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HYDRANAUTICS
Nitto Group Company

HYDRANAUTICS HYBRID MEMBRANE TECHNOLOGY ACHIEVES IMPROVED PERFORMANCE

Case study

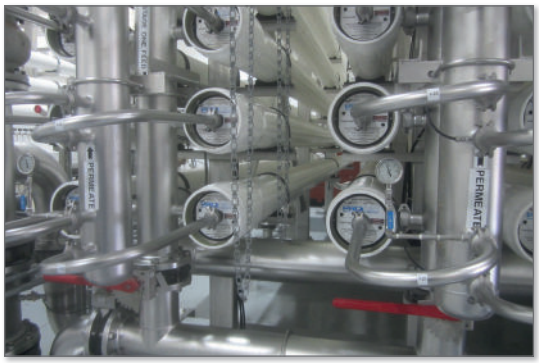
A 3-way Pilot Test between Competing Brands won by Hydranautics' Hybrid Design comprising ESPA4-LD and ESNA1-LF2-LD membranes

The PROBLEM

After 12+ years of service, the original Brand-Z membranes were no longer available for replacement. By 2016, old membranes required higher feed pressure than their system was capable of pumping, the permeate production was lower than original targets of 2.5 MGD, and more post-treatment chemicals were required to increase alkalinity for stabilizing the finished water.

The operating company was paying higher charges for electricity, cleaning and post treatment chemicals. Because flux balancing could not be achieved with old membranes, they fouled faster, yielding less production from 2nd stage.

Therefore, the company was on look out for a membrane that best fit their hardness passage goals, organic rejection and lower operating pressures.



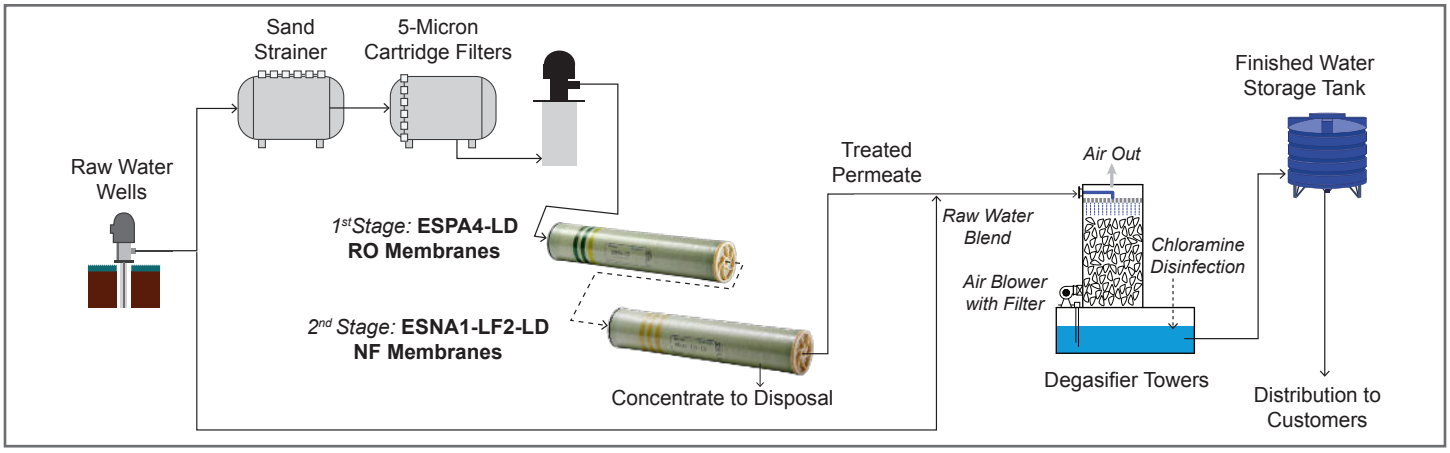
Location	Delray Beach, FL, USA
Feed water source	Surficial wells
Application	Municipal drinking water
Capacity	30 MGD
Start-up date	2004
Hybrid Design	10 NF units, 40:21 array of 7M vessels. ESPA4-LD in the 1st stage and ESNA1-LF2-LD in the 2nd stage

The SOLUTION

In 2016, pilot testing was done to give Brand-X, Brand-Y and Hydranautics, a chance to run side-by-side and show the performance of their respective design proposals.

During the pilot proof test, a hybrid design comprising Hydranautics ESPA4-LD low-pressure reverse osmosis and ESNA1-LF2-LD nanofiltration (NF) membranes provided the desired range of alkalinity and hardness passage, great organic rejection to eliminate the potential of Disinfection By Products (DBP's), and the lowest feed and differential pressures.

Without valves to flux balance the system, Hydranautics hybrid design allowed higher flow into the 2nd stage because the high permeable NF membranes were positioned in the 2nd stage. This hybrid combination gave the best rejection up front (1st stage) with the ESPA4-LD's and bled the desirable amount of alkalinity in back (2nd stage) with the ESNA1-LF2 LD's.



The below table shows the performance of the Hydranautics membranes.

PBCo WTP-3 Parameters	**Brand-Z Membranes** *(2004 - 2016 performance)*	**Hydranautics Hybrid Design** *(2018 performance with Hydranautics replacements in 2017)*
Permeate TDS	20 – 50 mg/L	> 50 mg/L
Permeate Color	< 2.0 color units	< 2.0 color units
Permeate Total Hardness	< 15 mg/L as $CaCO_3$	> 30 mg/L as $CaCO_3$
Permeate Bicarbonate	< 15 mg/L as $CaCO_3$	> 30 mg/L as $CaCO_3$
TTHM Formation Potential	< 0.042 mg/L	< 0.042 mg/L
HAA5 Formation Potential	< 0.030 mg/L	< 0.030 mg/L
Feed Pressure	100 – 130 psi	85 psi
dP 1st Stage (ESPA4-LD)	30 – 45 psi	15 psi
dP 2nd Stage (ESNA1-LF2-LD)	15 – 20 psi	10 psi

The IMPACT

In 2017, Hydranautics installed 10 NF trains of its hybrid design. Improved flux distribution in both stages is seen as the higher permeable NF membranes reside in 2nd stage.

The feed pressures were 30 psi lower than the original Brand-Z membranes. The plant generated higher revenue as it continued to produce original target of 2.5 MGD per NF train, while consuming less post treatment chemicals and saving with lower energy costs annually.

About the author

MR. KIRK LAI

***Kirk Lai** is the Field Service Engineer for Hydranautics and has been with the company for 14 years. He provides on site services and support to plants all across the United States.*

For more information about Hydranautics case studies, contact us at **hy-info@nitto.com** or visit our website at **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 one of the most respected and experienced firms in the membrane separations industry. We joined the Osaka, Japan based Nitto Denko corporation in 1987 which was founded in 1918 and now has 117 companies in more than 20 countries, with over 30,000 employees worldwide. Our alliance with this global film industry giant boosts Hydranautics to a superior level of technological sophistication, product performance and customer response.

We are not simply product manufacturers; we are your membrane technology partners. As leaders of high quality membrane solutions, we believe our obligations 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. Our support is offered from early stage conceptual design and engineering to start-up and maintenance, no matter the location globally whether it is on land or off-shore.

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