

# TETRA® CoIOX™ Bioreactor System

Severn Trent Services offers the TETRA® CoIOX™ aerobic bioreactor system that uses a fixed-film biological process to provide superior nitrification, BOD reduction and filtration of suspended solids for water and wastewater applications where aerobic biological treatment is used. Configured as a submerged packed bed reactor, this compact space-saving unit offers greater efficiency, operational reliability and versatility than other aerobic biological treatment processes. When combined with the TETRA® Denite® system for biological denitrification, CoIOX provides superior biological nutrient removal to meet strict discharge standards in a fraction of the space required for other systems.



The CoIOX system functions predominantly as a fixed-film system with microorganisms attaching themselves to the surface of the media. The voids between the media granules also serve as areas for suspended biomass growth, resulting in a significant increase in total microorganism concentration. Therefore, the detention time required for effective wastewater treatment is significantly decreased while the solids retention time is increased.

CoIOX media is submerged, maximizing treatment efficiency and enabling greater process control. Media selection is essential and provides the maximum surface area and void volume for biomass growth and the filtration capability to assure superior solids removal. Media is selected on the basis of effective size (high specific surface area), uniformity coefficient, shape, hardness, and specific gravity. Air supplied from the bottom of the unit has a slow movement upward through the media which provides for very high oxygen transfer efficiencies.

Influent suspended solids and excess biomass are removed by the TETRA Power Backwash™, a procedure where backwash air and water are supplied to the bottom of the reactor as required to control solid loading within the reactor.

## Applications

- **Nitrification:** applied loadings of ammonia-nitrogen of 30-50 lb/day per 1,000 ft<sup>3</sup> of media can be handled at wastewater temperatures as low as 10°C (50°F) with an oxygen transfer efficiency of at least 15%.
- **BOD Reduction:** high loadings of soluble organics (up to 250 lb of BOD/day per 1,000 ft<sup>3</sup> of media) can be treated due to the unique media characteristics and the heavy-duty reactor construction. Intimate contact of the water with the concentrated biomass assures treatment efficiency.
- **Suspended Solids Removal:** the reactor media can accommodate high solids loadings and the effluent meets most secondary treatment standards. Excess solids are wasted from the reactor by applying backwash air and water, simultaneously, to the bottom of the reactor at rates of 6 icfm/ft<sup>2</sup> air and 6 gpm/ft<sup>2</sup> water.

Typical Results for TETRA® CoIOX™ System			
	Municipal	Industrial	
Parameter	Effluent	Influent	Effluent
BOD (mg/L)	<5	1000	<5
NH <sub>4</sub> N (mg/L)	<0.5	250	<2
TSS (mg/L)	<10	—	<10



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## TETRA® CoIOX™ System Components and Specifications

Depending on the application, the TETRA® CoIOX™ system will consist of one or more packed bed bioreactors with all necessary auxiliary equipment. All units are custom designed to meet treatment and site requirements.

- **Reactor Vessel:** concrete or steel, round or rectangular - usually 18-20 feet deep.
- **Reactor Bottom:** nozzleless design; stainless steel air headers and pipe laterals; plastic jacketed 5000 psi concrete T Block underdrains.
- **Reactor Media:** monomedia granular sand with 2-3 mm effective size at depths of up to 10 feet.
- **Support Layers:** gravel in five layers totaling 36 inches deep in a reverse graded fashion.
- **Backwash Air:** distributed across the entire area of the reactor bottom, supplied by a positive displacement blower at a rate of 6 icfm/ft<sup>2</sup>.
- **Backwash Water:** supplied at a rate of 6 gpm/ft<sup>2</sup> with a low head centrifugal pump. The head loss across the reactor bottom is 4.0 inches water column.
- **Process Air:** utilizes the same distribution system as backwash air, each reactor is supplied by a dedicated blower.
- **Reactor Valves:** pneumatic or electric control valves with double acting cylinders. Isolation valves can be included.
- **Instrumentation:** PLC with human machines interface and multiple screens included. Also includes output for a centralized computer control and/or SCADA system. It also includes flow meters, analyzers, level switches, local panels and system alarms.
- **Reactor Operation:** Automatic with manual overrides. Backwashing and air bumping are time based.
- **System Integration:** Works well with other treatment plant processes such as overall nitrogen removal.

