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HYDRANAUTICS

INCREASED PRODUCTION & REDUCED PRESSURES USING ESPA2-LD MAX

Case study

Using New Thin Membrane Composite Technology to Reduce Operational Costs in a Municipal Drinking Water Plant in South Carolina

The PROBLEM

Charleston county is one of the ten fastest growing counties in South Carolina. A private utility in Charleston county has operated an RO well water treatment system since 1992.

In 2009 Hydranautics ESPA2 elements were installed in their Plant III RO system. Plant III consisted of four, two stage RO Units and produced a maximum of 2.88 MGD (Million Gallons per Day).

Charleston county has since had a 22% increase in population from 2009 to 2022 which has lead to an increase in demand for water. Advances in membrane technology since 2009 has resulted in elements with either an increase in membrane surface to 440 ft^2 **or** an increase in the thickness of the feed spacer to 34 mil. Typical 440 ft^2 RO elements are still equipped with the smaller 28 mil feed spacers due to volume limitations imposed by spiral element standardized sizes.

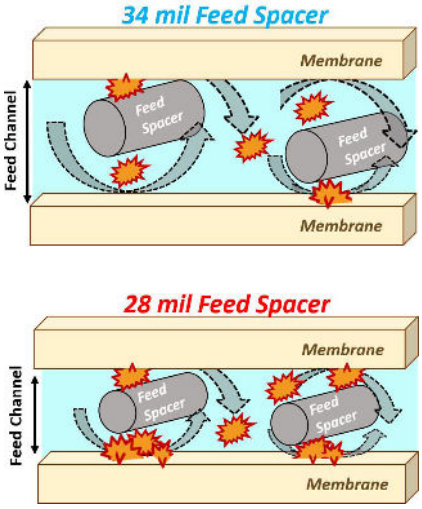
While the typical 440 ft^2 elements produce a higher permeate flow, they are often not very efficient. When installed in systems, they frequently experience an increase in fouling rates and differential pressure losses, resulting in higher energy demands.

Country	United States
Location	Charleston County
Feed Water Source	Charleston Aquifer
Application	Drinking Water
RO Units	4
Stages	2
Array	11:5 (7M)
Recovery	80%

The SOLUTION

As most of a RO membrane element's volume in expended by the brine spacer when the volume of membrane is increased, standard elements use a thinner feed spacer to make up for that volume loss. However, Hydranautics' new **ESPA2-LD MAX has both the larger 440 ft^2 area and thicker 34 mil feed spacer** by utilizing a robust, thinner membrane support fabric.

A thicker 34 mil feed spacer results in a wider feed channel, reducing the tendency for particles to become trapped. This helps prevent increases in differential pressures and allows trapped foulant to be more easily removed.

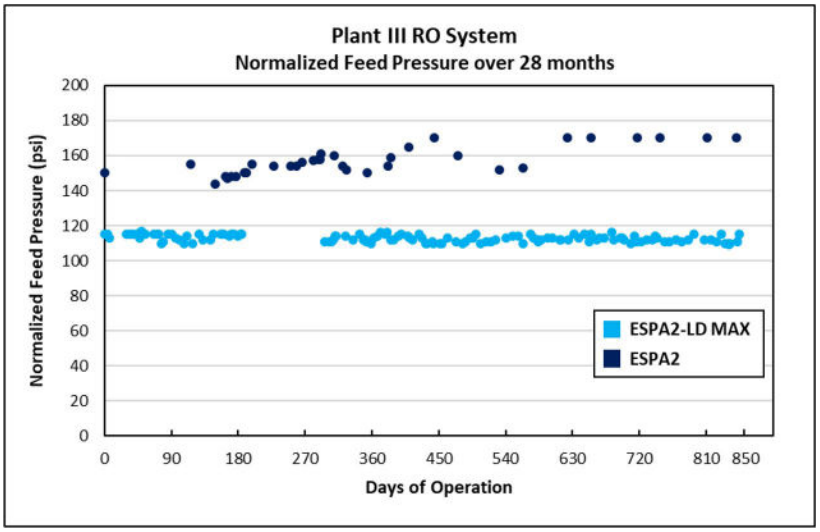


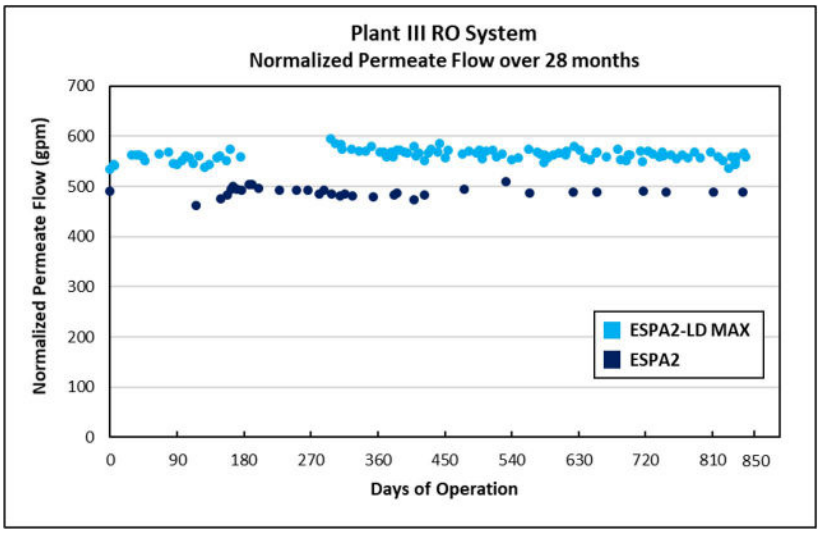
To increase the private utility's Plant III water production, Hydranautics removed Plant III's nine year old ESPA2 elements and installed new ESPA2-LD MAX elements.

After 28 months of run time, the ESPA2-LD MAX elements were found to have:

- operated at a lower feed pressure
- produced a higher permeate flow
- maintained previous quality of permeate

Plant III continues to operate with stable reduced pressures, increased permeate production, and excellent permeate quality. Since having installed ESPA2-LD MAX elements, their drinking water has won the Southeast Desalting Association (SEDA) contest for best drinking water two years in a row.





	ESPA 2	ESPA2-LD MAX
Feed Pressure	170 psi	115 psi ↓
Normalized dP	61.7 psi	30.8 psi ↓
Normalized Perm Flow	489 gpm	562 gpm ↑
Normalized SP%	2.3 %	2.3 %

Performance after initial 850 days (28 months) of Operation

The IMPACT

After installing new ESPA2-LD MAX elements, Plant III experienced a **21% decrease in annual energy costs** and produced an additional **63 million gallons more per year**.

Plant III was able to achieve this increase in production and decrease in energy usage without the addition of extra capital equipment or modifying any of Plant III's existing treatment systems due to the new thin membrane technology present in ESPA2-LD MAX.

By utilizing thin membrane composite technology, ESPA2-LD MAX elements are able to offer both a maximized active membrane area of 440 ft^2 and a larger 34 mil feed spacer, leading to:

- Higher permeate production
- Reduced fouling
- Lower differential pressures
- Better flux balance than standard 440 ft^2 RO elements
- Reduced energy costs

Plant III was able to achieve **ROI within the first year** of operation from the energy reduction, cost savings and revenue boost from increased water production. After **four years** of operation with ESPA2-LD MAX elements, Plant III's cumulative cost benefit from increased revenue and **cost savings** would total approximately **$530,000 USD**.

% Change after installing ESPA2-LD MAX

Carbon Emissions	Annual Energy Cost	Feed Pressure	Differential Pressure	Permeate Production
↓ 20%	↓ 21%	↓ 32%	↓ 50%	↑ 15%

Performance after Initial 850 days (28 months) of Operation

For more information about Hydranautics case studies, contact us at **hy-marketing@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 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.

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