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InnoCyclone — Mining Tailings Wastewater Treatment

Case Study | TANCO — Tantalum Mining Company, Bernic Lake, Manitoba

97%	67%	0.012 mg/L	<5 mg/L
TP Removal	TSS Removal	TP Effluent (Target <0.025)	TSS Effluent Target

Project Background and Challenge

Tantalum Mining Company (TANCO) is committed to protecting the water quality of Bernic Lake — an endorheic system with no natural outlet. As a result, nutrients, particularly phosphorus, accumulate over time, increasing the risk of eutrophication.

Wastewater from the tailings pond is treated through a settling pond before being discharged into Bernic Lake. Although typical influent concentrations are relatively low (approximately 0.5 mg/L total phosphorus and below 20 mg/L TSS), continuous discharge leads to long-term accumulation. Seasonal algal growth in the polishing pond further degrades effluent quality.

To mitigate these impacts, TANCO requires a treatment solution capable of consistently achieving stringent discharge targets of below 0.025 mg/L total phosphorus and 5 mg/L TSS prior to release into the lake.

The Innovantage Solution

Innovantage implemented the InnoCyclone system at TANCO to treat tailings wastewater and meet stringent discharge requirements. The system uses a proprietary Charged Bubble Flotation (CBF) process to separate contaminants, offering faster and more efficient treatment compared to conventional Dissolved Air Flotation (DAF), with a smaller footprint and lower energy demand.

During the pilot, aluminum sulfate was used as the primary coagulant, with a low dose of polymer to enhance floc formation. The addition of InnoFloc — a flocculation accelerator — further improved particle aggregation and flotation efficiency. Chemical dosages were optimized based on influent water quality to achieve effective and consistent contaminant removal.

Project Information	
Location	Bernic Lake, Manitoba, Canada
Client	Tantalum Mining Company (TANCO)
Project Type	Mining Tailings Wastewater Treatment
Completion Date	October 2026
Discharge Targets	TP < 0.025 mg/L	TSS < 5 mg/L

Results

Historical data from TANCO indicated average TSS of approximately 20 mg/L and total phosphorus near 0.5 mg/L. During the pilot, the InnoCyclone system achieved excellent phosphorus and solids removal, with TP reduced to approximately 0.015 mg/L and TSS below 3 mg/L — both meeting the stringent discharge targets.

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During continuous operation, average TSS temporarily increased to 11.25 mg/L due to a polymer pump failure. After repair and process optimization, TSS levels stabilized between 4–8 mg/L (average 6 mg/L), within the target range. Minor fluctuations at low TSS concentrations are expected and do not indicate performance issues.

At higher flow rates (103 GPM), TSS rose to 10 mg/L due to unoptimized dosing, highlighting the need for recalibration when scaling up. Continuous operation was also partially constrained by the absence of an automated sludge management system, which will be incorporated in the full-scale design.

Contaminant	Influent (mg/L)	InnoCyclone Effluent (mg/L)	Removal Efficiency (%)
Total Suspended Solids (TSS)	15	5	**67%**
Total Phosphorus (TP)	0.5	0.012	**97%**

Key Takeaways

- Stringent targets met: TP reduced to 0.012 mg/L (target <0.025 mg/L); TSS consistently within the 4–8 mg/L range under optimized conditions.
- Protects Bernic Lake: High phosphorus removal prevents long-term nutrient accumulation in this closed endorheic system.
- Compact and efficient: The InnoCyclone's smaller footprint and lower energy demand compared to conventional DAF systems make it well-suited for remote mining sites.
- Scalable solution: Pilot results confirm the system can meet discharge targets; full-scale implementation will include automated sludge management for continuous unattended operation.