

MBR

A packaged wastewater treatment system designed for superior effluent quality and multiple membrane products

APPLICATION: Municipal Wastewater

CAPACITY: 25,000 GPD (95 m³/d)

LOCATION: Hamlin Beach, New York, USA

COMMISSIONED: May 2018

TECHNOLOGY: Packaged Plant MBR

CHALLENGE

Hamlin Beach State Park is a recreational facility located on the southern shores of Lake Ontario. In order to accommodate future wastewater flows the Park selected H2O Innovation to provide a packaged Membrane Bioreactor plant. The system includes a large equalization basin to handle peak demands that occur during holiday weekends with the bulk of the treatment equipment being installed within a steel multi-section tank and equipment skid that are both housed within a building.

The system must handle both high peaks during busy park weekends but also length periods of very low loading during the winter months where only Park staff is present. For this application, PTFE hollow fiber membranes were selected within the 2 membrane trains. The system is fully automated and consistently achieves non-detect BOD and TSS.

SOLUTION

A membrane bioreactor (MBR) was selected as the preferred treatment process in order to meet the permitted effluent quality. A packaged plant was preferred by the client for ease of installation and compact footprint. The stainless steel system was placed inside a small building with lab and office facilities to protect equipment, instrumentation and operations staff from harsh environmental conditions. The biological treatment system is designed to handle an average daily flow rate of 25,000 GPD with a maximum hydraulic capacity of 50,000 gpd.

Raw water is first screened through a 5 mm automated bar screen and transferred to the equalization tank to suppress the flow variation of the facility. This provides a more consistent flow and organic loading rate to prevent biological upsets which lead to poor treatment and foaming issues. From the flow equalization tank, the wastewater is pumped through two 2 mm rotary brush screens and flows by gravity to the biological treatment train comprised of anoxic and aerobic zones. The mixed liquor from the biological train flows by gravity to two, redundant membrane trains. Screening equipment was rated for Class 1, Div. 1 hazardous location and was located in a separate room than the packaged system.



Hamlin Beach State Park WWTP



Packaged Plant MBR System at Hamlin Beach WWTP

SOLUTION (continued)

Alkalinity dosing to the aerobic zone was provided to supplement alkalinity during the summer months that experiences higher than expected ammonia loads from the State Park collection system. A compact ultraviolet (UV) reactor was installed on the final effluent to provide further disinfection.

FLEXIBLE MEMBRANE SYSTEM

The packaged MBR was designed to fit several membrane modules covering an acceptable surface area range for various hollow fiber products. A robust control system that accommodates a range of membrane manufacturers' operating parameters, including air scour rates, permeation cycles, cleaning frequency or other process control parameters such as sludge wasting to control MLSS, is also incorporated.

The supporting ancillary equipment was selected in order to facilitate various operating conditions, including: flow ranges for permeate pumps, air scour rates for membrane blowers, permeate and air header connections that are universal to the various module types and chemical dosing systems to satisfy the range of cleaning concentrations. Sumitomo PSH series modules were pre-approved and installed in the system, but the system was designed to accommodate other hollow fiber membrane products.

The packaged plant approach contributes to a reduction in installation labor and on-site time for commissioning since the system can be fully tested at the factory. Figure 2 shows the packaged system components, including the treatment train, permeate/CIP pump skid, blower and RAS pump skid, chemical dosing skid and control and power panels.

RESULTS

The packaged MBR system provides superior effluent quality and meets even the most stringent discharge requirements as shown in the results below.

The benefits of a pre-assembled, pre-tested system include significantly less site installation labor and commissioning time to provide an efficient construction timeline.

Parameter	Effluent Concentration (mg/L)	SPDES Criteria (mg/L)
BOD	< 2	< 5
TSS	< 1	< 10
Settable Solids	< 1	< 5
pH	6 - 8	6 - 9
Ammonia	< 1	< 1.2 ¹
DO	> 7	N/A
Total Residual Chlorine	ND	< 20 µg/L
Fecal Coliform	ND	< 200

Note: 1 Summer month effluent requirement. Winter effluent concentration is 2.2 mg/L.