



Waste Water Treatment

Biological Treatment

External MBR

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Biological Treatment External MBR Waste Water Treatment

BACKGROUND:

ClearBakk specializes in the construction of water treatment packages and polymer hydration with a proven track record serving a wide range of clients in Alberta 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 in Alberta to help in treating their wastewater collected from 600 people 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, more reliable and better effluent quality than traditional extended aeration plants.
- Pressurized aeration provides enhanced oxygen transfer.
- Educator based air injection system offers the high energy efficient, high oxygen transfer efficiency and quiet operation.
- External 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 for longevity and avoiding rusting of components, ensuring the asset life is maximized.
- External membrane and clear spool pieces of pipe enable the operator visually observe the operation of the plant.
- A set of air diffusing system was equipped as an addition to air injection system for flexible operation and to minimize the down time.
- Provision was made for future installation of UV disinfection in case 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:

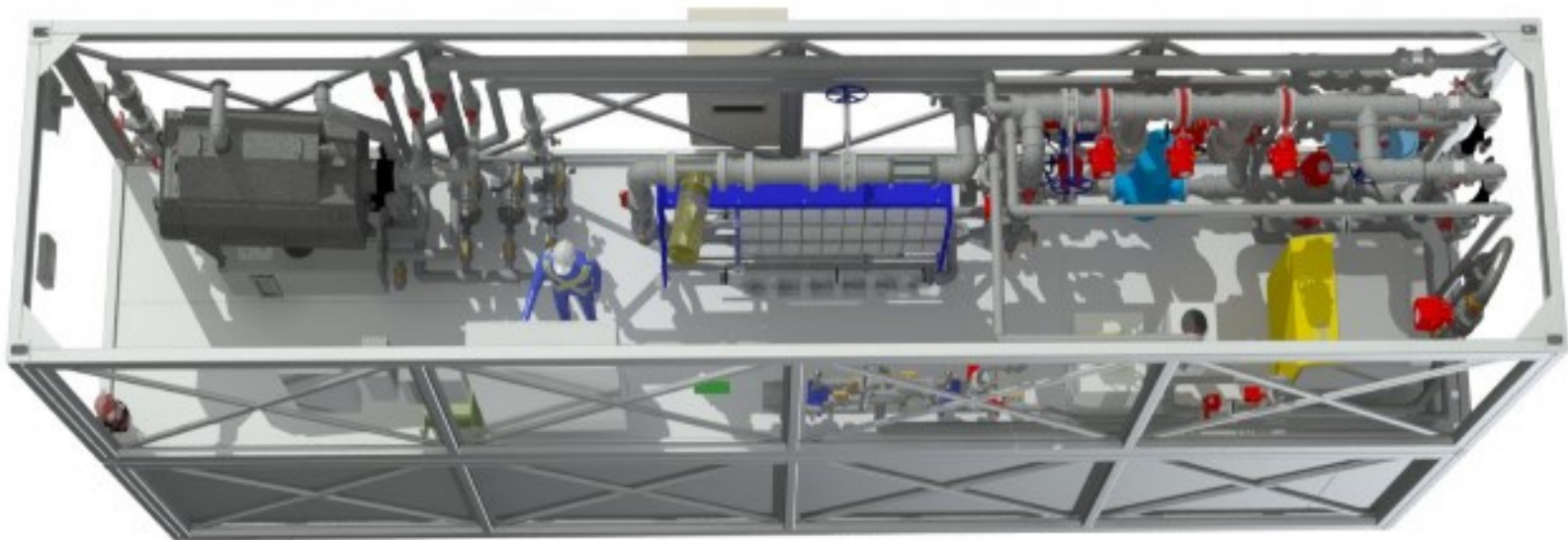
- Simpler process – Eliminating the membrane tanks and sludge tank, the process is much simpler than traditional MBR process.
- Higher oxygen transfer efficiency – Usage of pressurized aeration, eductor based air injection offers better water-oxygen mixing and oxygen transfer.
- Smaller footprint – Higher oxygen transfer efficiency allows much shorter hydraulic retention time for aeration. The footprint was decreased by more than 40%.
- Lower capital cost – Lower cost because of simpler process and smaller tankage required. The capital cost is cut down by **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:

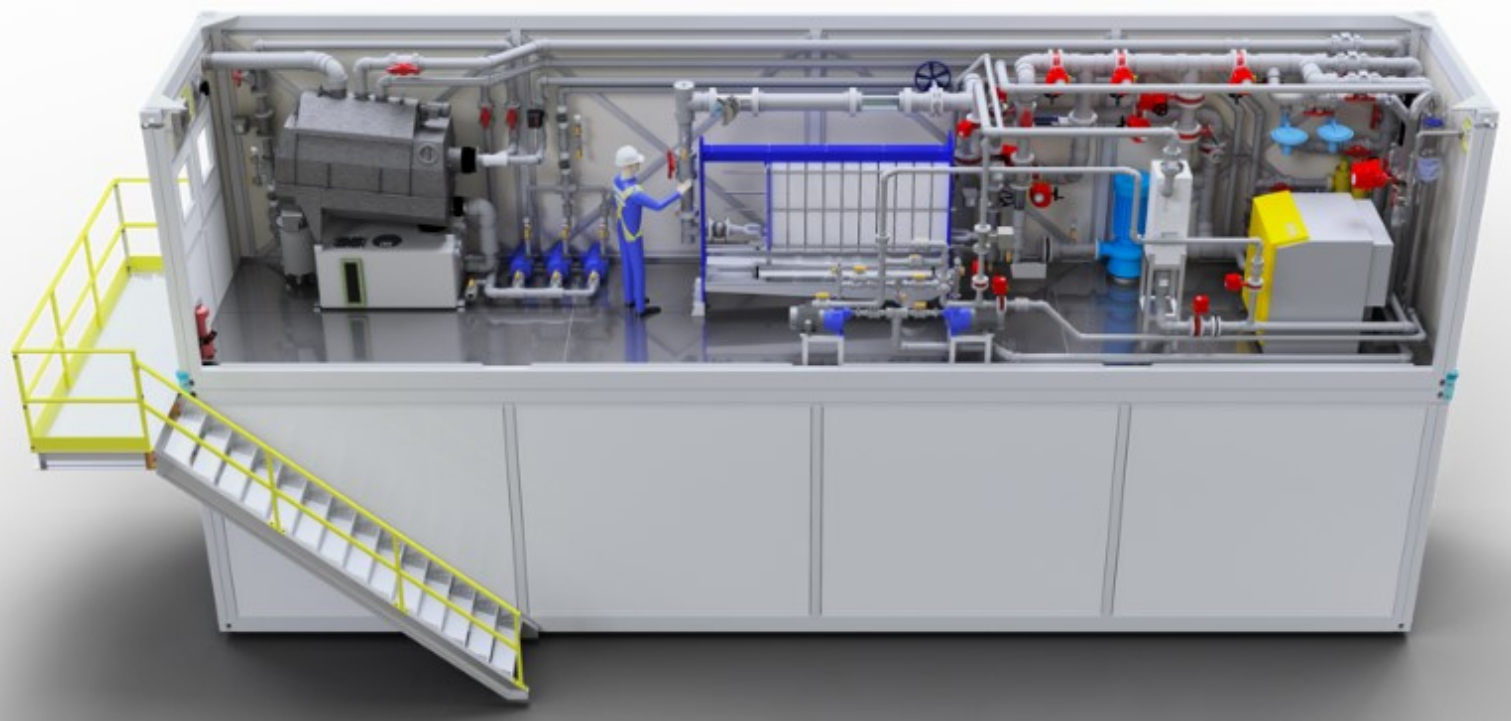
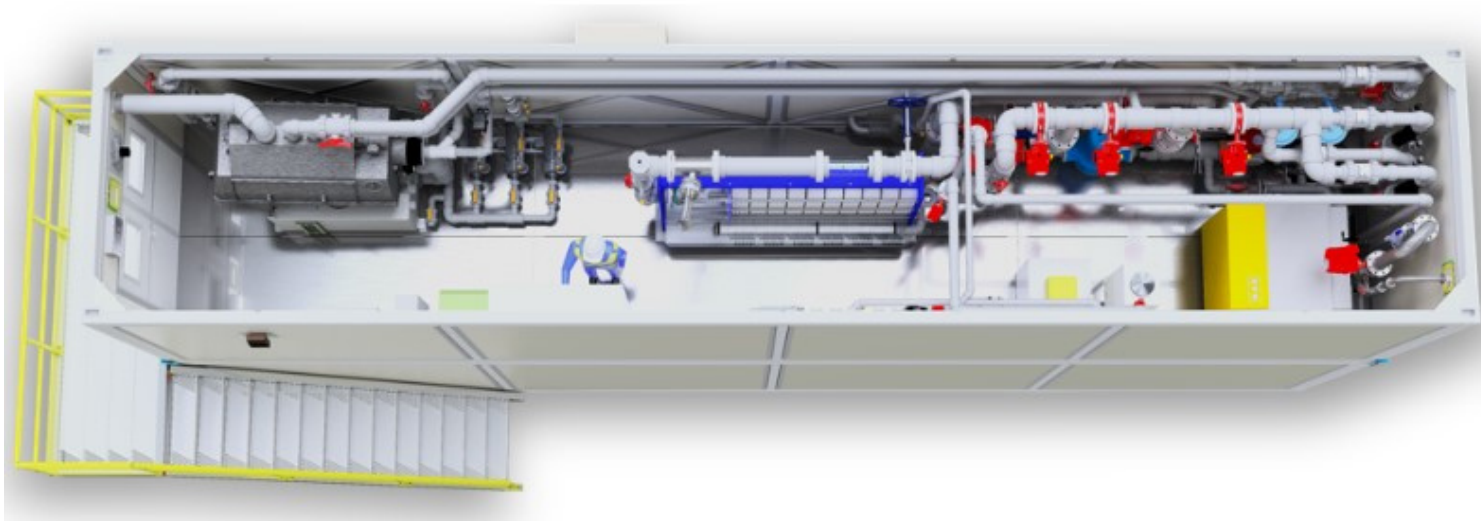
- Design population: 600
- Design average day flow (DAF): 140 m³/day
- Peak hourly influent flow: 1468 L/min
- Effluent to meet at-grade discharge, and can meet the water quality for irrigation with addition of disinfection
- Suited to harsh climate in the winter: ambient air temperature (minimum) -42°C
- Building Size: two of 8' W x 40' L x 9'- 9/16" H containers. The size meets ISO standard for intermodal transport on ship, rail or road.



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SYSTEM OVERVIEW:

- 600 person population – Peak 800 pop



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SYSTEM INTRODUCTION:

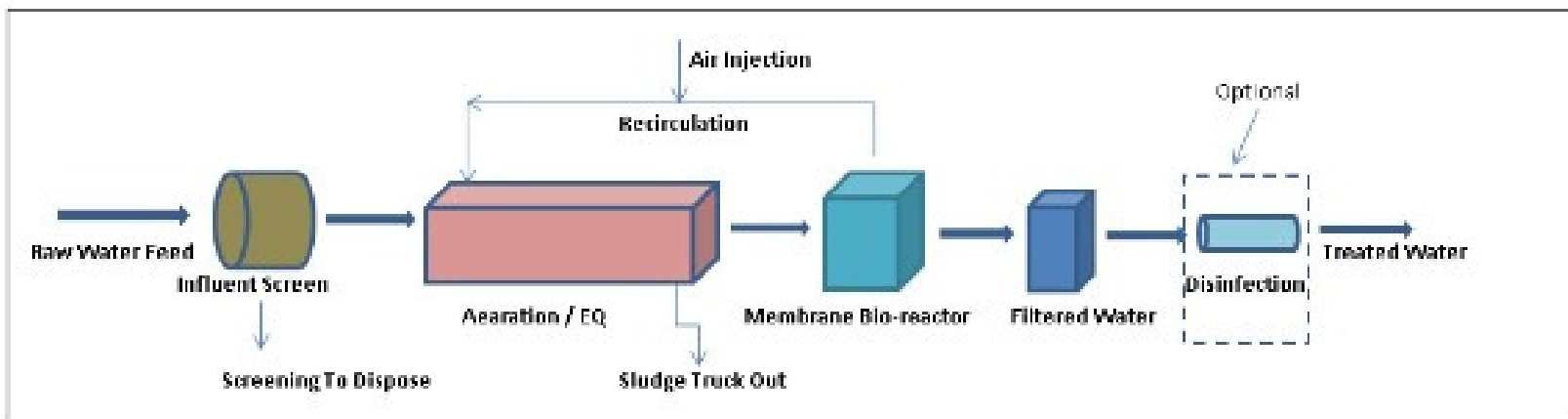
Design Influent and Effluent Water Quality

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/ 100 mL and Fecal Coliform <200/ 100 mL are required for irrigation for daily samples.

Process Schematic



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SUMMARY:

Treatment Achieved

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 can meet the treatment requirement.
- Based on the actual operation, the plant can easily treat the water for up to 800 people and meet the effluent quality requirements.

Minimized Footprint – almost same footprint as the first generation plant with half capacity

The two plants in the below picture are both constructed by Clearbakk:

- The grey one is the first generation plant - 300 PE plant with footprint of 30' x 10'.
- The yellow one is the second generation plant – 600 PE plant with footprint of 40' x 8'.

