

Wastewater Reuse Solutions

Transforming textile wastewater into reusable process water



Leadership in Filtration

MANN+
HUMMEL

Wastewater reuse solutions: Textile industry park, China



THE CLIENT

Industrial wastewater treatment plant in China

INTEGRATED MEMBRANE SOLUTION: ULTRAFILTRATION AND REVERSE OSMOSIS

PureULTRA II hollow fiber ultrafiltration (UF) modules and MICRODYN fouling-resistance brackish water reverse osmosis (RO) elements



OUTCOME

Enabled reuse of printing and dyeing wastewater by implementing an integrated UF and RO system, which reduced freshwater consumption, improved permeate quality, and supplied stable process water back to the factory

THE CUSTOMER

Located in a textile industrial park, this wastewater treatment plant is operated by a multi-utility company that provides heat and water to several enterprises in the park while also managing sewage treatment.

Due to strict local water regulations limiting the use of fresh surface water, the company was motivated to reduce, reuse, and recycle its water resources. By installing the integrated membrane system, the facility significantly reduced its dependence on freshwater and minimized wastewater discharge into the environment.

THE PROJECT

The integrated water reuse system has a feed capacity of 40,000 m³/d, producing 27,000 m³/d of high-quality permeate. The treatment process includes an equalization tank, primary sedimentation tank, advanced oxidation, and membrane bioreactor (MBR), followed by UF and RO. After advanced treatment, the reclaimed water meets the quality standards for process water and is distributed back to the industrial park's companies.

FAST FACTS

Location:

Guangdong Province, China

Technology:

Equalization tank, primary sedimentation tank, advanced oxidation, MBR, UF, and RO

Application:

Wastewater reuse

Plant capacity:

40,000 m³/d

Water type:

Printing and dyeing wastewater

Start-up date:

June 2023

Number of elements:

UF: 528 pieces

RO: 1,728 pieces

THE CHALLENGE

After conventional biochemical treatment, the chemical oxygen demand (COD) level in printing and dyeing wastewater remained high at around 120 mg/L. Under these conditions, both UF and RO were exposed to severe fouling and scaling risks primarily due to high alkalinity. In addition, the project is in southern China where summer water temperatures reach nearly 40°C, placing the membranes under extremely stressful operating conditions.

THE SOLUTION

The system is equipped with MANN+HUMMEL PureULTRA II hollow fiber UF modules and MICRODYN fouling-resistant brackish water RO elements.

PureULTRA II outside-in pressure UF modules, made of polyvinylidene fluoride (PVDF) hollow fibers with unique hydrophilic technology, feature a pore size of 0.025 microns and excellent tolerance to long-term chemical cleaning at high concentrations. In this project, the permeate turbidity was consistently below 0.2 nephelometric turbidity unit (NTU).

MICRODYN RO elements provide enhanced fouling resistance and high solute rejection, making them ideal for upgrading RO systems. In this project, the RO system achieved a salt rejection rate of over 98%.

THE RESULTS

The project was put into operation in June 2023. A performance evaluation was carried out using the PureULTRA II hollow fiber UF modules and MICRODYN fouling-resistant brackish water RO elements. The integrated UF and RO system consistently produced permeate with total dissolved solids (TDS) below 500 mg/L. With more than 27,000 m³/d of high-quality reclaimed water returned to production, the system achieved a reuse rate of over 67%.

The PureULTRA II UF modules operated stably, with an average flux of 45 LMH and a product water turbidity below 0.2 NTU. The modules operated for 33 minutes with a total backwash of 2 minutes. They were cleaned in place (CIP) weekly using 800 parts per million (ppm) sodium hypochlorite. The system salt rejection rate of MICRODYN RO exceeded 98%, the recovery rate was 67.5%, and the average flux was 17.6 LMH. Together, they enabled substantial water savings, reduced wastewater discharge, and contributed to environmental protection. In addition, the system lowered chemical consumption and maintenance frequency, further enhancing operational efficiency and sustainability.

The multi-tech system was designed to treat the challenging dyeing effluents and delivered highly effective, cost-efficient, and excellent performance.



FEED TO UF

pH	COD _{cr}	Conductivity	Hardness (CaCO ₃)	Fe	Mn
6-9	≤120 mg/L	≤9000 µs/cm	≤500 mg/L	≤0.8 mg/L	≤0.2 mg/L

FILTRATE FROM RO

pH	COD _{cr}	Conductivity	Hardness (CaCO ₃)	Fe	Mn	Turbidity
6-9	≤30 mg/L	≤300 µs/cm	≤20 mg/L	≤0.1 mg/L	≤0.1 mg/L	≤3 NTU

Membrane model: PHF-80-V

Number of modules	10 in operation, 1 in standby
Total number of elements	528
Permeate flow	170 m ³ /h×10
Feed flow	188 m ³ /h×10
Recovery rate	90%
Pretreatment	MBR

Membrane model: 8040-FR-400/34

Number of modules	6
Number of passes	1 pass, 2 stages
System array	32:16
# of elements per pressure vessel	6
Total number of elements	1,728
Permeate flow	187.5 m ³ /h×6
Feed flow	277.8 m ³ /h×6
Recovery rate	67.5%
Pretreatment	UF

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for textile dye recovery:
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