

Biological Workforce

By Scottie Dayton - Treatment Plant Operator Magazine August 2009

Microbial Inoculator Generators help a treatment plant cure ponding in trickling filters and resolve permit issues while improving treatment and odor control

Ponding in its two open rock trickling filters and the manifold pressure relief tube spilling over during normal dose cycles plagued the Rushville (N.Y.) Wastewater Treatment Plant and produced dissolved oxygen and ammonia issues. The situation worsened each year with increased flows.

The breaking point arrived when the small lagoon system treating wastewater from the local high school neared the end of its life expectancy. The school board, which owned and operated the system, preferred hooking to the Rushville sewer instead of upgrading its facility. But the additional 8,000 gpd from the school would cause the plant to exceed its permitted discharge of 60,000 gpd.

The village hired Sniedze Associates, an engineering firm in Canandaigua, N.Y., to design a solution. Researching options, Tom Burke, P.E., learned that the town of Savannah, N.Y., had remediated its buried sand filters by using White Knight Microbial Inoculator Generators (Knight Treatment Systems Inc.). A visit to Savannah's facility and data collected on the system convinced Rushville consultants to use the technology to remediate their treatment process.

The solution proved cost-effective and ended ponding and odors, increased plant capacity, and eliminated clogging in both filter beds' pressure distribution manifolds.

The experiment

Each lot in Rushville, population 620, has its own septic tank maintained by the village. The tanks were connected to a sewer when the village treatment plant opened in 1988. It serves 275 residential and 12 commercial accounts generating 55,000 gpd.

Treating wastewater with filtration beds was an experiment for the state Department of Environmental Conservation.

Although the technology is common and successful in the hot, arid southwest, bacteria in the exposed, uncovered beds went dormant during New York winters and drowned during spring and summer rains.

The combination created compliance issues. "Our ammonia permit is for 1.5 mg/l, and we hit 3.0 mg/l in winter," says public works supervisor Art Rilands. "We averaged 6.5 mg/l DO in summer, and we're permitted for 7.0 mg/l." Because the worst of the situations lasted only one month, regulatory authorities did not cite the plant.

Until the upgrade, the settled wastewater from individual septic tanks gravity-fed through 4- and 8-inch PVC sewers into three 6,000-gallon community septic tanks, then into a lift station. Two 7.5-hp Hydromatic pumps in the lift station pumped the effluent 35 feet up to the plant, through a drum screen, and out to the dual 110- by 220-foot trickling filters.

Seeking answers

To help meet CBOD and DO permit levels, 4-inch pipes at the bottom of the beds collected the liquids. Forty percent of the water gravity-flowed back to the plant for recirculation to the beds. The remainder flowed to a 10,000-gallon concrete aeration basin. A paddle-type aerator in the basin ran continuously to provide sufficient aeration before discharging water to a tributary of Canandaigua Lake.

The original design called for alternate dosing. As flows increased, however, plugged emitters became a big problem.

Trying to prevent the open ones from ponding, Rilands' predecessor switched to dosing both beds simultaneously.

"That didn't work for very long," says Rilands. "He then tried enlarging the 1/8-inch emitters to 1/4 inch in the 2-inch distribution pipes. They did that on one-quarter of the west bed and gave up. It didn't work."

As a partial solution, Rilands and assistant Mike Pierre jetted the distribution lines twice a year using a DT 100 trailer-mounted pressure washer (Harben Inc.) with 3/4-inch hose. Although the jetter was rated at 8 gpm/3,000 psi, Rilands cleaned at 7 gpm/2,000 psi. It took one day to jet the lines in each bed. During cleaning, a gate valve in the plant diverted the flow to the alternate field.

Up with capacity

The upgrade, which increased the plant's capacity to 79,000 gpd, went on-line in late August 2008. For the first time, the high school discharged to the sewer system.

Before entering the plant, the settled wastewater now passes through an 80,000-gallon concrete surge tank with a coarse air diffuser, then into a 20,000-gallon concrete aerobic "nursery" tank divided into five sections. Each 4,000-gallon section holds five municipal model White Knight Microbial Inoculator Generator columns.

The 46-inch-high, 16-inch-diameter high-density polyethylene columns have 1-inch tubular growth media in the center. Inserted into the media is a packet of IOS-500 bacterial matrix fixed to an inoculating wand. Microorganisms reproduce on the media and within the mixed liquor flowing through and around the columns.

An air pump introduces a fine bubble mix through a diffuser in the bottom of each column. Rising bubbles oxygenate the wastewater and activate the initial charge of bacteria, which digest the organic constituents. Effluent from the generators is pumped through the drum screen, then to the filter beds. As the microorganisms populate the nursery, enough are discharged to the beds to continue biological remediation.

Getting better

Effluent is recirculated as before, except that a fine air diffuser has replaced the paddle-type aerator in the aeration basin. "The diffuser works better, allowing us to recirculate only 10 hours a day instead of 24," says Rilands.

Because of the late-season startup followed by a harsh winter, it could take six to 12 months before Rilands sees significant changes in DO, CBOD and ammonia levels, but he has noticed other improvements. "The ponding stopped,

the microbes are eating the biomat in the filtration beds, and the odor control is much better,” he says. This spring produced a significant snow melt and heavy rains that exacerbated the treatment plant’s serious infiltration issues. At the height of the event, 275,000 gpd ran through the facility without affecting treatment efficiency. The amount of maintenance at the plant remains the same. The microbial system requires pumping every other month. “Mike and I pull the columns to make sure no debris is sticking to them,” says Rilands. “The biggest culprit is paper that sometimes sneaks through. We tap the tubes with a plastic rod to dislodge any film. We also tap a rubber membrane at the bottom of the column to clean it. The work takes half a day.” The upgrade changes anaerobic wastewater to aerobic more quickly, and Rilands sees the whole treatment process working better and more efficiently.