



# TREATING INDUSTRIAL WASTEWATER WITH PRO-LF IN A COAL-CHEMICAL ZLD PROJECT

*Case study*

*Using PRO-LF1 to Help a Chinese Coal-Chemical  
Zero Liquid Discharge Plant Achieve Stable  
Performance*

The

## PROBLEM

As part of the “13<sup>th</sup> Five-Year Plan,” the Chinese government required Chemical Enterprises to relocate to chemical industrial parks. This was partially done to ensure updated wastewater facilities were installed that could properly handle the volume and type of wastewater discharged by the different industrial manufacturing processes.

A coal-chemical enterprise in Anhui, the eighth most populous landlocked province in the

Eastern part of China, actively responded to the requirements of the national environmental protection policies and relocated to a coal-chemical industrial zone. A prerequisite for relocation was building a Zero Liquid Discharge (ZLD) system and reusing the wastewater as a resource.



Country	China
Province	Anhui
Application	Zero Liquid Discharge
Model	<b>PRO-LF1</b>
% Recovery	70 %
Feed Water Type	Coal-Chemical Industrial Wastewater
Capacity (m <sup>3</sup> /h)	105
Feed COD (mg/L)	< 300
Feed EC (uS/cm)	30,540
Flux (lmh)	15.7
Array	20:10 (6M)
Number of Trains	2
Quantity per Train	180

The

## SOLUTION

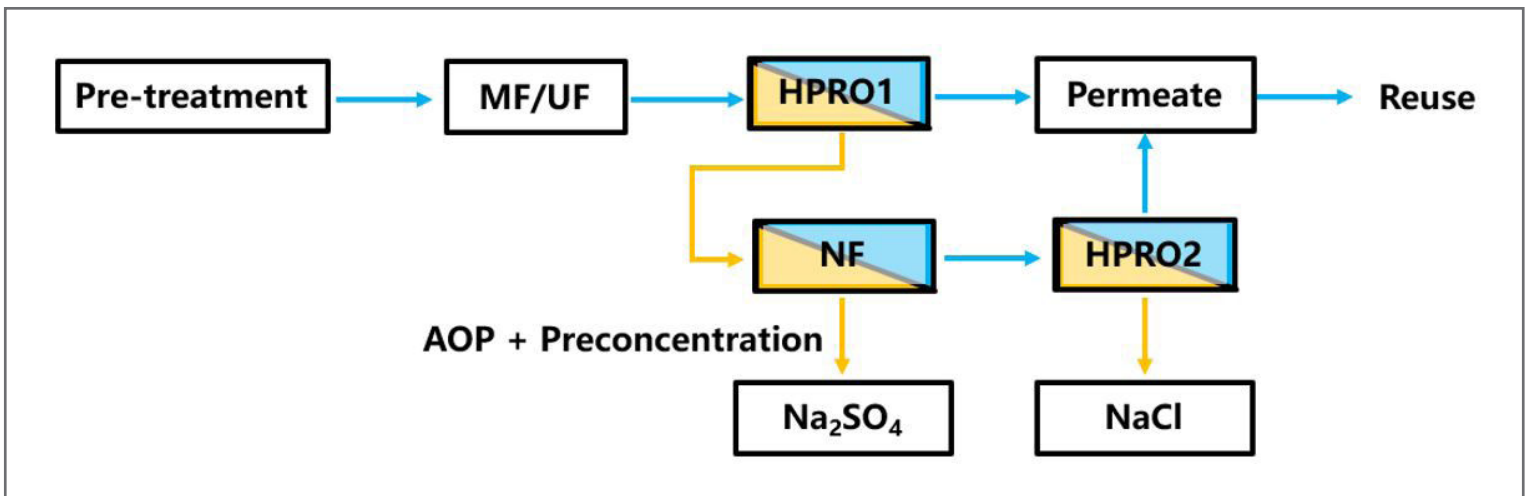
When starting their ZLD treatment system in 2021, the plant was designed with both Hydranautics' low-fouling, high-pressure PRO-LF1 RO membranes and high-performing ion selective PRO-XS2 NF membranes.

PRO-LF1 is a spiral wound RO membrane element that has a neutral charge that achieves the lowest organic fouling while treating high salinity wastewaters. These elements are ideal for treating the high-fouling brine streams generated from the first step in a ZLD system to maximize system productivity. PRO-LF1's resistance to organic fouling leads to lower frequencies between cleanings, reduced chemical costs and system downtimes. The implementation of PRO-LF1 has improved the efficiency of several ZLD plants globally.

The end-user completed two phases of

construction of the ZLD system. The PRO-LF1 membranes were installed in April 2022. The design capacity of the final system is 105 m<sup>3</sup>/h. After pre-treatment, the wastewater was treated by a high-pressure HPRO1. The permeate from HPRO1 was reused by the plant as recycled water, while the concentrate was further treated by the salt separation NF unit.

The final HPRO1 system was loaded with 180 PRO-LF1 elements and operated at 70% recovery. The system operated efficiently and with stable performance for over a year.



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## IMPACT

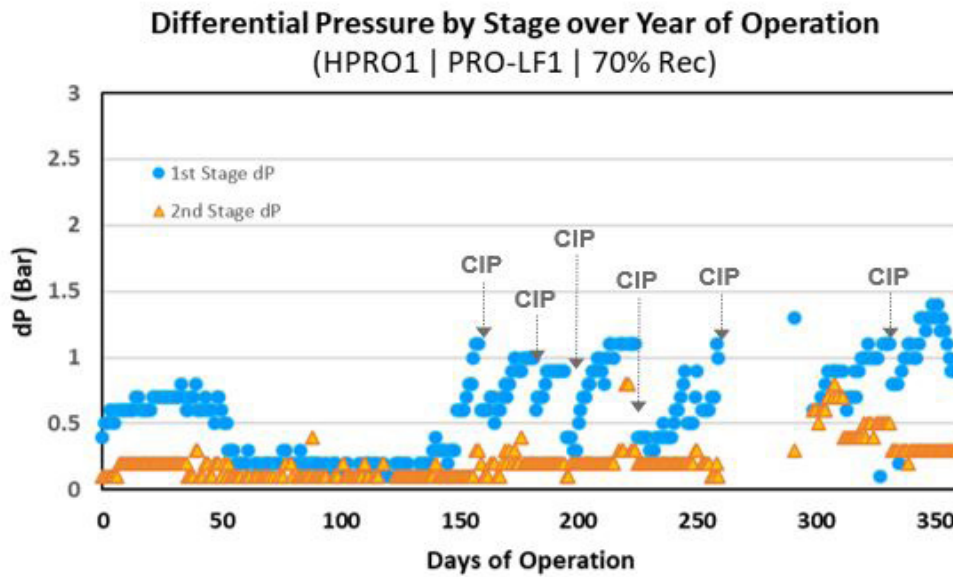
The HPRO1 system treated high salinity, high organics wastewater for over a year with stable performance. The system was able to operate without cleaning for 5 months after the initial operation and would go on to only require additional CIPs approximately once a month.

The fouling resistant nature of the PRO-LF1's membrane surface enabled efficient cleanings which resulted in significant differential pressure reduction post CIP. With persistent

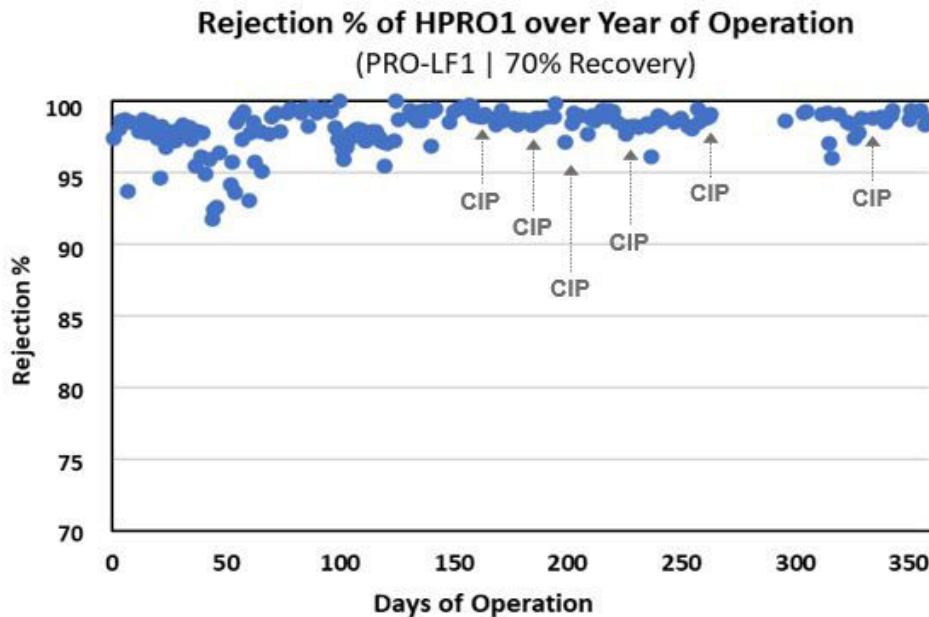
cleanings, the first stage's differential pressure remained below 1.5 bar and the second stage differential pressure remained below 0.8 bar throughout the first year of operation.

The PRO-LF1 elements were able to maintain stable rejection performance and meet customer water quality requirements even after monthly harsh cleanings.

# Maintenance of Stage dPs with Routine CIPs



# Stability of Salt Rejection of HPRO1 after Multiple Harsh CIPs



For more information about Hydranautics case studies, contact us at [hy-marketing@nitto.com](mailto:hy-marketing@nitto.com) or visit our website at [membranes.com](http://membranes.com)

## About Hydranautics

Since our founding in 1963, Hydranautics has been committed to the highest standards of technology research, product excellence and customer fulfillment. Hydranautics entered the Reverse Osmosis (RO) water treatment field in 1970 and is now one of the global leaders in Integrated Membrane Solutions. Hydranautics became a part of the Nitto Group in 1987. Nitto is Japan's leading diversified materials manufacturer. The group offers over 13,000 high value specialty products worldwide including optical films for liquid crystal displays, automotive materials, reverse osmosis membranes for desalination and transversal drug delivery patches.

As leaders of high quality membrane solutions, we believe our commitments extend beyond manufacturing and selling our products. Our skilled staff of technicians, engineers and service professionals assist in designing, operating and maintaining a robust, reliable and efficient membrane system to meet your requirements and exceed your expectations.