



AEROMOD
Wastewater Process Solutions

SEQUOX® Biological Nutrient Removal

Activated Sludge Process Provides Nutrient Removal with High Quality Treatment and Energy Savings



Quincy, CA 1.1 MGD

Aero-Mod believes nutrient removal requires energy efficiencies. The SEQUOX® Biological Nutrient Removal Process along with the **DO optimizer**® control meets this requirement. It is the latest innovation for biological nutrient removal from Aero-Mod. SEQUOX (SEQUential OXidation) offers the benefits of sequencing aeration with plug flow kinetics and the reliability of continuous clarification.

Consistent superior effluent quality is achieved with total nitrogen levels of 3 mg/L or lower. Phosphorus removal

can be achieved by incorporating a fermentor/anaerobic selector and/or chemical addition. The process is energy efficient and has a small footprint. Furthermore, it requires no recycle pumps or mixers.

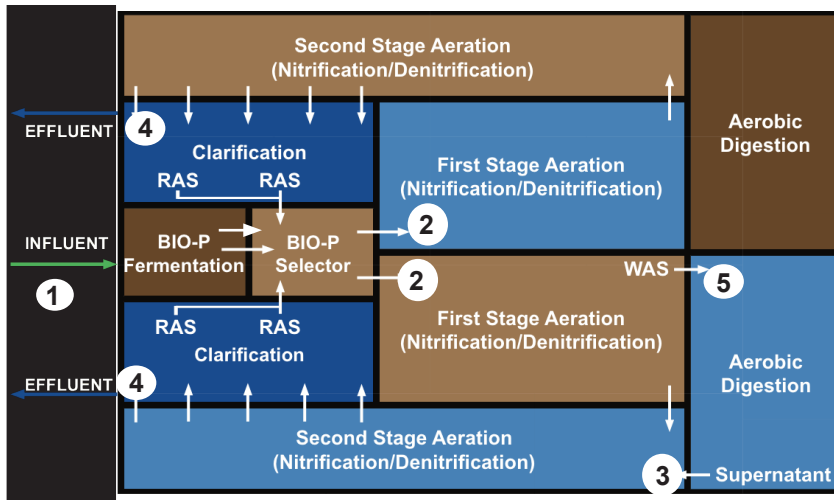
The SEQUOX® process often incorporates the ClarAtor® clarifier technology which is low-maintenance and operator friendly. Featuring stainless steel and fiberglass components with no moving parts below the water, its unique flow regulation system provides in-basin surge storage. The **DO optimizer**® control system

FEATURES

- Biological Nutrient Removal
- Plug flow kinetics
- Continuous clarification with sequencing aeration
- Sequential reactions without turning blowers on/off
- Superior energy control
- Operator friendly and low maintenance
- Automatic back-up controls should PLC fail
- Selector tank promotes better settling characteristics
- No moving parts below the water surface

maximizes energy efficiency by balancing organic demand with mixing energy requirements.

At Aero-Mod, we take great pride in our innovative processes that prioritize saving money and energy for our clients. We are committed to keeping innovation at the forefront of our design.



SEQUOX® Biological Nutrient Removal

1 – Flow enters into an Anoxic- Selector Tank or BIO-P Fermentor/Anaerobic Selector Tank, where the raw sewage is combined with returned activated sludge (RAS) from the clarifiers.

2 – This mixture then flows into the First Stage Aeration Basins where the air is sequenced on/off on a 2 hour cycle. During peak organic loadings the **DOptimizer** controls the alternation of air and can activate both 1st Stage Aeration Basins.

3 – Flow continues into the Second Stage Aeration Tanks, where aeration is sequenced on/off on a 2-hour cycle between the two basins. This sequencing is opposite to the 1st Stage Aeration Basins. The result is efficient nitrification/denitrification through sequential reactions, eliminating the need for turning blowers on and off or using dedicated internal recycle pumps and mixers in separate anoxic tanks.

4 – The flow then enters the ClarAtor Clarifier where the biomass is settled and returned to the Selector Tank. The clarified effluent is withdrawn and discharged.

5 – At regular intervals solids are automatically or manually wasted to an Aerobic Digester/Aerated Sludge Holding Tank. Supernatant is simultaneously decanted back to the aeration process over a fixed level weir.

The combination of cyclical aeration in the four (4) basins creates excellent aerobic conditions for BOD and ammonia removal when aerating. When the air is off, the nitrate laden MLSS settles and becomes oxygen deprived, creating anoxic conditions for the nitrates to become the oxygen source and allow for denitrification to occur. The plug flow process repeats this cyclical on/off aeration several times as the liquid mass progresses through the SEQUOX® process and on to the clarifier.

The SEQUOX® process with our innovative **DOptimizer** control strategy offers optimal energy efficiencies. It has more turn down for under loaded plants than ever before. The control philosophy allows the plant to mimic the actual organic loading coming to it. A plant is driven either in an organically “ACTIVE” mode; or, it is in a mixing “SEMI-ACTIVE” mode; or, it is virtually under no organic load and can “REST”. Energy savings is the result of operating the minimum required basins and reducing blower usage for minimum mixing energy, or, no energy as the blowers are turned off in the “REST” mode.

LOAD TUNE YOUR PLANT WITH THE



CONTROL STRATEGY

ClarAtor® Clarifier

Combining the SEQUOX process with the ClarAtor clarifier technology offers cost effective compact solution. Other ClarAtor advantages include:

- No moving parts below the water
- Unique ability to regulate effluent flow rate for in-basin surge storage
- Uniform influent distribution and collection
- Stainless steel and fiberglass fabrication
- Rapid and positive sludge withdrawal
- Minimal maintenance

Use the SEQUOX® Process and DO₂ptimizer™ D.O. Control to “Load-Tune” Your Process

Aero-Mod’s SEQUOX® process has a continuous, plug-flow pattern with sequential reactions. Sequential reactions means the aeration basins are aerated intermittently to minimize the mixing requirements to half of the tankage. Sequential reactions also means that with the alternating conditions of aerobic and anoxic, nitrification and denitrification will occur in the aeration basins. Denitrification will reclaim a portion of the oxygen used in nitrification. Use of the DO₂ptimizer™ D.O. Control System

provides control of the air supplied to the aeration system in the tankage to provide the minimum air necessary for proper treatment and operation. At all times the Dissolved Oxygen (D.O.) level in the aeration basins is monitored, and the proper blower operation is correspondingly controlled. During periods of high loading (organic driven), the blower speed and quantity are adjusted to maintain the D.O. level within a set range. During periods of low loading (mixing driven), the blower speed and quantity are adjusted

to maintain mixing intensity while limiting the D.O. to a maximum level. During periods of minimal or no loading (rest), the blowers are turned off to allow the process to “rest”. The combination of the SEQUOX Process and the DO₂ptimizer D.O. Control System provide a cost-effective way of maintaining the most power-efficient operation of the wastewater treatment plant while achieving Total Nitrogen removal to the lowest levels attainable biologically.

Operator-friendly settings give the operator full control of the process.

The screenshot displays the DO CONTROL interface with the following data:

ACTIVE DO STATUS		DO READING INTERVAL		HIGH DO SETPOINT	
AVERAGE DO ACTIVE	0.40	1.0	1.5	WINTER MODE NOT ACTIVE	
BASIN A1 DO	0.57	INTERVAL REMAINING	0.96	DEWATERING MODE NOT ACTIVE	
BASIN B1 DO	0.23	LOW DO SETPOINT	1.0	WAS PUMP NOT RUNNING	

BLOWER	STATUS	MODE	ACTUAL Hz	ACTUAL Hz
BLOWER - 1	RUNNING	LEAD	60	ACTUAL Hz
BLOWER - 2	RUNNING	LEAD	60	ACTUAL Hz
BLOWER - 3	RUNNING	LAG-ONLINE	22	ACTUAL Hz
BLOWER - 4	STANDBY	LAG-ONLINE	0	ACTUAL Hz
BLOWER - 5	IDLE / OFF	LAG-OFFLINE	0	ACTUAL Hz

SETPOINTS	BLOWER1	BLOWER2	BLOWER3	BLOWER4	BLOWERS
BLOWER / AERATION SHUTDOWN OFF DELAY REMAINING	15	THESE TWO TIMERS ARE FOR HIGH DO CONDITIONS			
BLOWER / AERATION OFF TIME REMAINING	30				
LAG BLOWER ON DELAY REMAINING	15	THIS TIMER IS FOR LOW DO CONDITIONS			

Navigation menu: PLANT OVERVIEW | PLANT STATUS | DO STATUS | POSITIONING VALVES | BLOWERS | TRENDS | SETPOINTS | SETTINGS | ALARMS

- TN levels to lowest achieved biologically
- Mimics/matches actual demand to achieve energy efficiency
- Able to reduce energy consumption over conventional D.O. control
- Operates with energy efficiency even on plants well below design capacity

ClarAtor® Clarifier Technology

Headache Free Clarifier With No Moving Parts



The ClarAtor clarifier equipment is installed into concrete tankage, utilizing common-wall aeration basin construction, helping to lower capital and construction costs.

Aero-Mod's proven ClarAtor® clarifier technology puts the operator in the best position to succeed. It features no moving parts below the water, a uniform distribution of the influent, and a uniform collection of the effluent. It also offers the unique ability to regulate the effluent flow rate. It is applicable to municipal and industrial biological wastewater treatment plants.

This secondary clarifier technology can be used for a wide range of flows

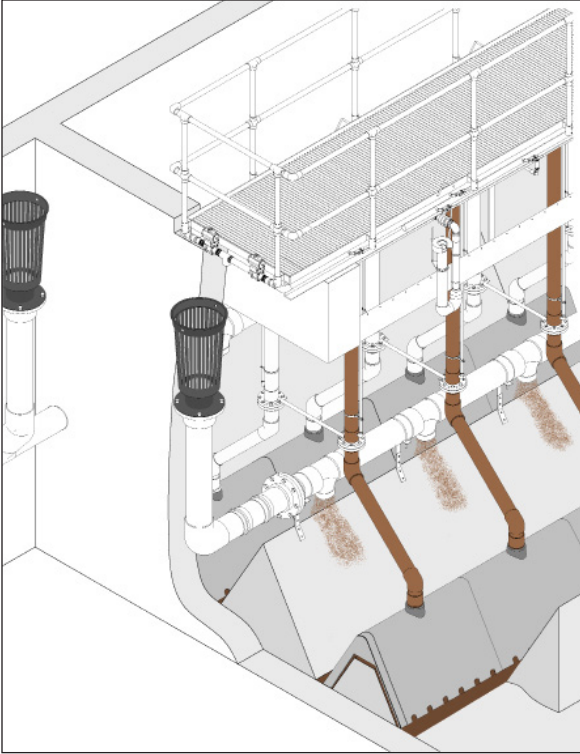
(including infiltration and inflow problems) and can be applicable for retrofitting rectangular clarifiers.

The clarifier equipment is typically installed in conjunction with the SEQUOX nutrient removal process. It is installed into concrete tankage that is common wall to the activated sludge process. The equipment is fabricated of stainless steel, fiberglass and associated PVC piping with a bridge that includes grating and aluminum handrails.

ClarAtor® Clarifier

- No moving parts below the water surface
- No motors, gears or electrical components
- Stainless steel and fiberglass fabrication
- No field welding or painting
- Uniform influent distribution
- Unique ability to regulate effluent flow rate provides in-basin surge storage
- Rapid and positive sludge withdrawal
- Minimal maintenance
- Applicable over a wide range of flows

Typical operator attention required is periodic cleaning of the walkways, skimmers, and effluent discharge weirs. Because no mechanical equipment is below water, maintenance is virtually eliminated.



Distribution and removal system creates the optimal settling environment for wastewater treatment plant clarification. Furthermore, the ClarAstor's unique effluent regulation system allows more flow to enter the plant than is exiting, creating in-basin surge storage.

within the basins or in a sideline surge tank. This flow control system limits the upward velocity in the clarifier, producing a better quality effluent with a more regulated flow rate to downstream tertiary treatment or disinfection systems.

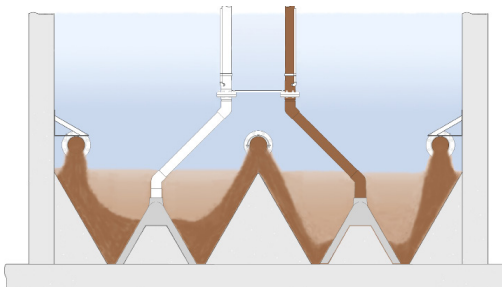
With no moving parts under the water and common-wall construction of the process tanks; a complete treatment plant fits in a rectangular configuration. This greatly reduces yard piping, electrical requirements, transfer pump stations and treatment footprint. The end result can be significant savings in capital and maintenance costs.

Settling occurs under ideal conditions because there is not a moving sludge scraper. Settled solids are rapidly removed from the bottom of the clarifier through stationary hydraulic suction hoods evenly spaced across the floor of the clarifier. Airlifts attached to the top of these suction hoods provide the pumping mechanism. The return activated sludge (RAS) rate is controlled by a timer which controls the airlifts in a "minutes on/minutes off" mode.

The return activated sludge is discharged back to the selector/ aeration tank through the RAS trough on the bridge.

Effluent is evenly withdrawn across the clarifier through submerged launders and discharges through a flow regulation system. This unique system with the ClarAstor technology creates a clarifier able to regulate the effluent flow rate on the downstream end and absorb the excess flow

The hydraulic suction hood assemblies have ports along the bottom of the clarifier to allow solids removal via airlifts evenly spaced along the length of the suction hoods.



SEQUOX® Process

Combining the ClarAstor Clarifier with the SEQUOX process offers a compact low maintenance plant. Other SEQUOX advantages include:

- Biological nutrient removal
- Continuous clarification with sequencing aeration
- Operator friendly, low mechanical process
- Reduced energy requirements
- Superior effluent quality



AEROMOD
Wastewater Process Solutions

SR Diffuser Access System

An Innovative Solution to the Challenge of Diffuser Inspection and Maintenance



The patented SR (Slide Rail) Diffuser Access System provides simple removal of the aeration diffusers within a tank without turning off the blowers or draining the tank(s). Applications for the system typically are for aeration or digester basins.

Isolation and air control are provided by a ball valve on each assembly. Removal is achieved by loosening a stainless steel union and lifting up the lightweight PVC assembly on guides. Rigidity is provided by a permanently mounted stainless steel slide rail firmly bolted to the tank wall and floor. The result is a low maintenance, operator friendly system for diffuser upkeep.

Diffuser inspection is easily accomplished without draining the tanks, turning off the blowers or

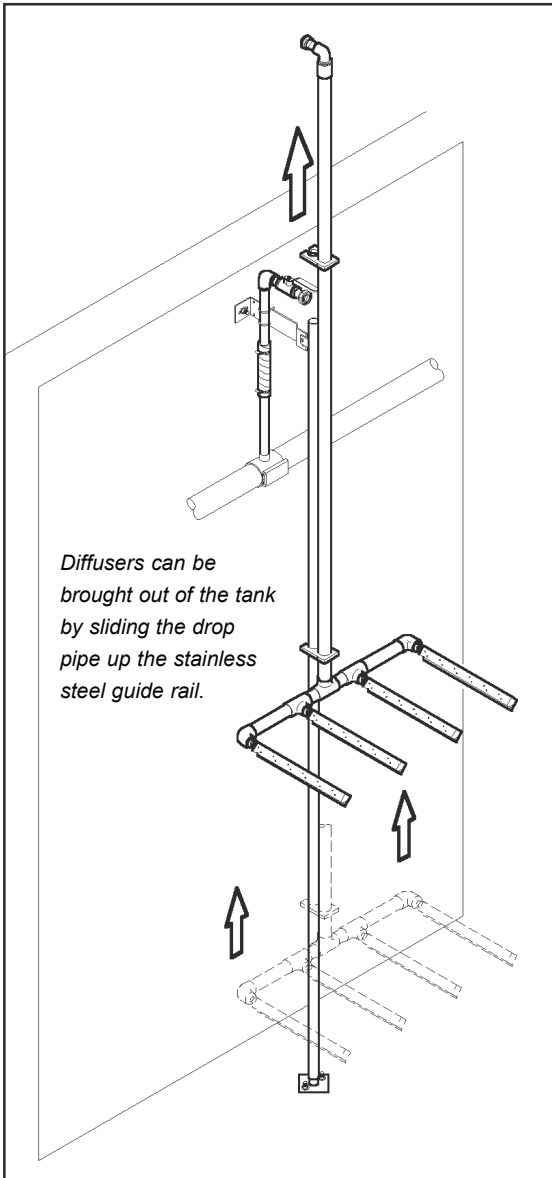
SR Diffuser Access System

- **Lightweight diffuser system**
- **Provides access to diffusers without turning off the blowers or draining tanks**
- **Individual isolation and control**
- **Constructed from long lasting, non-corrodible materials - S/S and PVC**
- **Connects to new or existing air pipes**
- **Eliminates the need for hoist or winching systems**
- **Provides access to an individual drop pipe without affecting the entire system**

using a hoist. Diffuser cleaning and maintenance can be performed without affecting the operation of the treatment plant or shutting off other diffuser assemblies.

Typical installations include the tubular type of coarse or fine bubble diffusers. Two to six diffusers assemblies are usually mounted to a common slide rail system.

Product Bulletin



PVC Drop Pipe

Typically, a two inch schedule 40 PVC pipe is used to transfer air to the diffusers below the surface of the water in the tank. Supports are mounted to the drop pipe that direct the assembly along the guide rail for inspection and maintenance. At the top, a stainless steel union is installed on the pipe that can easily be disconnected for removal of the assembly. Additionally, a stainless steel shut-off/throttling ball valve is located at the top of the assembly to isolate the assembly from the air line.

Guide Rail Mounting System

The rigidity needed for operation of the SR Diffuser Access System is provided by the 1.5 inch, schedule 5,

stainless steel guide rail. The guide rail is attached to the side of the tank, near the top, by a stainless steel wall bracket and then secured to the bottom of the tank by a stainless steel floor mounted support.

Installations of the SR Diffuser Access System can include new construction or retrofits to existing mixing or aeration basins. Systems can be designed for “wet installation” in retrofit applications with all hardware mounted above the water.

Diffusers

The SR Diffuser Access System can be used with stainless steel coarse or tubular membrane diffusers. The arrangement of the diffusers per drop pipe is usually two, four or six diffusers in either 12 or 24 inch diffuser lengths. The number of diffusers, as well as the total number of SR assemblies, is contingent on the air requirements. This flexible system readily accepts most types of diffusers in varying amounts.

Aero-Mod Treatment

The SR Diffuser Access System is an innovative component of an Aero-Mod wastewater treatment solution. Every Aero-Mod system is custom-designed to your exact specifications and features:

- 304 Stainless steel fabrication for long-term reliability and reduced maintenance
- Simple, operator friendly processes and equipment for operational consistency
- Common-wall, cast-in-place concrete tank construction for easy expansion
- Patented equipment and processes