CASE STUDY

RO | UF | MBR

Wastewater Treatment
British Columbia, Canada

TORAY

Toray MBR Modules Help Achieve Sustainable Management of Wastewater on Vancouver Island

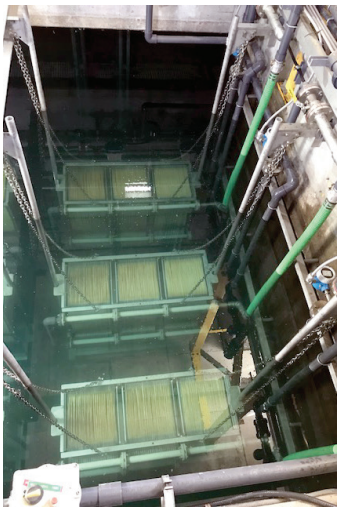
BACKGROUND

In 2006, Toray began a successful relationship with the Cowichan Valley Regional District (CVRD) in beautiful Vancouver Island, Canada. Two membrane bio-reactor (MBR) systems were commissioned that year at CVRD at the Lambourn Estates and the Sentinel Ridge Sanitary Sewer Systems. Both systems incorporated Toray's TMR140 series MBR modules.

The Lambourn Estates system treats an average daily flow (ADF) of 140 m^3/d with a peak daily flow (PDF) of 350 m^3/d. The effluent is further treated by ultraviolet (UV) then discharged to the ocean. The ADF at Sentinel Ridge plant is 180 m^3/d.

CVRD later installed several new MBR plants, including Twin Cedars (137 m^3/d ADF) in 2007; Woodland Shores (200 m^3/d) in 2008; and Arbutus Ridge (350 m^3/d) in 2016.

MBR systems are proven to produce a high-quality effluent with a compact footprint, low maintenance, and modular design that makes it easy to upgrade. Table 1 below shows the typical MBR effluent quality when treating municipal sewage. An analysis performed in June 2020 at the UV outlet of Sentinel Ridge shows the MBR modules are still producing excellent treated water quality (Table 2).



Figures 2 & 3: Operation of NHP210-300S at Arbutus Ridge

Figure 1: Installation of original Toray MBR

Table 1 — Typical MBR effluent quality

Parameter	Units	Effluent quality	Notes
BOD	mg/L	<5	Typically, non-detectable
TSS	mg/L	<5	Typically, non-detectable
NH3-N	mg/L	<1	Typically, <0.5 mg/L
TN	mg/L	<10	Typically, <3 mg/L in warm climates
TP	mg/L	<0.5	Typically, <0.1
Turbidity	NTU	≤1	Typically, <0.2, 95% of the time

Table 2 — Effluent quality at Sentinel Ridge

Parameter	Units	MBR effluent quality
Fecal coliform	CFU/100 mL	<1
Nitrate-N	mg/L	0.22
Total N	mg/L	5.37
BOD	mg/L	<4
TSS	mg/L	<2
Turbidity	NTU	0.4

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PERFORMANCE

At Sentinel Ridge, the influent BOD is 350 mg/L and operates at an MLSS between 9–15 g/L. The only pretreatment includes two equalization tanks that are hydraulically connected and a 2 mm screen. The MBR system operates at an average flux rate of 11 gfd with a transmembrane pressure (TMP) between 1.0 and 1.5 psi and cleaning intervals of once every six months.

The graph in Figure 4 illustrates the influent and effluent total suspended solids (TSS). Effluent TSS was 1 mg/L on average.

HIGH PACKING DENSITY MBR

In 2016, Toray introduced the 'New High Performance' (NHP) MBR module (Figure 5). The NHP uses the same durable polyvinylidene fluoride (PVDF) flat-sheet membrane of the TMR modules. However, one TMR140-100S module consists of 1,507 ft² in membrane area, while an NHP210-300S holds 2,260 ft² in membrane area, giving the NHP module a 50% higher packing density. The additional surface area allows the end-user to treat higher flows or operate at a reduced flux rate. Furthermore, the unique construction of the NHP module has reduced the weight by 70% for easier shipping and handling. TMR modules are easily retrofittable with the NHP.

CVRD installed several of its MBR plants with this latest technology. The MBR system at Arbutus Ridge was able to expand its capacity from 350 m³/d using two rotating biological contractors to 650 m³/d using six NHP210-300S modules. The Twin Cedars plant installed four NHP210-300S modules by retrofitting the TMR140-100S model and utilizing spare spaces available in the MBR tank. The capacity tripled from 137 m³/d to 450 m³/d. Lambourn Estates also installed four NHP210-300S modules.

Figure 4: Influent and Effluent TSS
(note: all non-detect permeate samples were assumed to be 0.2 mg/L)

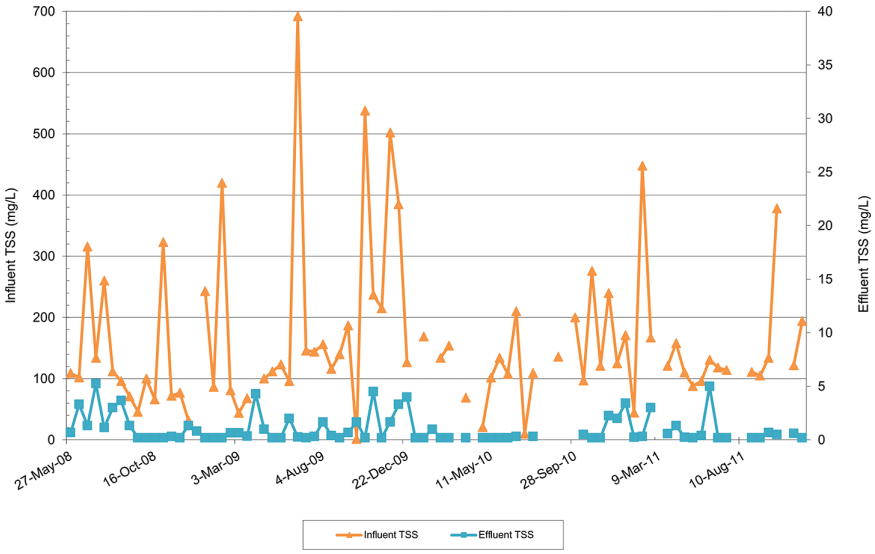

Figure 5: Toray flat-plate and flat-sheet MBR Modules

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