CASE STUDY

TEXAS BEEF-PROCESSOR MEETS STRINGENT TN LIMITS USING MICROC® 2000 & NITRACK® AUTOMATION

A Texas beef-processing plant facing more stringent nitrogen-discharge regulatory limits turns to EOSi to assess, implement, and optimize a cost-effective operational solution using EOSi's MicroC® carbon sources and Nitrack® Program dosing automation for achieving permit compliance — without costly and disruptive capital upgrades.

Client: Large beef processing plant (5,000 head/day)

Location: Texas

Flow Rate: 1.5-2.2 MGD

Treatment Technology: Controlled Swing-Zone Lagoon

Target Nitrogen Concentration: 75 mg/L total nitrogen

Background

The Texas beef-processing plant's wastewater treatment facility operates two anaerobic lagoons discharging into two controlled swing-zone lagoons, each with eighteen aeration zones. Like many protein-processing plants, this facility produces wastewater with highly variable flow rates and contaminant concentrations.

Influent to the wastewater treatment facility produces TKN (total Kjeldahl nitrogen) concentrations of 275-450 mg/L, and COD (chemical oxygen demand) concentrations of 800-3,000 mg/L. The plant's location experiences high winds and drastic temperature swings that also pose challenges to managing the treatment lagoons and basins.



The wastewater treatment facility's process achieved effluent concentrations of 150-200 mg/L nitrate-nitrogen (NO_3-N), enabling the facility to be compliant with its previous effluent TN (total nitrogen) discharge limit of 200 mg/L. However, this level of treatment effectiveness, plant design, and configuration would not be capable of meeting an upcoming new limit for TN of 75 mg/L — putting the facility's operating permit at risk.

Costly Upgrades vs Cost-Effective Optimization

The processing plant considered capital projects upgrading the wastewater treatment facility to enable it to meet the upcoming new nitrogen limits. The plant evaluated several options, including converting the treatment facility to a Modified Ludzak-Ettinger (MLE) configuration, a process using nitrate produced in the aeration zone as a source of oxygen for treatment bacteria needed in the event of the breakdown of raw wastewater in the anoxic pan. Recognizing that embarking on a new capital project like this would likely be costly and disruptive to plant operations, the processing facility engaged EOSi to find a more cost-effective operational solution leveraging EOSi's MicroC® carbon sources precisely managed by their Nitrack® Program dosing-automation solutions.

EOSi MicroC supplemental carbon sources are widely used in denitrification, enhanced biological phosphorus removal (EBPR), and biochemical oxygen demand (BOD) addition applications, and biological treatment of nitrate, nitrite, and selenium in FGD (flue gas desulfurization) wastewater.

EOSi's Nitrack Program process automation enables plant operators to continuously monitor and optimize their unique treatment processes. Nitrack's cloud-based communications integrate with plant operator's treatment control systems, providing ongoing remote monitoring of the nitrification and denitrification processes, real-time recommendations to improve process performance, and monthly reports on MicroC usage and treatment effectiveness.

MicroC®
Premium Carbon Sources

Figure 1

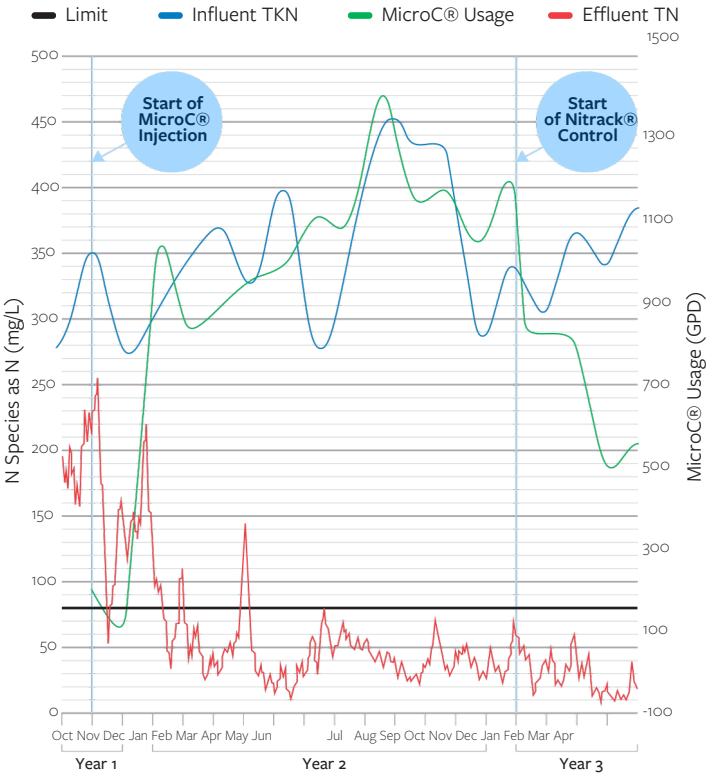
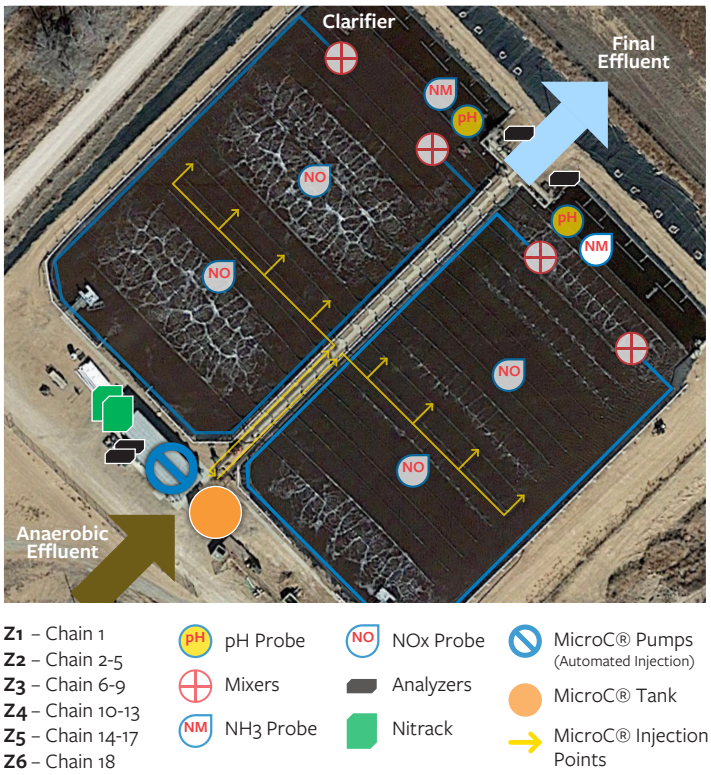


Figure 2



EOSi Process Analysis & Performance Monitoring

EOSi initiated several process-analysis programs, support services, and feed-automation technologies aimed at developing and deploying a cost-effective operational solution, including:

Diagnostic Process Analysis (DPA)

EOSi collected data to profile nutrient and COD concentrations throughout the treatment process, then developed a dynamic, site-specific MicroC® model to evaluate how adding MicroC would impact treatment effectiveness. The modeling results revealed that using MicroC 2000 could enable the existing treatment facility to achieve the new 75 mg/L TN requirement.

MicroC® Evaluation & Application Support (ME&AS)

EOSi developed a detailed MicroC® program, including optimal feed rates, injection points, and control strategies. EOSi provided in-line analyzers, a chemical storage tank, and pumping and dosing equipment.

Due to the intermittent aeration in different zones of the controlled swing-zone lagoons, MicroC 2000 injection was automated based on dissolved oxygen concentrations during the air-off time.

As shown in Figure 1, MicroC distribution lines along the width of the basin ensured an even distribution of MicroC throughout the process. After tailoring the dosing program for this facility, MicroC 2000 was dosed for 90 days to demonstrate its effectiveness, with the plant operators continuing the established dosing on an ongoing basis thereafter.

Performance Monitoring & Data Management (PM&DM)

After implementing the MicroC® program, EOSi provided ongoing remote monitoring of the nitrification and denitrification processes, real-time recommendations to improve process performance, and monthly reports on MicroC 2000 usage and treatment effectiveness.

MicroC® and Nitrack® Success

Adding EOSi's MicroC® 2000 carbon sources to the plant's existing wastewater treatment process enabled this plant to consistently meet its new nitrogen discharge limits (as shown in Figure 2). In the months after the plant's MicroC program was initiated, it also became evident that the treatment facility would benefit from the real-time, automatic dosing administered by EOSi's Nitrack® Program service and technology.

Using the Nitrack Program, the plant's average daily MicroC 2000 usage was reduced by 50 percent, from 1,083 to 500 gallons per day. Nitrack's additional benefits of lowering chemical costs, improving effluent consistency, and freeing operators for other essential tasks duties compelled plant operators to continue using the Nitrack Program on an ongoing basis.

EOSi's operational solution enabled the processing and treatment plant to avoid a costly and disruptive capital upgrade project. With EOSi's Nitrack Program, the beef-processing plant's treatment process has been optimized and automated to minimize chemical costs while maintaining consistent compliance.