

CASE STUDY

RO | NF | UF | MF

Process Water — Glass Manufacturing
São Paulo, Brazil



Innovation by Chemistry

Toray's Integrated Membrane Solution for Water Reuse at a Glass Manufacturing Facility in Brazil

CHALLENGE

Owens Illinois (www.o-i.com), a leading manufacturer of glass packaging, faced challenges in meeting quality standards for cooling tower make-up water at their plant in São Paulo. Wastewater treatment at the plant consisted of physiochemical processes, a biological reactor, sand filter, and charcoal filter for reuse in the cooling towers.

However, the IS (Individual Section) machines, a necessary aspect of the glass modeling process, contaminated the water stream with heavy oil and greases. These conditions made it challenging to meet the target water quality (see Table 2) using conventional treatment. As a result, blending the effluent with other water sources (well water and municipal supply) was required to meet the necessary water quality. Additionally, chemicals to control scaling and microbiological growth became more frequent, further increasing operating costs.

SOLUTION

The end-user selected Ecopolo to design and build an advanced treatment system, incorporating Toray UF modules followed by Toray RO elements as a final polishing step. Ecopolo incorporated the advanced treatment system into the existing conventional process to remove contaminants previously unattainable and continues to operate the wastewater treatment plant today satisfactorily. The UF removes suspended solids, colloidal particles, bacteria, viruses, coliform, partial organic load, and color. The RO reduces dissolved salts, including total hardness, silica, chlorides, and residual organic matter.



Figure 1: RO and UF system — UF system designed and constructed by Ecopolo (www.ecopolo.co.br)

Figure 1: Simplified Process Diagram

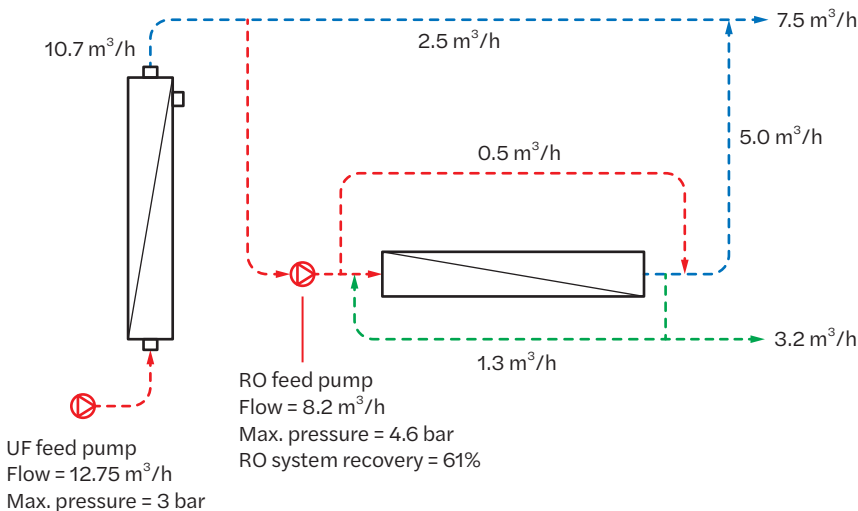


Table 1 — UF/RO Specifications

Item	UF	RO
Model	HFU-2020N	TMG20-440C
Quantity	Four (4) modules	Six (6) elements
MWCO	150 kDa	Not applicable
Membrane surface area	72 m ² /module	440 ft ²
Membrane material	PVDF	Polyamide
Nominal pore size	0.01 μm	Not applicable
Flux	44.3 L/m ² ·h	18.3 L/m ² ·h
Filtration time	30 minutes	Not applicable

Table 2: Quality of the boiler feed make-up water

Parameter	Unit	Target quality	Reuse water quality (treatment type)	
			Conventional	Advanced RO/UF
Turbidity	NTU	<10	38	<1
BOD	mg/L	<10	43	4
Chloride	mg/L	<30	222	24
Total Hardness	mg/L CaCO ₃	<50	178	31
Total Silica	mg/L	<20	25	4
Total Iron	mg/L	<0.5	0.66	<0.05

RESULTS

As indicated in Table 2, the implementation of Toray UF and Toray RO into the existing reuse system led to significant water quality improvements. Further implications include the following:

- > Increase in the concentration cycle from 2 to 3.5, leading to a change in the flow rate and 52% reduction in effluent generation.
- > Reduced use of chemicals for controlling scale and other contaminants. Within one year, the plant saw a 47% decrease in operating costs.



Figure 2: RO system



Figure 3: UF system



Partners for this project:
Owens Illinois (www.o-i.com)
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