

advanced wastewater treatment

**MBR
Membrane
Module**



*Containerized Systems
ideal for:*

- Decentralized municipal wastewater treatment – saving on sewerage laying costs
- Resorts, hotels, housing developments, subdivisions
- Workcamps
- Industrial wastewater treatment

Which is the best system?

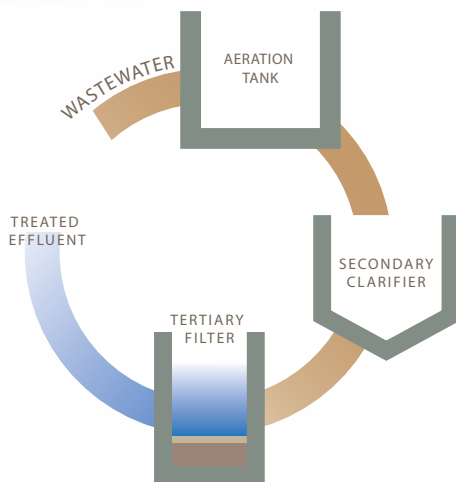
2008 Comparison of Technologies by Stantec Consulting for Salem, MI

Treatment Option	Footprint	Aesthetics	Capital Cost	O&M Costs	Operator Attention Required	Meets Stringent Effluent Requirements	Total Score	Overall Ranking
Membrane Bioreactor	4	4	1	2	4	5	20	1
Conventional Extended Aeration	3	3	3	3	2	3	17	2
Oxidation Ditch	2	2	3	3	3	4	17	2
Sequencing Batch Reactor (SBR)	4	4	2	1	1	4	16	4
Activated Sludge	2	1	2	3	2	3	13	5

5 = More advantageous 1 = Less advantageous

Custom Engineered Treatment Systems





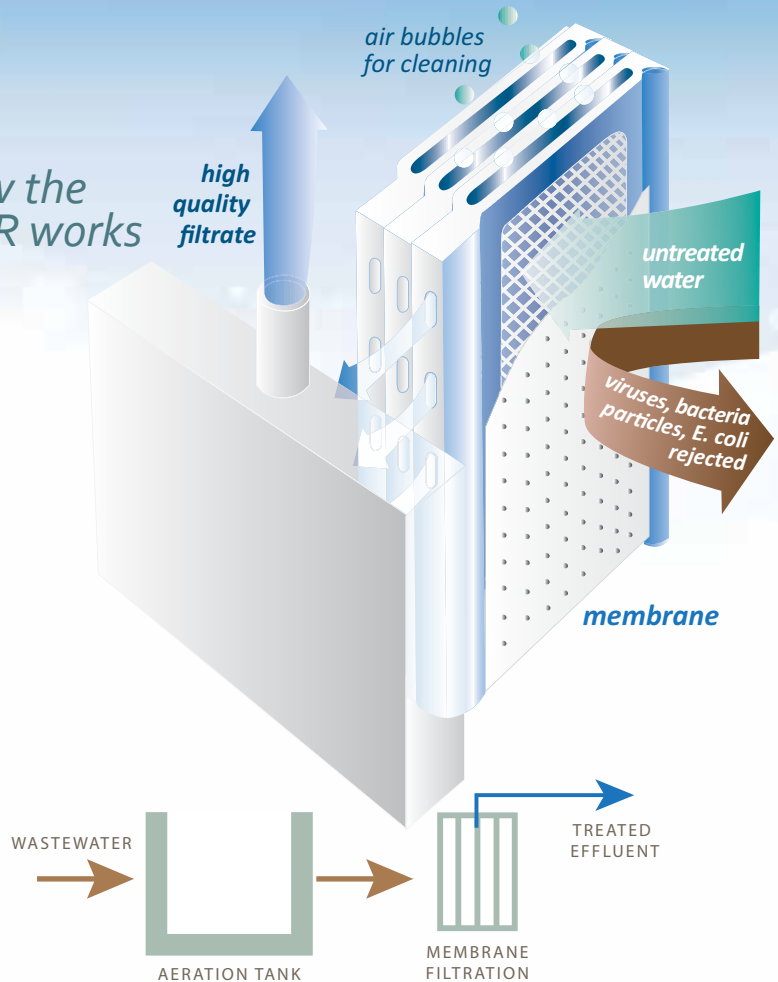
Conventional Activated Sludge Process

In the conventional activated sludge process, liquid from the biological reactor flows to the secondary clarifier where solids settle down by gravity and the clarified liquid overflows to the clarifier tank. The treated effluent may be passed to the tertiary filter for removal of residual suspended solids.



Sludge facilities can release a higher quality of filtrate with the addition of an ultrafiltration membrane. Ceramic membranes are long lasting and can be gravity fed, so very inexpensive to operate. Ask us about our ultrafiltration options.

How the MBR works



Membrane Bioreactor (MBR)

With an MBR, the secondary clarifier and tertiary filter are eliminated and the liquid from aeration tank flows to the membranes for filtration. Membranes provide a physical barrier to the suspended solids and allow clear water to pass through. The effluent obtained is as clear as the tap water. Our MBR is run at a much higher concentration of microorganisms – mixed liquor – to accelerate the treatment process, which reduces the footprint and excess sludge for disposal.

ADVANTAGES

- Meets the strict effluent criteria for total suspended solids: $< 1 \text{ mg/L}$, turbidity $< 1 \text{ NTU}$, $\text{BOD}_5 \leq 5 \text{ mg/L}$, TP (total phosphorus) $\leq 0.2 \text{ mg/L}$
- Compact footprint: 30 to 50% size compared to conventional activated sludge process
- 60-80% less sludge waste
- Lower maintenance costs
- Lower capital cost compared to conventional activated sludge process with tertiary filtration
- Use as a pre-filter for RO for unrestricted reuse or potable

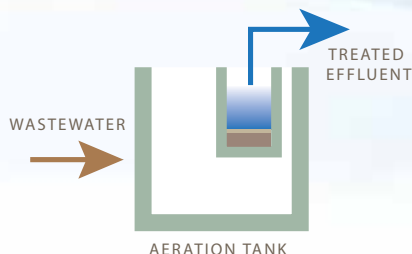
CONFIGURATIONS

MBRs are supplied in various configurations depending on specific requirements:

- One or multiple ISO shipping containers to meet flow required
- Larger plants in 12' wide x 12' high x 40' long steel tanks
- For higher flows, supply of equipment for installation in concrete tanks



SEQUENCING BATCH REACTOR



Sequencing Batch Reactor (SBR)

SBR is a batch biological wastewater treatment process where all the processes of flow equalization, biological treatment, separation of solids from liquid, and drawing off of clear liquid occur in a single tank. Much less area is needed than when separate tanks are required for equalization, biological treatment, and gravity separation of solids from liquid. The number of tanks used depends on



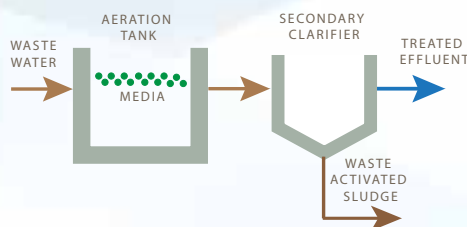
SBR tank with decanter (closeup)

the flow. Operation of each SBR basin is cyclic in nature and comprises Fill, the React stage of aeration/aerobic treatment, Settling and Decant. The decanter moves down while drawing clear supernatant from the surface which flows out of the SBR tank.

ADVANTAGES

- High quality effluent: total suspended solids ≤ 10 mg/L, BOD5 ≤ 10 mg/L, nutrient removal
- Compact footprint
- No secondary clarifier needed
- Better control of sludge bulking
- Lower cost compared with conventional activated sludge process

MOVING BED BIOREACTOR (MMBR)



Moving Bed Bioreactor (MMBR) and Integrated Fixed Film Activated Sludge (IFAS)

MMBR is a biological fixed-film process using microorganisms that reside inside media. Media is either free-floating or fixed structured. Retention screens are needed for free-floating media. MBBR is ideal as a pre-treatment for the main industrial wastewater treatment plant.

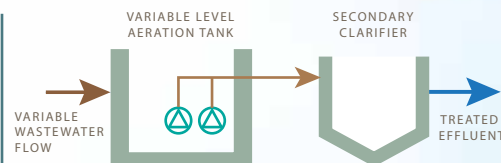
The combination of MBBR and a return activated sludge system is an IFAS system. IFAS creates less solids loading on the secondary clarifier.

ADVANTAGES

- Least cost upgrading of existing wastewater treatment plants
- High quality effluent: total suspended solids ≤ 15 mg/L, BOD5 ≤ 15 mg/L, nutrient removal
- Better control of sludge bulking
- Greater biomass resulting in accelerated treatment with compact footprint
- Less waste sludge
- Less solids loading on the secondary clarifier



VARIABLE LEVEL EXTENDED AERATION



Variable Level Extended Aeration

All flow equalization occurs in aeration tank which has a variable level to accommodate peak flows.

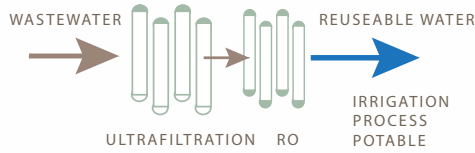
ADVANTAGES

- No need for equalization tank – cost saving
- Flow and pollutant load dampening – energy saving
- For 24-hour detention aeration tank volume, no need to provide significant additional volume
- For aeration tank detention time less than 24 hours, additional volume for equalization provided



- Stable operation due to uniform out-flow to secondary clarifier
- Variable level in the aeration tank provides 'cushion' from peak flows
- High quality effluent: total suspended solids ≤ 15 mg/L, BOD5 ≤ 15 mg/L, nutrient removal

Water Recycling



With advancements in membrane technology, it has become cost effective even for small systems to use RO and ultrafiltration to filter wastewater for beneficial reuse. The systems are low maintenance, with no replacement filter costs, lower chemical cost. Systems have a small footprint and are easy to implement.

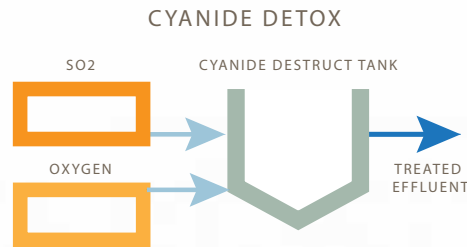
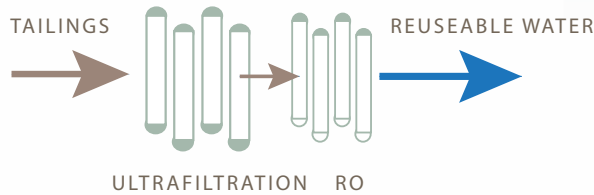


RO system recovers 90% of wastewater stream for Alberta camp

ADVANTAGES

- Meets stringent discharge limits
- Compact, supplied in pre-fab buildings or skids to fit inside existing buildings

Mine Waste Treatment



Our pilot studies have shown that mine tailing wastewater can be successfully treated with the filtration technologies available today.

BI Pure Water with its partners developed a system to detoxify cyanide that is working well at gold mines. After recovery of gold from the ore, the pond tailings are treated in a single-stage cyanide destruction process to reduce the concentration of residual cyanide and precipitate heavy metals in the final effluent stream. This process meets the target cyanide limits set by the regulatory authority, which can be as low as 1 mg/L CN total, or less than 50 mg/L weak acid dissociable (WAD) cyanide.

ADVANTAGES

- Process is cost efficient and usage of oxygen lowers energy cost
- Tried and tested process
- Meets stringent discharge limits
- Compact, supplied in pre-fabricated buildings



Cyanide destruction process underway in tank



BC & North American award winning design & manufacture



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