CASE STUDY

ACETIC ACID TO MICROC® 2000: VIRGINIA WWTP BOOSTS SAVINGS & EBPR PERFORMANCE

A Virginia municipal WWTP using VFA (volatile fatty acid) acetic acid as a carbon source for enhanced biological phosphorus removal discovers EOSi's lower-cost/higher-performing MicroC® 2000 delivers a substantial feed rate reduction and an approximate 30% cost savings.

Client: Virginia Municipality

Facility: Wastewater Treatment Facility

Flow Design: 5MGD

Treatment Technology: 5-stage Bardenpho

TN Discharge permit: 4 mg/L

Total Phosphorus Limit: 0.3 mg/L

Study Period: June - November

Background: Acetic Acid Drawbacks

A Virginia municipal 5 MGD wastewater treatment facility discharging to the Potomac River Basin was recently upgraded to achieve enhanced nutrient removal objectives of 4 mg/L of total nitrogen (TN) and 0.3 mg/L of total phosphorus (TP). The major components of the upgrade included two new five-stage biological reactor trains, two new secondary clarifiers, new primary clarifiers, and new tertiary denitrification filters. The upgrade also involved conversion of existing ditches to plug flow reactors, new solids-processing equipment, and adding chemical storage and feed equipment for 20% acetic acid and aluminum sulfate (alum).



Virginia Wastewater Treatment Facility

The facility was feeding alum to the secondary clarifiers, and optionally feeding alum to the influent of their Parkson Dynasand® continuous-backwash tertiary filters for final trimming of effluent orthophosphate. However, the facility was using VFA (volatile fatty acid) acetic acid as a carbon source for enhanced biological phosphorus removal (EBPR).

The facility's municipal operators were aware of the potential drawbacks or downsides of using VFAs like acetic acid, including procurement and operational costs, variable supply, pH fluctuations, microbial shifts, sludge generation, odor risk and environmental issues — and decided to evaluate alternatives like EOSi's MicroC® 2000.

Acetic Acid vs EOSi's MicroC® 2000

Approximately 300 gpd of a 20% acetic acid solution was being fed to the anaerobic zone. The evaluation replaced the 20% acetic acid feed in one of the facility's biological reactors (including a measured transition period) with EOSi's MicroC® 2000 non-hazardous carbon sources. The objective: compare EBPR performance of MicroC 2000 to acetic acid with the intent to reduce chemical costs.

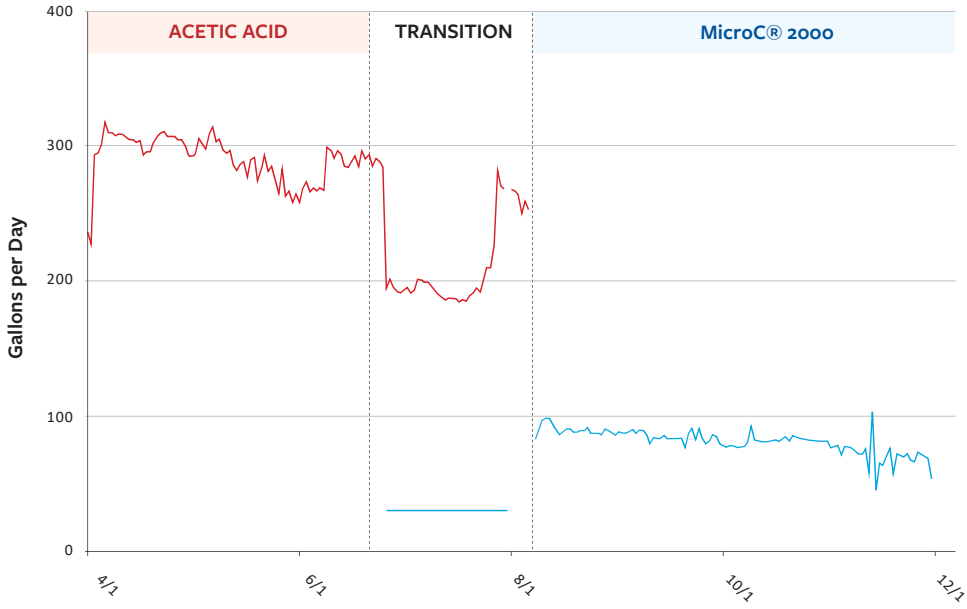
The table below shows the phosphorus loading for the three trial periods under investigation including the BOD:P ratios with and without external carbon addition. The result: final effluent TP is well below permit objectives for all three trial scenarios, and % TP removal was roughly equivalent. Further, TN discharge was noticeably lower during the MicroC 2000 period — despite the lowest BOD:PO4 ratio of 25 during the MicroC 2000 feed period.

MicroC®
Premium Carbon Sources

PARAMETER	UNIT	ACETIC ACID	TRANSITION	MicroC® 2000
Flow	MGD	2.75	2.79	2.96
lbs BOD	lbs/day	4267	4950	4167
lbs PO4	lbs/day	167	157	187
lbs TP	lbs/day	220	302	264
BOD:PO4		26	32	22
BOD:TP		19	16	16
Acetic Acid Feed	gal/day	290	210	0
MicroC 2000®	gal/day	0	30	81
Assumed BOD/COD Ratio		80%	80%	80%
*Adjusted BOD:PO4		28	35	25
*Adjusted BOD:TP		21	18	18
TP % Removed		98.2%	98.7%	98.0%
Final Effluent TN	mg/L	4.10	4.00	2.83
Final Effluent TP	mg/L	0.17	0.17	0.21

*Adjusted values consider the BOD added from the external carbon source

FIGURE 1 PERFORMANCE COMPARISONS OF EBPR FEEDS



Cost Savings of 30% with MicroC® 2000

Prior to the trial transition period, the acetic acid feed averaged 290 gpd. This feed volume was reduced to 210 gpd during the transition period, with the makeup provided by adding 30 gpd of MicroC® 2000. The MicroC 2000 feed rate averaged 67 gpd following the complete transition to MicroC 2000 (see Figure 1) with a significant downward trend in usage.

Demonstrating a feed rate reduction of 220 gpd and an estimated cost savings of approximately 30%, the trial validated EOSi's MicroC 2000 carbon sources as the lower-cost/higher-performance carbon source alternative to using acetic acid, and the entire plant was thereafter converted to using MicroC 2000 exclusively to achieve long-term cost savings for the facility.