

ENERGY EFFICIENT · VOLATILE SOLIDS DESTRUCTION

# BioCycle-D™ Optimized Aerobic Digestion Process

**AUTOMATIC  
CONTROLS FOR  
STRAIGHTFORWARD OPERATION**

CONTACT [SALES@ENVIRO-MIX.COM](mailto:SALES@ENVIRO-MIX.COM) TO  
DISCUSS HOW BIOCYCLE-D CAN OPTIMIZE  
YOUR AEROBIC DIGESTION PROCESS.



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## THE BIOCYCLE-D™ OPTIMIZED AEROBIC DIGESTION PROCESS

provides ideal conditions for aerobic sludge digestion and the reduction of organic matter through endogenous respiration, maximizing volatile solids (VS) destruction, pathogen reduction, and sludge conditioning at a fraction of the expense of a conventional aerobic digestion process. The process is engineered to the requirements of each application and is capable of producing Class B biosolids.



### IMPROVING THE APPROACH TO AEROBIC DIGESTION

Biosolids management costs for a small to medium-sized wastewater treatment facility can account for 50% of the facilities operations and maintenance expense. Upgrading the aerobic digestion process can save both time and money, while ensuring process performance to meet disposal requirements.

#### OPPORTUNITIES:

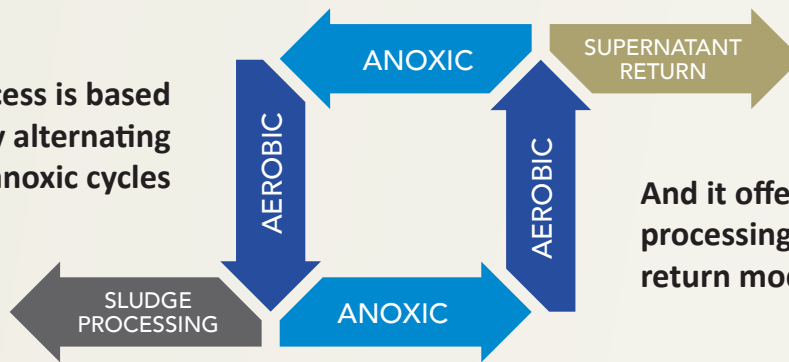
- **Reduce energy costs**
  - Stop blower operation when aeration is not required
  - Keep tank contents mixed with a low energy mixing solution
  - Decouple aeration from mixing to match air supply with process oxygen demand
- **Minimize sludge disposal costs**
  - Maximize VS destruction
  - Meet Class B biosolids requirements for land disposal
  - Reduce sludge volumes for disposal by improving dewatering results
- **Decrease operator demands**
  - Provide visibility into real-time process changes
  - Automatically adapt operation based on process changes
  - Eliminate caustic chemical addition for alkalinity recovery



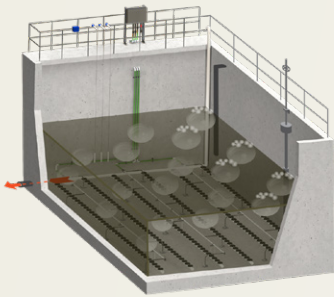
## STRAIGHTFORWARD OPERATION

BioCycle-D operates on the principle of alternating aerobic and anoxic/anaerobic conditions to optimize digestion and save energy. Through instrument feedback, **the BioCycle-D controller automatically transitions the cycles** from aerobic for VS destruction to anoxic/anaerobic for facilitating denitrification, alkalinity recovery, and energy savings.

The BioCycle-D process is based on automatically alternating aerobic and anoxic cycles



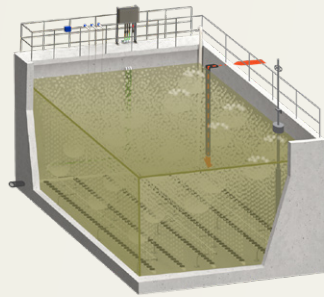
And it offers optional sludge processing and supernatant return modes



### OPTIONAL SLUDGE PROCESSING MODE:

Ensures sludge is homogenous for downstream processing and maintains phosphorus in the sludge through low oxic states.

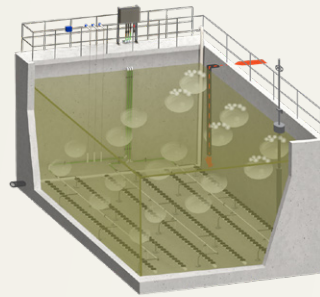
Sludge leaves the digester and goes to processing or disposal.



### AEROBIC CYCLE:

Provides oxygen for volatile solids destruction as waste activated sludge (WAS) or primary sludge (PS) enters the digester for solids processing.

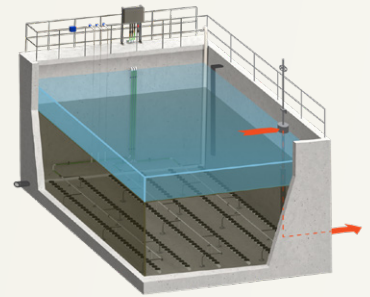
Aeration plus mixing.



### ANOXIC CYCLE:

Provides complete mixing to facilitate denitrification, alkalinity recovery, and energy savings as WAS or PS enters the digester for solids processing.

Mixing only, no aeration.



### OPTIONAL SUPERNATANT RETURN MODE:

Automated settle and decant mode to thicken sludge.

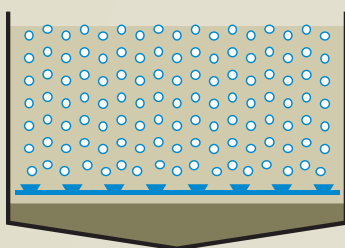
Supernatant leaves the digester and returns to the head of the secondary treatment process.

## ENERGY EFFICIENCY

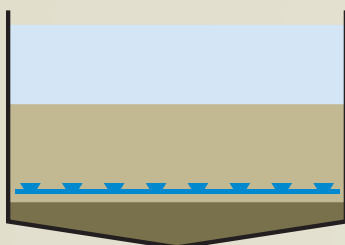
BioCycle-D solutions deliver 50% or greater energy savings over a conventional approach to aerobic digestion by decoupling aeration from mixing — in other words, the function of mixing is no longer provided by the diffused aeration system, allowing for smaller blowers and significant turndown. In most cases, the volume of air required to mix the digester's contents is far greater than the volume of air required to satisfy the oxygen demand. This condition is commonly referred to as "mixing limited."



### CONVENTIONAL APPROACH Aeration Only

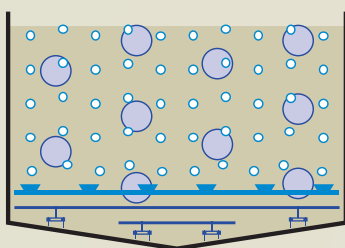


Air on: mixing limited

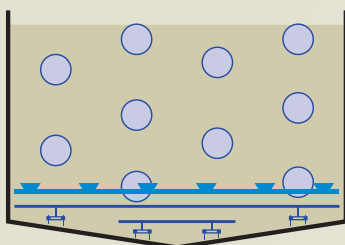


Air off: unmixed

### DECOUPLED APPROACH Aeration + Compressed Gas Mixing



Air and mixing on: process satisfied



Air off: completely mixed

Aeration is designed for VS destruction only, not to keep the contents of the tank mixed.

Ability to mix and aerate below the grid eliminates dead zones in cone-bottom tanks.

Concurrent operation of aeration and mixing allows air to be turned down infinitely.

Keeping contents mixed maximizes denitrification, alkalinity recovery, and VS destruction.

BioMix Compressed Gas Mixing uses a fraction of the energy compared to conventional aerated mixing.

Completely mixed, air-off time periods allow for further conditioning of the sludge for dewatering.

When the aeration system is designed solely based on the oxygen requirements and the mixing system is designed based on the mixing requirements, energy efficiency and process flexibility are maximized. The table below demonstrates actual savings from an installation in Illinois.

		CONVENTIONAL APPROACH Blowers Only	BIOCYCLE-D Blowers + Compressor
Operating Power (BHP)	Blowers	24 hours @ 180 HP	16 hours @ 54 HP
	Compressors	—	24 hours @ 13.5 HP
Power Consumption (kWh/day)		3,221	886

**72%**  
POWER SAVINGS  
WITH BIOCYCLE-D



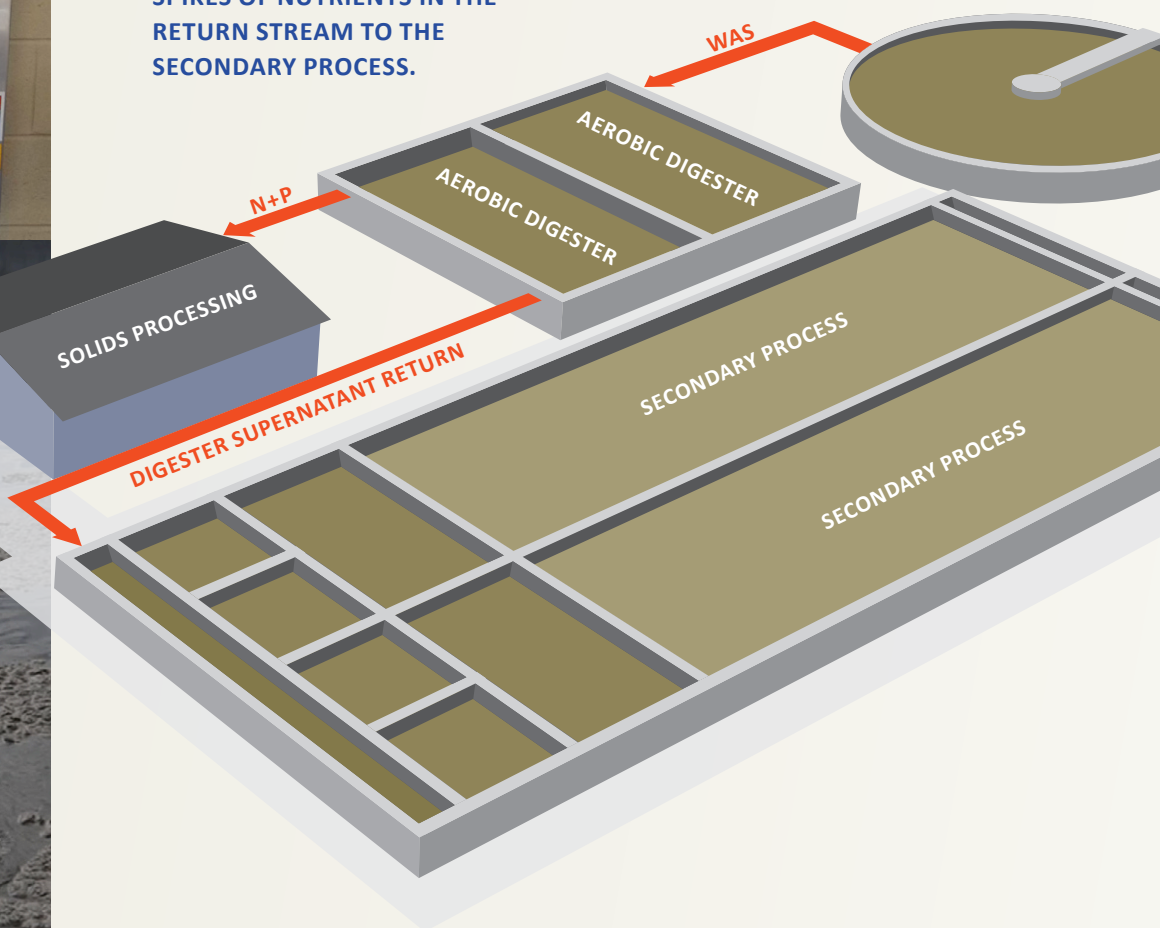
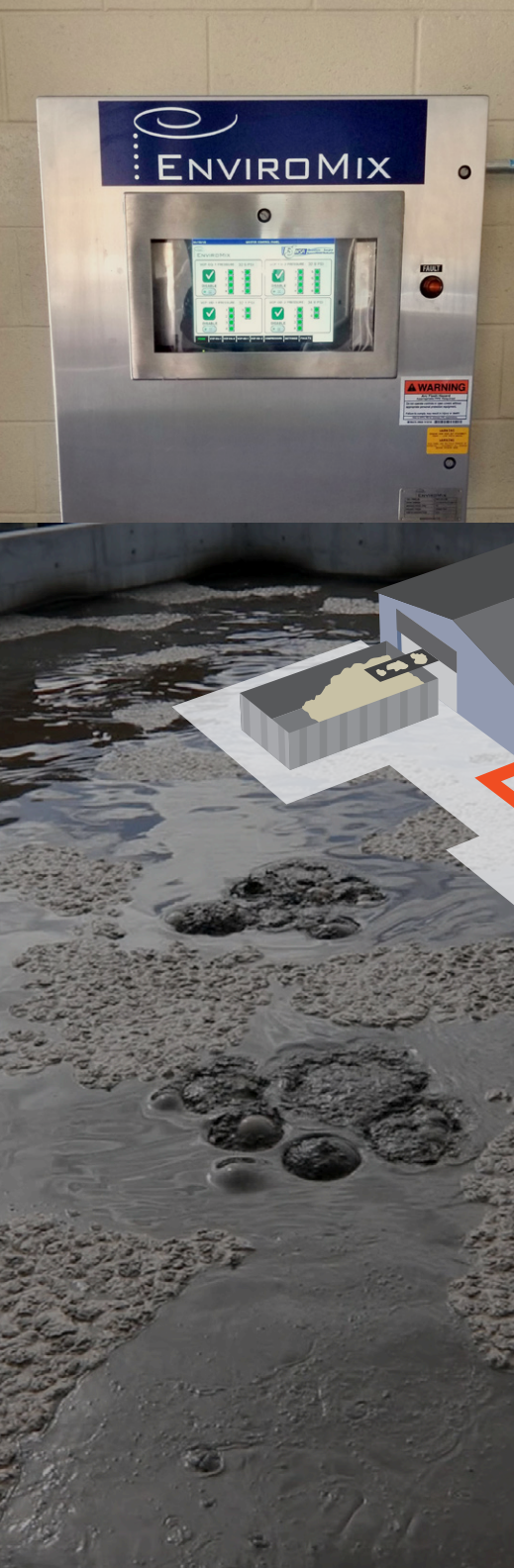


## PROCESS OPTIMIZATION

**Nutrient removal and sequestration are important features of BioCycle-D** for optimization of the aerobic digestion process, as well as improving the treatment efficiency of nitrogen and phosphorus in the activated sludge process.

BioCycle-D's automatic controls adjust the process phases for variable sludge loading rates, significantly reducing nitrogen and phosphorus in the supernatant return stream to secondary process. This minimizes side stream loads, enabling the treatment process to meet strict nutrient limits. **Substantial energy and chemical savings as well as reduced operator attention can be realized by using online process instrumentation** to adjust the aerobic and anoxic cycle durations based on real-time demands.

**BIOCYCLE-D SEQUESTERS NUTRIENTS IN THE SLUDGE, ELIMINATING SPIKES OF NUTRIENTS IN THE RETURN STREAM TO THE SECONDARY PROCESS.**



Sludge disposal costs continue to rise. **BioCycle-D provides highly effective VS destruction, reducing the volume of biosolids required for disposal.** Automatic aerobic and anoxic cycling stress the biomass and cause cell lysing, allowing the conditioning of the biological extracellular polymeric substances (EPS) into readily biodegradable compounds. These compounds further condition the sludge, improving sludge dewatering and reducing sludge disposal volumes.



## UNPARALLELED FLEXIBILITY

BioCycle-D has the flexibility to accommodate a variety of sludge treatment requirements such as tanks in parallel, series, or single tank operation, and demands to meet Class B biosolids for land application. BioMix's patented nozzles and headers are **compatible with any tank geometry or configuration**, and circular headers conform to the slope of the tank floor, eliminating "dead spots." BioCycle-D technology is able to uniformly mix sludge at concentrations up to 4% solids.

<b>Markets</b>	biosolids, municipal wastewater, industrial food & beverage
<b>Tanks</b>	compatible with any geometry (rectangular, circular, hopper bottom, annular, ditch, covered, or other)
<b>Operational Configurations</b>	series, parallel, tank out of service, or ability to alternate between any of the above
<b>Facility Sizes</b>	small single tank, large multi-tank
<b>Water Levels</b>	variable mixing intensity based on operating depth, no minimum depth requirements
<b>Thickening Options</b>	pre-thickening, manual decant, automatic decant
<b>Monitoring and Control Options</b>	time based cycle control, ORP control, pH control, DO control



MIXING  
GUARANTEE



PATENTED  
TECHNOLOGY



THIRD-PARTY  
VERIFICATION

EnviroMix, Inc. focuses on delivering solutions that reduce energy costs and enhance process performance in the water and wastewater industry. We design and manufacture performance-proven technologies that improve water quality and reduce energy consumption in critical areas of the treatment process. Utilizing patented and proprietary technology, we provide equipment and process control solutions to enhance plant performance for both the municipal and industrial markets.



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