InnoFloc — Waste Activated Sludge Capturing and Dewatering

Case Study | City of Selkirk, Manitoba

99.9%	99.4%	95.3%	~88%
TSS Removal	COD Removal	TP Removal	Moisture Content After Dewatering

Project Background and Challenge

The City of Selkirk operates an advanced wastewater treatment system that integrates membrane filtration with an activated sludge process. To manage phosphorus, alum is added to promote coagulation prior to solid-liquid separation.

Waste Activated Sludge (WAS) is directed to sludge-settling lagoons, where solids and associated phosphorus settle, and the supernatant is recirculated back to the treatment plant. Over time, sludge accumulation reduces lagoon capacity, requiring periodic dredging to restore performance.

To address this challenge, Innovantage proposed a pilot trial using the InnoFloc technology to intercept and treat WAS before it enters the lagoons. The approach focuses on removing total suspended solids (TSS), organics, and phosphorus — returning clarified water to the plant. By reducing sludge volume at the source, this solution decreases reliance on lagoon dredging, lowers long-term operational costs, and enhances overall treatment efficiency. The captured sludge can also be further processed for phosphorus recovery and beneficial reuse.

The Innovantage Solution

Innovantage implemented the InnoFloc technology to capture and treat Waste Activated Sludge (WAS), enabling effective separation of solids from clarified water. This inline system uses targeted chemical dosing to enhance coagulation and flocculation, facilitating the removal of suspended solids, organics, and phosphorus.

WAS is intermittently discharged from the wastewater treatment plant at approximately 10 L/s over 5-minute intervals, totalling approximately 116 m^3/day. To intercept this flow before it reaches the lagoon, a pump was installed at the discharge point to divert the pre-coagulated (alum-treated) sludge directly to the InnoFloc treatment unit. Polymer is then injected into the diverted stream to promote the formation of larger, more stable flocs, improving solids aggregation and settleability.

Following flocculation, the treated sludge is pumped into 45-foot geotextile bags, where gravity-driven dewatering occurs. Water gradually drains while solids are retained, significantly reducing moisture content and improving handling characteristics.

The dewatered solids are then blended with bulking agents and composted to produce a nutrient-rich soil amendment — supporting the City of Selkirk's sustainability goals by enabling phosphorus recovery, reducing sludge management demands, and promoting beneficial reuse within a circular waste management framework.

Project Information	
Location	Selkirk, Manitoba, Canada
Client	City of Selkirk
Project Type	Waste Activated Sludge Capturing and Dewatering
Completion Date	September 2024
Design Flow	116 m^3/day

Results

The InnoFloc system effectively treated Waste Activated Sludge (WAS), producing effluent that met municipal discharge requirements. Polymer addition enabled floc formation and solid-liquid separation without the need for additional coagulation.

Separation performance was moderate in the initial pass due to high solids content limiting flotation efficiency. However, allowing the flocculated sludge to mature prior to dewatering in geotextile bags significantly improved results, yielding high-quality effluent.

Removal efficiencies exceeded 99% for COD and TSS, 95% for BOD and TP, and 96.5% for TKN. With optimized alum dosing, phosphorus removal increased to over 95%, achieving effluent concentrations below 1 mg/L. The process effectively reduced sludge to approximately 88% moisture content while generating clean discharge water.

Contaminant	WAS Influent (mg/L)	InnoFloc Effluent (mg/L)	Removal Efficiency (%)
Total Suspended Solids (TSS)	9,930	7.3	**99.9%**
Chemical Oxygen Demand (COD)	9,770	54	**99.4%**
Biochemical Oxygen Demand (BOD)	4,250	15.2	**95.0%**
Total Phosphorus (TP)	12.6	0.6	**95.3%**
Total Kjeldahl Nitrogen (TKN)	542	18.7	**96.5%**

Key Takeaways

- Outstanding solids removal: TSS (99.9%) and COD (99.4%) removal — meeting provincial discharge standards.
- Effective phosphorus capture: TP reduced from 12.6 mg/L to 0.6 mg/L (95.3%) with standard dosing; further optimized alum dosing achieves >95% and effluent <1 mg/L.
- Lagoon life extension: By capturing WAS before it enters the settling lagoons, the system reduces sludge accumulation and defers costly dredging operations.
- Efficient dewatering: Geotextile bag dewatering reduces moisture content to approximately 88%, simplifying downstream handling and transport.
- Circular economy: Dewatered sludge composted to produce a nutrient-rich soil amendment, recovering phosphorus for agricultural use.