



AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

SUCCESS STORIES

PLANT NAME AND LOCATION

YORK RIVER TREATMENT PLANT (HAMPTON ROADS SANITATION DISTRICT) - YORK RIVER, VA

DESIGN DAILY FLOW / PEAK FLOW

0.5 MGD (1893 M³/DAY) / 0.5 MGD (1893 M³/DAY)

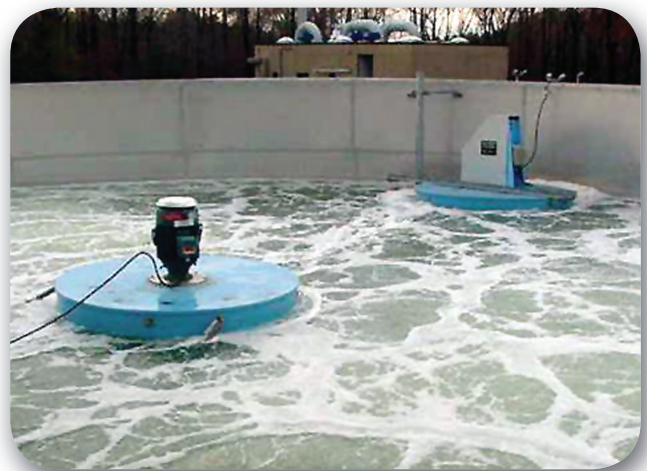
AQUA-AEROBIC SOLUTION

SINGLE-BASIN AquaSBR[®] SYSTEM, 4-DISK AquaDisk[®] FILTER

AQUA-AEROBIC TECHNOLOGIES CHOSEN FOR FIRST MUNICIPAL-INDUSTRIAL WATER REUSE PROJECT IN VIRGINIA!

Hampton Roads Sanitation District (HRSD) was created in 1940 to reduce pollution in the Chesapeake Bay. It currently serves a population of approximately 1.6 million with nine regional wastewater treatment plants in Hampton Roads and four smaller plants on Virginia's Middle Peninsula. HRSD set the goal to reuse its treated wastewater for nonpotable purposes in the 1980s. An oil refinery located next to their York River Treatment Plant (YRTP) approached HRSD in 1996 to supply reclaimed water for the refinery's cooling and process water. Previously, the refinery utilized increasingly expensive potable water and upgrading its own treatment facilities was too large an investment. In December 2000, HRSD signed a 20-year agreement to provide the refinery with 0.5 MGD of reclaimed water. This was Virginia's first municipal-industrial water reuse project!

Since the existing activated sludge treatment process at HRSD's York River Treatment Plant couldn't reliably meet the refinery's special target requirements for both low turbidity and year-round ammonia concentration, other treatment processes had to be investigated. HRSD first investigated filtration technologies for enhanced solids removal. Following a pilot study in 1998, they installed a 4-disk AquaDisk[®] cloth media filter. HRSD chose the AquaDisk cloth media filter over a sand media filter because of its footprint and operational advantages. HRSD then researched several secondary treatment processes and decided to install a single basin AquaSBR[®] system fed with primary clarifier effluent to produce year-round biological nitrification. The AquaSBR was chosen for its reliability and cost-effectiveness. The reclamation operation began in July 2002 and the reclaimed water quality has always been better than originally required. The reclaimed water system is designed so that fully treated



York River's AquaSBR[®] basin in operation.

water can be fed to the AquaDisk filter from either the full-scale plant effluent or the sidestream AquaSBR system.

HRSD sells the reclaimed water to the refinery at cost, to recover only the additional investment of building and operating the sidestream treatment and filter. The total cost of the reclaimed water over the 20-year agreement period is approximately half that of potable water. Not only does this reuse partnership save the refinery money and provide a drought-proof water source, it also conserves natural resources and reduces nutrients otherwise released into the York River, and ultimately into the Chesapeake Bay. The partnership has also led to the receipt of two awards: the WaterReuse Association's national "Project of the Year" (2003) and "Honors Award for Engineering Excellence" (2004) from the American Council of Engineering Companies of North Carolina.

AquaSBR® SYSTEM PROCESS

The AquaSBR system operates on a simple concept of introducing a quantity of waste to a reactor, treating the waste in an adequate time period, and subsequently discharging a volume of effluent plus waste sludge that is equal to the original volume of waste introduced to the reactor. This "Fill and Draw" principle of operation involves the basic steps of Fill, React, Settle, Decant, and Sludge Waste. The system may be designed to include seven individual phases of operation but the inclusion or duration of any individual phase is based upon specific waste characteristics and effluent objectives.

Where nutrient removal is required, a simple adjustment to the SBR's operating strategies permits nitrification, denitrification, and biological phosphorus removal. Optimum performance is attained when two or more reactors are utilized in a predetermined sequence of operation.

AquaDisk® FILTER PROCESS

Clarified effluent from the activated sludge system enters the filter and flows by gravity through the cloth media of the stationary hollow disks. The filtrate exits through the hollow shaft which supports the individual disks and flows to the



4-disk AquaDisk® filter located inside a small building at the York River Treatment Plant.

effluent channel. As solids accumulate on the surface of the media, the water level surrounding the disks rises. Once a predetermined level is reached, the disks rotate and the media surface is

automatically vacuum backwashed clean. Heavier solids settle to the bottom of the tank and are then pumped to a digester or to the plant headworks.

DESIGN CHARACTERISTICS

The single basin AquaSBR system produces biological nitrification for the sidestream treatment process prior to entering the cloth media filter. The 4-disk AquaDisk filter produces reuse quality effluent for discharge to the oil refinery for its cooling and process water purposes.

Since the start-up of York River's side stream process, the AquaSBR system and AquaDisk filter have consistently produced reclaimed water that is higher quality than what was required at the time of the reuse agreement in December 2000.

AVERAGE ANNUAL OPERATING DATA

LOADING	DESIGN INFLUENT	AVG INFLUENT	DESIGN EFFLUENT	RECLAIMED EFFLUENT
AVG Flow mgd	0.5	----	0.5	0.46
Peak Flow mgd	0.5	----	----	----
COD mg/l	450	----	40	31
TSS mg/l	120	93	< 10	< 1
NH ₃ -N mg/l	----	23.3	< 2	0.4
Total P mg/l	5	5	< 2	1.3
NTU mg/l	----	----	< 5	0.6

AquaSBR® SYSTEM ADVANTAGES

- Tolerates variable hydraulic loads
- Tolerates variable organic loads
- Controls filamentous growth
- Provides quiescent settling
- Separation of aeration and mixing
- Lower installation costs
- Return activated sludge pumping eliminated
- Small footprint
- Simple to expand or upgrade
- One company accountability

AquaDisk® FILTER ADVANTAGES

- Consistent, high quality effluent
- Lower backwash rates
- Tolerates extreme variations in loads
- Reuse quality effluent
- Continuous filtration during backwash
- Minimal operator attention
- Minimal maintenance
- Small footprint
- Eliminates sand media and underdrains