



AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

SUCCESS STORIES

PLANT NAME AND LOCATION

THE CORPORATION OF SHEPHERDSTOWN – SHEPHERDSTOWN, WV

DESIGN DAILY FLOW / PEAK FLOW

0.8 MGD ADF, 1.375 MGD MDF, AND 2.2 MGD PHF

AQUA-AEROBIC SOLUTION

(1) AQUA-AEROBIC® MBR SYSTEM

OLDEST TOWN IN WEST VIRGINIA ADOPTS MODERN Aqua-Aerobic® MBR SYSTEM TO MEET CHESAPEAKE BAY INITIATIVES

Along the banks of the Potomac River and nestled in the lower Shenandoah Valley, sits the quaint and historical Shepherdstown, the oldest town in West Virginia with nearly 1,200 residents and home to Shepherd University which serves about 4,000 students. The town attracts visitors year-round who come to take in the shops and bistros along German Street and visit the town's many historical landmarks including the Mecklenburg Tobacco Warehouse. This 1920's landmark housed the town's waterworks that supplied water to Shepherdstown residents until the mid '70s.

The importance of water led to new developments over the years in treating the town's wastewater. In 1978, Shepherdstown commissioned its first public sewage treatment plant, an extended aeration system which utilized multiple treatment basins and clarifiers.

As with many of today's aging plants reaching 30+ years of service, the outdated technology and in-efficiencies had placed a burden on the town and its officials. The system was no longer able to accommodate the community's growth or meet the federally mandated Chesapeake Bay Initiative's strict effluent requirements on nitrogen and phosphorus.

It was evident that Shepherdstown was in need of a modern and more advanced technology to efficiently treat its wastewater and meet the newly imposed Bay initiatives.

The need to meet new and future effluent goals and to increase flow through the existing basins led them to consider membrane technology. Tasked with evaluating and selecting the best solution, Chapman Technical Group

researched and compared membrane technologies based on specific process and mechanical criteria.

In 2010, Shepherdstown selected the Aqua-Aerobic® MBR Membrane Bioreactor as the new system which would treat the town's wastewater. The decision was based on the ability to utilize the plant's existing infrastructure without the need for additional tanks. Other deciding factors included the ability to increase plant capacity from 800,000 gpd to 2.2 gpd (peak) within the existing footprint, the system's ability to achieve the ultra low nutrient limits and having a good relationship with the installing contractor on previous Aqua-Aerobic projects.

Most convincing was the low cost of ownership over the life of the plant compared to other technologies that were evaluated.



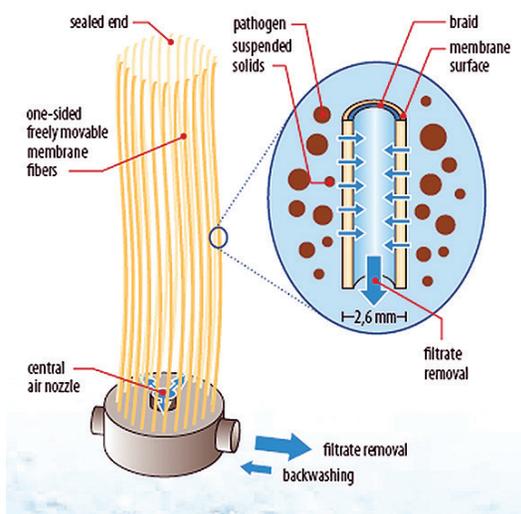
Shown are Aqua-Aerobic® MBR submerged membrane modules.

Aqua-Aerobic® MBR PROCESS

Fill Mode - The Aqua-Aerobic® MBR system is designed to receive raw, screened influent on a continuous basis. To attain optimal process performance, two biological reactors are employed, with only one reactor receiving influent at any given moment. In this two basin MBR system, one reactor will operate in “fill” mode, while the other reactor is allowed to “draw”. The unique hydraulic design of the Aqua-Aerobic® MBR system features in-basin equalization to benefit process performance and reduce the hydraulic impact on the membrane sizing.

Fill and Draw Mode - Throughout the fill and draw sequence, each biological reactor processes through a completely mixed, time managed sequence of controlled aeration to achieve carbonaceous removal, and reductions in nitrogen and phosphorus. Because these process requirements are met within each biological reactor, the need for separate anoxic tanks, anaerobic selectors and recycle pumps is eliminated. By operating with mixed liquor suspended solids (MLSS) concentration of 8,000 to 10,000 mg/l, the Aqua-Aerobic® MBR system offers the smallest footprint among activated sludge technologies.

Membrane Filtration - From the biological reactors, the MLSS is pumped to separate membrane tanks for complete removal of particles larger than 0.03 micron. Filtration is accomplished by effluent permeate pumps that draw suction on the submerged membranes. The excess sludge is returned by gravity to the biological reactor, that is in “draw” mode. By providing four



membrane tanks, the filtration system can provide continuous permeate production while allowing for automatic cleaning operations to maintain low trans-membrane pressures.

DESIGN CHARACTERISTICS

Since start-up in 2012, the Aqua-Aerobic® MBR at Shepherdstown has consistently met or exceeded its treatment objectives, producing quality effluent with BOD, TSS Nitrogen and Phosphorus at or below requirements.

In addition, plant operators experience the simplicity of running a new, high-tech Aqua-Aerobic® MBR system that requires low maintenance and operator attention.

OPERATING DATA - NOVEMBER 2013

Parameter (avg. monthly)	Influent	Design Effluent	Actual Effluent
AVG Flow (mgd)	0.224	---	---
BODs (mg/l)	246	5.0	<1.5
TSS (mg/l)	205	5.0	<1.0
TN (mg/l)	42.78	3.0	2.97
Total P (mg/l)	4.8	0.3	.07

In October of 2012, the city held a dedication ceremony for the new wastewater treatment plant where the engineer and Director of Public Works held up a bottle of water from the influent side of the Aqua-Aerobic® MBR and a bottle resembling store-bought bottled water from the effluent side of the MBR. Public Works Director, Frank Welch then said, *“The old plant worked, but not as well as this one”* clearly showing the quality that is achievable from this membrane technology.



The biological treatment reactors of the Aqua-Aerobic® MBR.