FLEXIBLE MBR SYSTEM OPERATING WITH THREE DIFFERENT MEMBRANE PRODUCTS

CASE STUDY

A centralized WWTP for a septic waste disposal company uses different membrane modules in each of its three MBR trains

APPLICATION: Municipal Wastewater from septic waste

CAPACITY: 1,500 m^3/d (0.39 MGD)

LOCATION: Fort MacKay, Alberta, Canada

COMMISSIONED: January 2018

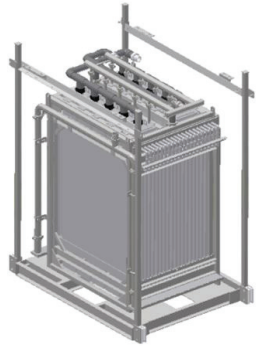

Figure 1:
Universal platform for support and interchanging of membrane modules

CHALLENGE

A leader in sewage hauling in Northern Alberta was looking to construct its own robust wastewater treatment facility to handle various wastewaters coming in from remote communities and worker camps. The facility was designed as a cost saving measure, to eliminate long range transport for areas north of Fort McMurray.

SOLUTION

An MBR was selected as the preferred treatment process in order to meet the requirements for effluent quality and installed footprint. The facility includes typical pre-treatment operations for MBRs: fine screening, equalization and aerobic bioreactors. The system was designed to handle an average daily flow rate of 0.2 MGD (750 m^3/d) and is expandable up to 0.4 MGD (1,500 m^3/d).

flexMBR™ SYSTEM

All three trains have identical designs. The flexMBR* system includes a universal platform and flexible control system to accommodate multiple products and process parameters including air scour rates, filtration cycles, cleaning frequency and other process control parameters such as sludge wasting to control MLSS.

The supporting ancillary equipment was selected in order to facilitate the various operating conditions, including flow ranges for permeate pumps, air scour rates for membrane blowers and header connections that are universal to the various module types.

The membrane modules were pre-installed on the platforms prior to shipping, allowing for a streamlined commissioning effort and reduced onsite installation hours.

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Figure 2: flexMBR Installation

MEMBRANE SPECIFICATIONS

There are many MBR membrane products that have been developed according to the sizing and operational characteristics of existing models to address membrane replacement needs. Some approaches vary, but product development is bound by common engineering principles and limits that have created a convergence in design. Table 1 shows key design criteria to illustrate the similarities between the membrane modules selected for this project. Based on the technical specifications of each membrane vendor, a flexible design was possible and could be accommodated without any modifications to the membrane tanks.

Table 1: Summary of membrane module parameters

Parameter	Membrane 1	Membrane 2	Membrane 3
Membrane Type	Hollow Fiber	Hollow Fiber	Hollow Fiber
Support Orientation	Vertically	Vertically	Vertically
Membrane Chemistry	PVDF	PTFE	PVDF
Nominal Pore Size, µm	0.4	0.1	0.04
Surface Area per Module, ft^2	3,228	2,905	3,013
Module Footprint, ft	5.0 x 3.8	6.1 x 3.6	4.0 x 3.3
Number of Modules/Train (Present)	3	3	3
Number of Modules/Train (Future)	6	6	6

RESULTS

The flexMBR™ system puts the power in the Owner's hands by creating a competitive bid environment for the membranes and performance warranties. This design allows the Owner to identify the strengths of three different products under the same operating conditions. Perhaps most importantly, the flexMBR™ protects the Owner against price escalation that often occurs at the time of membrane replacement. As the MBR industry moves toward standardization, there will continue to be membrane module innovations that enhance efficiencies in performance. MBR systems that are designed with flexibility in mind provide the opportunity for existing plants to take advantage of those innovations.