Reference Case

Optimizing treatment to cut chemical use and surcharge costs.

CarboNet

A rendering facility sought to reduce effluent turbidity and discharge fees while cutting chemistry costs. CarboNet delivered both, and made overall improvements to further reduce costs, complexity, and eliminate a health & safety concern.

BACKGROUND

The plant processes wastewater from beef, fish, and poultry feedstocks using a floc tube and dissolved air floatation (DAF). Solids are skimmed from the DAF and disposed. Treated water is sent to the city, where surcharges must be paid for turbidity exceedances.

Incumbent chemistry included coagulant (PAC), dry cationic flocculant, and an acid/base combination to adjust pH during treatment. Automation is used to dose coagulant and flocculant driven by readings from meters at the input to the floc tube and a clarified water holding tank after the DAF. Operators monitor and maintain the system, making down the dry flocculant 3 to 4 times a day by climbing a ladder and enter scaffolding above the equipment.

PROBLEM

Total suspended solids (TSS) levels regularly exceeded discharge limits, resulting in surcharges.

- **Measurement and dosing:** The meter in the clarified water holding tank was often disrupted by foam, triggering inconsistent dosing. Additionally, the pump dosing coagulant was oversized for the application, delivering concentrated pulses of chemistry that didn't mix properly in the water.
- **Health & safety concerns:** Operators were required to physically prepare make-down of dry polymer involving accessing the make-down system through scaffolding.
- **Optimizing total treatment cost** is challenging because pH adjustment requires different rates of the other chemistries. Operators didn't have necessary information to make cost-based decisions on tradeoffs between pH and total treatment cost of all chemistries combined.

APPROACH

CarboNet compared SimplePrime coagulants and SimpleFloc flocculants against the incumbent chemistries. Initial bench tests showed a significant TSS reduction could be achieved with lower doses of active polyacrylamide using a NanoNet boosted flocculant.

The field team also investigated pH correlation to total treatment costs. A separate set of bench tests were conducted to determine the impact of pH adjustment on total treatment cost—leading to a recommendation of 6.0 for an estimated 17.5% savings on all chemistries used.

During the full-scale trial, the CarboNet team made recommendations to further optimize treatment:

- **Using a liquid polymer instead of a dry** required 1 batch of make down per day instead of 3 to 4, and did not require operators to climb ladders or enter scaffolding.
- **Changing out a dosing pump and switching to a continuous setting** for the coagulant improved flocculation at a lower volume of coagulant.
- **Installing a weir to protect the meter** in the clarified water tank (post DAF) helped prevent foam from disrupting the readings, ensuring more accurate and consistent flocculant dosing.

The operations team approved these changes, and the production scale trial confirmed that CarboNet chemistries would reduce both chemical cost and effluent surcharges. Treatment became more efficient at a lower cost, while removing a health & safety concern.

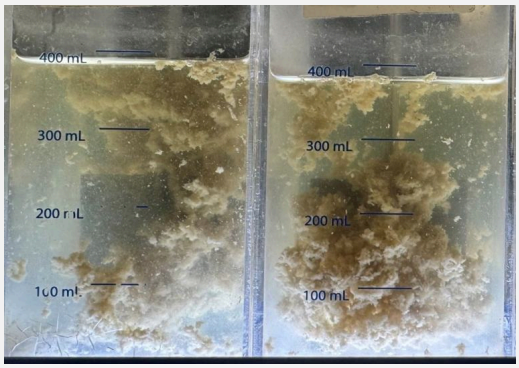
RESULTS

The facility exceeded their goals of reducing TSS and discharge fees. The new treatment program improved performance, reduced cost-to-treat, saved operator time, and removed a HSE concern.

- Reduced TSS 24%
- Reduced total cost to treat 47% ($86,000 annually)
- Reduced make down labor 75% and removed HSE concern
- Improved treatment system monitoring capabilities

BENCH SCALE

Validation of chemistry



INCUMBENT PACKAGE CARBONET PACKAGE

	INCUMBENT	CARBONET
Coagulant	100 ppm Incumbent	100 ppm SimplePrime 8210
Flocculant	1.5 ppm Incumbent	2.5 ppm SimpleFloc 4035A
Active PAM	1.5 ppm	0.73 ppm
Effluent TSS	133 mg/L	77 mg/L

SCALED TRIAL

Reduces chemistry used and TSS

CONTINUOUS DOSING PULSED DOSING

	INCUMBENT	CARBONET
Annual Coagulant Usage	107,194 kg	51,996 kg
Annual Flocculant Usage	2,000 kg (dry)	3,612 kg (emulsion)
Annual Active PAM Usage	1,800 kg*	1,084 kg
Median TSS Value	204 mg/L**	156 mg/L

**Assuming standard 90% active PAM content*
***Average of 3-month pre-trial data*
Annual Chemical Consumption based on Trial Results

COST REDUCTION

Estimated from 3 months of trial data

	INCUMBENT	CARBONET
Annual TSS Surcharges Cost	$152,000	$89,000
Annual Chemistry Program Cost	$190,000	$90,000
Total Savings		**$163,000**

"Rendering demands a robust chemistry, which CarboNet provided. But the best part of working with their team was their approach to improving the whole system. We have done many trials, and this is by far the best we have ever had."

Paul Faber,
Environmental Manager

System Design

AUTOMATED COAGULANT AND FLOCCULANT DOSING

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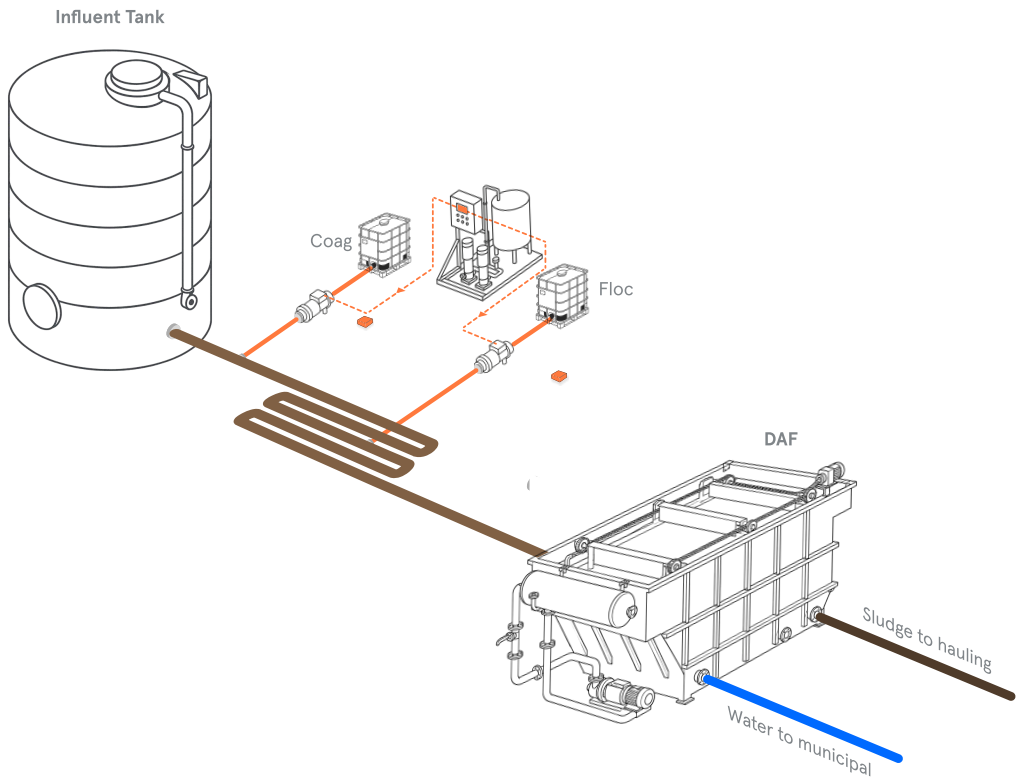
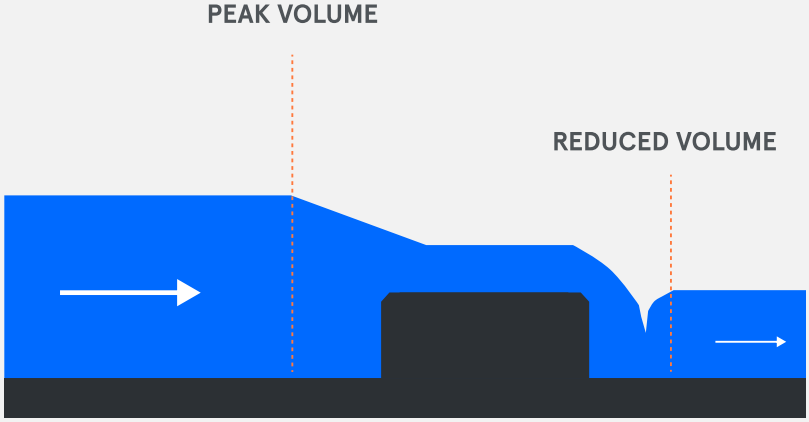


CUSTOM WEIR FOR CLEAN SAMPLING

Isolating flow beneath the foam line for accurate, representative TSS data.

***Left**: Foam and entrained air in the clarified water holding tank disrupted TSS meter readings, producing unreliable data.*

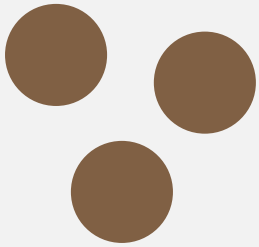
***Below**: Custom-fabricated weir isolates a clean flow path beneath the surface foam, shielding the meter and enabling accurate TSS measurement.*



Flocculant Bridging with NanoNets

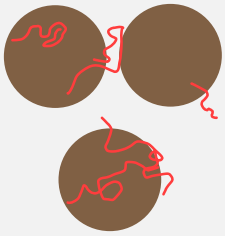
Without

0% POLYACRYLAMIDE



Solids in water

70% POLYACRYLAMIDE



Particles with a high-affinity for polyacrylamide (iron hydroxides, hydrocarbons) become saturated and consume the polymer with little to no bridging between particles.

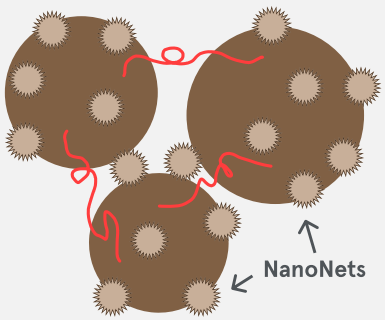
100% POLYACRYLAMIDE

Once particles are saturated, additional polymer is partially bound, leaving polymer loops to effectively bridge particles

With

NanoNets bind sites that typically consume polyacrylamide. Polyacrylamide is now available for bridging, generating larger and stronger flocculation.

30% POLYACRYLAMIDE



NanoNet Case Studies