AQUA-AEROBIC SYSTEMS, INC.

SUCCESS STORIES

PLANT NAME AND LOCATION
SALISBURY TOWNSHIP WWTP - GAP, PA

DESIGN DAILY FLOW / PEAK FLOW
0.58 MGD (2196 m³/day) / 1.16 MGD (4391 m³/day)

AQUA-AEROBIC SOLUTION
AquaPASS® Phased Activated Sludge System

SALISBURY RETROFITS EXISTING PROCESS WITH AN AquaPASS® SYSTEM TO COMPLY WITH THE CHESAPEAKE BAY INITIATIVE

The Salisbury Township WWTP in Gap, PA utilized a conventional activated sludge (CAS) system prior to being retrofitted with an AquaPASS Phased Activated Sludge System in May 2008. The upgrade was necessary in order to comply with the Chesapeake Bay Initiative for local impaired waterways, requiring stringent permit limits on effluent Total Nitrogen and Total Phosphorus by 2010.The plant's conventional system was not designed for nutrient removal and required only secondary limits of 20 mg/l BOD_5, 30 mg/l TSS, 6 mg/l NH_3-N, and 2 mg/l TP. Salisbury experienced constant upsets during peak wet weather flow conditions that required operator intervention to prevent solids from rising over the effluent weir. In addition, the conventional system could no longer handle the increased hydraulic loadings from the area's rapid population growth of about 11.5% in the past nine years.

Since the previous upgrade occured in 1999, it was important to evaluate alternative technologies that would not only meet the new treatment objectives but also operational, process, and construction aspects including: utilizing the existing concrete structures, preserving the current hydraulic profile, allowing continued operation throughout installation, and reducing operation and maintenance requirements.

The AquaPASS® system at Salisbury Township WWTP is located next to a recreational park (shown left) and several Amish farms.

Salisbury and its consulting engineer, ARRO Consulting, Inc., began investigating several technologies in 2005 and ultimately selected the AquaPASS Phased Activated Sludge System for its ability to combine prominent features of both batch and continuous-flow processes into a singular treatment process. This offered Salisbury the temporal and spatial process control it needed. Installation of the AquaPASS system was complete in May 2008. Salisbury was the first treatment plant to install AquaPASS technology.

AquaPASS® SYSTEM PROCESS

The AquaPASS system utilizes time-based process management in a continuous flow regime, employing four stages with secondary clarification to attain low levels of effluent carbon, nitrogen and phosphorus.

1. Anaerobic Stage - Raw sewage enters the Anaerobic Reactor and concentrated, denitrified biological solids are transferred from the PreAnoxic zone, where Volatile Fatty Acid (VFA) production is enhanced. Turbulent, efficient mixing keeps particle turnover periods < 5% of the reactor's HRT. Elevated VFA-enriched mixed liquor is conveyed to the Staged Aeration/Anoxic Reactor.

2. Staged Aeration Reactor - Anaerobically conditioned biosolids are received and multi-variable D.O. control manages discreet aerobic and anoxic intervals. Aerobic intervals enable operator-defined D.O. levels to be controlled. Anoxic stages produce completely mixed biomass at near-zero D.O. levels. Efficient oxygen is delivered via proportional aeration management.

3. Phase Separator Conditioning Stage - Reactor receives return activated sludge from final clarifiers. Enhanced solids concentration is promoted in a low-energy environment. Supernatant is returned to Staged Reactors and concentrated sludge is fed to Pre-Anoxic Reactor.

4. Pre-Anoxic Stage - Reactor conditions sludge from Phase Separator for further nitrate reduction. Aggressive mixing in absence of D.O. prepares biosolids prior to anaerobic treatment. Elevated solids concentration results in reduced pumping requirements and variable frequency control of the pumps manages retention times in anaerobic and anoxic stages. VFA production is enhanced. Denitrified sludge is conveyed to the Anaerobic stage.

DESIGN CHARACTERISTICS

Salisbury's AquaPASS system is designed to meet the new stringent Total Nitrogen and Total Phosphorus effluent levels influenced by the Chesapeake Bay Initiative, 6.9 mg/l and 0.86 mg/l respectively. It is also designed to provide 140% more treatment capacity in the same footprint as the previous conventional activated sludge system.

Performance of Salisbury's AquaPASS system was evaluated in May 2009 to verify its ability to meet the new 2010 permit requirements of the Chesapeake Bay Initiative. Results of the evaluation were as follows:

AVERAGE OPERATING DATA (2009)

LOADING	DESIGN INFLUENT	DESIGN EFFLUENT	AVG EFFLUENT
AVG Flow mgd	0.58	----	0.24
Peak Flow mgd	1.16	----	0.34
BOD mg/l	250	15	< 5
TSS mg/l	215	30	< 5
TKN mg/l	35	----	< 2.3
NH_3-N mg/l	40	1	< 0.5
Total N* mg/l	----	6.9	< 4.5
Total P mg/l	6	0.86	< 0.4

*Nitrite was < 0.3 mg/l and Nitrate was < 1.9 mg/l.

Since its startup in May 2008, the AquaPASS system has produced effluent quality satisfying Salisbury's existing (non-BNR) permit, and has demonstrated the ability to meet 2010 permit levels with Total N and Total P effluent below design conditions. In addition, effluent BOD5, TSS, and NH_3-N have been reduced by more than 98%!

AquaPASS® SYSTEM ADVANTAGES:

- Lowest lifecycle cost; annual energy savings up to 50% versus comparable activated sludge process
- Tailored aeration system design options: finebubble, coarse-bubble, surface, or jet aeration
- Exceptional design flexibility supports a wide range of geometries, depths, and footprints; efficient common-wall construction; modular design
- Load-based proportional power savings via staged aeration system
- Reduced WAS volume of 20-50% with Phase Separator technology
- Minimized internal sludge recycle requirements versus multi-stage nutrient removal processes
- Attractive, retrievable equipment options
- Fully automated and SCADA-ready
- Final Clarification provided separately to maintain process responsibility with biological system