INNOCYCLONE
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InnoCyclone — Treatment of MSW Landfill Leachate

Case Study | Brady Road Resource Management Facility, Winnipeg, Manitoba

78.5%	75.1%	34.7%	~115 m³/d
TP Removal	Barium Removal	TSS Removal	Design Flow

Project Background and Challenge

Municipal landfills generate significant volumes of leachate that must be managed in compliance with provincial environmental regulations. This leachate is highly complex, containing a wide range of contaminants derived from mixed waste streams, making treatment both technically challenging and costly.

At the Brady Road Resource Management Facility in Winnipeg, leachate is currently transported by tanker trucks to a wastewater treatment facility located over 40 km away, resulting in substantial operational costs and logistical constraints. The City's objective is to implement an onsite treatment solution capable of improving leachate quality to allow discharge to a nearby wastewater lagoon, and ultimately to the environment.

The primary goal of this project was to evaluate the performance of the InnoCyclone system in reducing key contaminants, including:

- Chemical Oxygen Demand (COD)
- Biochemical Oxygen Demand (BOD)
- Total Suspended Solids (TSS)
- Total Phosphorus (TP)
- Heavy metals (Barium, Beryllium, Chromium, and others)

This evaluation aimed to determine whether the system could meet discharge requirements or reduce the pollutant load on downstream biological treatment processes. The data generated will support the development of a full-scale solution to reduce hauling costs and minimize environmental impact.

The Innovantage Solution

Innovantage deployed a mobile InnoCyclone wastewater clarification system to treat landfill leachate directly at the source. The pilot system was installed adjacent to the leachate storage tank and utilizes Charged Bubble Flotation (CBF) technology to efficiently separate suspended solids, nutrients, and other contaminants from the wastewater.

Treatment Process

1. Leachate is pumped from the storage tank and undergoes chemical conditioning.
2. Ferric chloride is applied as a coagulant.
3. A low dose of polymer enhances flocculation.
4. Proprietary InnoFloc is added to further promote particle aggregation and flotation.
5. The conditioned leachate is processed through the InnoCyclone unit, separating it into clarified effluent (returned to the lift station) and sludge (captured and dewatered).

Samples of the treated effluent were collected and analyzed at the onsite laboratory of the Brady Road Resource Management Facility to assess treatment performance.

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Project Information	
Location	Winnipeg, Manitoba, Canada
Project Type	Landfill Leachate Treatment
Completion Date	August 2024
Design Flow	~115 m³/day

Results

Initial bench-scale testing with various coagulants and polymers demonstrated strong clarification performance, confirming the technical feasibility of the treatment approach. Onsite pilot performance clearly demonstrated the InnoCyclone system's ability to significantly reduce key contaminants in landfill leachate. The data showed notable reductions in TP, TSS, organics, and selected heavy metals.

Key Contaminant Removal Performance

Contaminant	Raw Leachate	Clarified Leachate	Removal Efficiency (%)
Chemical Oxygen Demand (mg/L)	2,900	2,600	**10.3%**
Biochemical Oxygen Demand (mg/L)	1,170	992	**15.2%**
Total Suspended Solids (mg/L)	190.0	124.0	**34.7%**
Total Phosphorus (mg/L)	5.308	1.139	**78.5%**
Barium, mg/L	0.3562	0.0887	**75.1%**
Beryllium, mg/L	0.0007	0.0002	**71.4%**
Chromium, mg/L	0.1134	0.0772	**31.9%**
Calcium, mg/L	264.6	222.0	**16.1%**

While removal efficiencies varied across parameters — and some contaminants were not fully reduced — the results confirm the technology's capability to mitigate pollutant loads and support downstream treatment processes.

Key Takeaways

- Effective pre-treatment: Strong phosphorus (78.5%) and heavy metals removal (Barium 75.1%, Beryllium 71.4%) validate the InnoCyclone as a viable onsite pre-treatment solution.
- Cost reduction potential: Onsite treatment could significantly reduce or eliminate hauling costs associated with transporting leachate 40+ km for treatment.
- Optimization opportunity: With further refinement of chemical dosing and process control, higher and more consistent removal efficiencies are achievable for COD, BOD, and TSS.
- Scalable solution: Pilot results provide a solid technical foundation for developing a full-scale onsite leachate treatment system.