



This demonstration train at HRSD James River Treatment Plant was reconfigured for testing purposes.

Background

A future waste load allocation agreement requires that the James River Treatment Plant remove 75% of the influent nitrogen load. This results in a target effluent TN concentration of 10-12 mg/L. Site constraints did not allow for the expansion of tank capacity. Instead, the facility opted for an IFAS technology to meet future nitrogen limits. One of nine trains was modified to serve as a demonstration train in October 2007.

The demonstration train was operated without carbon addition for over one year. Monthly average effluent total nitrogen concentrations exceeded 10 mg/L for several months during this period. It was decided that carbon addition be evaluated to enhance denitrification efficiency, particularly in the colder months of operation.

Facility Owner:	Hampton Roads Sanitation District
Facility:	James River Treatment Plant
Location:	Newport News, Virginia
Chief Operator:	Robert Rutherford
Engineering Firm:	CH2M Hill
Flow Design / Actual:	20 MGD / 14.5 MGD
Treatment Technology:	4 stage w/ IFAS media
External Carbon Source:	MicroCglycerin™
Case Study Period:	March 2009 – April 2009
Study Status:	Complete, successful.

Case Study Objectives:

- 1) To achieve target nitrogen reduction using a non-flammable carbon source in the demonstration train.
- 2) To optimize denitrification performance using a number of test configurations
- 3) To evaluate the start-up time required to improve denitrification efficiency using external carbon
- 4) To identify a non-flammable, consistent and easy to handle carbon source to meet effluent TN goals following the completion of the upgrade

"Our goal was to evaluate the potential efficacy of the IFAS treatment technology as a plant upgrade option, and to establish the parameters for optimizing the design of an IFAS system. MicroCglycerin™ proved to be a reliable and consistent carbon source, which helped ensure that the test program was focused on core process issues."

- JAMES P. MCQUARRIE, P.E., CH2M HILL

Case Study: James River Plant Optimizes Denitrification with MicroCglycerin™

MicroCglycerin™ Implementation

The protocol established by CH2MHill, EOSi and the James River staff called for the addition of MicroCglycerin™ in a number of test configurations:

Figure 1 (right) Identifies the feed points and the location of the MLR pumps.

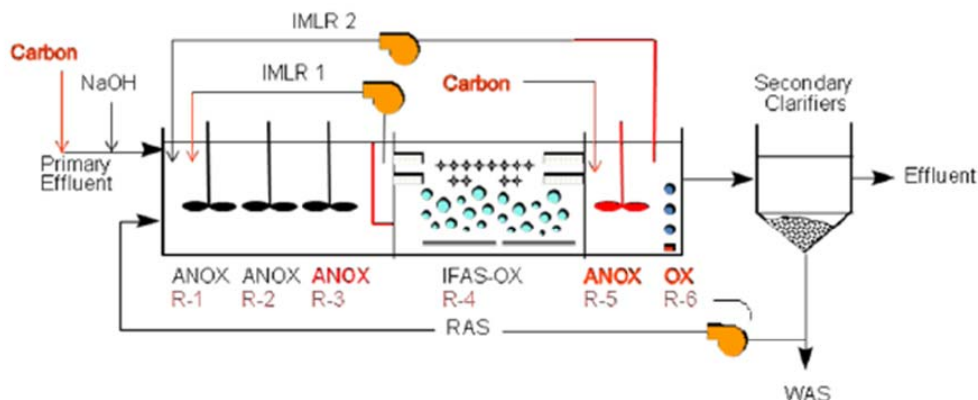


Table 1 (below) Identifies the test configurations, the characteristics of those configurations and the average TN removal performance and effluent TN concentration.

Test Number	1	2	3	4	5	6
MLR 1, x $Q_{influent}$	2	2	2	2	2	2
MLR 2, x $Q_{influent}$	0	0	1	1	1	1
R1 Feed, gal/hr	-	4	4	4	3	3
R5 Feed, gal/hr	4	-	-	-	-	1
Average TN, mg N/L	9.7	7	8	7.8	8.7	6.2
Average TN removal	76.90%	79.90%	79.70%	83.40%	77.40%	86%

Source: McQuarrie, J., et al. *Full-scale design challenges for the James River treatment plant improvements project: Using a demonstration scale project to optimize final design.* Proceedings of the Water Environment Federation Nutrient Removal Conference. Washington, DC. 2009

Conclusions

- 1) TN concentrations of 8 mg/L or less were achieved with MicroCglycerin™ in all but one feed configuration (Tests 2-6)
- 2) Average TN removal of 80.6% was achieved for the duration of the pilot
- 3) TN removal of 86% was achieved with dual-feed points to R1 and R5 (Test #6)
- 4) Operator noted immediate reduction in nitrate concentrations (<1 hour) upon starting the MicroCglycerin feed, validating that intermittent carbon addition is possible in the future
- 5) Two storage tanks capable of holding a non-flammable carbon source will be installed as part of the final design.

"My operations staff wanted a safe, non-flammable carbon source for the test. MicroCglycerin™ met these requirements. We found it to be remarkably consistent and easy to work with as far as handling, storage, and pumping."

- ROBERT RUTHERFORD
JAMES RIVER PLANT MANAGER

Acknowledgement

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