



Industrial Plant Retrofit with Toray Modules

APPLICATION: Process Water
CAPACITY: 1,900 m³/day (350 gpm)
LOCATION: Iowa, USA
TECHNOLOGY: Ultrafiltration
COMMISSIONED: 2021



Newly installed UF membranes modules

CHALLENGE

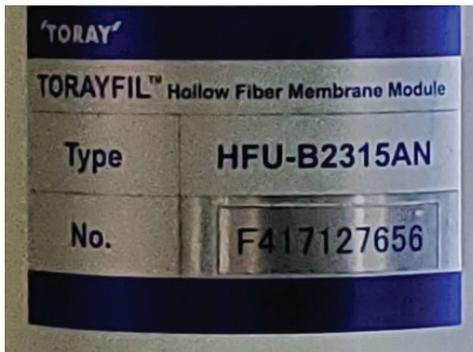
An industrial ethanol client located in Iowa, United States, was facing issues with its existing microfiltration (MF) system, which was composed of 48 Pall hollow fiber modules (Microza UNA-620A). The plant processed tertiary water (gray water) from the city first through the Pall MF modules, then through reverse osmosis (RO), so that it could be used as process water. The varying levels of quality in the gray water made it difficult for the Pall modules to handle the different loads on the system. As a result, it often failed to provide the necessary flow.

The system, originally designed to treat 350 gpm (1,900 m³/day) of process water, was approaching end of life based on reduced water flow and filtrate quality. The client also needed to expand the capacity of its facility without making a significant capital investment.

SOLUTION

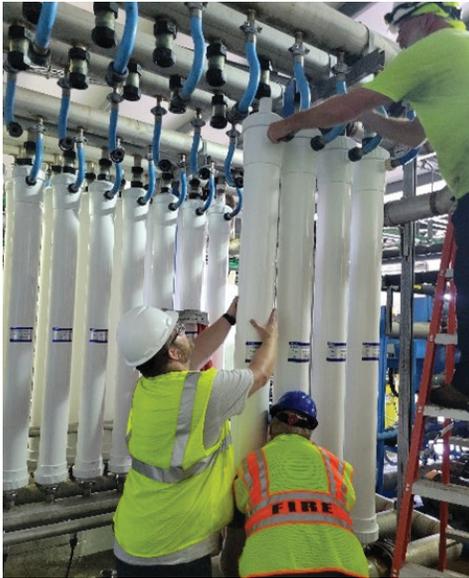
Its engineering expertise, its field service capabilities, and its open-source strategy positioned H₂O Innovation as the best suited to perform this retrofit project. Because the client was previously tied to proprietary MF modules, it needed a highly flexible replacement approach that would reduce operating costs, while increasing the efficiency of its facility.

After examining several replacement possibilities, H₂O Innovation determined that the Toray ultrafiltration (UF) modules would provide the best long-term solution to increase the flow of the system. In collaboration with Toray Membrane USA, Inc., H₂O Innovation designed new engineering solutions that incorporated Toray's HFU-B2315AN modules as a direct replacement, thus allowing the system to have more membrane surface area and to produce more permeate in the same footprint.



New Toray membrane module

UPGRADED WITH TORAY MODULES



Installation of the UF membrane modules

The module upgrade process was completed, from start to finish, in less than a day. Four H2O Innovation team members joined forces with three plant staff members to replace the existing membrane modules with the Toray modules in an efficient and timely manner.

The Pall modules were replaced with the Toray UF modules, which feature a durable polyvinylidene fluoride (PVDF) hollow fiber membrane that has a higher packing density per module. The Toray modules offer an outer membrane surface area of 646 ft², as opposed to 538 ft² for the Pall modules, which represents a 20% increase in capacity.

The wider Toray modules (178 mm as opposed to 165 mm) would also have interfered with the original aeration headers. The existing 2" headers were therefore replaced with new 1.5" headers to make room for the new membrane modules. In addition to the new aeration headers, the individual air lines were replaced with polyethylene (PE) tubing, thereby allowing for a greater flexibility. Any existing component that could be kept as was, such as the original Asahi connectors and the hoses, were reused, thus eliminating unnecessary expenses.

MODULE COMPARISON

SPECIFICATIONS	TORAY	PALL
Model #	HFU-B2315AN	UNA-620A
Surface Area	646 ft ²	538 ft ²
Type	Ultrafiltration	Microfiltration
Pore Size	0.01 µm	0.1 µm
Module OD	178 mm	165 mm
Form Factor for Connections	Identical	

RESULTS

As a result of this retrofit, the client gained a system that now includes 20% more membrane surface area, produces more permeate, and is less likely to foul. H2O Innovation's successful solution not only increased the capacity of the system while drastically reducing the need for capital expenditure, but it also allowed the water quality and flow performance to meet and even exceed expectations.

This project was one of the first of its kind to be completed in North America and showcases H2O Innovation's technical expertise and market access. As per the company's estimations, several North American facilities with a similar capacity will likely require replacement and upgrade within the next five to ten years.



Installation of the UF membrane modules