

Menu for Success

Three unique wastewater solutions and a combination of treatment techniques enable a small, seasonal restaurant in New York State to stay in business

By *Scottie Dayton*

A 500-gallon metal septic tank with two dry wells served a three-bedroom home when it was built on Skaneateles Lake near Syracuse, N.Y., in 1939. Later, a seasonal 100-seat restaurant was added without updating the system. It failed every summer and healed itself every winter.

Skaneateles Lake Demonstration Project authorities evaluating lake properties in 2003 felt the site posed the biggest threat to the lake. Eric Murdock, P.E., chief engineer for Syracuse and manager of the project, evaluated various advanced treatment systems. The restaurant could not afford anything more than \$75,000.

Size, electrical usage, and oper-

ation-management requirements eliminated many brands. Noise was a factor, too. "One manufacturer recommended using a 9-hp blower, which would have screamed," says Murdock. "It was not the ideal solution for a restaurant on a very quiet lake."

Murdock focused on a design that accounted for the proper settling of materials in the tanks. Research showed that for \$15,000 more he could do pretreatment, too. His design incorporates a grease trap, split flows, time dosing, recirculation, biological remediation, and in-tank and subsurface soil treatment. The system configuration, which is achieving remarkable reductions in BOD, is efficient, cost effective, and applicable to



A mobile crane operator sets the low-profile, 1,000-gallon bottomless concrete tank over the two rows of Infiltrator chambers to form the odor-recovery bed. (Photos courtesy of Eric E. Murdock, P.E.)



The odor-recovery bed is ready to be covered with organic-rich mulch. The vertical pipe is an observation port for evaluating air flow.

many commercial facilities throughout the country.

Soil conditions

Soils varied from hardpan to well-compacted silt and clay with no percolation rate. Only a small patch of rocky gravel on the 5.8-acre parcel was suitable for the drainfield. The restaurant and parking lot are in a flat area at the bottom of a steep hill. A 16-slip marina is part of the development.

System components

To calculate design flow, Murdock took daily potable water meter readings throughout 2004 to deter-

System Profile

Location:	Skaneateles Lake, N.Y.
Facility served:	Glen Haven Hotel
Designer:	Eric Murdock, P.E., chief engineer, City of Syracuse, N.Y.
Installer:	Dan Sweeney, Ted McBride Co., Cortland, N.Y.
Site conditions:	Hardpan to well compacted silt and clay, small area of rocky gravel; all with no percolation rate
Type of system:	White Knight Microbial Inoculator/Generator systems, Knight Treatment Systems Inc., Oswego, N.Y.; Equalizer 24 chamber drainfield, Infiltrator Systems Inc., Old Saybrook, Conn.
Hydraulic capacity:	950 gpd



Above, five polyethylene tanks from Fralo Plastech are positioned end-to-end in a tight configuration. At left, the recirculation valve in the dosing tank returns 100 percent of the effluent to that tank if the water in it is low. If the liquid level in the dosing tank is high, 50 percent returns to that tank and 50 percent flows through a distribution box to the trenches and dry wells.

mine water usage. Flows ranged from 65 to 1,850 gpd. To determine baseline waste strength, he collected septic tank samples from June through August, analyzing averages of five-day BOD (3,500 mg/l), TSS (1,656 mg/l), and oil and grease (520 mg/l). He sized the system to handle 950 gpd.

Major components are:

- 1,000-gallon, two-compartment polyethylene grease trap. All tanks from Fralo Plastech LLC, Syracuse, N.Y.
- Tank riser systems from Tuf-Tite Inc., Lake Zurich, Ill.
- 1,500-gallon, two-compartment septic tank.
- 5000-0011 Deluxe/Commercial effluent filter with 1/16-inch slot from Zoeller Pump Co., Louisville, Ky.
- Two 1,500-gallon, single-compartment tanks for equalization and dosing.

- 50/50/100 recirculation valve from Quantics Inc., Crestwood, Ky.
- 1/2-hp Goulds effluent pump.
- 1,500-gallon, two-compartment pretreatment tank.
- Two Model WK-80 White Knight Microbial Inoculator/Generator systems from Knight Treatment Systems Inc., Oswego, N.Y.
- 200 feet of Equalizer 24 chambers from Infiltrator Systems Inc., Old Saybrook, Conn., set on 60-inch centers.
- User Friendly Series programmable Simplex Control Panel from SJE-Rhombus Controls, Detroit Lakes, Minn.

System operation

Wastewater flows are separated inside the building. Grease-generating fixtures empty into the grease

trap, then gravity-feed into the septic tank. All sanitary plumbing flows directly into the septic tank, which discharges by gravity into the 3,000-gallon equalization/dosing tank.

"The largest tank Fralo makes is 1,500 gallons, so we manifolded two together at the bottom, enabling them to act as one," says Murdock. "They fill simultaneously." All piping is pressure-rated 4-inch PVC Schedule 40, except for the line from the dosing tank to the treatment tank, which is 1.5-inch.

An effluent pump sends 25 gallons every 30 minutes from the flow equalization tank to the two microbial inoculator generators in the treatment tank. Each unit is a 12-inch-diameter, 35-inch-long,

flows through a distribution box split six ways. Four pipes lead to 50-foot-long trenches, and two pipes lead to the dry wells.

"The original dry wells were abandoned in 1986 after reportedly failing," says Murdock. "We used the 6-foot-diameter precast concrete dry wells that replaced them."

Installation

The five tanks, positioned end-to-end in a tight configuration, were installed against a slight incline. Dan Sweeney from Ted McBride Co. in Cortland, N.Y., excavated all the soil from the embankment, placed the tanks on the flat surface, then backfilled around them to re-establish the same slope.

"We were hoping the system would achieve a 50 percent BOD reduction, then let the soil do the rest. However, we found that using time dosing and recirculation in this configuration produced a much higher reduction."

Erik Murdock

high-density polyethylene column with a 4-inch PVC pipe in the center. A bag of IOS-500 bacteria is suspended inside the pipe, which is surrounded by one cubic foot of plastic media.

An air pump introduces a steady supply of fine bubbles at the bottom of each generator. Rising oxygen mixes and distributes the microorganisms throughout the tank, where they digest organic matter. Every incoming dose displaces 25 gallons out the other end of the treatment tank. The liquid gravity-flows back to the dosing tank and passes through a recirculation valve.

If the water in the dosing tank is low, 100 percent of the effluent returns to the dosing tank. "Time-dosing enabled me to accommodate budget restrictions and address the variable flow rate," says Murdock. "Multiple recirculation also increases our treatment levels and keeps the microbes happy."

If the liquid level in the dosing tank is high, 50 percent returns to the dosing tank and 50 percent

Assembling the drainfield in the gravel parking lot took half a day. Sweeney dug 24-inch-wide, 2-foot-deep trenches, then placed the traffic-rated chambers, backfilled with gravel, and covered the chambers with geotextile fabric. Lastly, the parking lot gravel was replaced. The entire installation took a week in April 2005.

According to Murdock, manufacturers of advanced treatment technologies typically treat wastewater to a secondary treatment level of 30 mg/l BOD and TSS. "We were hoping the system would achieve a 50 percent BOD reduction, then let the soil do the rest," he says. "However, we found that using time dosing and recirculation in this configuration produced a much higher reduction."

Once Murdock figured out what the system was doing, he installed a microbial inoculator generator in the grease trap and put its second aerator in the septic tank. He then calculated his standard percent reduction by comparing the 2004 baseline BOD samples

(3,500 mg/l) to the last samples collected on June 27, 2007 (408 mg/l).

"We were targeting a 50 percent reduction, but are achieving a 97 percent reduction from an untried system configuration," says Murdock. "That's nothing short of miraculous." One element of the system's success was limiting the amount of grease introduced and having kitchen personnel scrape off plates into garbage cans.

However, the air introduced into the microbial inoculator generators created an odor problem. Murdock had a 4-inch PVC vent pipe run up the side of the building and extended above the roof. It didn't work. Heavy, moist air sweeping down the steep hill kept odors on the ground. An inline fan installed in the pipe blew the air up the vent and into the atmosphere, where downward currents picked up the exhaust and dropped it into an outdoor dining area.

Pressed to the limit, Murdock devised an innovative odor recovery bed constructed in a low profile, 1,000-gallon bottomless concrete tank. "We installed an inline fan in a 4-inch pipe that branches into two rows of chambers surrounded by washed stone, then covered with mulch," he says. "I don't believe this approach has ever been tried before, but it worked. We never had another odor."

Maintenance

Knight Treatment Systems has the maintenance agreement. A technician services the system at the beginning and end of each season.

He activates the system a week before the restaurant opens and changes out the microbial packs. By combining treatment techniques and thinking beyond conventional wisdom, Murdock created a system that is attracting much attention from the industry while saving the restaurant owner \$50,000. ■

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