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CASE STUDY

SOUTH FLORIDA WRF EVALUATES & SWITCHES FROM METHANOL TO NONHAZARDOUS MicroC® 2000 FOR ENHANCED FILTER DENITRIFICATION

A South Florida municipal WRF seeking to eliminate the safety risks and high operational costs of using methanol as a carbon source switches to nonhazardous MicroC® 2000 optimized with EOSi's Nitrack® automation control to enhance their denitrification filter process.

Location: South Florida, USA

Facility: Municipal Water Reclamation Facility

Flow Design / Actual: 3 MGD

Treatment Technology: Tetra Denitrifcation Filters

Study Period: May - December

EOSi Solution: MicroC® 2000 + Nitrack®

EOSi's MicroC a Viable Replacement for Methanol in Tetra Denitrification Filters

The South Florida municipal water reclamation facility (WRF) operating with a daily average flow of 3 MGD was using methanol for supplemental carbon dosing to comply with the facility's effluent permit requirements of 3 mg /L total nitrogen (TN). The facility dispensed methanol using a flow-paced automation strategy involving Tetra denitrification filtration, a process using shallow-bed micro-media filtering with added carbon sources to metabolize nitrates in wastewater effluent into subsequently released nitrogen gas.

The facility wanted to eliminate the inherent safety risks and costly transport, handling, and storage costs requirements for using hazardous materials like methanol, and identified EOSi's non-hazardous and non-flammable MicroC 2000 as a potential carbon source replacement for denitrification. But would using MicroC 2000 be operationally viable in a Tetra denitrification filtration process designed for methanol use? MicroC 2000's yield is estimated to be 29% higher than methanol, so facility operators determined they would need to increase their backwash schedule to accommodate MicroC 2000's increased yield either by performing the backwash for a longer duration or more frequently.

To verify, EOSi conducted a 4-phase trial consisting of baseline data collection, an acclimation or transition period, a MicroC manual-dosing evaluation, and an evaluation using MicroC with EOSi's Nitrack automated dosing controller. The trial would be considered successful if EOSi could demonstrate that MicroC 2000 used in the Tetra denitrification filtration process could be a cost-effective and non-hazardous alternative to methanol that enabled the plant to comprehensively meet or exceed all effluent targets.

	Methanol Usage GPD	MicroC Usage GPD	Effluent TN mg-N/L	Influent Flow MGD	Influent TN mg-N/L	Influent TP mg-P/L	Effluent NOx mg/L	Effluent TP mg-P/L
Baseline Phase Methanol	89	0	0.74	3.02	35.63	3.78	0.10	0.07
Transition Phase Methanol/MicroC	61	29	0.57	3.42	36.00	3.40	0	0.04
Evaluation Phase MicroC	0	73	0.72	3.44	29.60	3.24	0.11	0.04

TABLE 1 MicroC 2000 maintained effluent TN quality while reducing overall supplemental carbon usage from methanol by 18%.

EOSi MicroC 2000 vs. Methanol Trial

EOSi installed two Hach Nitratax probes utilized to effectively quantify the NOx removal across the denitrification filters throughout the baseline and evaluation periods. One probe was installed in a common influent box before the screw lifts into the denite filters, and the second probe was installed at the influent of the chlorine contact chambers.

Phase 1: Baseline data collection

Baseline data of methanol being dosed into the denite filters.

- Lab data collection
- Probe real-time data collection.

Phase 2: Transition phase

- MicroC dosing slowly started while methanol was also being dosed.
- Incrementally increasing MicroC 2000 dosage while incrementally decreasing methanol

Phase 3: MicroC 2000 evaluation phase

- MicroC 2000 dosage adjusted manually to approximately 80 gpd.

Phase 4: Transition phase

EOSi implements flow-paced dosing logic to adjust the MicroC 2000 dosage based on Clearwell flow meter data:

- EOSi implements nighttime reduction dose of 50% between the hours of 7pm and 6am based on data collected.
- EOSi implements fine-tuning adjustment to the nighttime-reduction logic based on collected data.
- EOSi reduces max MicroC dosage from 100 gpd to 80 gpd.

Baseline data was collected for a four-month period, where an average methanol dose was 89 gpd with an average TN effluent of 0.74 mg/L. During the evaluation phase, when MicroC was dosed manually, an average of 73 gpd with an average effluent TN was 0.72 mg/L. The result: ***MicroC 2000 was able to maintain effluent TN quality while reducing the overall supplemental carbon usage from methanol by 18%.***

During the Phase 4 transition, EOSi implemented their Nitrack automated-dosing controller using a flow-paced control logic to further reduce MicroC 2000 usage to an average daily dose of 66 gpd, resulting in an overall supplemental carbon usage reduction from methanol by 26%. The flow-paced dosing logic was initially implemented, and an additional nighttime flow-paced reduction was implemented about a week later to achieve further MicroC dosage savings.

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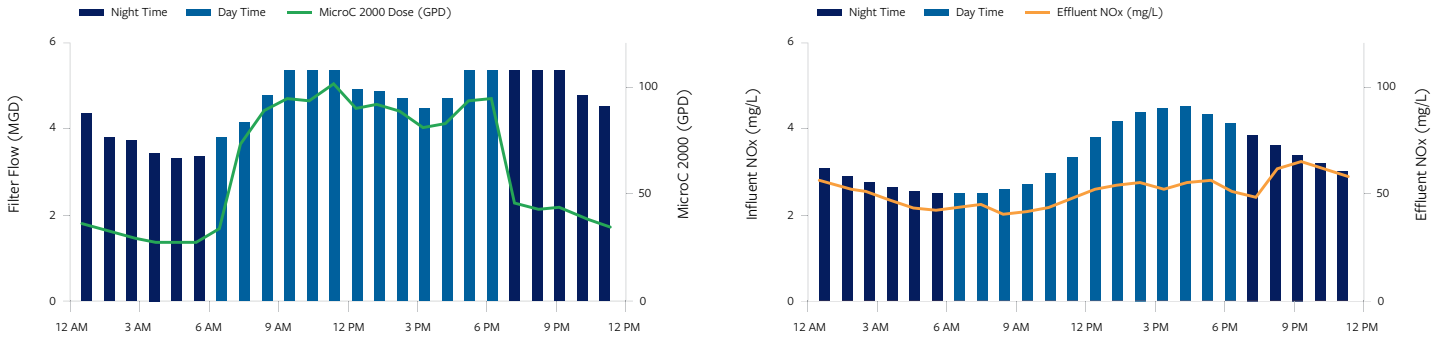
FIGURE 1 EOSi implements night-time dose reduction of 50% between hours of 7 PM and 6 AM to further optimize MicroC 2000 usage while maintaining effluent NOx quality. This adjustment to the control strategy further reduced the MicroC 2000 usage to 66 GPD, resulting in an overall supplemental carbon usage reduction from methanol by 26%.

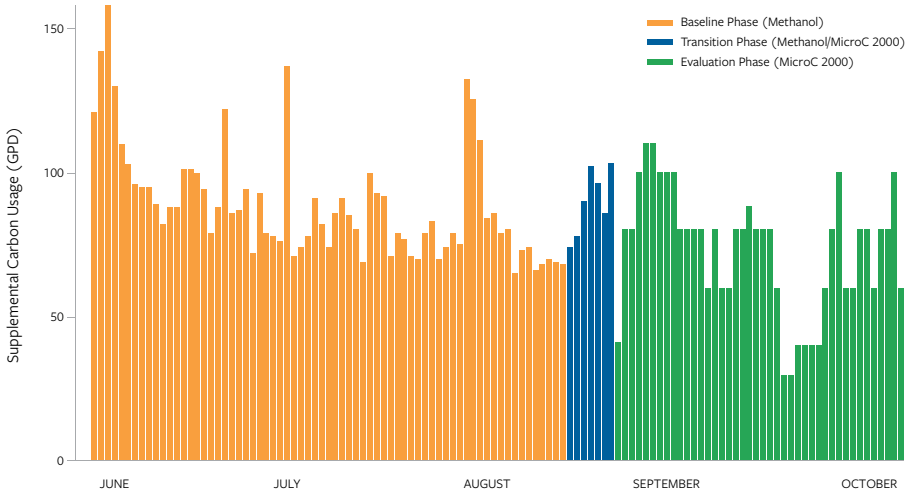


MicroC 2000 + Nitrack Exceeds Methanol Performance — with 26% Less Usage.

The South FL WRF evaluation conclusively demonstrated that MicroC 2000 combined with EOSi's Nitrack automation system can exceed methanol performance at relative consumptive rates much lower than anticipated. A total nitrogen concentration of 1 mg/L or below was met consistently throughout the duration of the evaluation with a lower consumptive rate than with methanol.

The trial effectively demonstrated MicroC's viability as a high-performing non-hazardous carbon source alternative at the facility, successfully eliminating the safety and flammability concerns inherent with using methanol. The evaluation success criteria was achieved by maintaining effluent TN quality with the switch from methanol to MicroC 2000 through comprehensive analysis of the facility's lab data, process data, and comparison with the baseline data analysis. Further, ***EOSi's Nitrack control system also reduced the overall supplemental carbon usage of MicroC 2000 from methanol by 26%.***

FIGURE 2 Daily supplemental carbon usage illustrated above by each of the evaluation phases. The observable trends indicate reduced supplemental carbon usage with MicroC 2000 compared to when the facility had been dosing with methanol.



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