

A photograph of a person, likely a woman, holding a clear glass filled with water. She is giving a thumbs-up gesture with her other hand. The background is a soft-focus outdoor setting with green foliage. The text is overlaid on the left side of the image.

**MAKING THE GRADE ON
SAFE DRINKING WATER
FOR THE CITY OF
BOCA RATON**

Case study

High Flow, High Permeate Quality and Cost Savings with high longevity (10 years) through ESNA1-LF2 membranes with low-fouling LD Technology[®]

The

PROBLEM

Boca Raton city's water treatment plant originally comprised of conventional lime softening process. Although it reduced hardness and alkalinity well, but reducing color was poor. The shallow Biscayne Aquifer is heavy in organics and color. The treatment plant would frequently receive home owner complaints about discoloration in their tap water.

Commissioned in 2004, membrane softening using Hydranautics' ESNA1-LF2 nanofiltration

membranes solved the problem of the color and disinfection by products (DBP). These membranes passed enough alkalinity and hardness to keep the product water relatively close to that of the old lime softening targets.

These first-generation membranes saw flux declines and increasing differential pressures at a rate that made them clean each membrane train every 3–4 months.



<i>Location</i>	Boca Raton, FL, USA
<i>Feed water source</i>	Biscayne wells
<i>Application</i>	Municipal drinking water
<i>Capacity</i>	40 MGD
<i>Start-up date</i>	2004
<i>NF Design</i>	72:36 array of 7M vessels, housing 756 membranes

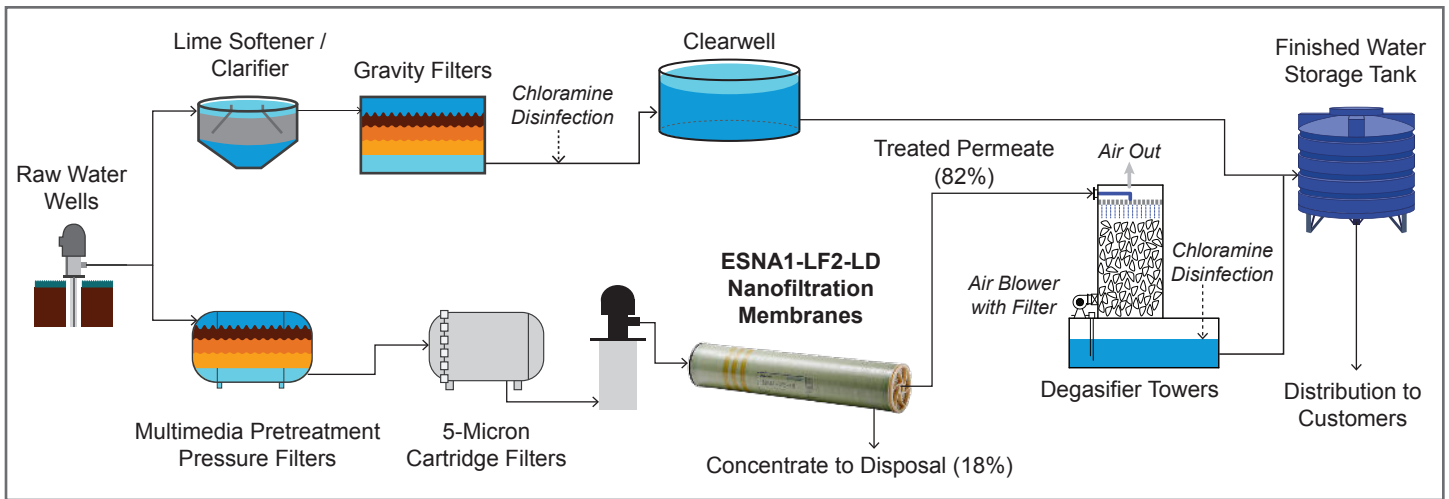
The

SOLUTION

In 2015, Hydranautics replaced with new and improved ESNA1-LF2-LD membranes which used larger 34 mil feed spacer with low fouling LD Technology®. This brought down cleaning frequency to 1–2 per year instead of earlier 3–4 times due to lower differential pressure and more effective cleanings.

Additional savings were in energy consumption, manpower and cleaning chemicals by not needing as many cleanings.

Each nanofiltration train has 72:36 array of 7M vessels, housing 756 membranes. The average flux per unit is 20.7 l/mh (12.2 gfd) and 82% recovery. There are 10 trains with 3.676 MGD capacity and 2 NF trains with 1.838 MGD capacity each, to make a total plant permeate capacity of 40.0 MGD.



The below table shows the performance of the Hydranautics membranes.

Constituent / Parameter	ESNA1-LF2 (2004)	ESNA1-LF2-LD (replacements in 2015)
Bicarbonate	< 175 mg/L as CaCO ₃	< 175 mg/L as CaCO ₃
Color	< 2.0 color units	< 2.0 color units
Total Dissolved Solids (TDS)	< 300 mg/L	< 300 mg/L
Total Hardness	50 – 80 mg/L as CaCO ₃	60 – 90 mg/L as CaCO ₃
Total Organic Carbon (TOC)	< 1.0 mg/L as C	< 1.0 mg/L as C
TTHM Formation Potential	< 0.042 mg/L	< 0.042 mg/L
HAA5 Formation Potential	< 0.030 mg/L	< 0.030 mg/L
Feed Pressures	95 – 100 psi	70 – 75 psi
dP 1 st Stage	25 – 35 psi	18 psi
dP 2 nd Stage	15 – 20 psi	12 psi

The IMPACT

The plant staff has experienced reduction in cleaning frequency due to lower fouling potential of ESNA1-LF2-LD membranes. The feed pressure is lower by 20% even after 2½ years of operation, thus saving electrical energy.

The City of Boca Raton has reaped benefits of the newest ESNA1-LF2-LD in the way of stable performance that is producing the flows, permeate quality, and cost savings from lowered feed / differential pressures and the reduction of cleaning chemicals.



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.

Nitto

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