

Spiral Membrane Elements with Printed Spacers

Details of the demo / pilot

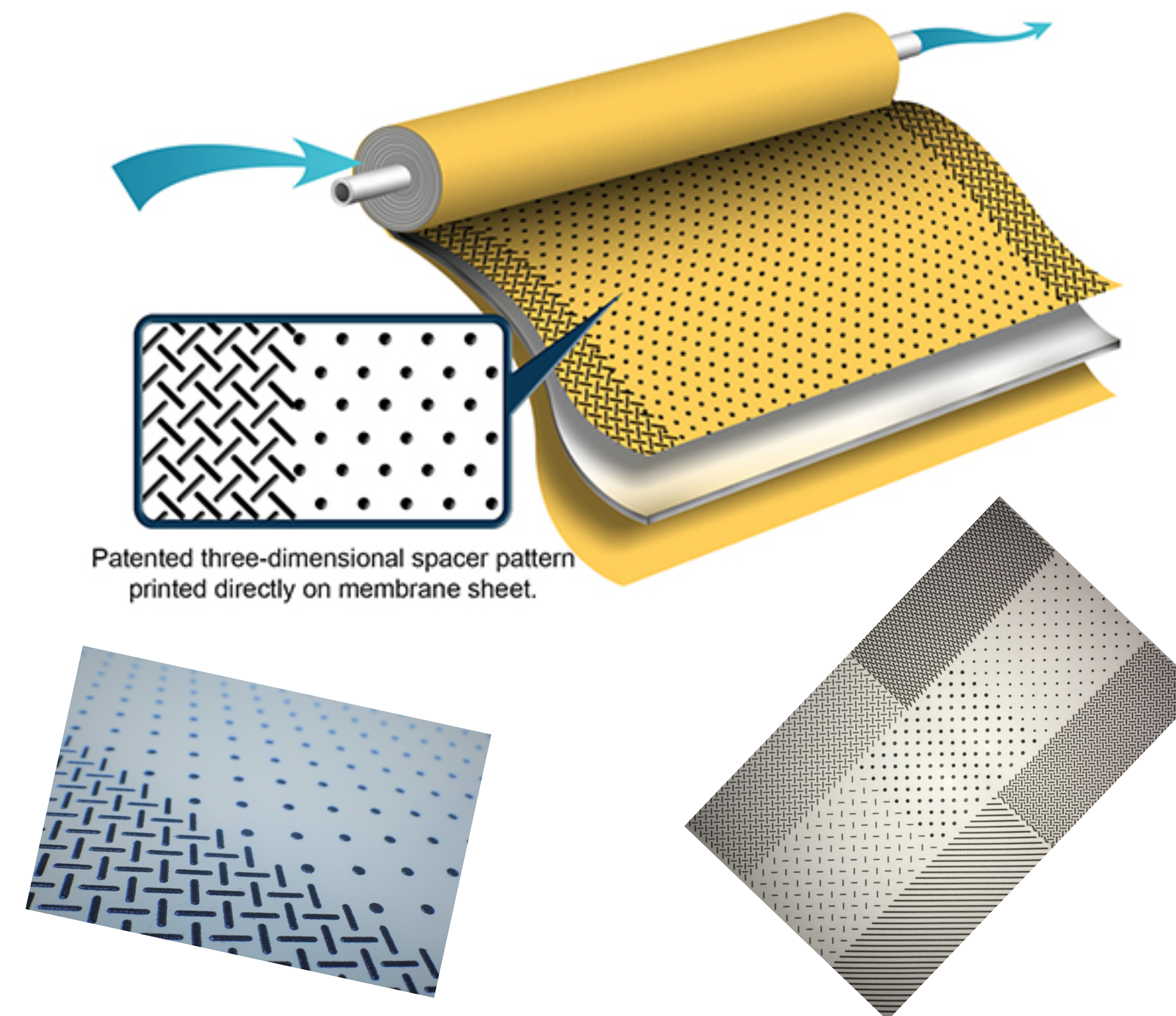
Name of client – Water Surplus
Location of plant - Rockford, IL
Application Type – Boiler Feed Water
Flow rate - 6.5 GPM feed
Influent – 1164 uS



The demo system included two separate RO trains, one with conventional mesh spacers and one with printed feed spacers. Configuration is dual trains of 2-1-1, 4040s and 2540s. The system controls all key parameters and can be viewed and controlled in real time.

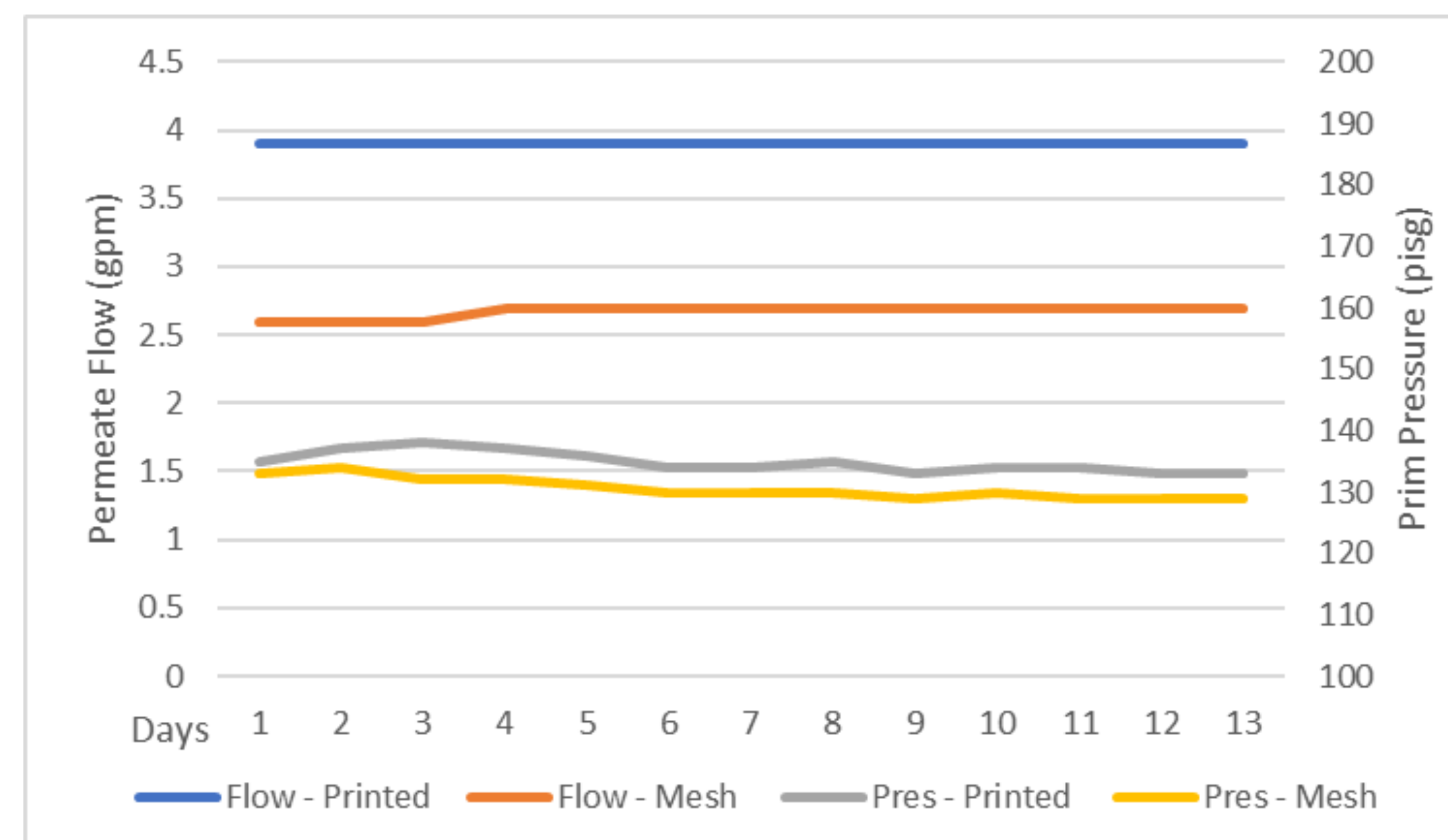
What was the compelling value proposition?

- 1. More permeate per element** – thinner printed feed spacers enable more membrane surface area with the same pressure drop and rejection. A 600 square foot 8x40 element is now possible.
- 2. Lower fouling** - printed spacers have more open flow channels which minimize fouling potential and enable faster and more effective cleaning.
- 3. Lower energy** – printed spacer of the same thickness as mesh, have lower pressure drop per element with the same membrane area. This reduction in pressure drop lowers the total energy consumption.
- 4. Higher recovery** – printed spacers enable higher recoveries due to lower fouling potential.
- 5. Directed feed flow** – printed spacers can direct feed flow paths for process and re-use applications to avoid membrane fouling and improve separations.



The Experience

The research data at Water Surplus proves that printed spacer technology has much higher permeate flow than elements with mesh spacers. This is also validated by proprietary test data from many RO element companies and RO system operators.



What problem did this aim to solve?

Originally, the idea of embossed or printed spacers for spiral membrane elements was developed under a US government grant to produce highly compact desal systems for individual soldiers.

Today, printed spacers help solve the most significant barrier to spiral membrane treatment expansion – high cost. Even after 40 years of innovation, RO & NF based water treatment is still the most expensive option.

Customized feed spacers by application lower the total cost of treatment by the following methods:

- Increased flow per element reduces total equipment and hardware cost
- Lower fouling and more effective cleaning reduce total life cycle costs
- Reduced pressure drop lowers energy consumption
- Higher recovery reduces waste to drain

What this means for the future?

Several years of research and development have evolved this proprietary technology to operational elements that have the same quality (rejection) as conventional mesh spacer technology, but with much higher permeate flow and lower fouling potential.

Current work is focusing on high rate production printers and adhesives to meet the expected demand for this technology. Advantages of this disruptive technology for the industry are significant in terms of increased capacity, lower energy consumption, and reduced maintenance and cleaning times due to membrane fouling.

Printed spacers have the potential to not only add value to existing products, but to accelerate the expansion of membrane based water treatment by reducing the total cost of high quality water.