



BLUE REVOLUTION FROM CANADIAN CRYSTALLINE

Save Tomorrow's World, Today



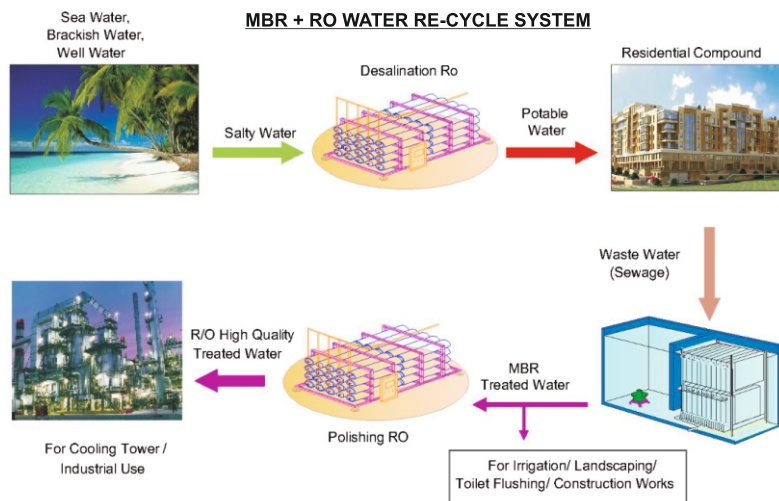
GREENER ENVIRONMENT
GREENER WORLD

POLLUTION CONTROL | WATER RECYCLING

Silver Stream[®]

Less Space
Low Cost
Low Power
Low Maintenance

MBR & MBBR
Technology



Canadian Crystalline 'Silver Stream' At a Glance

Far more precious than gold or silver, a little more crucial than petrol and as vital as oxygen, yes, we're talking about water. We know that 75% of the world's fresh water resources are contaminated, the remaining is fast disappearing. Soon how well we survive will depend on how well we conserve water. Thankfully technology has advanced enough to offer us choices in water conservation.

One of the most reliable way to do today is by recycling water. We at Canadian Crystalline "Silver Stream" present you a reliable method to recycle water through our superior, pre-fabricated packaged waste water treatment plants. These plants have the capacity to completely treat and cleanse waste water and make it suitable for various activities like Landscaping, Floor Washing, Gardening, A/C Cooling Tower and Toilet Flushing applications. They truly lend a helpful hand in reducing the load on natural water resources.

Canadian Crystalline newly developed technology has resulted in machines with better efficiency, less power consumption and is more compact in terms of size and weight.

About our Canadian Crystalline 'Silver Stream' MBR

1) The Membrane Bio-Reactor unit (hereinafter referred to as "MBR") can treat domestic wastewater generated from

✓ Residential Apartments	✓ Commercial Complex	✓ Labour Camp / Defence / Refugee Camps
✓ Public Amenities / Convenience	✓ Factories / Industries	✓ Resorts & Clubs

2) Canadian Crystalline "Silver Stream" MBR is "Low maintenance cost" "Space saving" "low initial cost" advanced water treatment system, by combining active sludge treatment and submerged Membrane Bio-reactor Systems.

3) Canadian Crystalline "Silver Stream" MBR adopting membrane filtration process requires less space and yet provides higher treatment performance compared with the conventional treatment systems. That is why the MBR is ideal for places with limited space, and for recycling of treated water for drip irrigation, landscaping, toilet flushing, road compacting, curing of concrete, etc.

4) Raw sewage treatment capacity: from 10 KLD to 100,000 KLD OR 10 m3/day to 100,000 m3/day are available in the range of Canadian Clear "Silver Stream" Systems.

5) Canadian Clear "Silver Stream" MBR sets 2 or 3 membrane modules in a vertical formation, containing multiple membrane modules. Pumping wastewater through the membranes effectively treats the water. Sludge clogging on membrane surface is greatly reduced as air is constantly scored from beneath the membrane module.

Features of Advanced Technology Canadian Crystalline 'Silver Stream' MBR

1) Easy Operation and Low Maintenance Cost

- Clog-resistant: Noodle type membrane design
- Easy inspection: as membrane modules are noodle type
- The membrane-based solids-liquid separation ensures easy maintenance hence no need to pay attention to Sludge control and sedimentation.
- Periodical maintenance for membrane is only one cleaning by dosing chemical solution once in three (3) Months.
- Operation and maintenance for MBR is very simple.

2) Space saving (Low footprint)

- Operating with a high concentration of Mixed Liquor Suspended Solids (MLSS), the MBR process requires only a smaller reaction tank and does not require settling tank or sludge thickening tank. Therefore, the required area for Canadian Crystalline "Silver Stream" MBR process will be one fourth (1/4) of the activated sludge process.

Canadian Crystalline "Silver Stream" MBR, when catered to large sewage treatment for cities and municipalities saves space, thus reducing the cost of the project drastically, as worldwide the real estate value is escalating to unprecedented levels.

The retention time for the treatment is considerably reduced compared to Activated Sludge Process. Thus the Canadian Crystalline "Silver Stream" MBR is a compact design.

3) Low Cost

Simple and compact design leads to initial cost savings, reduces sludge disposal cost as less sludge is produced.





7) Movable unit

Canadian Crystalline “Silver Stream” MBR up to 100 KLD capacity can be transported because of its compact size, hence it can be transported to other sites after project termination and can be reused.

8) Easy installation

Since Canadian Crystalline “Silver Stream” MBR is a prefabricated plant, only joints, piping and wiring works are required at site. Therefore, installation work is easy and installation period is short.

9) Less sludge volume

Volume of generated sludge will be reduced to one fourth (1/4) compared with Activated Sludge Process. MBR is operated in conditions of high concentration of MLSS, thereby producing less sludge.

Canadian Crystalline 'Silver Stream' System Configuration

1. Features of process

MBR (Membrane Bio-reactor) is a process that combines a membrane filtration process and activated sludge process. The MBR process does not require secondary clarifies and sand filters used for tertiary treatment in the conventional activated sludge process.

2. Facilities:

I. Primary Treatment facilities:

Raw water septic tanks (can be provided by the Buyer)
The existing septic tanks serve as an equalization tank to provide constant flow to MBR System.

Raw water pump

One Raw water submersible pump will be installed in the raw water septic tank / Equalization Tank . The sewage water is collected in the raw water septic tank / Equalization Tank after passing it through the inlet screen. The pump is operated automatically according to the water level in the anoxic tank.



Inlet fine screen

The inlet fine screen is installed on the Equalization Tank. The slit size of the screen is 6 mm. The screen removes fine substances contained in the wastewater such as toilet paper, hair, etc. to prevent clogging and/or scratching of membrane. Screened water flows to the Equalization Tank by gravity. Screenings are scraped automatically / manually and discharged.

4) High Reliability

Canadian Crystalline “Silver Stream” MBR uses PVDF membranes made with advanced resin processing technology.

5) Energy saving

Blower energy requirements are lowered by positioning the membrane modules in a vertical formation to reduce the volume of pumped air required to clean the membrane Surfaces.

6) High quality treated water

As wastewater is filtered by membrane with pore size of 0.2 μm , the treated water can be used for drip irrigation, landscaping, toilet flushing, road compacting, curing of concrete, etc. The treated water can also be used for industrial purpose and also for air-conditioning cooling. MBR system is capable of removing Phosphorus and Nitrogen in 6 hours retention time. MBR is capable of removing Coliform Bacteria and all biological contamination by high rate activated sludge. The treated water has no smell. With the conventional activated sludge process, the quality of treated water tends to deteriorate due to insufficient sludge sedimentation (caused by bulking, etc.) On the other hand, no such problems occur to the MBR process because the sludge is separated by membrane filtration.

Items	Unit	Raw Water	Treated Water
BOD	mg/l	150 to 300	30mg/l or less
SS	mg/l	150 to 400	10mg/l or less



II. Membrane Bio-reactor Facilities (MBR System)

The Membrane Bio-reactor Facilities (MBR System) consist of an Anoxic Tank followed by an Oxidation Tank with a membrane unit.

The facility has 2 major functions. One is to remove organic content within the sewage water (BOD) by activated sludge method. The activated sludge process injects oxygen into the reaction tank to make aerobic micro-organisms grow within the tank, and make those micro-organisms digest and thus remove the organic content (BOD) within the sewage water.

The organic matter is partly digested to generate carbon dioxide, and partly used to grow bacteria.

The MLSS of the conventional activated sludge system is approximately 3 - 4 g/l., while that of the MBR system is 7 - 20 g/l., and that is why the micro-organisms concentration can be maintained at high level. The time required for treatment can thus be reduced to approximately 30% of the conventional system.

The other function is to separate solids from liquid using a membrane filter. This process removes the Suspended Solids (SS) within the sewage water by membrane filtering, since the pore size of the membrane is as fine as 0.2 μm . In addition, since the membrane unit is installed immersed within the reaction tank, the gravity sedimentation tank required for conventional systems is eliminated.

Anoxic Tank and Oxidation Tank:

The Anoxic Tank receives flow from the equalization tank, either by gravity or by pumping. Anoxic tank consists of an Agitator / Mixer for constant churning of the mixed effluent. At the same time, bacteria nitrifies the ammonia to nitrogen contained in the wastewater.

The oxidation unit consists of an oxidation tank, membrane unit, and filtered water pump.

The wastewater is pre-screened with the inlet screen and is fed to the anoxic tank. The retention time in the oxidation tank is approximately 4 to 6 hours. BOD is removed by aerobic micro-organisms, which is maintained by high concentration of MLSS.

After these biological treatments are completed, solids-liquid separation is performed through the membrane unit installed within the oxidation tank. The filtrate is discharged as treated water with the filtered water pump. The filtered water pump is automatically operated according to the water level within the oxidation tank.

The membrane unit consists of a membrane module for filtering and the air diffusing unit that feeds air for washing the surface of the membrane module. The air fed from the air diffusing device cleans the surface of the membrane and at the same time provides oxygen required for biological treatment. The sludge generated within the reaction tank is discharged manually with the excess sludge valve discharge to the sludge storage tank.





Air blower

Air blower is required for the operation of the oxic tank unit. Air blower continuously feeds air to the air diffusing device of the membrane unit to supply oxygen required for cleaning the surface of the membrane and also for biological treatment.

III. Sludge holding tank (can be provided by The Buyer)

Sludge generated from MBR plant is evacuated to the sludge storage tank. The sludge can be used as excellent agriculture manure for landscaping, gardening, agricultural produce, etc.

IV Treated water tank (can be provided by The Buyer)

Treated water tank will hold the treated water to be evacuated according to the Buyer's frequency of use.

Advantages of using Canadian Crystalline 'Silver Stream' MBR

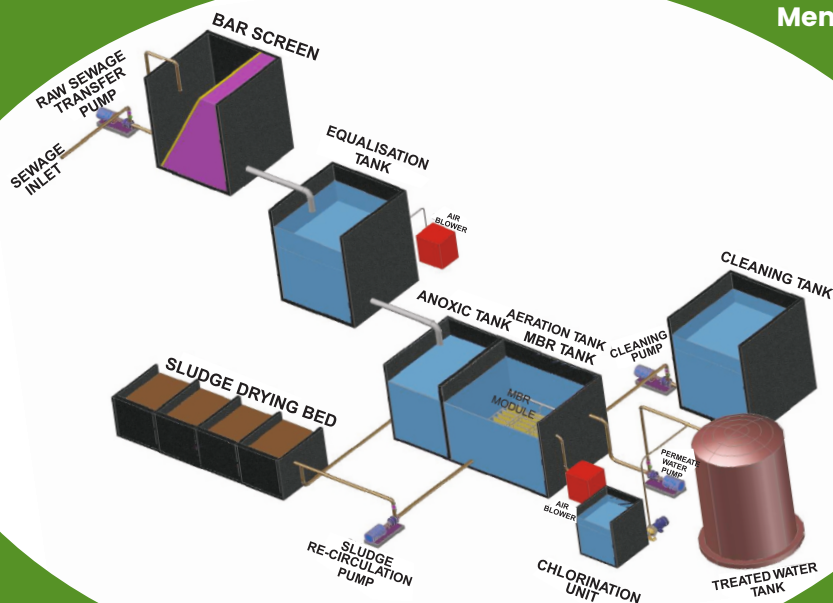
- 1) The wastewater transportation cost from the facilities to municipality's sewage treatment plant can be reduced.
- 2) Since wastewater is treated by 0.2 μm membrane, treated water may be used for toilet flushing, irrigation, car washing, curing water for concrete works and so on. Fresh water feed for these purposes can be saved. Since treatment plants can also be transported loaded on a trailer, they can be used for other locations and construction sites.
- 3) In residential areas where sewer pipes are not connected, domestic wastewater generated must be vacuumed on to tanker trucks to a public sewage treatment plant for further treatment. Treatment of wastewater by the MBR reduces the amount of wastewater (sludge) to be brought out to approximately one fourth ($1/4$) thus reducing cost

Canadian Crystalline "Silver Stream" MBR uses less electricity consumption, in comparison with activated sludge process systems, thereby reducing the power cost.

Noodle type membrane



Waste Water Treatment With Membrane Bio-reactor Technology



TECHNICAL DATA OF CC 'SILVER STREAM' MBR

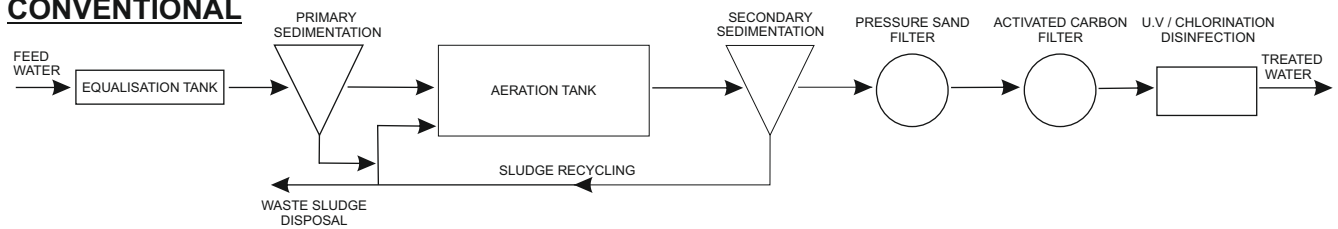
Sl.No.	DESCRIPTION	UNIT	5 KLD	10 KLD	20 KLD	35 KLD	50 KLD	75 KLD	100 KLD
1	TREATMENT CAPACITY	m ³ /day	5	10	20	35	50	75	100
2	AVERAGE FLOW RATE	m ³ /hr	0.25	0.5	1	1.75	2.5	3.75	5
3	FLOOR AREA REQUIRED FOR PLANT INSTALLATION	m x m	1.0x1.5	1.5x1.5	1.8x2.0	2.3x2.3	2.7x2.7	3.2x3.5	3.6x3.8
4	VOLUME OF RAW WATER COLLECTION SUMP	m ³	2	4	8	14	20	30	40
5	VOLUME OF TREATED WATER COLLECTION SUMP	m ³	2	4	8	14	20	30	40
6	POWER CONSUMPTION	kW	5	9	9	10	15.5	17	23

* HOURS OF OPERATION : 20 Hrs

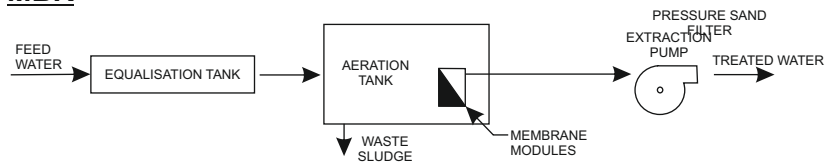
* Larger capacities above 100 KLD are also available in our range.

MBR VS CONVENTIONAL

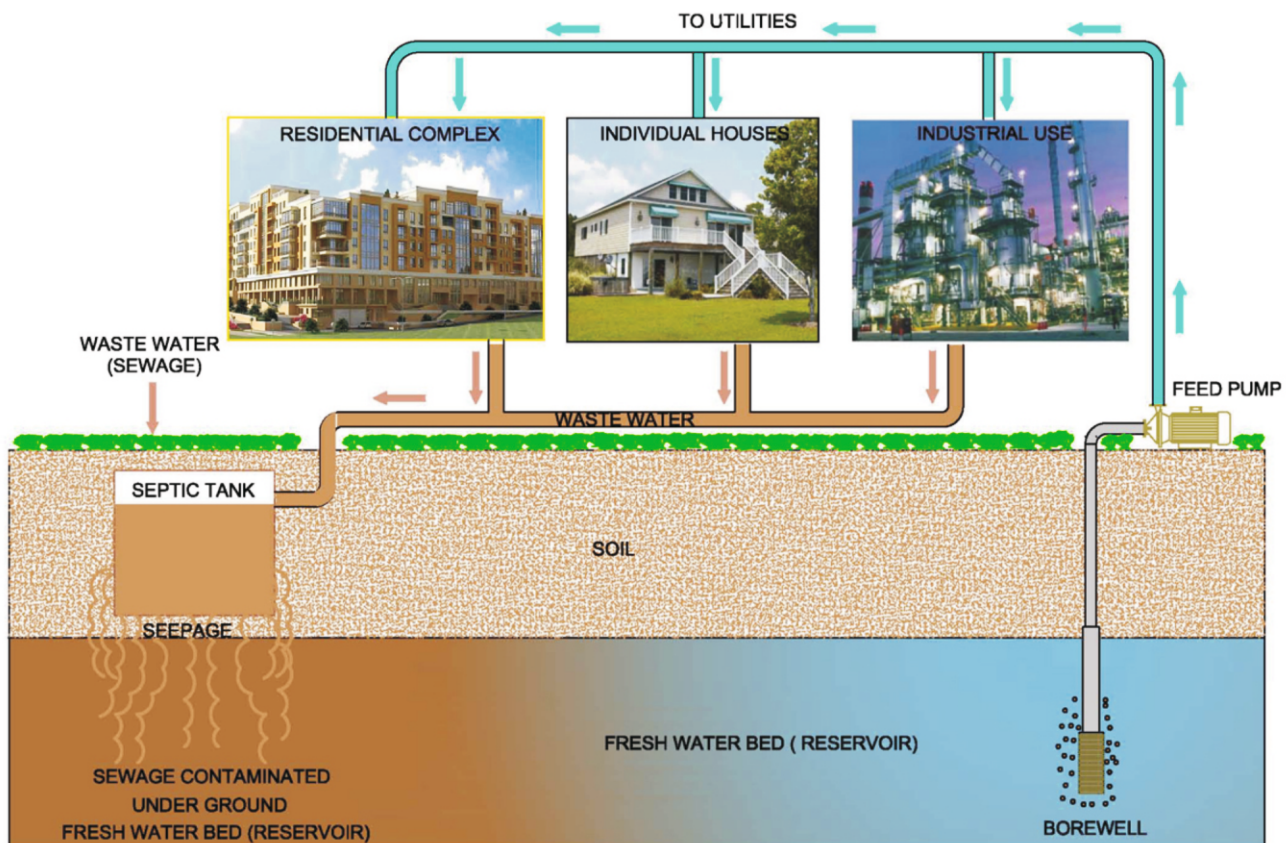
CONVENTIONAL



MBR



ARE YOU DRINKING SEWAGE CONTAMINATED WATER ?



Canadian Crystalline 'Silver Stream' MBBR Technology At A Glance

The Canadian Crystalline "Silver Stream" industrial WWTP technology systems are based on the Canadian Crystalline High-Speed bio-degradation and sedimentation technology which is unique due to its compactness and performance in respect of volumetric efficiency. These technologies are combined in a prefabricated, skid mounted or containerized tank system with variable length, which is mobile / compact and easy to transport anywhere.

The skid mounted system is designed for indoor installation with proper ventilation. The machinery is placed uncovered on the skid at one end. The units can also be placed outdoor under shelter with natural ventilation. These units are transported in ISO freight containers and are manufactured in lengths from 20 to 40 feet.

Canadian Crystalline Site Mounted Systems

Canadian Crystalline "Silver Stream" MBBR systems comes complete with one or two bio-reactors and one clarifier tank. They are best suited for medium organic loads and strict effluent requirements and fit for direct discharge to the environment. Any combination of hydraulic and organic load can be accommodated by using multiple container plants with standard containers in parallel or customized containers in series.

Canadian Crystalline newly developed technology has high efficiency, consumes less power and is more compact.

About our Canadian Crystalline 'Silver Stream' MBBR

The Moving Bed Bio-Reactor unit (hereinafter referred to as "MBBR") can treat domestic wastewater generated from

✓ Residential Apartments

✓ Commercial Complex

✓ Labour Camp / Defence / Refugee Camps

✓ Public Amenities / Convenience

✓ Factories / Industries

✓ Resorts & Clubs

1) DIMENSIONAL CRITERIA

Any treatment plant must be based on actual measurements of the waste stream with respect to hydraulic and organic load. The critical parameter is daily average flow, peak flow and influent / effluent BOD and TSS.

For common applications in Sewage Treatment Plants for pulp and paper, dairies and other applications in the food processing industry, there is sufficient experience at hand in order to design a system and guarantee the effluent, based on the information provided by the client.

Designs for new applications should be based on a full waste water analysis and followed up by a test program in order to verify the design and guarantee the quality of effluent. Such tests may range from bio-degradability testing in laboratories to pilot test on site.



2) Canadian Crystalline "Silver Stream" MBBR is "Low maintenance cost" "Space saving" "low initial cost" advanced water treatment system, by combining active sludge treatment and Floating Media Bioreactor Systems.

3) Canadian Crystalline "Silver Stream" MBBR adopting media process, requires less space and yet provides higher treatment performance compared with the conventional treatment systems. That is why the MBBR is ideal for places with limited space, and for recycling of treated water for drip irrigation, landscaping, toilet flushing, road compacting, curing of concrete, etc.

4) Raw sewage treatment capacity: from 10 KLD to 100 KLD in containerized form and 200 KLD to 100,000 KLD at site construction are available in the range of Canadian Clear "Silver Stream" Systems.

Features of Advanced Technology Canadian Crystalline 'Silver Stream' MBBR

Canadian Crystalline "Silver Stream" MBBR has the following special features, compared with other treatment systems

1) Easy Operation and Low Maintenance Cost

Clog-resistant: Free Floating Media

Easy inspection: Floating Media is loose and free for cleaning and inspection

The media based flocculation ensures increased surface area with no need to pay attention to Sludge control and sedimentation.

Periodical maintenance of media is carried out by maintaining MLSS and sludge volume only.

Operation and maintenance of MBBR is very simple.

2) Space saving (Low footprint)

Operating with a high concentration of Mixed Liquor Suspended Solids (MLSS), the MBBR process requires only a small reaction tank followed by a settling tank or clarifier for large volumes. Therefore the required area for Canadian Clear "Silver Stream" MBBR process will be only one third (1/3rd) of the activated sludge process.

Canadian Crystalline "Silver Stream" MBBR, when catered to large sewage treatment for cities and municipalities saves space, thus reducing the cost of the project drastically, as worldwide the real estate value is consistently escalating.

The retention time for the treatment is considerably reduced compared to Activated Sludge Process. Thus the Canadian Crystalline "Silver Stream" MBBR is a compact design.

3) Low Cost

Simple and compact design leads to initial cost savings. Reduces sludge disposal costs as minimum quantum of sludge is produced

4) High Reliability

Canadian Crystalline "Silver Stream" MBBR uses PP Floating Media using advanced resin processing technology.

5) Energy saving

By increasing the surface area in the Aeration Pond using floating media, the area of oxidation becomes less and blower energy requirement is also low.

6) Floating Media:

Floating media can be utilized in new or old bio-reactors and enhance performance, Once the media is placed inside a bio-reactor and set in proper operation, you have a completely stable, clog-free bio-film reactor.

Micro-organisms, which are attached to the floating media reduce the organic load. This is a fixed-film process where the floating media become carriers that build a floating bed in the water (The Bio-Film) and stabilize WWTP.

The Bio-Film grows on the bio-media surface that moves along with the water inside the reactor chamber and the floating media carries the bio-mass, also known as MBBR Moving Bed Bio-Reactors.

Once submerged inside the bio-reactor, the floating media operates as non-clogging media. No channels or dead spots as in other technologies. The movement is caused by either aeration, or mechanical stirring, depending on reactor design and effluent requirements. The floating media optimizes growth (bio-mass), and provides shelter and protection for the bio-mass and makes the WWTP extremely robust and reliable.

The floating media has been extensively tested and implemented into numerous wastewater plants worldwide. The floating media has proven to be superior to any known bio media and can handle pH variation, shock loading and cold temperature which drastically reduces the plant size. The Canadian Crystalline Bio-Media has proven to stabilize most wastewater plants.





Floating media represents flexibility and new-engineered potentials in wastewater treatment plant operation. Use in the existing tanks, upgrade existing plants and for efficient BOD, NH₃-N and TSS removal without tank expansion.

Floating media provides flexibility in design and use for aerobic and anaerobic systems. Use existing tanks, modernize existing system to meet effluent requirements.

7) Capacities

The 3 compartment system has the following nominal capacities at an influent of TSS 200 ppm and 95% cleaning efficiency in terms of BOD.

The 2 compartment system has the following nominal capacities at an influent of TSS 500 ppm and 80% cleaning efficiency in terms of BOD.

8) Movable unit

Canadian Crystalline "Silver Stream" MBBR up to 200 KLD capacity can be transported because of its compact size. Therefore, it can be transported to other sites after project termination and can be reused.

9) Easy installation

Since Canadian Crystalline "Silver Stream" MBBR is a prefabricated plant, only joints, piping and wiring works are required at site. Therefore, installation work is easy and installation period is short.

10) Less sludge volume

Volume of generated sludge is reduced to half (1/2) compared with Activated Sludge Process because MBBR can be operated in conditions with less surface area and also due to higher MLSS, thereby producing less sludge.

Canadian Crystalline 'Silver Stream' System Configuration

1. Features of process

ASP by extended aeration is a process that combines equalization and aeration.

2. Facilities:

I. Primary Treatment facilities:

Raw Effluent Collection Sump (can be provided by the Buyer)

The collection tank can be provided underground or overhead reservoir can be built at site or the existing tank can be used for collection of sewage / effluent from various points

Raw water pump

One Raw water submersible pump is installed in the raw water septic tank / Equalization Tank. The sewage water is collected in the raw water septic tank / Equalization Tank after passing it through the inlet screen. The pump is operated automatically according to the water level in the anoxic tank.

Inlet fine screen

The inlet fine screen is installed on the Equalization Tank. The slit size of the screen is 6 mm. The screen removes fine substances contained in the wastewater such as toilet paper, hair, etc. to prevent clogging and/or scratching of membrane. Screened water flows to the Equalization Tank by gravity. Screenings are scraped automatically / manually and discharged.

1. Equalization And Holding System

It is assumed that the waste water piping system ends in a customer provided three-chamber combined buffer / pumpwell / sludge storage tank system prior to the Equalization Tank. The buffer capacity must be sufficient to level out the daily peak flows and hold sufficient water for preservation of the bio-culture during weekends. The holding capacity of the system depends on the weekly flow profile.

2. Biological Treatment System

The treatment plant will take suction from the pumpwell by its own feed pump. The pump is level controlled and has a capacity of 1-2 times the average to daily flow. The plant has therefore an intermittent working mode in terms of hydraulic flow, while the air blower supplying air to the bio-reactors is continuously run.

The change in bio-degradation reactor comes in one or two stages depending on required cleaning efficiency. Plants with higher cleaning efficiency of 80-85% need a two stage system. The bio-reactors degrade the dissolved organic matter by oxidation into carbon dioxide which escapes to the air, and to produces biomass which acts as activated sludge. The Silver Stream MBBR uses inhouse developed suspended free floating bio-film carrier media, which provides a large protective bio-film surface to host the bacteria and simultaneously accumulates the active bio-sludge inside the carrier elements. Thus, the system takes advantage of both the fixed film and the activated sludge bio-degradation principle, offering high volumetric efficiency.

The bio-degraded water flows into a clarification stage where the suspended solids settles by gravity. The water is directed through a skim well to a plate settler system which provides the final clarification of the effluent. For systems with high cleaning efficiency, the sedimentation may be enhanced by the addition of polymers.



3. Sludge Separation System

The sludge pump is activated each time the feed pump stops, with suction from the clarification bottom drain. The pump discharges through a hydrocyclone with overflow back to the bio-reactor, while the concentrated underflow is discharged to the sludge storage. When necessary, the sludge is emptied and evacuated on to a truck and hauled away for sun drying.

4. Equipment Specification

The basic system comes with the following standard equipment:

A mild steel tank coated with FRP / GRP consisting of a framework of square pipes and vertically stiffened sides and partitions. The tank is internally coated with tar epoxy and externally painted in white with Canadian Crystalline name and logo in one foot high letters on two sides.

A free floating plastic bio-film carrier medium is in each bio-reactor. 2/3 filling rate as standard, with 100 square feet bio-film surface per cubic foot reactor volume.

A plate separator system of 60 degrees with inclined PVC plates in the settling tank. Three plates per foot length, projected area 5 square feet per square foot tank surface.

One regenerative blower or rotary lobe blowers as appropriate, air filter/silencer on the blower inlet, muffler on the outlet for flow regulation. Air header in galvanized steel and air distribution system in PVC as required.



Two open impellers, stainless steel, close coupled centrifugal process pumps with carbon/ceramic mechanical seal and viton elastomers. Waste water pipes in galvanized steel or PVC as required.

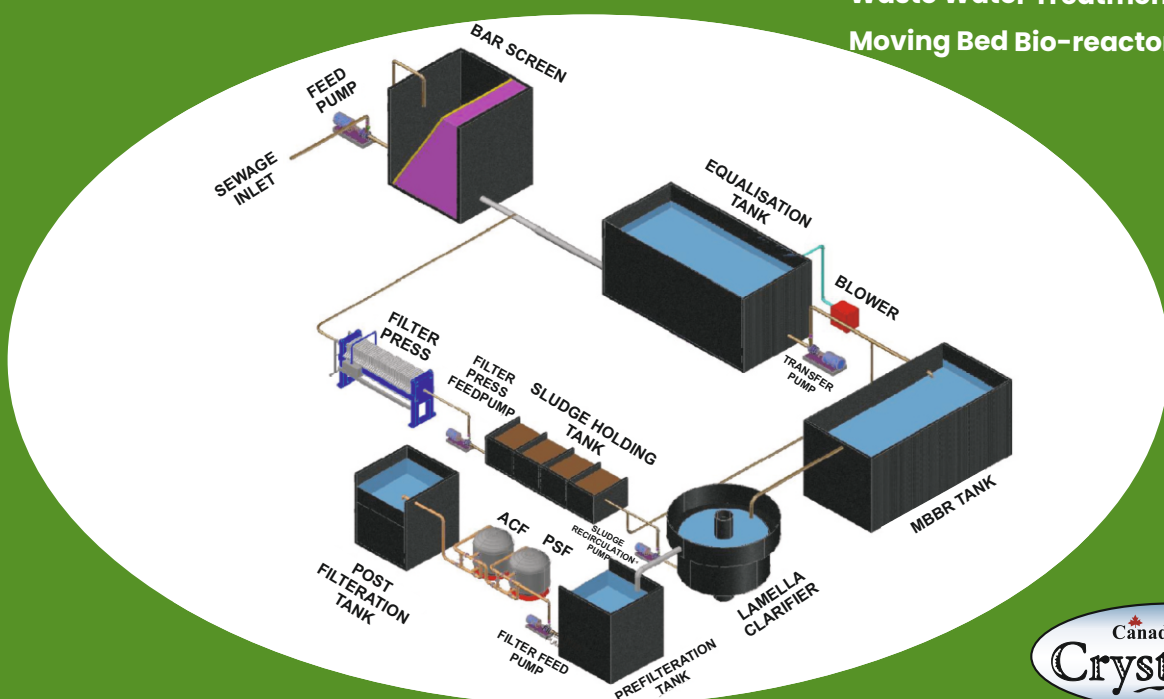
One main electrical switchboard / control panel with start / stop buttons and running lights. Automatic start / stop or process pump on high / low level, control of pH agent supply.

Advantages of using Canadian Crystalline 'Silver Stream' MBBR

- 1) The wastewater transportation cost from the facilities to municipality's sewage treatment plant can be reduced.
- 2) Treated water can be used for toilet flushing, irrigation, car washing, curing water for concrete and so on. Fresh water feed for these purposes can be saved. Since treatment plants can also be transported loaded on a trailer, they can be used for other location and construction sites.
- 3) In residential areas where sewer pipes are not connected, domestic wastewater generated must be evacuated on tanker trucks to a public sewage treatment plant for treatment. Treatment of wastewater by the MBBR reduces the amount of sludge to approximately one third (1/3) compared to activated sludge Technology.
- 4) Canadian Crystalline "Silver Stream" MBBR uses less electricity consumption, in comparison with the other treatment systems, thereby reducing power cost.



Waste Water Treatment With Moving Bed Bio-reactor Technology

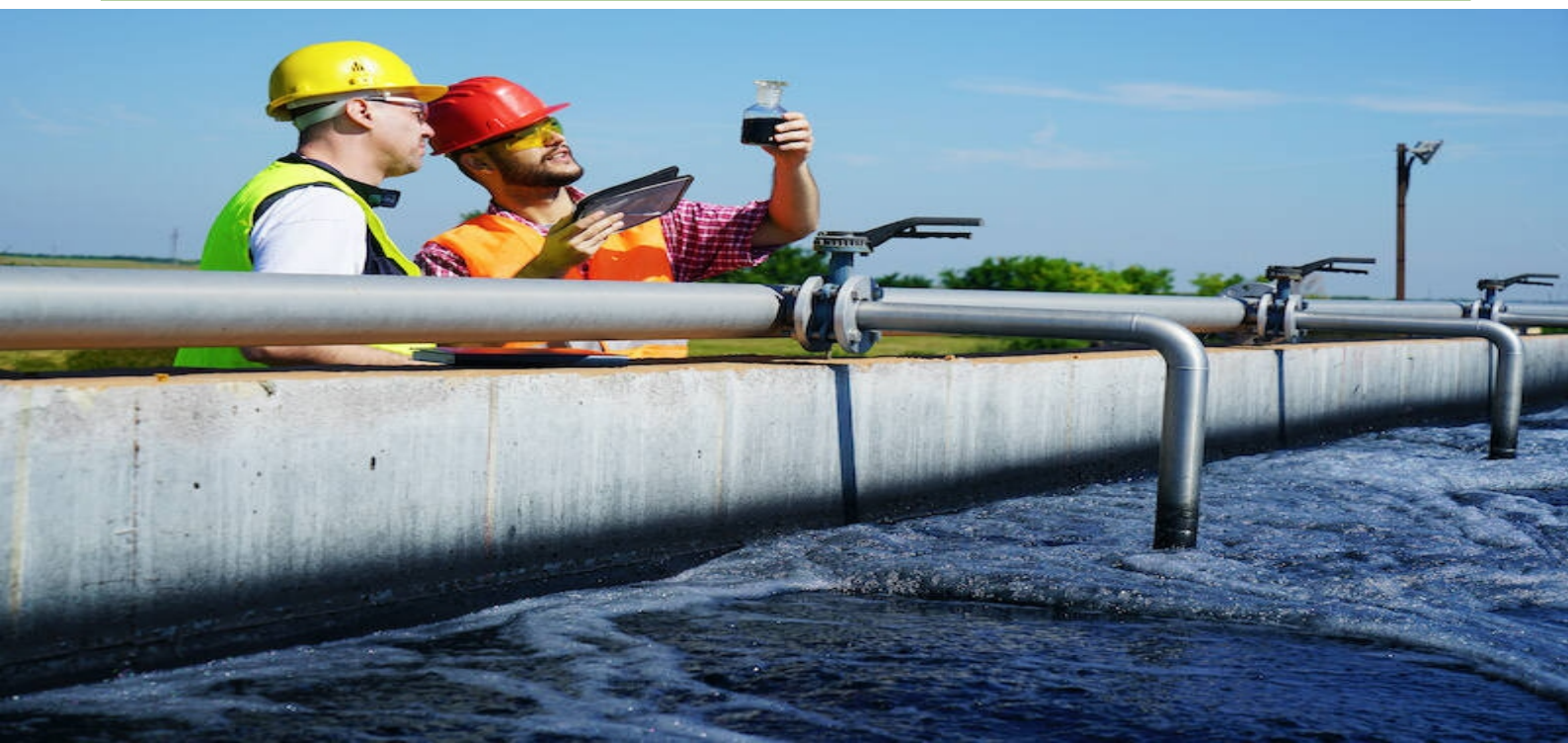
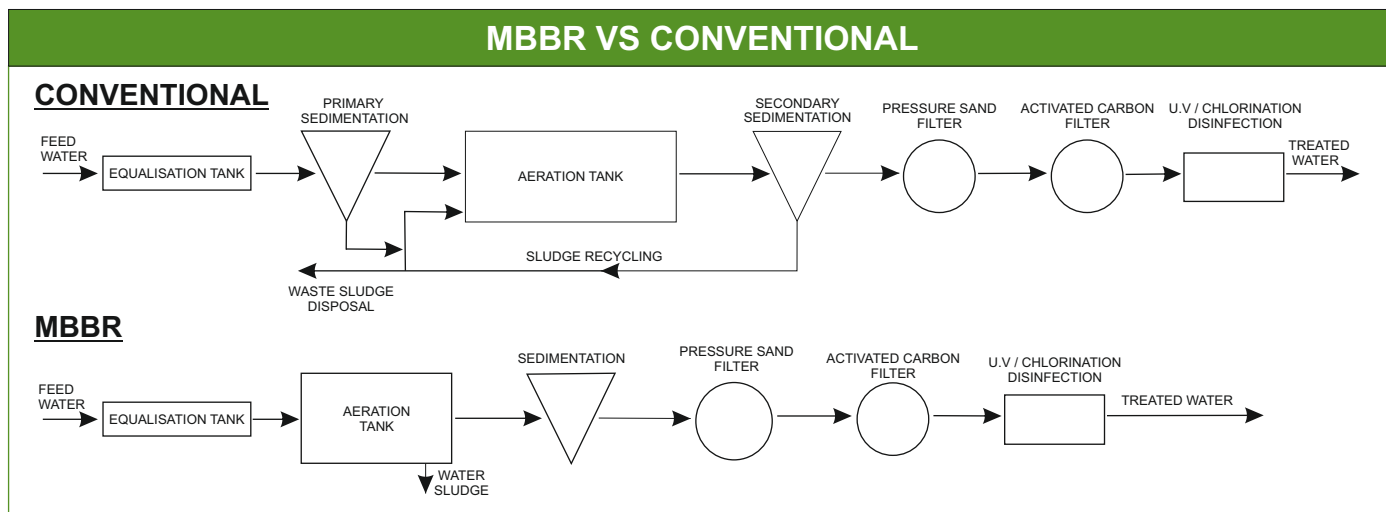


TECHNICAL DATA OF CC 'SILVER STREAM' MBBR

Equipment	Specification	Unit	10m ³ /day	25m ³ /day	50m ³ /day	100m ³ /day
Tank Container	Overall dimentions	Inches	238 ½" x 96" x 102"	238 ½" x 96" x 102"	480" x 96" x 102"	680" x 120" x 102"
Centrifugal Pumps	Nominal Capacity	M3/hr	1.0 m3/hr	1.5 m3/hr	2.0 m3/hr	4.0 m3/hr
	Pressure	Psi	28	28	28	28
Metering Pump	Nominal Capacity	LPH	6	6	6	6
	Back pressure	Psi	60	60	60	60
Electrical System	Installed effect	Kw	6	9	12	15

* Larger Capacities above 100 KLD are also available in our range

Quality of Effluent	BOD	COD	TSS
Raw Effluent	250 ppm	700 ppm	100 mg/ltr
Treated Effluent	< 30 ppm	< 150 ppm	< 30 mg/ltr





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