



Waste Water Treatment

Biological Treatment
External MBR

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Biological Treatment External MBR

BACKGROUND

ClearBakk specializes in the engineering and construction of water treatment packages and polymer hydration packages with a proven track record serving a wide range of clients in Western Canada and across North America. Our corporate philosophy is people and technology. We engage in exploring new technologies to improve the performance of our system.

ClearBakk was approached by an Oil & Gas client in Alberta to help in treating their wastewater collected from a 600 person camp to meet Alberta Environment discharge standards. Clearbakk employed our innovative, next generation (patent pending) waste water treatment plant technology to meet and exceed the client's needs and environmental requirements



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MAIN FEATURES

- Membrane bioreactor system was used to provide faster startup time, increase reliability, and produces better effluent quality than a traditional extended aeration plant.
- Pressurized aeration provides enhanced oxygen transfer.
- Educator based air injection system offers high energy efficiency, high oxygen transfer efficiency and quiet operation.
- External Membrane Bioreactor (MBR) technology allows for easier clean-in-place (CIP) and reduced CIP chemical consumption over submerged membranes. The damaged membranes can be easily identified and isolated (each membrane has a shut-off valve). External membranes also provide simple preservation and are easy to scale up for future expansion.
- All tanks, structural members and flooring are aluminum alloy to ensure the asset life is maximized.
- External membrane and clear spool pieces of pipe enable the operator visually observe the operation of the plant.
- An air diffusing system was equipped in addition to the air injection system for flexible operation and to minimize down time.
- Provision was made for the future installation of UV disinfection if the effluent is to be used for irrigation.

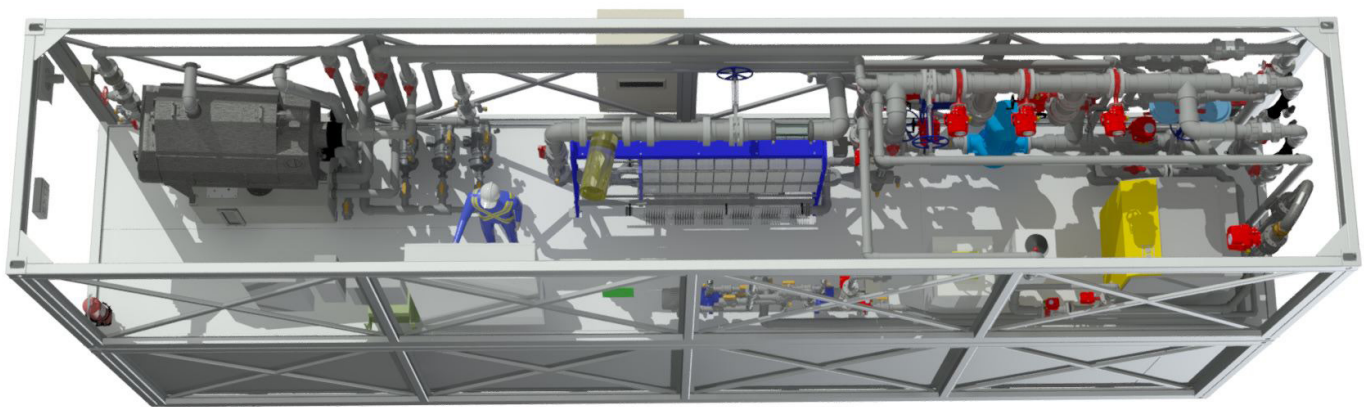
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ADVANTAGES

Compared to the first generation plant, the next generation plant has the following advantages:

- Simpler process – By eliminating the membrane tanks and sludge tank, the process is much simpler than traditional MBR process.
- Higher oxygen transfer efficiency – Usage of pressurized aeration, eductor based air injection offers better water-oxygen mixing and oxygen transfer.
- Smaller footprint – Higher oxygen transfer efficiency allows for much shorter hydraulic retention time for aeration. The footprint was decreased by more than 40%.
- Lower capital cost – Simpler process and smaller tankage required, which resulted in a capital cost reduction of 15%.
- Easy system maintenance – Automatic external membrane CIP reduces time spent by operators to clean membranes. The membrane was inspected after 1 year of operations and was found to be free of buildup indicating sustained efficacy of automatic cleaning.

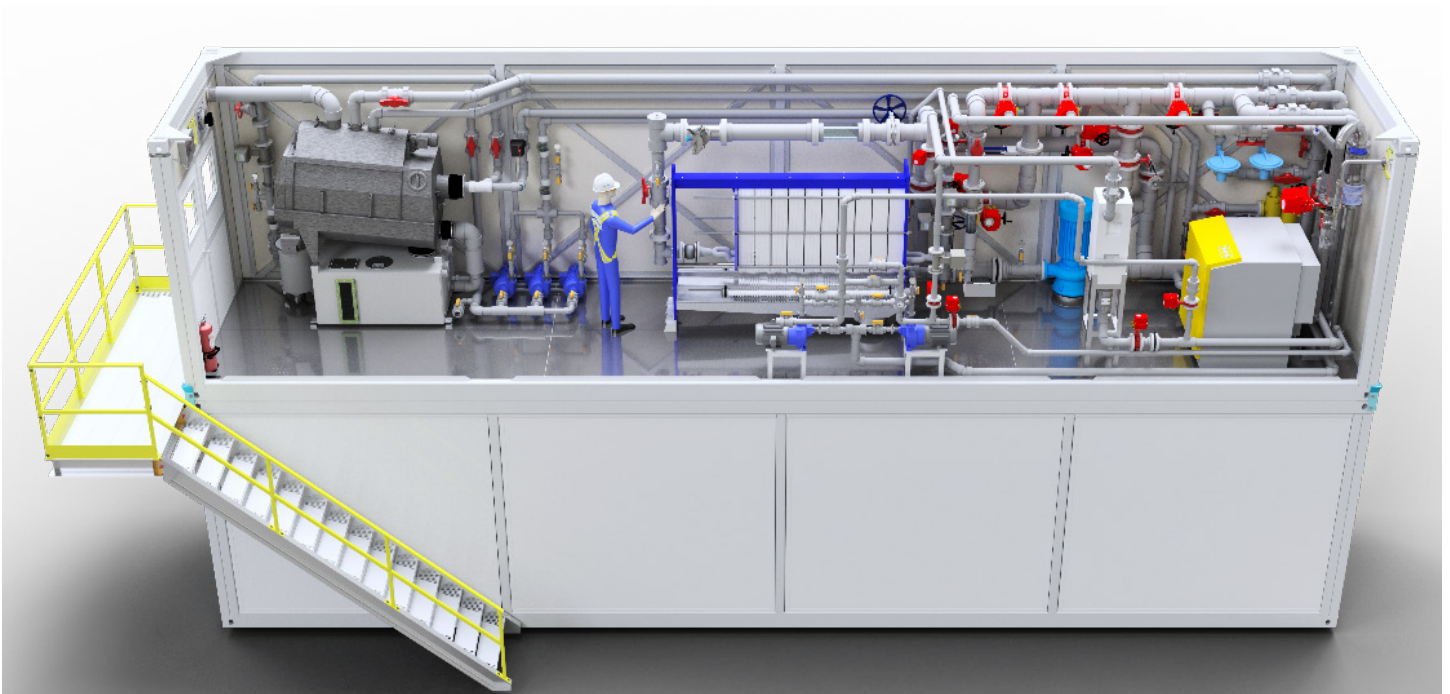


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SYSTEM OVERVIEW

- Design Capacity: 600 People (800 Peak)
- Design Average Daily Flow (DAF): 140 m³/day
- Peak Hourly Influent FLOW: 1468 L/min
- Effluent meets at-grade discharge, and can meet the water quality for irrigation with addition of UV disinfection
- Built to withstand harsh winter climate condition: -42°C
- Building Size: 8' W x 40' L x 9' 9/16" H Containers. This size meets ISO standard for intermodal transportation on ship, rail, or road.



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SYSTEM INTRODUCTION

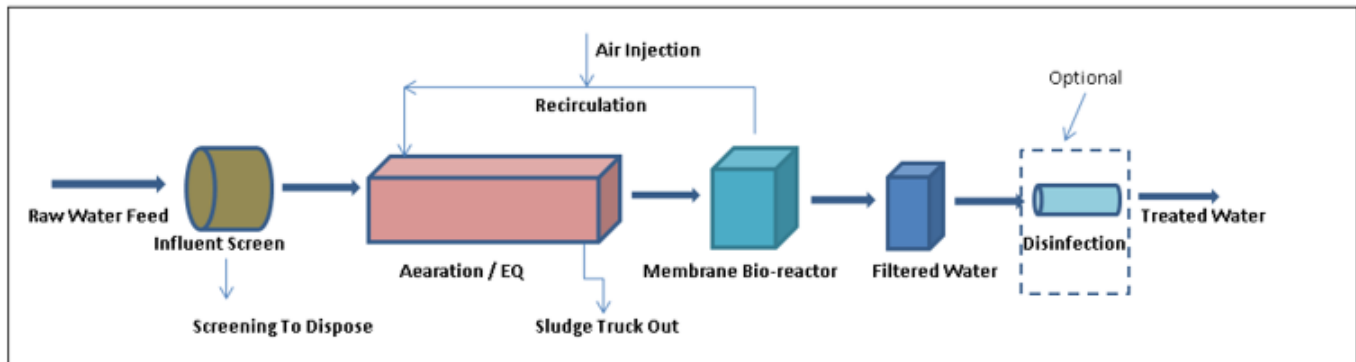
Design Influent and Effluent Water Quality Comparison

Constituent	Average 5-day carbonaceous Biological Oxygen Demand (CBOD ₅), mg/L	Peak 5-day carbonaceous Biological Oxygen Demand (CBOD ₅), mg/L	Total Suspended Solids (TSS), mg/L	Ammonia-Nitrogen (NH ₃ -N), mg/L	Alkalinity (as CaCO ₃), mg/L	PH	Oil and Grease	Influent temperature
Influent	400	600	400	<40	>350	>7; <8.5	<80	>15; <25
Effluent	25*	-	25*	-	-	6.5-8.5	-	-

* Based on 30 day average of composite effluent samples.

** There is no total coliform and fecal coliform requirements for the at-grade discharge. Total Coliform <1000/100mL and Fecal Coliform <200/100mL are required for irrigation for daily samples.

Process Schematic



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SUMMARY

Treated water quality met or exceeded quality guidelines. The treatment capacity exceeded the design capacity.

- Typical effluent water quality is: TSS < 5 mg/L and cBOD5 < 5 mg/L at design influent water quality.
- With high strength influent (monthly average cBOD5 >700 mg/L) at 75%-85% design flow, the effluent water quality still meets the treatment requirement.
- Based on the actual operation, the plant can easily treat the water for up to 800 people and still meet the effluent quality requirements.
- Similar footprint as the first generation plant while double the capacity.

The two plants are picture below. Both are constructed by ClearBakk.

- First Generation Plant (Grey) – 300 PE plant with footprint of 30' x 10'.
- Second Generation Plant (Beige) – 600 PE plant with footprint of 40' x 8'.

