AMPC
AUSTRALIAN MEAT PROCESSOR CORPORATION

Snapshot Report

Environmentally friendly, carbon negative coagulant for wastewater treatment – full-scale trial.

Project Code
2024-1102

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Date Submitted
27/02/2025

Project Description

This project sought to assess the effectiveness of Tanfloc, a tannin-based coagulant, in the Dissolved Air Flotation (DAF) system at the Red Meat Processor's wastewater treatment facility in Inverell, NSW, through a 30-day full-scale trial.

The main problem being addressed is the need for more eco-friendly and efficient solutions in wastewater treatment, as traditional methods using metal-based coagulants lead to equipment corrosion, pH adjustments, and a higher carbon footprint.

The project began with an initial site visit, where bench-scale tests were conducted using facility wastewater, followed by replicated full-scale coagulation trials. Based on these trials, recommended upgrades were proposed and implemented by the Red Meat Processor to optimise the DAF system's performance. The subsequent 30-day full-scale trial using Tanfloc assessed outcomes across sustainability, technical performance, and economic viability.

The project findings will help drive the adoption of greener, cost-effective practices in wastewater management within the red meat processing industry. The results will support the transition to sustainable treatment methods, reduce environmental impact, improve operational efficiency, and meet decarbonisation goals, ultimately benefiting industry stakeholders and contributing to the circular economy.

Project Content

The project encompassed the following topics:

- Efficient removal of key contaminants to enhance the quality of treated wastewater.
- Mitigation of greenhouse gas (GHG) emissions and a lower carbon footprint.
- Operational efficiencies and reduced chemical dependency related to equipment corrosion and pH dosing, respectively.
- Improved sludge recovery and management.
- Financial positive benefits.
- Scalability and applicability of tannin-based coagulants across different red meat facilities.
- Framework for transitioning to a sustainable wastewater treatment process, setting future sustainability initiatives in the red meat sector.

Providing data-driven insights into the use of Tanfloc at the Red Meat Processor (RMP) will support their broader adoption across the red meat industry. This aligns with the industry's environmental responsibility and decarbonisation goals, facilitating a shift toward low-impact, resource-efficient wastewater treatment while reinforcing circular economy principles.

Project Outcome

To assess the subsequent 30-day trial and evaluate the DAF performance under different conditions, samples were taken before and after the DAF, and analysed externally by a certified laboratory, during three periods: (1) before the equipment upgrades – January 2023 and April 2024, (2) post-upgrades without chemical dosing – August 2024 to November 2024 and (3) post-upgrades with chemical dosing – December 2024 to January 2025.

The implementation of Dissolved Air Flotation system upgrades in August 2024, followed by the introduction of the chemical dosing in December 2024, resulted in quantifiable improvements in the removal efficiencies of Total

Suspended Solids (TSS), Fats, Oils, and Greases (FOGs), and Biochemical Oxygen Demand (BOD). The initial DAF modifications enhanced flotation performance, while the addition of chemical dosing further improved the coagulation and flocculation processes, leading to higher contaminant separation rates, as shown in Figure 1.

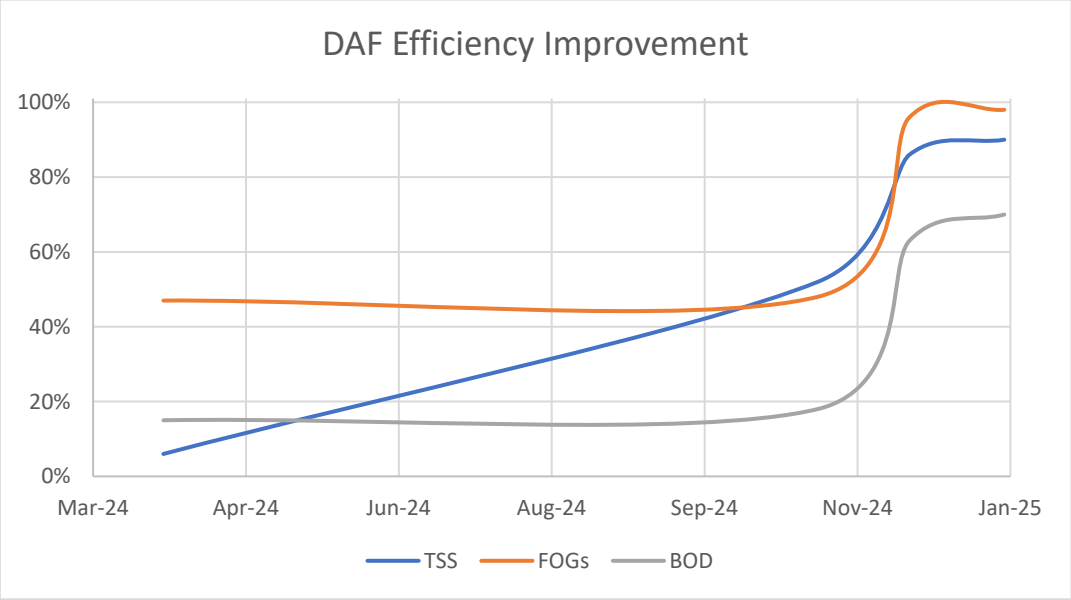

Figure 1. DAF efficiency improvement across periods (%).

The findings of this study demonstrate that Tanfloc significantly improves wastewater treatment efficiency by enhancing contaminant removal. The treatment achieved an 86% removal of TSS, 94% removal of FOGs, 63% removal of BOD, 55% reduction in TN, 58% reduction in TP and 21% reduction in TDS, substantially facilitating downstream treatment.

Lower organic material entering the anaerobic ponds reduces aeration requirements, leading to energy savings and contributing to the facility's carbon neutrality goals. Efficient fat removal prevents excess fat accumulation in ponds, which, under anaerobic digestion, could generate pollutant gases such as methane. Additionally, improved fat removal increases the recovery of valuable resources such as third-grade tallow. Enhanced TN, TP, and TDS removal improves wastewater quality, making it easier to treat in the subsequent process stages, and enabling reuse within the facility for irrigation, internal washing, and cleaning.

In addition to analysing key contaminant removal, the sludge tank's filling time was evaluated (Table 1). The assessment estimated the average time required for the sludge tank level to increase by 20%, providing insight into how DAF upgrades and chemical dosing adjustments affected sludge capture.

Table 1. Sludge tank average filling time across periods.

Period	Sludge Tank Average Filling Time to reach 20% increase in level (hours)
Before equipment upgrades	16.6
Post-upgrades without chemical dosing	16.1
Post-upgrades with chemical dosing	9.6

*Rain events were not accounted for but may introduce minimum variability in this analysis.

The reduction in the sludge tank filling time in the 30-day full scale trial indicates that chemical dosing has improved particle precipitation, emulsification and capture efficiency, leading to the formation of denser and more compact sludge. The shorter filling time in the sludge tank implies that the DAF system is capturing a greater proportion of suspended solids and FOGs, reducing the load on downstream processes.

A key advantage of this enhanced solids separation is the ability to redirect DAF sludge to the tricanter for third-grade tallow recovery. With 94% FOG removal, the process efficiently extracts high-fat-content sludge, which is ideal for tricanter processing. This not only reduces the organic load on subsequent treatment stages but also generates valuable by-products such as third-grade tallow, supporting resource recovery and aligning with circular economy principles.

It is important to note that RMP had no prior chemical dosing system in place and had not previously trialled any coagulants or flocculants. This trial is an innovative initiative to assess the effects of chemical dosing at the DAF. However, it does not explore all available market options, such as metal-based coagulants.

Besides the 30-day full-scale trial at RMP, additional study results testing Tanfloc in Australian facilities have been included in the project.

A case study in a red meat facility similar to RMP assessed Tanfloc dosing for effective coagulation and flocculation through jar testing and pilot-scale trials in different equipment. An optimal range of 0.8-1.0 mL/L was reported, aligning with industry benchmarks for high-strength wastewater treatment. The facility used ACH (Aluminum Chlorohydrate) as a coagulant, which required 1.6 mL/L of the chemical to achieve similar turbidity and FOG removal levels. Tanfloc's higher affinity for organic matter allows for improved destabilisation and aggregation of particles at lower dosing concentrations when compared to metal-based coagulants.

Due to their acidic nature and residual ions, metal-based coagulants increase water corrosivity. ACH, in particular, is known to reduce alkalinity, requiring additional chemicals to maintain system stability and prevent corrosion in downstream equipment and piping. On the contrary, Tanfloc does not contribute to excessive acidification of the wastewater, not requiring pH correction and reducing the need for supplementary chemical dosing such as caustic soda or lime, which are commonly required when using metal-based coagulants to stabilise pH fluctuations in wastewater. The operational benefits when using a non-metal-based coagulant are shown in Figure 2.

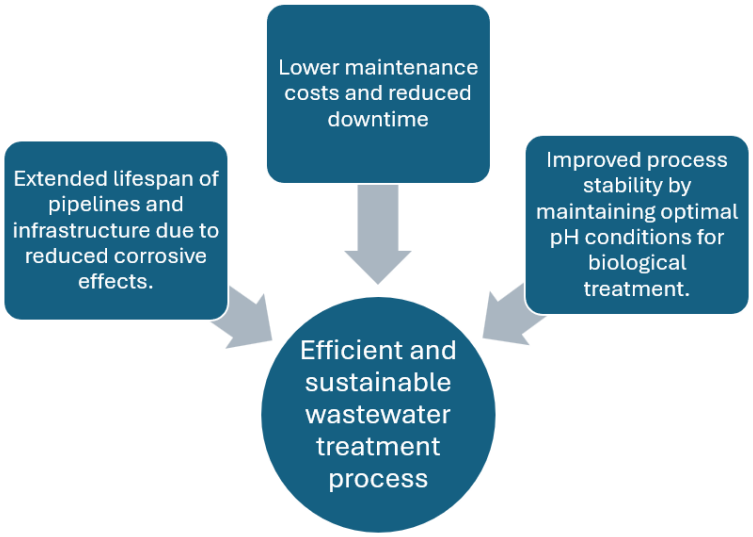

Figure 2. Operational benefits when using a non-metal-based coagulant.

While Tanfloc presents a slightly higher unit cost, its lower dosing requirements contribute to an overall economic advantage. Additional key financial benefits of Tanfloc, when compared to metal-based coagulants, are shown in Figure 3.

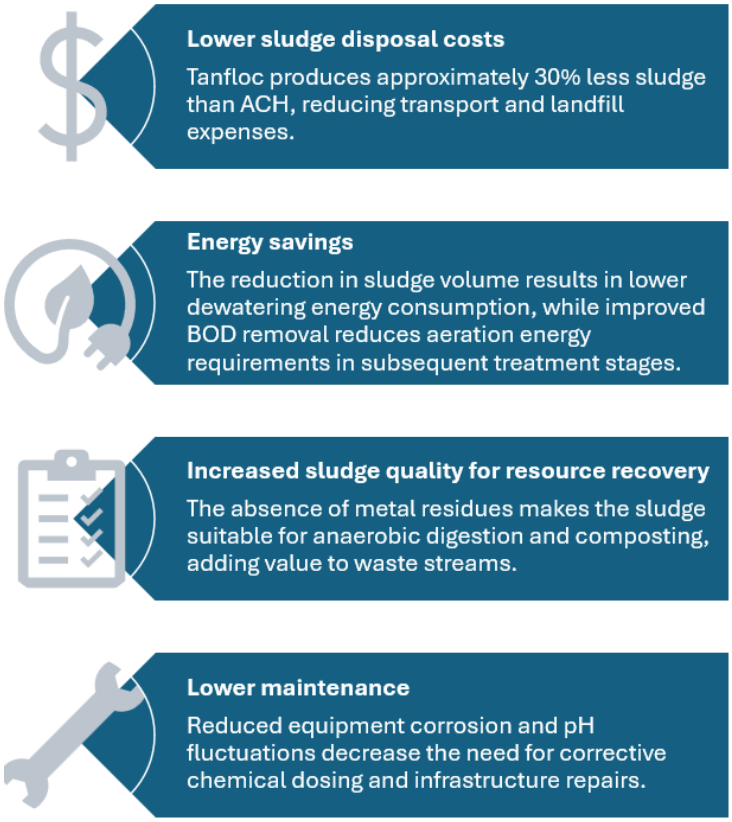

Figure 3. Key financial benefits of Tanfloc, when compared to metal-based coagulants.

Based on the 30-days full-scale trial findings an economic assessment was conducted to evaluate the capital and operational costs of implementing Tanfloc dosing in Bindaree's DAF system, considering potential financial benefits such as energy savings from reduced aeration and increased revenue from improved by-product production, resulting in a payback period of just one year. This demonstrates the economic viability of Tanfloc dosing at Bindaree's site. Moreover, the economic assessment can be extended to other red meat facilities and adapted to their specific operational processes. For example, it could compare Tanfloc with a metal-based coagulant requiring additional pH adjustment, which may also result in a strong return on investment.

Benefits for Industry

The successful application of Tanfloc at the Red Meat Processor, giving the improvements in effluent quality and sludge management, supports the viability of scaling up Tanfloc use across other facilities in the industry, helping to achieve sustainability objectives related to water and energy conservation, waste minimisation, and carbon footprint reduction. There are no major technical barriers for red meat processors to adopt Tanfloc into their wastewater treatment systems, as it integrates seamlessly into existing DAF systems without significant capital investment.