Call Joni Tanner at 919/513-1678 or visit www.soil.ncsu.edu/training.

North Carolina

The North Carolina Septic Tank Association has these courses:

- Oct. 8-9 – Installer/Inspector, New Bern
- Oct. 14-15 – Installer Inspector, Greensboro
- Oct. 16 – Pumper, Greensboro.

Call Connie Stephens at 336/416-6394 or visit www.ncsta.net.

Utah

The Utah On-Site Wastewater Treatment Training Program is offering Onsite Wastewater Treatment Certification Workshops in Logan on:

- Oct. 14-15 – Level 2 Certification
- Oct. 20-22 – Level 3 Certification
- Oct. 29 – Level 3 Certification Renewal.

Call Carmell Burns at 435/797-3174 or visit http://uwrl.usu.edu/partnerships/training/classes.html.

Virginia

These courses by the Virginia Onsite Wastewater Recycling Association (VOWRA) and Virginia Center for Onsite Wastewater Training (VCOWT) are at Blackstone unless indicated otherwise:

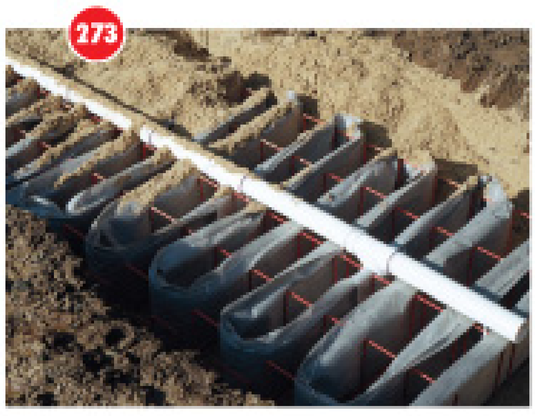
- Oct. 19-23 – Soils (VCOWT)
- Oct. 25-26 – National Installer Training, Richmond (VOWRA)
- Oct. 25-26 – Operations and Maintenance, Richmond (VOWRA)
- Oct. 27-28 – Onsite Sewage Regulations (VCOWT)
- Oct. 28-29 – Understanding Water Movement in Soil (VCOWT).

For VCOWT classes, contact Lydia Cox at 434/292-3101 or visit www.southside.edu. For VOWRA courses, contact Ben Morrell at 540/465-9623 or visit www.vowra.org. ■

PRODUCT news

September 2009

S-Box Offers Modular Leachfield System



The Modular Leach Field system from S-Box eliminates the need for stone and intricate pipefitting. Delivered complete with plumbing, the system can be installed in any weather condition. The module includes a narrow, fabric-covered fin arranged in a serpentine pattern. A wire frame, which also supports a pre-installed distribution pipe, holds the fin in place. Effluent can be supplied to the system by gravity flow, pump or siphon. The modular unit also can be used with other alternative treatment systems. **860/740-6884; www.sbox.us.** ■

ONSITE installer classifieds

September 2009

www.onsiteinstaller.com

AERATORS

We sell Flagg-Air 340, Secoh, Gast and Medo Linear, FPZ and Gast Regenerative, Thomas and Gast Rotary Vane aerators, rebuild kits and alarms at wholesale prices. Septic Services, Inc. www.septicserv.com. 1-800-536-5564. (IM)

BLOWERS

VFC200P-5T, FUJI Pumps, Regenerative Blowers, Ring Compressors. All models, accessories. Authorized distributor. Authorized parts and repair center. Call 888-227-9822. www.carymfg.com (IBM)

BUSINESSES

Florida - Installation, repair, pumping business for sale in South-Central Florida. Willing to qualify license. Advertising and name recognition in place. 863-441-5264. (I10)

BUSINESSES

(2) Septic tank delivery trucks; 1-ready mix truck; 7-Celico septic tank forms (1000-1500 gallon); misc. drop box, riser forms, lift tank forms. Trucks and loaders in good condition. (In service in 2007) All forms in good or better condition. (Used in 2007) Package price $70,000. 218-829-9678 or 800-829-5755. (IBM)

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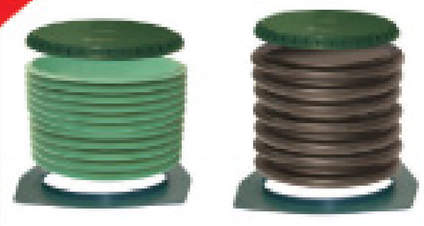

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