

CASE STUDY:
 Norfolk, Virginia
 HRSD VIP Wastewater Treatment Plant



Application:	Anoxic Swing Zone and Aerobic Zone Decoupled Aeration
Design Flow (ADF):	40 MGD
Mixing Efficiency:	≈ 0.11 HP/1000 FT ³
Compressors:	Two (2) 100 HP Rotary Screw
Nozzles:	704
Design Engineer:	HDR Engineers, Inc.

BioMix™ Compressed Gas Mixing Technology Helps HRSD Keep Chesapeake Bay Clean

Hampton Roads Sanitation District (HRSD) owns and operates the Virginia Initiative Plant (VIP) in Norfolk, VA which provides secondary treatment with biological nutrient removal (BNR). **HRSD upgraded the plant in 2015 with the objective of providing additional nitrogen removal capabilities and improved biological phosphorus removal.** A second goal of the upgrade was to increase the capacity of the plant from 80 MGD to 100 MGD, reducing the possibility of overflows during major storms.

One driver for the upgrade was the reduction of nutrient discharges to the Chesapeake Bay. Virginia's Phase 1 Watershed Implementation Plan for the Bay established reduced nitrogen wasteload allocation levels. Upgrading VIP was a major element in HRSD's strategy to meet the new standards and improve local water quality.

BioMix Compressed Gas Mixing was selected for the versatile bioreactors (VBRs), which are aerobic/anoxic swing zones and third stage aerobic zones, to decouple aeration from mixing.

By selecting BioMix, the plant realized:

- Annual O&M savings of \$75,000 vs. submersible mixers
- 20-year present worth savings of \$1.35 million
- Annual methanol savings of \$125,000



Aeration satisfies oxygen demand while BioMix compressed gas mixing maintains mixed liquor suspension



ENERGY EFFICIENCY

Unparalleled mixing efficiency of 0.11 HP per 1000 ft³



STRAIGHTFORWARD OPERATION

One duty and one standby compressor instead of dozens of mechanical mixers



PROCESS OPTIMIZATION

Supplemental mixing during aerobic operation prevents excess dissolved oxygen in mixed liquor return



UNPARALLELED FLEXIBILITY

Mixing that is independent from or concurrent with aeration, providing anoxic or supplemental mixing



Two 100 HP compressors replaced dozens of mechanical mixers



Decoupling aeration from mixing prevents over-aeration



The versatile bioreactors (VBRs) in anoxic operation

As part of the overall plant upgrade, BioMix enabled HRSD to comply with standards, reduce costs, and protect the Chesapeake Bay.

In order to meet the government mandates and further reduce the nutrients discharged to the Chesapeake Bay, HRSD upgraded VIP to achieve annual average effluent concentrations of 5 mg/l total nitrogen and 1 mg/l total phosphorus. **This was accomplished by converting the previous 3-stage nutrient removal process to a 5-stage enhanced BNR process by adding a second anoxic zone and a re-aeration zone.**

The configuration supports two operating modes, a normal flow mode providing 5-stage biological nutrient removal and a wet weather mode comprised of a 3-stage process. This added flexibility was enabled through the construction of a new VBR and secondary clarifier. These units will work in series with the VIP reactors to enhance nutrient removal during normal flow conditions and then transition to separate, parallel operation during high flow events.

BioMix Compressed Gas Mixing was selected for the energy efficiency and process flexibility it provides.

- BioMix provides supplemental mixing in the aerobic stage, enabling the diffused aeration system to match process oxygen demand without over-aeration. This minimizes excess DO in the mixed liquor return, preventing poisoning of the post anoxic zones and reducing costly methanol dosage.
- In the VBRs, during 5-stage BNR operation, BioMix operates independently from the aeration system to create anoxic conditions and maintain suspension of mixed liquor.



Contact sales@enviro-mix.com today to discuss the ways EnviroMix can optimize your mixing solutions.