

## HYDRAcap® MAX UF Handles High Turbidity Feed Water at High Flux to provide pretreatment for CPA3 RO in a Containerized Integrated Membrane System



**Location:**  
Ras Al Khaimah, UAE

**Feed water source:**  
Cement Factory Cooling  
Tower Blowdown

**Application:**  
Reuse

**Capacity:**  
1,000 m<sup>3</sup>/day (RO  
Permeate)

**UF Design:**  
1 rack x 10 HYDRAcap  
MAX 60

**RO Design:**  
5:3 x 6M CPA3 Single  
Stage

### The Problem

Water scarcity is a well-known problem in the Middle East. Desalination and wastewater reuse are critical to meet the region's water needs. One reuse opportunity is treatment of cooling tower blowdown to produce high quality RO effluent that can be reused in industrial processes. However, cooling tower blowdown water can be very difficult to treat by RO, since it can have a number of chemical additives in the water and can have high turbidity, which is highly variable. Utilization of an Ultrafiltration (UF) pretreatment system is a good solution to the latter problem as the UF membranes provide consistent removal of turbidity regardless of influent variation. In this particular case, water quality was significantly worse than the system was designed to treat – 10 NTU. Feed water turbidity was consistently in the range of 60-80 NTU with spikes to 140 NTU.

### The Solution

In 2013 Hydranautics supplied ultrafiltration (UF) and brackish water RO membranes to Celar Water Equipment Co. in Sharjah, UAE, who designed and built a wastewater treatment plant for a cement factory in the Emirate of Ras Al Khaimah, as shown in Figure 1. Plant design capacity is 1,000 m<sup>3</sup>/day of RO permeate and pretreatment before RO membranes comprises of lamella clarifier, Hydranautics capillary pressurized PVDF ultrafiltration, Birm filter for removal of iron and cartridge filtration. The unique feature of this UF system is that backwash is not used to clean the UF membranes, which results in very high raw water recovery. Only air scouring and chemical cleans are used.

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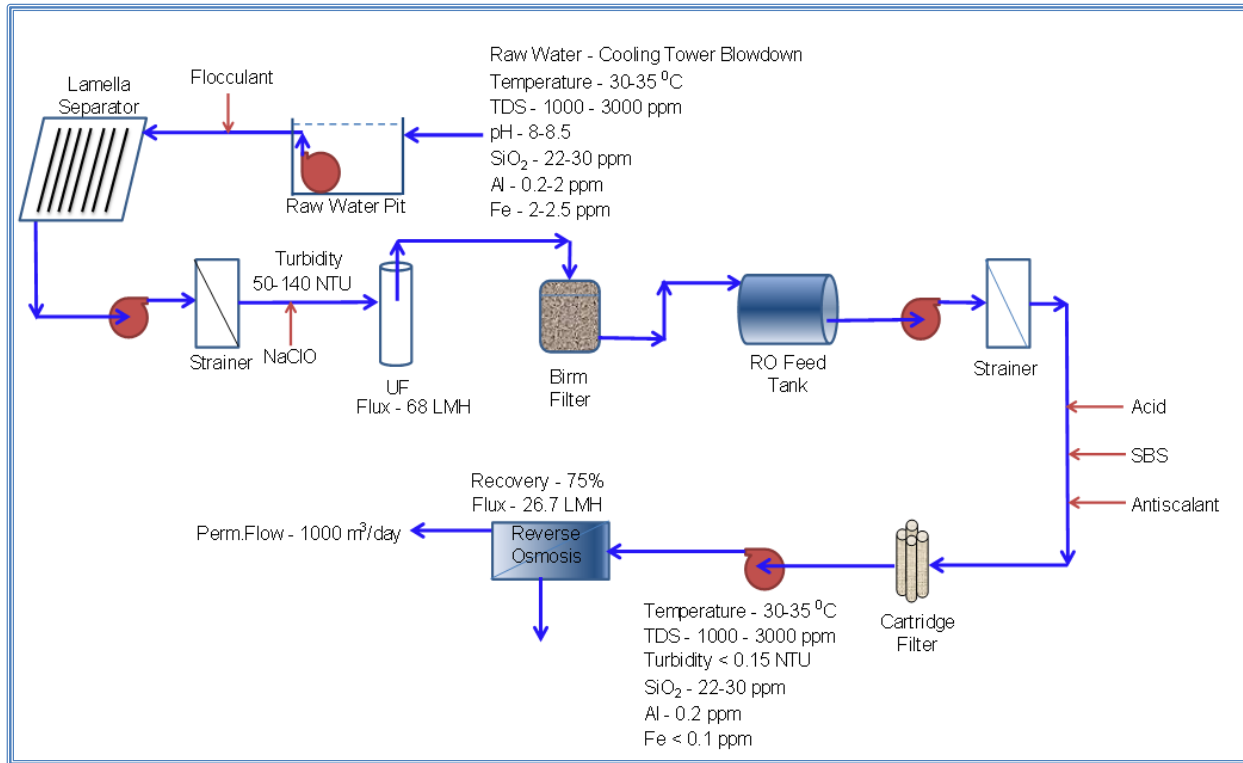


Figure 1: Process Flow Diagram and UF System Design Parameters

UF System Design	
Parameter	Design Value
Filtrate Flow	1,333 m <sup>3</sup> / Day
Flux	68 LMH
Feed Turbidity	10 NTU
Filtration Time	1 x Per Day
MC1 Frequency	20-40 minutes
Recovery	97%
Module Type	Hydranautics HYDRAcap MAX 60
UF Fiber Material	PVDF

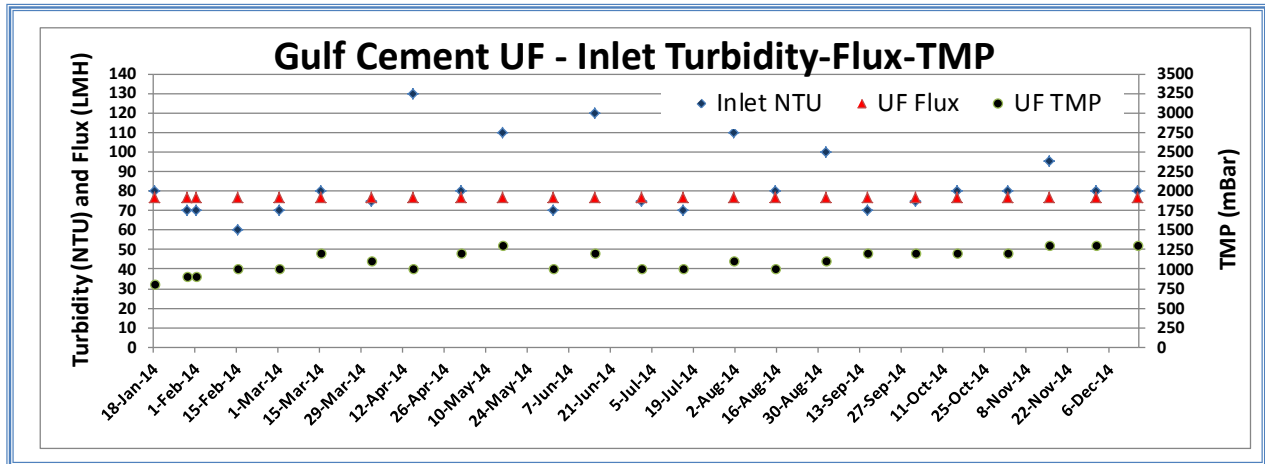


Figure 2: HYDRAcap MAX System Operating Data

## The Conclusion

As shown in Figure 2, despite feed water turbidity consistently 6-8 times higher than the design value, the UF system has been able to sustain high flux of 68 l/m<sup>2</sup>h with stable TMP. This also indicates that Hydranautics proprietary air scour cleanings are effective in removing high levels of accumulated particulate matter from the membrane surface and modules, translating to high recovery (97% in this case) and elimination of the backwash system. HYDRAcap MAX UF provides highly efficient pretreatment to RO systems in challenging applications.