

Case study:

Improving year-round nutrient removal to extend the life of a wastewater lagoon

- BioCord® Reactors
- Village of Limoges, ON
- Limoges Sewage Treatment Lagoon



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WINNER

The challenge:

Avoiding the high cost of a complex, mechanical treatment plant

After completing its master plan in 2013, the village of Limoges, a growing community near Ottawa, Ontario, learned that its wastewater lagoon system was nearly at capacity and would not be able to support anticipated growth. With the population expected to surge from 3,200 to nearly 11,000 in the coming years, the master plan recommended replacing the lagoon system with a mechanical treatment plant.

This approach was thought to be the best option to increase treatment capacity and meet regulatory limits for ammonia, BOD, TSS and phosphorus. However, the capital cost was estimated at more than \$17 million and would also result in higher operating costs for more operators, electricity, consumables and maintenance.

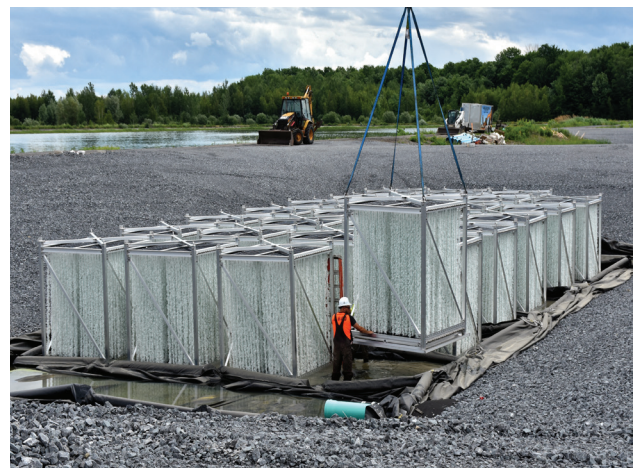
The solution:

In situ BioCord system reduces capital cost by more than 50% vs. alternatives

The community began evaluating alternative options that could leverage the existing treatment infrastructure to improve performance and avoid the high cost of replacement.

Bishop Water's BioCord Reactors emerged as the preferred solution based on low capital and operating costs, ease of use, and robust cold-weather performance.

BioCord Reactors are like a condominium for bacteria that provide a massive surface area on which a productive, cold-tolerant biofilm can form and thrive. This process intensification technology increases the population of bacteria far beyond what an ordinary lagoon can achieve and dramatically improves the removal of organics and nutrients from wastewater – even when the wastewater temperature is near freezing.



BioCord Reactors shown during installation. Once the BioCord Reactors were set in place and connected to the aeration system, the baffle curtains were raised into place to create the raceway.

The system is designed to be installed directly into a treatment lagoon and eliminates the need to expand the plant footprint or build a costly, energy-intensive mechanical treatment plant.

The project was completed for about \$7.5 million, less than half the cost of the mechanical plant option and also included refurbishment of the lagoon cell and new equipment for screening, grit removal, disk filtration and UV disinfection.

The results:

Award-winning project provides robust cold-weather nutrient removal

Two trains of BioCord Reactors were installed into the lagoon system, each with 30 units. Baffle curtains were also installed to direct the flow of wastewater through the treatment cells, maximize contact time and prevent short circuiting. Each BioCord Reactor is equipped with an integrated aeration system that provides oxygen to the bacteria, scours excess biofilm, and provides mixing of the wastewater.

The upgraded system is designed to provide a significant increase to the lagoon’s treatment capacity, boosting it from 1,500 m³/day (intermittent discharge) to 3,500 m³/day (continuous discharge), while also achieving regulatory limits for nutrients and organics.

Even in winter, when water temperature drops as low as 1 degree Celsius, the BioCord system continues to provide treatment and responds to increases in loading. This year-round resilience is critical for continuous compliance with environmental standards and supports the community’s growth without the burden of excessive operational costs.

Date	Effluent flow avg (m ³)	Influent water temp (°C)	Ambient air temp (°C)	CBOD ₅ (kg/day)	TSS (kg/day)	Total phosphorus (kg/day)	Total ammonia nitrogen (kg/day)	
Limits				17.3 kg/day	17.3 kg/day	1.0 kg/day	3.5 kg/day (May 1 - Oct.31) 17.3 kg/day (Nov. 1 - April 30)	Previous year comparison
June 2023	1,033	14.00	11.25	4.6	12.9	0.3	8.7	1.5
July 2023	1,248	15.95	16.25	3.4	12.2	0.2	8.1	6.5
Aug. 2023	1,352	17.36	12.75	1.1	2.7	0.6	5.3	6.6
Sept. 2023	980	18.04	10.8	0.0	1.2	0.1	7.1	5.8
Oct. 2023	928	17.28	4.4	0.0	3.3	0.1	0.4	2.0
Nov. 2023	1,045	15.13	-5.5	4.4	0.8	0.1	0.4	1.0
Dec. 2023	1,391	12.48	-5	0.0	2.1	0.2	1.2	7.2
Jan. 2024	1,350	8.52	-8.6	0.8	8.6	0.3	1.7	17.8
Feb. 2024	1,209	9.10	-11	3.2	9.3	0.2	0.9	21.9
March 2024	1,625	9.15	-1.5	7.1	19.0	0.3	0.8	31.3
April 2024	1,742	10.28	0.25	0.0	6.3	0.2	0.7	30.8
May 2024	1,534	11.90	9	0.0	1.5	0.1	0.4	8.8
June 2024	1,435	14.80	16.75	1.1	1.1	0.1	1.4	8.7

BioCord commissioning period

BioCord biofilm steady-state

Once a steady-state biofilm was established, the BioCord Reactors provided significant reductions in effluent BOD and ammonia concentrations and enabled the lagoon system to achieve consistent regulatory compliance. Note: the system was commissioned in June 2023 and requires approx. eight to 12 weeks to develop a steady-state biofilm. The lagoon retention time is approx. 35 days. That timeline coincides with the graph from Oct. 2023 and onwards, showing consistent ammonia compliance in effluent.



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