

Background

Filter Innovations Inc. designs and builds wastewater treatment systems based on Membrane Biological Reactor (MBR) technology. Our MicroClear™ MBR System is designed specifically for small applications such as private households, condominiums, hotels, resorts, and golf clubs.

The principle advantages of the MBR include:

- significantly improved water quality
- elimination of the final clarification and tertiary filtration steps
- smaller footprint compared to a conventional activated sludge treatment

Our MicroClear™ MBR Systems can form the basis of new plants, or be used to upgrade existing systems. Individual components of the MBR system can be incorporated into existing systems to achieve the excellent quality of treated water.

Case History

Whitehouse Terrace Water Pollution Control Plant (WPCP)

The project “White House Terrace Wastewater Treatment Plant” was driven by Leeds Condominium Corporation Seven (LCC7, Brockville) at Whitehouse Terrace located on the St. Lawrence River.

In 2007, Members of the LCC7 board made a decision to build a new wastewater treatment plant to replace the existing 40 year old wastewater treatment facility, which did not produce treated water according to discharge requirements.

Upon consideration of various options, the LCC7 concluded that Membrane Biological Reactor (MBR) technology was the best choice for their application. The innovative and reliable technology of the MicroClear™ MBR System allowed for strict discharge parameters to be satisfied, permitting the discharge of treated water into the ecologically sensitive surface waters of the St. Lawrence River.



View of compact MBR Wastewater Treatment Plant with view of St. Lawrence River

Features of the Whitehouse Wastewater Treatment Facility

- Compact footprint
- Exceptional quality of treated water
- Fully automatic operation
- Quiet operation
- Telemetry allows for remote monitoring and control of the system
- Modular design allows for future expansion of system
- Low power consumption - filtrate is drawn through the system by a slightly negative pressure of only 0.1 bar

Effluent Parameters	Units	Concentration Objective	Concentration Limits
CBOD ₅	mg/L	15	25
TSS	mg/L	15	25
Total Phosphorus	mg/L	0.9	1
pH		6.0 - 9.5	6.0 - 9.5
Toxicity		Non-toxic effluent	Non-toxic effluent
<i>E. Coli</i>		100 counts per 100 mL	150 counts per 100 mL

The White House Terrace Wastewater Pollution Control Plant was designed by Filter Innovations Inc. in 2007. Based on the design objectives, the Application for Approval of Municipal and Private Sewage Works required by *Ontario Water Resources Act (R.S.O. 1990, Section 53)* was submitted in January 2008.

The project proposal was reviewed by the Environmental Assessment & Approvals Branch of the Ontario Ministry of the Environment (MOE), and a Certificate of Approval was issued in 2008.

Construction of the Whitehouse Terrace WPCP was started in November 2008. Commencement of the operation began in April 2009.



Loading of containerized part of the plant in February 2009

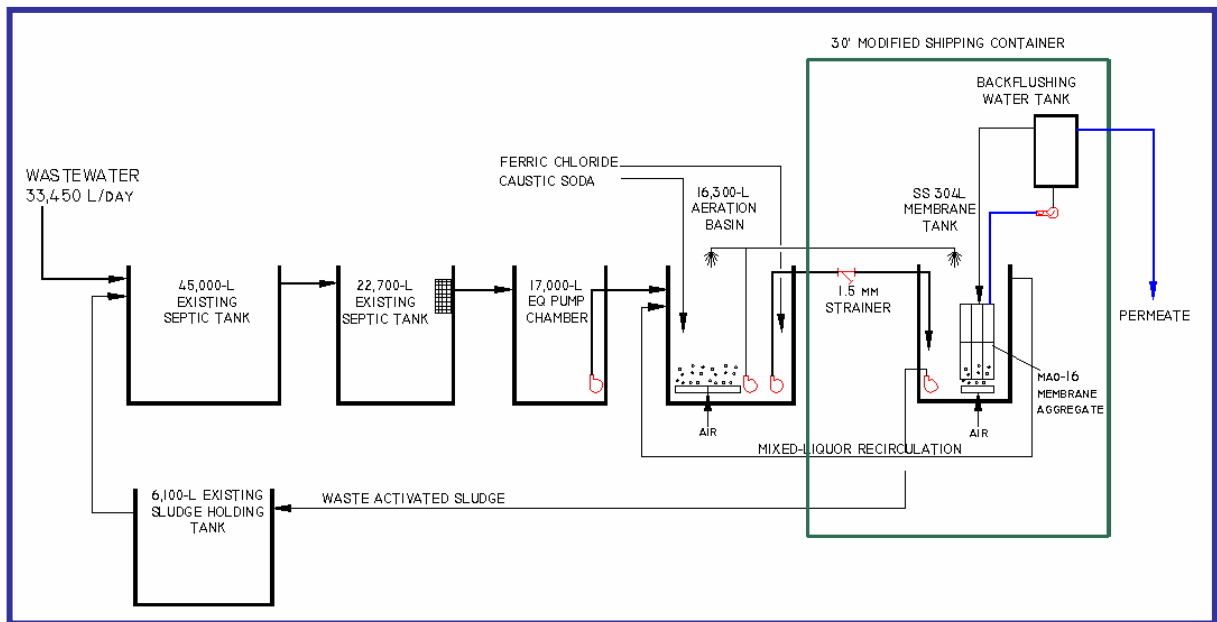


Internal of the containerized part of the plant (Membrane tanks & control panel)

Brief Description Treatment Process

The MicroClear™ MBR technology utilized in the project combines a conventional activated sludge process with membrane filtration. The capacity of the plant is 33,450 L/d (sewage from the LCC7 property such as the hotel, condominiums and other dwellings units). The main treatment stages of the Whitehouse Terrace WPCP are:

- Primary sedimentation
- Equalization
- Activated sludge biological treatment
- Membrane filtration



Whitehouse Terrace WPCP Schematic Flow Diagram

The main treatment process occurs in the aeration tank: the biological reactor. In the aeration tank bacteria and other beneficial microorganisms consume organic pollutions (BOD₅, bCOD, ammoniacal nitrogen, etc.) as food and convert them into carbon dioxide, water, and nitrates. During this process, microorganism numbers increase and excess sludge is formed as a result. To survive and flourish, these microorganisms require the presence of oxygen. An air blower system equipped with a low pressure alarm switch provides air to the diffused aeration system installed within the aeration tank. Metal salt is dosed into the aeration tank, causing phosphorus to precipitate as metal phosphate to reach the MOE discharge limits.

In the event that alkalinity levels (monitored by an online meter) become too low, alkali is added to maintain the pH within the desired range.

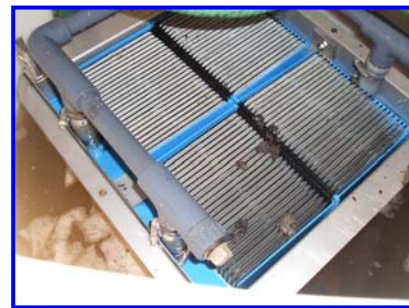
Treated water from aeration tank flows into two parallel membrane tanks where membrane filtration occurs. The function of this stage of treatment is physical filtration and the retention of any bacteria, parasites, and viruses (99.99+% removals). Turbidity levels are also reduced to below 1 N.T.U. at this stage.

Excess sludge is generated as a result of biological oxidation, and from chemical precipitation for phosphorus removal. This sludge is pumped to the existing sludge storage tank on a periodic basis.

The Control system includes a PLC control panel allowing for reception of input signals, processing of information, and control of outputs that operate the equipment. Operational monitoring and alarming of the system include FII standard software and automatic e-mail on system alarms. Telemetry module facilitates monitoring and control of the system from a remote computer. The operator can start/stop motors and pumps, view level switch status, monitor DO, pH, and turbidity levels, and monitor permeate flow rate.

The “Heart” of the System

Flat-sheet ultrafiltration (UF) membranes with a nominal pore size of 0.05 micron are used for filtration. Permeate is drawn through and out of the membranes under a slight vacuum of 0.7 to 0.1 bar. In order to keep the membranes clean (to the extent possible) during operation, permeate withdrawal is carried out on a cycle basis.



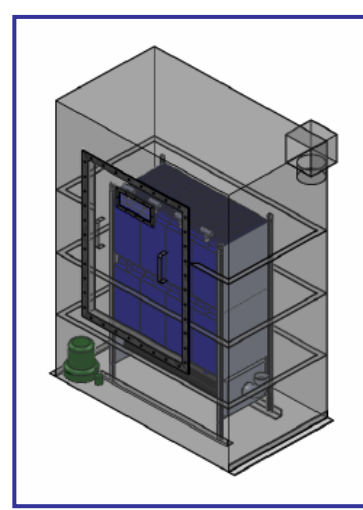
Membrane Module in Tank



MicroClear™ MCXL Module



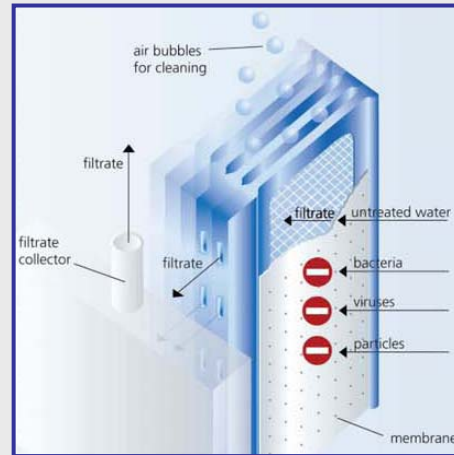
MA03-16 Aggregate with MicroClear™ MCXL Module



Membrane Tank with MA03-16 Aggregate

Significant features of FII MicroClear™ Membranes

- Excellent quality of treated effluent; BOD₅ < 5 mg/L, turbidity < 1 N.T.U.
- FII MicroClear™ Membrane with a molecular weight cut-off of 150 kDalton, equivalent to a pore size of 0.05 micron, leaving any bacteria (1-2 µm), parasites (5-50 µm), with a virus removal of 99.9999%
- Robust plastic construction of membrane modules
- Better resistance against clogging by fibrous substances – such as hair
- Compact, small footprint



MicroClear™ Membrane
Schematic Filtration

Conclusion

Filter Innovations' MicroClear™ membrane bioreactor system installed at the Whitehouse Terrace WPCP will produce high-quality water, completely meeting the strict discharge requirements necessitated by the ecologically sensitive surface water of the St. Lawrence River.

The small footprint of the FII MicroClear™ MBR System enables it to be seamlessly integrated into natural surroundings; there is no noise, and no odour associated with the system. Filter Innovations MBR technology provides a reliable means for treating wastewater and contributes to the overall sustainable development.