

CASE STUDY

RO | NF | UF | MBR

Industrial Wastewater Treatment
Wuxi, China



TORAY

Innovation by Chemistry

High-Surface Area TORAY Ultrafiltration Modules Solve System Footprint Challenge at Wuxi High-Tech Industrial Park

BACKGROUND

The Wuxi High-Tech Industrial Park began enforcing discharge guidelines issued by China's Ministry of Environmental Protection that require wastewater treatment plants to meet the Surface Water III Class standard.

The standard would make it difficult for conventional secondary treatment to meet the criteria for discharge. One of the plants in the industrial park, Wuxi Xingcheng Water Reclamation Plant (WRP), with a capacity of 170,000 cubic meters per day, could not meet the water quality requirements and evaluated implementing new treatment technologies.

However, due to limited footprint and the requirement to reduce suspended solids, the EPC contractor for Wuxi WRP, GreenTech Environmental Co., Ltd (GreenTech), evaluated ultrafiltration (UF) membrane technology the most effective treatment of the industrial wastewater, as illustrated in Figure 2.



Figure 1: UF system at Wuxi installed with Toray HFUG-2020AN UF modules

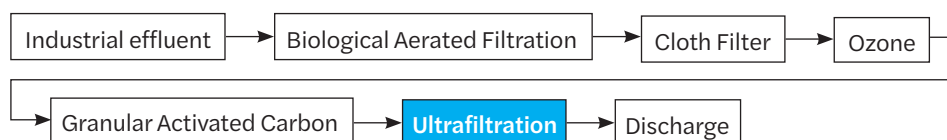
Table 1 – Quick Facts

Capacity	34,000 m ³ /d UF outlet
No. of trains	4
No. of modules	520
Operating mode	as recommended by Toray
Temperature	12–25 °C
Commissioned	October 2019

Table 2 – Water Quality

unit: mg/L	Previous filtrate quality	Target filtrate quality
CODcr	20	18
BOD5	4	3.6
Suspended solids	12	1
NH ₃ -N	1	1
Total Nitrogen	5	5
Total Phosphorus	0.2	0.1

Figure 2: industrial wastewater treatment design



PRODUCT ADVANTAGES

TORAY UF hollow-fibers feature the following advantages (detailed comparison in Table 3):

- Spun using a proprietary thermally-induced phase separation (TIPS) spinning method that produces a uniform and even distribution of pores with a nominal pore size of 0.01 µm for low fouling potential and high rejection;
- Unique composite PVDF UF membrane with low fouling surface layer on high flux and high strength support layer for extended membrane lifetime with minimal fiber breakage and fouling;
- Outside-to-in flow of filtrate results in higher flux operation for extended periods. This flow configuration effectively removes suspended solids during air-scrubbing and makes it ideal for treating high turbidity feeds.

SELECTION PROCESS

GreenTech evaluated Toray's UF membranes for structural integrity, fouling and flux rates, field data, and cost factors such as membrane module lifetime, and selected Toray's new high-surface-area HFUG-2020AN UF membrane modules.

As illustrated in Figure 3, the thinner hollow-fibers of the HFUG-2020AN allow for a 25% increase in membrane area per module within the same dimensions as the previous model (HFU-2020N). This feature enabled the end-user to work within existing footprint parameters to exceed the target production rates of 45 l/mh at 12 degrees Celsius flux requirement and leave room for expansion under the required operating conditions.

The UF system also features TorayWise™, a software that provides real-time visuals of the operation, which helps plants prepare for maintenance and other operational needs.

Toray's UF membranes, valued for their membrane durability, low-fouling, and high flux rates, continue to operate stably and efficiently, helping the Wuxi WRP meet stringent wastewater discharge requirements.

Figure 3: UF hollow-fiber diameter comparison



Table 3 – UF comparison

UF type		Unit	Previous model	New high-surface area model
Membrane model			HFU-2020N	HFUG-2020AN
Membrane material			PVDF (Polyvinylidene fluoride)	
Nominal pore size		µm	0.01	
Outer membrane surface area		m ²	72	90
Hollow-fiber diameter	Inner	mm	0.9	0.7
	Outer	mm	1.4	1.1
Typical feedwater / filtrate flow		m ³ /h	2.6–8.0	4.5–12.3
Weights	Full of water	kg	110	92
	After draining	kg	67	49
Dimensions	Diameter	mm	216	216
	Length	mm	2,160	2,160

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