

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 BOD₅ 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 BOD₅ 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 cham-

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



Wastewater stands in the failed pressure distribution disposal field.

ber and serves as a pump vault. (The top of the tank has a vented access port to the pump vault.)

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 BOD₅ 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

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the amount of grease and chemicals sent to the system, and they were very cooperative," he says.

After three months of operation, effluent began ponding above the disposal field. Clark shut off the pumps and had a pumper haul the liquid while the absorption bed rested for three months. Once the system produced high-quality effluent again, Clark reactivated the drainfield.

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.

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. ■