

G.A. Fleet Associates Provides Cost Effective Solutions for Upgrade of Goshen, NY Wastewater Treatment Plant

Wastewater treatment plants are complex systems with frequently changing flow and influent conditions. Overall parameters of a plant may also change according to the demands of the municipality, industry, and population. When a major treatment plant expansion/upgrade is required similar to the one at the Village of Goshen, NY, G.A. Fleet is available to assist the design engineer, elected town official, and plant operators with equipment selection. G.A. Fleet supplied nearly all of Goshen's equipment for the upgrade from a secondary treatment plant to a state-of-the-art tertiary treatment plant.



Technically, the initial design for expansion of the Goshen plant began some time ago with Bipin Gandhi, P.E., the Village of Goshen's engineer. This segment of the design was based on Lakeside Equipment Corp. CLR Oxidation Ditches and Spiraflo Clarifiers. The final design and contract documents were prepared by the engineering firm of Clough Harbour Associates of Albany, NY. The final contract documents included the Lakeside Equipment, ITT Santaire, ITT Flygt, ITT PumpSmart, and Trojan Technologies equipment. The Village of Goshen was able to achieve its goal of a full scale tertiary treatment plant and meet the effluent discharge permit limitations.

Plant Design Requirements

The following design data was used to select the appropriate equipment required for this project:

- Influent Parameters - Average Daily Flow = 2.0mgd / BOD5 = 230mg/l / TSS = 230mg/l / Ammonia = 30mg/l.
- Effluent Limits - Flow (30 day average) = 2.0mgd / CBOD5 = 5mg/l / CBOD5 (30 day average) = 20mg/l / UOD (30 day average), 48mg/l / TSS - 10mg/l / TSS (30 day average) = 20mg/l
- pH = 6.9 / Ammonia = 1.5mg/l / Ammonia (30 day average) = 2.8mg/l / Dissolved O2 = CBOD5 +2 and >5mg/l
- Effluent Disinfection Seasonal from 5/15 to 10/15: Coliform Fecal (30 day average) = 200/100ml Coliform Fecal (7 day average) = 400/100ml

Primary Treatment

Headworks solutions for Goshen included Lakeside Equipment:

- Raptor Fine Screen Model 47FS-0.250-132;
- Spiragrit 10 ft diameter Grit Chamber;
- Type L Grit Classifier.

The Raptor uses an in-channel cylindrical screen for removal of non-organic solids such as wood, fibrous materials, plastics, etc, which are automatically washed, dewatered, and compacted

for transportation away from the wastewater facility for landfill disposal. When the screen is called to operate by automatic cycle, liquid flows through the Raptor's screening basket, trapping solids in the circular basket formed by the bar screens. When liquid rises to a



Lakeside Equipment Raptor Fine Screen



Lakeside Equipment SpiraGrit

predetermined level, the rake begins to rotate, cleaning the screen bars. The rake's teeth pass between the bars of the screen to remove captured materials. When the rake reaches the top of the screen, the captured material drops into the central screw conveyor. For complete cleaning, the rake reverses direction and passes through a comb to its resting position and start of another cycle. The central screw conveyor then transports the

material as it is washed, compacted and dewatered on its way to the discharge chute. The next stage of treatment, grit removal, utilizes a Lakeside SpiraGrit Vortex Grit Chamber to remove grit and materials too small for the Raptor screen. The SpiraGrit operates efficiently over a wide range of daily flow rates – important for any municipality where flow rates are likely to fluctuate diurnally.



Lakeside Equipment Type L Grit Classifier

Rotating paddles maintain the flow velocity in the vortex chamber, keeping organics in suspension while allowing heavier grit to settle out on the chamber floor and eventually into the lower grit hopper. The settled grit is then transported from the grit collection hopper by a self-priming pump to a Lakeside Type L Grit Classifier. Here the grit stream is washed and separated. The wash water is discharged over a weir designed to ensure a uniform flow rate. Grit settles out of this stream and is removed by the helical screw conveyor to a dumpster for landfill disposal.

All components of the above headworks equipment are sized and furnished by Lakeside Equipment. This provides the engineer and the plant personnel with a single source of responsibility to coordinate commissioning and future maintenance.

Secondary Treatment

Secondary treatment at Goshen consists of oxidation ditches and final clarifiers for treatment. The goal is to reduce BOD and suspended solids. BOD reduction is



Lakeside Equipment Spiroflo Clarifier

accomplished by introducing controlled levels of oxygen into the wastewater to encourage microbial growth, which in turn feeds on and helps eliminate organic material from the water.



Lakeside Equipment CLR Oxidation Ditch

Central to this process is the Lakeside Closed Loop Reactor (CLR). The CLR uses a horizontal, bladed Magna Rotor to control oxygen transfer, thus allowing the proper amount of oxygen for BOD reduction. Rotor speed is controlled by variable frequency drives to optimize the oxygen transfer relative to

the energy required. Lakeside Equipment Corp. provided all of the associated mechanical components for this process, including baffles, covers and submersible mixers, all of which work in concert to reduce BOD and ammonia.

Next, the Lakeside Spiraflo Clarifiers provide effective solids separation and settling. Wastewater enters the Spiraflo Clarifier at the periphery of the tank and is directed along the narrow raceway formed by the skirt and the outer wall. This flow pattern dissipates the wastewater's hydraulic energy as it flows around the raceway and eventually spirals down under the skirt. Wastewater enters the main area and the solids settle to the bottom of the tank. From the full circumference of the skirt the clear effluent slowly rises to pass over the centrally located effluent weirs. The inflow is prevented from flowing directly to the effluent weir by the specially designed race skirt, which extends down to approximately two feet above the tank floor. The spiraling flow pattern makes use of total tank volume for more effective solids settling. The



Lakeside Equipment MagnaRotor



ITT Flygt NT-3153 RAS Sludge Pump Station

Spiraflo's hydraulic flow pattern minimizes those problems usually associated with centerfeed clarifier density effects, such as: waterwall effect, sludge wall creep and short-circuiting.

Sludge separated out by the clarifiers is removed by two separate pumping systems. The Return Activated Sludge (RAS) system consists of Flygt NT-3153 Sludge pumps controlled by an ITT PumpSmart VFD Controller. The Flygt sludge pump is designed with a self cleaning impeller, to provide reliable operation even when there is a high level of solids and fibrous content present in the sludge. The PumpSmart VFD Controller is known to significantly lower energy costs—up to 65% in some cases, by controlling pump speeds relative to the incoming flow rate to the plant headworks. The RAS pump system reintroduces sludge into the Lakeside CLR process to enhance the nutrient removal process. The second Waste Activated Sludge pumping system directs sludge from the clarifiers to the aerobic digesters.

Aerobic Sludge Digestion reduces sludge volume at Goshen. Flygt submersible mixers, Sanitaire Membrane Diffusers, and Aerzen Rotary Lobe Blowers provide the work at this stage. Sanitaire Membrane Diffusers distribute the air stream generated by the Aerzen blower system into fine bubbles throughout the sludge holding tanks. This maximizes oxygen transfer and speeds



ITT Sanitaire Membrane Diffuser Basin

growth of aerobic micro-organisms to reduce sludge volume. This process further concentrates the sludge and conditions it for eventual dewatering. The sludge dewatering process consists of a centrifuge fed by progressive cavity pumps.

Tertiary Treatment

Effluent water is polished and additional suspended solids are removed prior to discharge into the Rio Brook at the plant outlet. An automatic sand filter is used to polish the effluent of any final organics and suspended solids prior to disinfection.

Disinfection

The engineers selected UV for disinfection treatment over chemical treatment for this final stage. With Trojan Technologies UV3000PLUS ultraviolet disinfection technology, the Goshen



plant uses UV radiation to alter the DNA of bacteria, viruses, and other pathogens. The Trojan UV system continually monitors UV intensity in the reactor and sends an alarm if intensity falls below a set dose. This system also features fully automatic chemical/mechanical cleaning (ActiClean™) of lamp sleeves to maximize UV transmission and minimize fouling and field maintenance. Incorporating high-output, low-pressure lamps, the system automatically dims the lamps to match drop in flow or increases in water clarity, thereby decreasing energy consumption.

Trojan Technologies UV3000 Plus

The final stage is the Post Aeration System consisting of Sanitaire Fine Bubble Diffusers and Aerzen Rotary Lobe Blowers. In this basin, air generated by the Aerzen blowers is introduced to the final effluent through Sanitaire Fine Bubble Diffusers in order to raise the dissolved oxygen levels to minimize oxygen demand into the Rio Brook.



Trojan Technologies 3000 Plus Controls Center

G.A. Fleet's involvement in the Goshen, NY project has been pervasive. It started with suggested equipment selection in the earliest design stage and carried through to the final construction documents, bidding, obtaining orders, construction, and start-up. Few suppliers can provide this level of service, particularly for this high degree of waste water treatment.