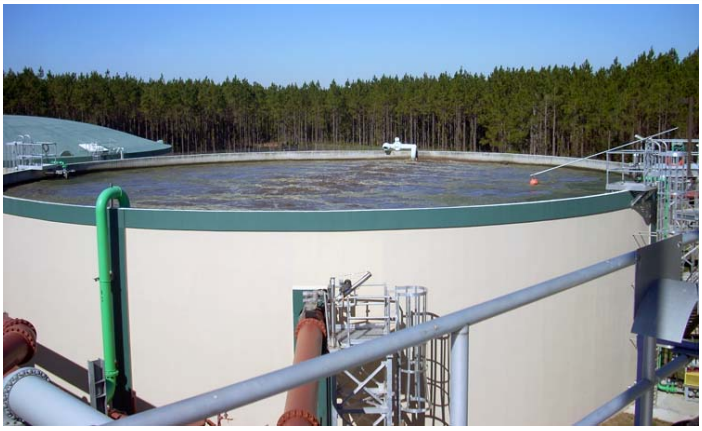
Case Study: Sequencing Batch Reactor – Replacing Acetic Acid with MicroCg™

MicroC™ Premium Carbon Sources

Environmental Operating Solutions



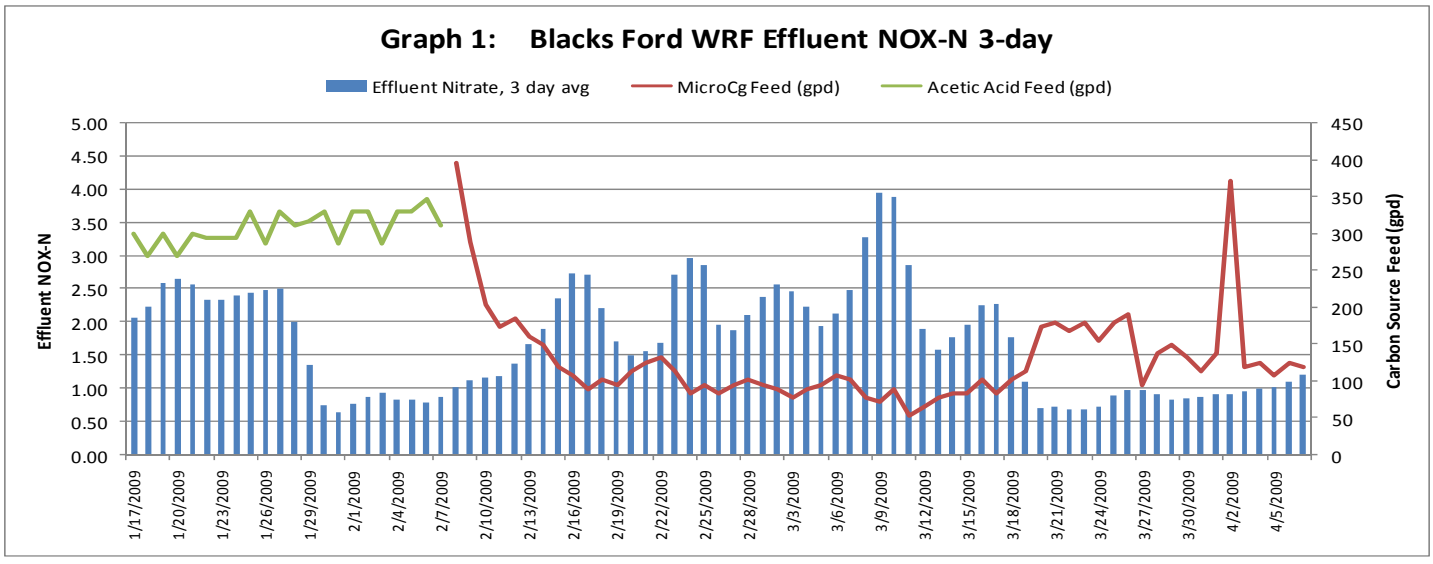
Sequencing Batch Reactor at Blacks Ford Water Reclamation Facility. Jacksonville, Florida

Municipality: Jacksonville, Florida
Facility Owner: JEA
Facility: Blacks Ford Water Reclamation Facility
Contract Operator: United Water Florida Operations, LLC
Flow Design / Actual: 3 MGD / 1.5 MGD
Treatment Technology: Sequencing Batch Reactor (SBR)
2009 TN Discharge permit: 3 mg/L – Annual basis
Case Study Period: Initial Results (Feb. 2009 – Apr. 2009)
Previous Carbon Source: 20% Acetic Acid Solution
Current Carbon Source: MicroCg™

Blacks Ford WRF is a designed 3 MGD (actual 1.5 MGD) sequencing batch reactor (SBR) plant which discharges into the St. Johns River Basin in NE Florida. The plant had been using a 20% acetic acid solution as their supplemental carbon source to comply with an annual total nitrogen (TN) discharge limit of 3 mg/L.

In an effort to reduce chemical costs, the facility operator researched MicroC™ Premium Carbon Sources. He concluded that MicroCg™ could reduce costs considerably, and is manufactured to exacting specifications with consistent physical and chemical properties, including COD value. Additionally, MicroCg™ is a non-flammable, non-hazardous chemical which eliminates many safety and handling concerns associated with acetic acid.

This Case Study provides initial results for the removal of nitrates using both carbon sources. At first, the carbon source was fed into the first SBR mixing cycle and the effluent nitrate levels were monitored using a Hach Nitratax® nitrate analyzer. Graph 1, below, illustrates the transition period from acetic acid to MicroCg™ as well as the preliminary nitrate residuals for the MicroCg™ product. As a process improvement, plant operators changed the MicroCg™ feed point to the SBR's second anoxic cycle during the month of March. The process was further optimized by adjusting the MicroCg™ dosing rate until the lowest dosage that gained the desired NOX-N residuals was determined.



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MicroCg™ Dosage

Once the process was optimized, the average feed dosage for MicroCg™ was 170 gpd with a residual nitrate of 0.91 mg/L. Past operating data for the 20% acetic acid showed an average dosage of 320 gpd with slightly higher residual nitrate values in the effluent. The table below illustrates the data collected once the process was optimized (from March 18 to April 7, 2009).

Table 1: MicroCg Performance - Optimization of Feed Point and Dosage in Large SBR

Date (2009)	Nitrate (mg/L)	MicroCg™ (gpd)
3/18	0.71	174.0
3/19	0.67	180.0
3/20	0.78	168.0
3/21	0.76	180.0
3/22	0.55	156.0
3/23	0.78	180.0
3/24	0.84	192.0
3/25	1.05	96.0
3/26	1.09	138.0
3/27	0.81	150.0
3/28	0.84	132.0
3/29	0.83	114.0
3/30	0.93	138.0
3/31	0.87	372.0
4/1	0.94	120.0
4/2	0.98	126.0
4/3	0.99	108.0
4/4	1.02	126.0
4/5	1.09	120.0
4/6	1.23	126.0
4/7	1.31	132.0

The above data demonstrates that nitrate removal was consistent, at a steady MicroCg™ feed rate, through the end of this period. MicroCg™ was therefore deemed a cost-effective carbon source for Blacks Ford WRF and is being fed consistently by the facility operator.

Quick and Easy Conversion from Acetic Acid to MicroCg™

The Blacks Ford WRF is a large sequencing batch reactor (SBR) plant which was able to readily convert from a 20% acetic acid carbon source to MicroCg™ with no disruption to the plant performance. Rapid acclimation was observed. Existing biological populations were used at the facility and acclimation occurred quickly with no spikes in effluent nitrates. The existing bulk storage tanks, piping, manifolds, and feed pumps were used without modifications.

Reduced Nitrate Levels

Initial results indicate that effluent nitrate levels can be meet or improve upon those achieved while using acetic acid. Once the chemical feed point was moved to the second anoxic cycle and the MicroCg™ feed was optimized, nitrate levels of about 0.91 mg/L were consistently achieved. This performance was a considerable improvement over that found with acetic acid, which was usually over 2 mg/L.

Summary

This facility operator was able to recognize an immediate cost savings through the reduction in the usage of supplemental carbon chemical. The 20% acetic acid chemical had been used at a rate of 320 gpd; the MicroCg average dosage was 170 gpd. This represents over 40% yearly savings for the operations budget which equates to more than $40,000 a year in total savings. MicroCg™ provides Blacks Ford with a cost-effective, nonflammable, non-hazardous electron donor for wastewater denitrification.

Supplemental Carbon Storage Tanks at Blacks Ford.

Acknowledgement

Environmental Operating Solutions, Inc. would like to thank Robert Parks, Manager – Operations & Maintenance, Blacks Ford WRF, for his participation and support in this study.