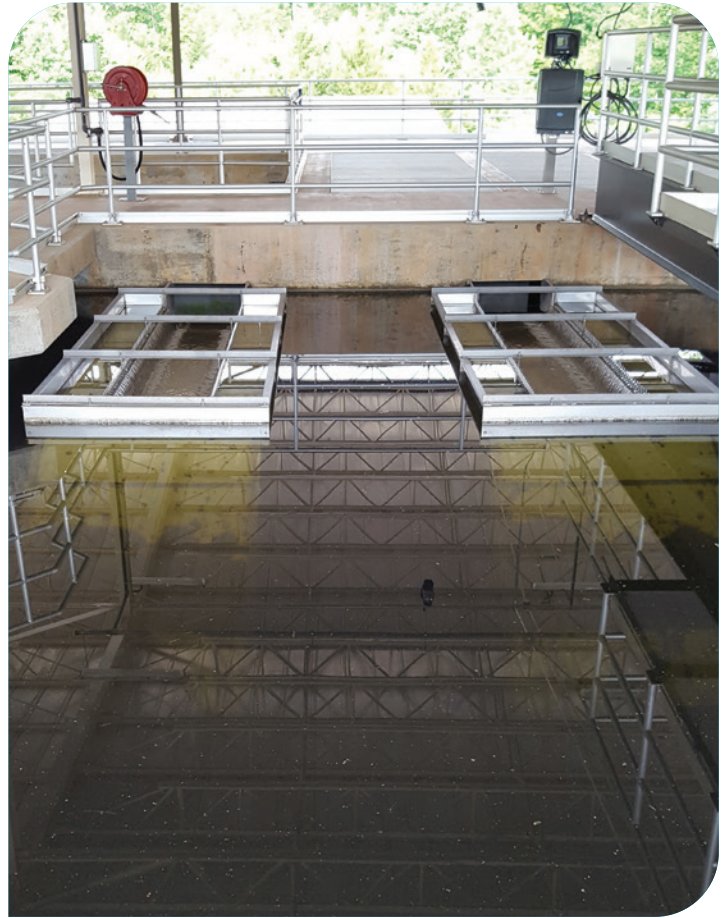


CASE STUDY

Lamella®, DynaSand®
City of Woodstock, GA



Two of Parkson's Trusted Technologies Combine to Provide an Enhanced Nutrient Removal Advantage to Protect Our Waterways

Overview

The Fitzgerald Creek Water Pollution Control Facility is owned by the Cherokee County Water and Sewer Authority (CCWSA) and located in the City of Woodstock, GA. The water reclamation facility became operational in 1988 and occupies a 50-acre campus about 30 miles NW of metropolitan Atlanta. It is permitted to treat 6.25 million gallons per day (MGD) and processes between 3 MGD and 5.9 MGD, with an average daily flow of 5.0 MGD of primarily municipal wastewater. The facility also receives wastewater from an industrial facility - a poultry processing plant.

Challenge

The original biological treatment process at Fitzgerald Creek utilized a combined extended aeration biological (sequencing batch reactor) system operating in the Intermittent Cycle Extended Aeration System (ICEAS) modified process (react-settle-decant). However, with increasing population trends and facing tighter nutrient regulations on the horizon, the CCWSA made a strong commitment to not only meet their anticipated discharge permit of 0.14 mg/L P, but consistently achieve <0.07 mg/L. In search for the right technology to assist with this venture, a technology and manufacturer evaluation process was put into place, and in 2001, plans to develop the best post-SBR treatment began.

Solution

Cherokee County conducted an extensive on-site pilot evaluation of several available process options and technologies, including various plate settler designs. Parkson (Ft. Lauderdale, FL) was selected as the preferred technology provider and piloting began in 2001.

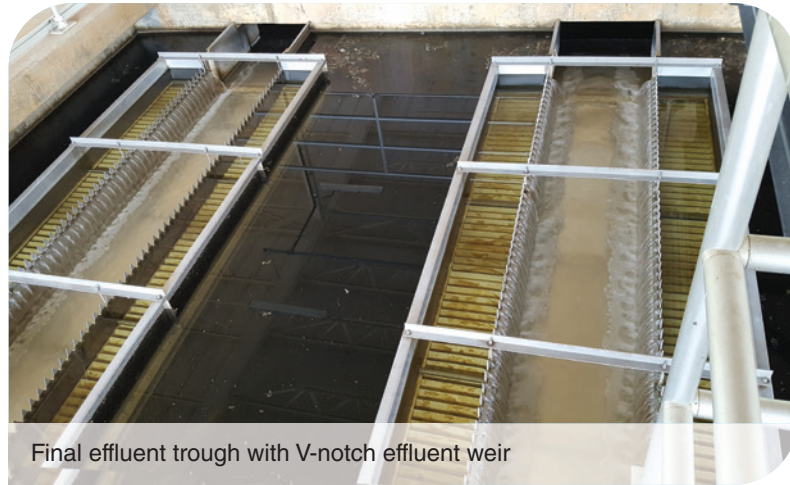
Several treatment options were evaluated, including plate pack settler only, DynaSand® continuous backwash filter only, and plate pack settler integrated with DynaSand filtration. Ultimately, the integrated design delivered the best results and far exceeded the technical performance criteria of 0.14 mg/L P, 100% of the time. The technical evaluation team and Parkson lead team then selected the combined enhanced nutrient removal (ENR) integrated design option, achieving <0.07 mg/L P, and designed to discharge into Little River directly. This included Parkson's technologies – Lamella® Gravity Settler in the plate pack configuration and DynaSand® deep bed filtration utilizing continuous backwash for overflow polishing.

One benefit of Lamella clarification is that it requires a significantly smaller footprint when compared to conventional clarifiers. The inclined plate settling area equals the plate's area projected on a horizontal surface with up to 10 square feet of settling area available for each foot of land (or floor space) occupied by the unit. Additionally, with Parkson's EcoFlow® technology, which allows for 100% plate utilization, a further 25% size advantage can be realized over other designs. When operating at optimized chemical treatment using PACL, Lamella provided a design loading rate of 0.30 gpm/ft².

Clarified water essentially free of TSS and >91% less P is then directed to Parkson's DynaSand deep bed continuous backwash sand filter. EcoWash® can be added to allow for reduced reject, higher energy efficiency and lower backwash volume - as much as 90% over traditional backwash systems - all while improving filtrate quality. Additionally, EcoWash uses a reliable PLC-based sand movement detection system that is tied to an alarm and can be monitored in the main control room. Typical final effluent concentrations for ammonia, phosphorus and turbidity leaving the final polisher and entering the Little River are shown in Table 1.



Plate pack and sludge rake mechanism



Final effluent trough with V-notch effluent weir

Table 1: Fitzgerald Creek WTF Effluent Quality

	Target	Average
Ammonia (mg/L):	0.5-1.0	<0.05
Phosphorus (mg/L):	<0.14	<0.06
Turbidity (NTU):	<2.0	<0.30

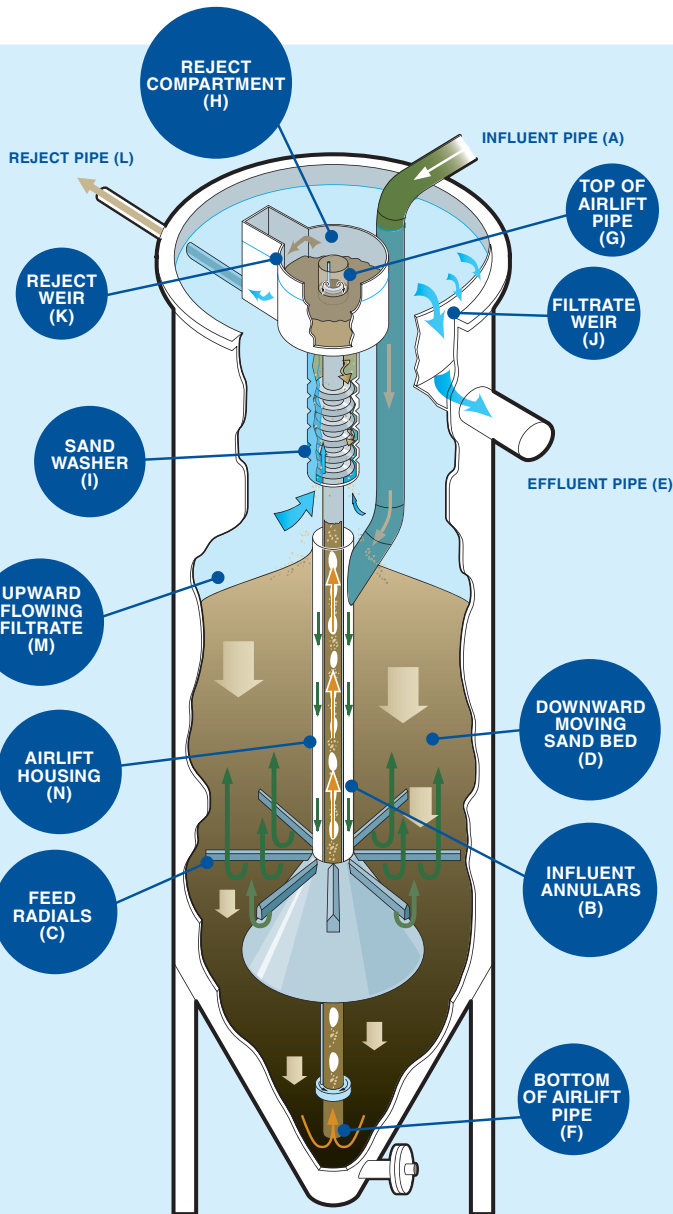
* Effluent empties directly into the Little River. Final water quality is well below national discharge permit limits on these powerful nutrients that impact aquatic environments negatively, even at small concentrations.

Fitzgerald Creek Facility Operation

Fitzgerald Creek's headworks consists of screens and flow equalization tanks that pre-condition and flow equalize the raw wastewater. Raw municipal water is then conveyed to four basins utilizing an extended aeration SBR process. The operational parameters are geared towards younger biology and low-end HRT to ensure highest biodegradation efficiency at high sequence rates of <10 days. The F:M ratio is maintained at 0.05-0.07. The basin SBR DO is maintained between 3-4 mg/L.

Table 2: SBR Operating Parameters

SBR Operating Parameters	Range
DO (react only)	3 to 4 mg/L
pH	6.7 to 7.1
F:M	0.05 to 0.07
Actual SRT	6 to 10 days



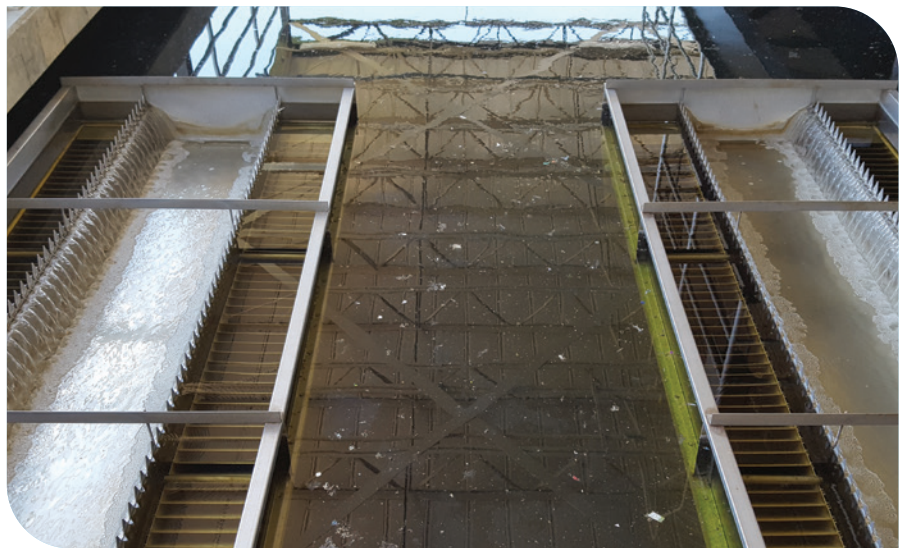
Cross-sectional view of DynaSand internals

SBR overflow is decanted to a pit preceding the Lamella gravity settler basins. The overflow first enters a flash mixing compartment where 140 mg/L-160 mg/L PAC is introduced under agitation for particle agglomeration and to enhance settling characteristics. Post agglomeration, 1-2 mg/L of anionic polymer is fed to flocculate the solids.

Chemically conditioned wastewater is then directed via gate valves to four Lamella settler basins each having four sets of Lamella plate packs. Each Lamella basin serves as a secondary clarifier where agglomerated and flocculated raw water solids settle onto inclined plates per basin. Solids that settle into the plates eventually drop to the bottom where a rotating assembly pushes the solids towards a central location to be pumped out. All solids are directed to the onsite digesters for further treatment.

Overflow is directed to a series of Parkson's DynaSand deep bed filter modules by gravity. The integrated LGS-DSF design is an enhanced nutrient removal process recognized for its superior ability to treat municipal water and wastewater to a final effluent quality that exceeds NPDES quality standards for surface water nutrients such as TSS, turbidity, and nitrogen and phosphorus. The Lamella Gravity Settler was equipped with EcoFlow® technology which allows for 100% plate surface area utilization. It is a true advancement over prior plate configurations where only 80% of the plate area was available for settling. EcoFlow benefits are unmatched in its peer group for plate efficiency and performance and allows for superior particle capture at higher flows.

To complete the enhanced nutrient removal process, Parkson's continuous backwash DynaSand filter system was added after the Lamella settler. An added benefit of using the single-stage deep-bed DynaSand filter system is its capability to be upgraded in the future to meet low Total Nitrogen (TN) limits. The DynaSand filtration system has the ability to simultaneously remove both N and P in the same filter with the addition of a supplemental carbon source and operated as a denitrification filter.



Results

Piloting concluded in 2008. Since then, the Parkson enhanced nutrient removal (ENR) integrated design continues to deliver water quality of <0.1 mg/L ammonia, <0.07 mg/L phosphorus and <0.5 NTU. Not only does the Fitzgerald Creek WWTP consistently meet EPA direct discharge limits on BOD, Total Nitrogen, phosphorus and turbidity, but these final effluent values are under Fitzgerald Creek's surface water discharge permits levels.

Plant operators have been very pleased with performance of the system and even received recognition as the 2015 Water Reclamation Facility of the Year by the Georgia Association of Water Professionals in the category of Advanced Treatment. This distinguished plant consistently exceeds their NPDES (National Pollutant Discharge Elimination System) surface water discharge permit on nutrients 100% of the time. ■

Table 3: Final Water Quality- Data to Little River

Water Quality Parameter	Lamella Feed	Post Lamella PP	Post DynaSand SF
TSS	>50 mg/L	<5 mg/L	<2 mg/L
Ammonia	0.05 to 0.5 mg/L	NA	0.04 to 0.09 mg/L
Phosphorus	1 to 3 mg/L	0.04 to 0.17 mg/L	0.03 to 0.07 mg/L
Turbidity	15 to 20 NTU	0.5 to 1.5 NTU	0.1 to 0.3 NTU



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