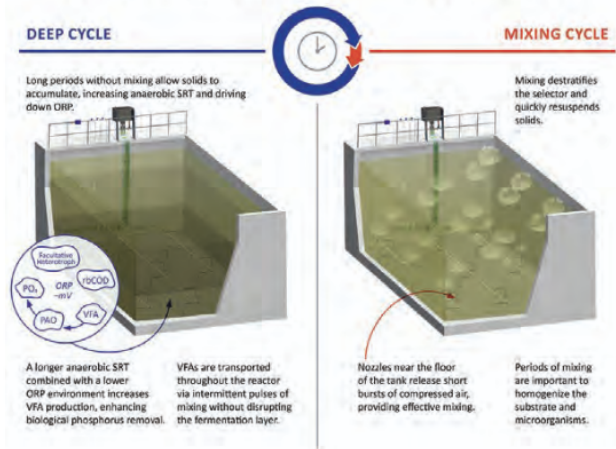


- 1) BioMix-DC transforms a traditional anaerobic selector into an intensified fermentation tank. It does this by alternating a short mixing cycle with a long deep cycle.
- 2) Intermittent pulses of air transport volatile fatty acids throughout the reactor without disturbing the fermentation blanket.



BioMix-DC Enhanced Anaerobic Mixing System optimizes the anaerobic fermentation process by selecting the right frequency and duration of the mixing cycle.



A Boost for Bio-P

AN INNOVATIVE MIXING SYSTEM FOR ANAEROBIC SELECTOR TANKS IS DESIGNED TO HELP CLEAN-WATER PLANTS MEET PHOSPHORUS LIMITS CONSISTENTLY WITHOUT CHEMICAL ADDITION

By Ted J. Rulseh

Biological phosphorus removal is gaining momentum for clean-water plant teams looking to meet ever-stricter effluent limits.

The question is how to make the process operate efficiently, effectively and consistently. The key lies in optimizing performance in the anaerobic selector upstream of the aeration basins.

EnviroMix, a Xylem brand, now offers BioMix-DC enhanced anaerobic mixing, designed to transform a traditional anaerobic selector into an intensified fermentation tank. It does this by alternating a short mixing cycle with a long deep cycle in a fully automated process.

The deep cycle suspends mixing for prolonged periods, allowing a solids blanket to accumulate and thus enhancing fermentation and production of volatile fatty acids. During the mixing cycle, the tank contents are mixed intermittently with bursts of compressed air fired through engineered nozzles on the tank floor.

The mixing cycle transports VFAs into the bulk liquid, phosphorus-accumulating organisms take them up. The process was named a 2022 WEF Innovative Product of the Year. Sarah Elger, director of product innovation and strategy with EnviroMix, talked about the technology in an interview with *Treatment Plant Operator*.

tpo: What is the background of this technology's development?

Elger: We had a solution around compressed gas mixing in anaerobic selectors, but operators questioned how we could mix using air and have truly anaerobic conditions. After testing at some of our installations, we determined that we could turn that complete-mix anaerobic selector into an

enhanced fermentation reactor. By turning the mixing on and off, we could create a fermentation blanket in the selector. Then by creating a gentle pulse while the mixing was off, we could transfer VFAs from that fermentation blanket up to the bulk liquid where there were PAOs that wanted access to that food. In the marketplace, many plants had fermentation tanks, or they had anaerobic selectors, or they had both, but not many were doing both in the same tank. So we were able to fill a need with a unique way of mixing.

tpo: Why is there demand in the marketplace for this type of process?

Elger: Customers are looking to meet new or tighter effluent phosphorus limits in ways that don't require chemical addition. Chemicals are getting a lot more expensive, and back in 2020 there were even problems getting access to them, so being able to remove phosphorus biologically is a huge benefit. And doing it with very consistent effluent quality, by having that integrated fermentation tank, gives them peace of mind that they will get repeatable results.

tpo: What is unique about this process?

Elger: Consulting engineers and mixing companies are doing fermentation by just shutting the mixing off for periods of eight hours or more. What we do is introduce that pulse of air every 30 to 60 minutes during those eight hours. That transports the VFAs being created in the fermentation blanket up to the portion of the reactor where there are PAOs. That is really the secret sauce that provides stability in effluent quality.

“We can accommodate flows of anywhere from a few hundred thousand to hundreds of millions of gallons per day.”

SARAH ELGER

tpo: What are the basic steps in the process?

Elger: The liquid entering the anaerobic selector is usually influent combined with return activated sludge. The goal here is phosphorus release. There is a deep cycle and a mixing cycle. During the deep cycle, mixing is suspended for eight to 12 hours. In that time the blanket is created, allowing for fermentation and VFA production. Intermittent pulses of air transport VFAs throughout the reactor without disturbing the fermentation blanket. The mixing cycle is a 15- to 20-minute interval where nozzles near the tank floor release short bursts of compressed air to completely mix the tank.

tpo: How easy is the technology for plant personnel to learn and operate?

Elger: Startup typically takes one to three days, and during that we provide a two- to four-hour training session that includes an hour focused on process and the setpoints. The setpoints generally don't change during operation, so plants can essentially set it and forget it. We're always available to answer questions over the phone or to provide repeat training sessions when new operators come on board.

tpo: What maintenance does this technology require?

Elger: There is no in-tank maintenance. There is no need for a platform that goes out to the mixer location and no need to pull out the mixer to remove rags or other materials that are plugging it. All of our maintenance is at a compressor, very similar to the blowers that operators are familiar with. The compressor is placed either indoors or under a canopy, providing a weather-friendly area for doing the maintenance.

tpo: How do operators control the process?

Elger: We pride ourselves on simplicity. A master control panel runs the program. The PLC is connected to an operator interface that has some great graphics. Simple icons on the screen indicate when things are running or not running, and there are buttons where users can interface and enter setpoints. All the screens are shared with system integrators, so they can be seamlessly integrated with facilities' SCADA systems.

tpo: How does the energy efficiency of this process compare with other mixing methods?

Elger: The compressed gas mixing by itself, when we're in the active mixing phase, is typically about 50% more efficient than mechanical mixing. But we're only mixing for perhaps an hour or two a day because for those eight- to 12-hour intervals the mixing is generally off. So if you compare that to continuous mechanical mixing, there is a 90% energy savings.

tpo: What kinds or sizes of facilities is this process best suited for?

Elger: We can accommodate flows of anywhere from a few hundred thousand to hundreds of millions of gallons per day. We have the ability to customize the air nozzle grids to fit any tank geometry. The process is best suited to any facility that is looking to meet phosphorus limits without chemicals, or with a massive reduction in chemicals. It's also for facilities that are doing bio-P but are getting inconsistent effluent results — for example, in a traditional reactor, when influent phosphorus spikes up, effluent phosphorus also spikes up and they may have to add some chemical at that time. Our solution addresses this issue. **tpo**



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