CASE STUDY

RO | UF | MBR | CHEMICALS

Wastewater Reuse
Sari Gam, India

TORAY

Toray Integrated Membrane Technology for Sustainable Water Recycling Processes in the Paper Industry

PROJECT OVERVIEW

N R Agarwal Industries Limited, a leading player in the paper industry, has been a pioneer in utilizing 100% deinked wood-free recycled furnish. The company offers high-quality paper products to both domestic and international markets. This facility produces effluents, which require treatment. The client already has a full ETP plant followed by a recycle plant that contains UF membranes.

BACKGROUND

At Plant 5, the wastewater generated from the recycled paper production line is carefully pretreated through a process involving a primary clarifier, color removal, two-stage aeration tank, secondary clarifier, multi-grade filter (MGF) and activated carbon filter (ACF). It is then reused as boiler water through a reuse process that combines UF membranes and RO membranes.

In the past, UF and RO membranes from other companies were used, but frequent issues such as fiber breakage and clogging led to serious operational difficulties. Therefore, all of them have now been replaced with Toray products.

CHALLENGES

The prominent wastewater reuse facility at Plant 5 was facing critical operational challenges with its newly installed competitor's Inside-Out UF membranes. The primary issues revolved around product loss caused by membrane fouling and elevated SDI levels caused by fiber breakage, making them unable to meet sustainable operation, leading to frequent membrane fouling in their RO system, which is there in the downstream. In the RO system, unexpected shutdowns and cleaning operations have resulted in enormous labor and costs, making it urgent to solve the problems of the entire UF and RO membrane treatment system.

Another challenge was the fluctuation in wastewater temperature combined with its high level of contamination. The feed water from the treatment unit was typically around 38°C, sometimes reaching as high as 40°C, which causes damage to the UF membranes.

In addition, the feedwater quality showed very high values for UF filtration plant feedwater — TSS=50 ppm, Turbidity=50 NTU, BOD=60 ppm, and COD=350 ppm — indicating an extremely harsh operating environment.

Figure 1 : N R Agarwal [Plant 5]

Figure 2 : Waste Paper

Table 1 — Quick Facts	
Client	N R Agarwal
Location	Sari Gam, Gujarat, India
Operation start	April 2023
Production capacity	2,500-3,000 m^3/d
Toray Product model	HFUG-B2315AN (50 modules) HFUG-2020AN (44 modules) TM720D-400
Application	Paper Industry Wastewater Reuse
OEM	RK Water management system

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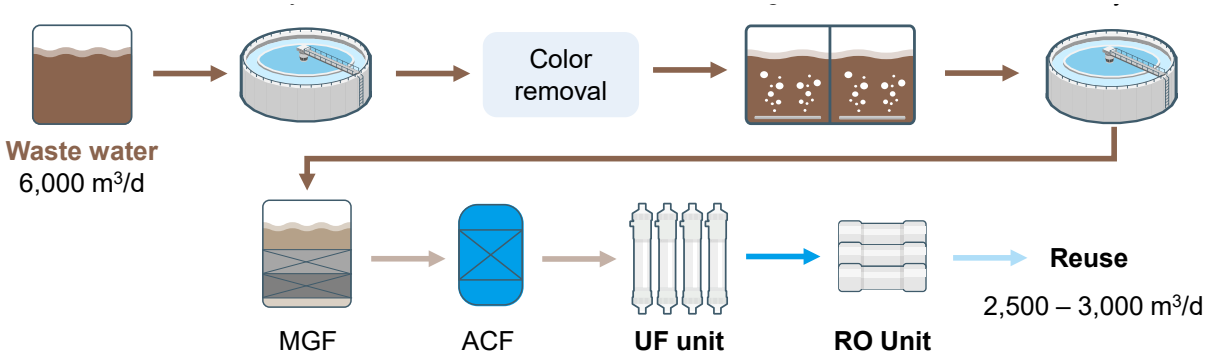

Figure 3 : Process Flow

Figure 4 : UF Unit

Figure 5 : RO Unit

Table 2 — Target Characteristics

	❶ Raw Wastewater	❷ UF Feed	❸ UF Filtrate	❹ RO Permeate
Water Temperature (°C)	38-40			
pH	7.2	6.5-7.0	-	-
Capacity (m^3/d)	6,000	5,600	5,000	2,500 - 3,000
TSS (mg/L)	10,000	50	Nil	-
Turbidity (NTU)	-	50	0.45	-
SDI			Less than 3 (90% of time)	
COD (mg/L)	2,000 - 2,500	200 - 400	150	-
Conductivity (µS/cm)	-	2,500	2,500	< 100 (TDS: 50 - 60 mg/L)

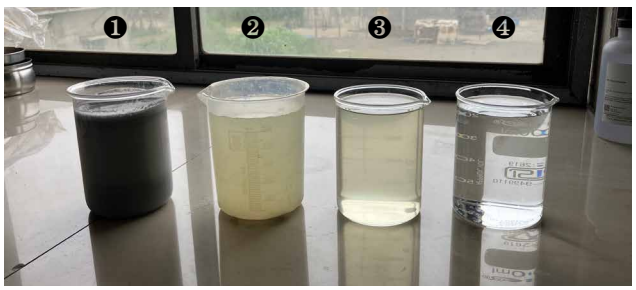

Figure 6 : Water Color Sample

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RESULT

Despite the previously mentioned worst-case UF inlet characteristics and high operating temperatures, our UF membranes perform with zero fibre breakage, consistent turbidity and SDI levels for over 2 years. Despite having smaller pore sizes than those of our competitors, our UF membranes excel in low fouling performance, reducing the frequency of chemical cleaning from once every 15 days to once every 25 days. This minimized operating costs while improving operational efficiency. Additionally, it has improved the stability of water quality by reducing shutdowns and frequent cleanings due to RO clogging, resulting in significant operational and cost benefits for the entire membrane process. The unification of membrane process management under Toray has also made management easier.

CUSTOMER VOICE

Mr. S. Venkatesh / N. R. Agarwal, President-Technical and Operations

At our factory, we take pride in producing recycled paper from recycled materials, using world-class technology to ensure consistently high quality. At the same time, we focus on making the most of limited resources and reducing environmental impact—for example, by treating and reusing the wastewater generated during production. I hope people can recognize these efforts as well. We are extremely satisfied with Toray's performance. All the serious issues we faced before have been resolved, and we are now considering using Toray's membrane systems in other water treatment processes. We look forward to Toray's continued reliable performance.

Figure 7 : Mr. Venkatesh / N R Agarwal

Mr. Rakesh Lad / RK Water Management system, Managing Director

"Since we started using Toray's UF and RO membranes over two years ago, we haven't had any major issues like membrane breakage. Even when minor problems occur, they respond immediately, so we can run our operations very stably over the long term. Switching from another company to Toray not only improved water quality but also boosted operational efficiency and ease of maintenance. It was a perfect decision that reduced our total operating costs. We look forward to receiving your high-performance products."

Figure 8 : Mr. Rakesh / RK water

Figure 9 : Operation Team with Mr. Chauhan, QC head of Plant 5

Figure 10 : Toray Member with Mr. Venkatesh

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