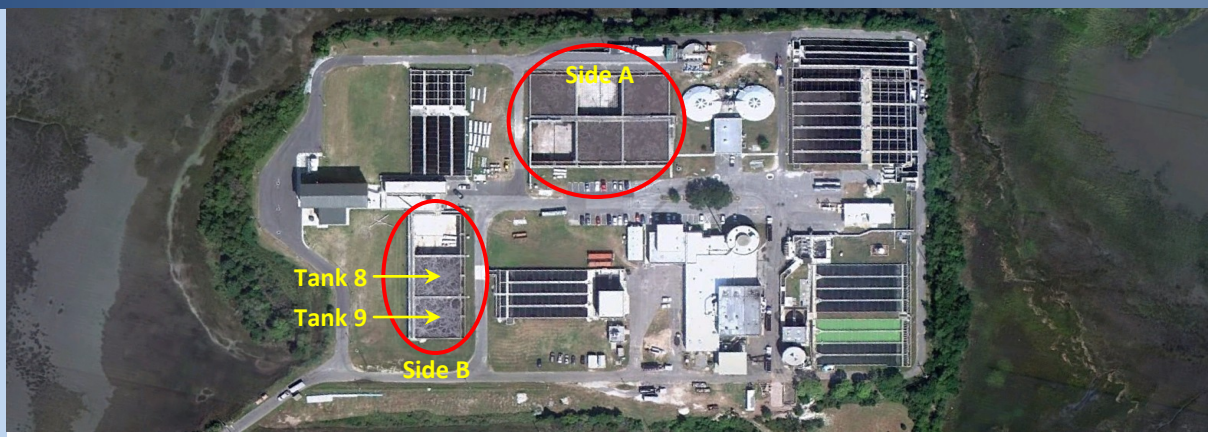
ENVIROMIX
Sustainable Solutions for a Cleaner Environment

INTELLIGENT PROCESS CONTROL FOR THE WASTEWATER INDUSTRY

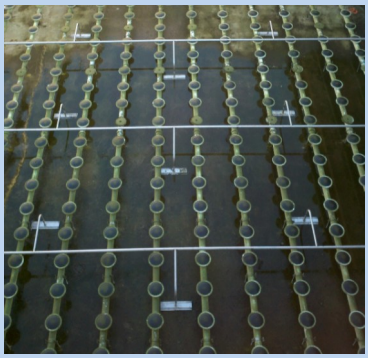
BioCycle™ Success Story — 49%+ Energy Reduction

Plum Island WWTP, 36 MGD, Charleston SC



Project Details

- BioCycle™ algorithm uses real-time process probe data to alternate between aerobic and anoxic cycles
- BioMix™ provides mixing during anoxic cycle
- Fine bubble diffusers provide aeration during aerobic cycle
- BioCycle demonstrated *49%+ power savings* versus nitrification only operation
- System maximizes energy savings and optimizes effluent quality



BioMix tank installation at Plum Island WWTP, Charleston, SC

Facility Summary

- Treatment process includes nine parallel complete-mix activated sludge treatment reactors: Side A (Tanks 1-6) and Side B (Tanks 7-9). Each is 72' wide by 74' long with 18.5' side water depth
- Discharges into the Charleston Harbor, an important recreational and commercial waterway

Operation of a BioCycle™ installation at the 36 MGD Plum Island WWTP in Charleston, SC, provided a reduction in blower demand of 49.9% while maintaining effluent quality and also decreasing total nitrogen concentrations. The BioCycle control system utilizes BioMix™ compressed gas ("large bubble") mixing, fine bubble aeration, and in-basin process probes to cycle between aerobic and anoxic conditions in the complete mix activated sludge biological reactors.

In early 2011, BioMix was installed in Tanks 8 and 9 of Side B between the aeration diffusers to allow for anoxic mixing periods. The innovative BioCycle system monitors multiple process variables, such as oxidation reduction potential (ORP), dissolved oxygen (DO), nitrate (NO_3-N), and ammonium (NH_4-N), to determine optimal aeration and mixing period lengths. During the aeration phase, DO is controlled at approximately 2.5 mg/L. When the aeration period ends and the BioMix system is turned on, the NO_3-N concentration is reduced to approximately 1 mg/L . Side B blower operation and power were minimized while producing effluent quality with a total nitrogen concentration less than that of Side A.

Figure 1 presents process data identifying DO in blue, NO_3-N in red, and ORP in yellow. Each aerobic-anoxic cycle period is ± 4 hours.

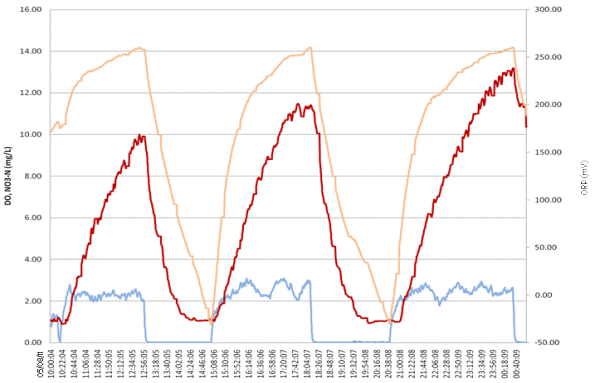


Figure 1

Demonstrated Results

The air into the two operating Side B reactors utilizing BioCycle was compared to that of the four operating Side A tanks. The significant 49.9% reduction in air consumed (see Figure 2) equates to a facility-wide savings of $176,000 per year.

	Total Process Average Daily Air Volume	A-Side, Average Daily Air Volume	B-Side, Average Daily Air Volume	B-Side Average Daily Air Volume as % of A-Side Average Daily Air Volume	Theoretical B-Side Average Daily Air Volume without BioCycle (A-Side x 24.8%)	B-Side % Reduction
03/01/2011 to 03/15/2011 without BioCycle (ft^3/d)	17,360,402	13,906,007	3,454,395	24.8%	- -	- -
05/01/2011 to 05/31/2011 using BioCycle (ft^3/d)	22,841,436	20,319,152	2,522,284	12.4%	5,039,150	49.9%

Figure 2

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