

Energy Efficient Nutrient Removal Process

STM-Aerotors™ and COP™ Clarifiers



CASE STUDY

Location: Village of Patchogue, New York

Owner: Village of Patchogue

Engineer: H2M (Holzmacher, McLendon & Murrell)

Contractor: R.J. Industries

Upgrade and Expansion

Constructed in 1926, the Village of Patchogue Wastewater Treatment Plant (WWTP) has seen many upgrades over the years, most recently in 1987. With a growing demand and an aging system, the existing equipment was operating past its design life and maintenance and repairs were becoming more frequent and expensive. In 2004, the Village decided to upgrade the entire sewer system and treatment plant.

Prior to the treatment plant upgrade Patchogue used a rotating biological contactor (RBC) for the biological treatment process. While this system was effective in removing carbonaceous BOD and providing some nitrification, it did not provide any nutrient removal.

The Village of Patchogue WWTP discharges directly into the Patchogue River near the South Shore Estuary of the Great South Bay in New York. The WWTP had also been labeled as one of five point source polluters of the South Shore Estuary. The Village set the goal to substantially contribute to the improvement of the water quality of the South Shore Estuary by reducing discharge limits to less than half of the permit regulations.

When nutrients such as ammonia, nitrate, and phosphorus enter the Patchogue River eutrophication takes place, reducing the fish population. For the WWTP upgrade and expansion, Patchogue looked for a technology that would provide nutrient removal in order to meet the discharge requirements.

In addition to meeting self-imposed regulations, the treatment plant sits on less than one acre, providing one of the greatest design challenges. The consulting engineer, Steve Cluff, said that “finding successful, low cost technologies which provided excellent treatment in a small footprint was critical.”

Pilot Study

In 2003, WesTech completed a pilot study on Long Island which proved the STM-Aerotors™ is an energy efficient technology that can be installed within a small footprint for biological nutrient removal. Successfully combining the advantages of the activated sludge and fixed film processes in a simple design, the Aerotor is a remarkable breakthrough in biological treatment.

When compared to other activated sludge technologies, the Aerotor used significantly less land area, lowers capital costs, and dramatically reduces power requirements. Aerotor effluent quality is better than that of typical fixed film processes and is comparable to the best activated sludge systems.



STM-Aerotors™ Basins

The Aerotor delivers aeration and mixing without the use of blowers, aeration piping, or diffusers due to its innovative design. With each rotation, Aerotor captures atmospheric air and draws it down into the mixed liquor and slowly releases the compressed air as coarse bubble aeration. In addition to effective aeration, the Aerotor also provides a large surface area for fixed film growth. The fixed film biology is a more diverse population of that improves the sludge settling characteristics of the solids.

STM-Aerotors™

| | |
|-----------|---------------------------|
| Quantity | 3 Aerotor units per basin |
| Schematic | 2 basins in parallel |
| Motor HP | 10 HP each |

WESTECH®

 SWIRE WATER

Equipment Selection

In 2010 WesTech was selected to provide two (2) STM-Aerotor systems and two (2) 55 ft diameter Clarifiers with WesTech's Clarifier Optimization Package (COP).

| COP Circular Clarifier | |
|------------------------|----------------|
| Quantity | Two (2) |
| Dimensions | 55 ft diameter |
| Sludge Collection | Spiral Blades |
| EDI | Dual Gate |

Due to the energy savings of the Aerotor and COP systems, Patchogue received grant funding including, green grant funding from the New York State Energy Research and Development Authority (NYSERDA). The new plant design incorporated complete nitrification and denitrification as well as increased capacity from 0.5 MGD to 0.8 MGD.

WesTech's COP Clarifiers provide many advantages over conventional clarifiers. Energy Dissipating Inlet (EDI) structures, spiral rake blades, and the sludge withdrawal ring provide optimum clarification, solids removal, and improved underflow concentrations.

WesTech offers the unique Dual Gate EDI. The Dual Gate EDI gives the flexibility to adjust for counter flow, tangential flow, or impinging flow conditions.

WesTech's spiral rake blades move solids more than four times faster than conventional rake blades. Rapid solids removal is critical to prevent denitrification and phosphorus release in the secondary clarifier. The sludge withdrawal ring reduces sludge inventory and sludge blanket depth while maintaining high solids concentrations. WesTech's fixed ring also reduces and eliminates underwater seals that frequently require maintenance.

The COP Clarifiers combine multiple performance enhancing features into a single system providing the most efficient secondary clarifiers available.

Customer Satisfaction

Operators at the Patchogue WWTP are pleased with the new equipment as operations and maintenance have been simplified with the Aerotor and COP technologies. They are reporting low effluent nitrogen levels and everyone is pleased with the quality of water being produced.



COP™ Clarifiers



COP: Rapid Sludge Removal Components

WesTech's STM-Aerotor and COP Clarifiers are an effective way to remove biological nutrients and improve water quality. Following the installation, Patchogue WWTP has continually met their discharge requirements. The new system is an efficient, compact, and low cost system that plays a vital role in the revitalization of the South Shore Estuary.

Village of Patchogue WWTP Water Quality

| | Influent | Effluent |
|------------------------|--|--|
| Total Nitrogen | Range: 31-53 mg/L Avg: 41.9 mg/L | Range: 1.3-13 mg/L Avg: 4.2 mg/L |
| Carbonaceous BOD | Range: 210-590 mg/L Avg: 320 mg/L | Range: < 4-4.4 mg/L Avg: < 4 mg/L |
| Total Suspended Solids | Range: 50-276 mg/L Avg: 173 mg/L | Range: < 5-24 mg/L Avg: 7 mg/L |