Aqua Membranes
PRINTED SPACER TECHNOLOGY®

Micron Technologies

Aqua Membranes Saves Emissions and Quadruples Life of Reverse Osmosis

Goals: Save Energy

Location: Boise, ID

Application type: Wastewater Recovery

Background: Micron Technology, a memory chip giant, approached Aqua Membranes 2 years ago to improve UPW water treatment in chip fabs worldwide and find new ways to meet their sustainability and decarbonization goals. On average, each chip produced requires ~2200 gallons of Ultra-Pure Water (UPW), and with well over a trillion chips produced each year, the total water usage is staggering. According to some estimates, semiconductor manufacturing uses 25.7 million gallons of water daily. Water used in production must be treated using reverse osmosis (RO) for both UPW and wastewater. Micron's goal is to utilize printed spacers in their facility in Boise, ID, and find out how Printed Spacer Technology® can revolutionize their water treatment systems to use less energy in the US and worldwide.

The pilot was set up to have two identical skids running in parallel, with a 3-1-1 banking and VFD set to keep the skids running at 65% recovery and 63 GPM. The skids are fed wastewater from the fab that comes in at 250 ppm, and the permeate is recycled back into the front end of the UPW water treatment system for reuse. Both systems were instrumented to collect AMP draw, DP, conductivity, and flow data. The data was then collected every 15 minutes and shared weekly with the Aqua Membranes and Micron teams for evaluation.

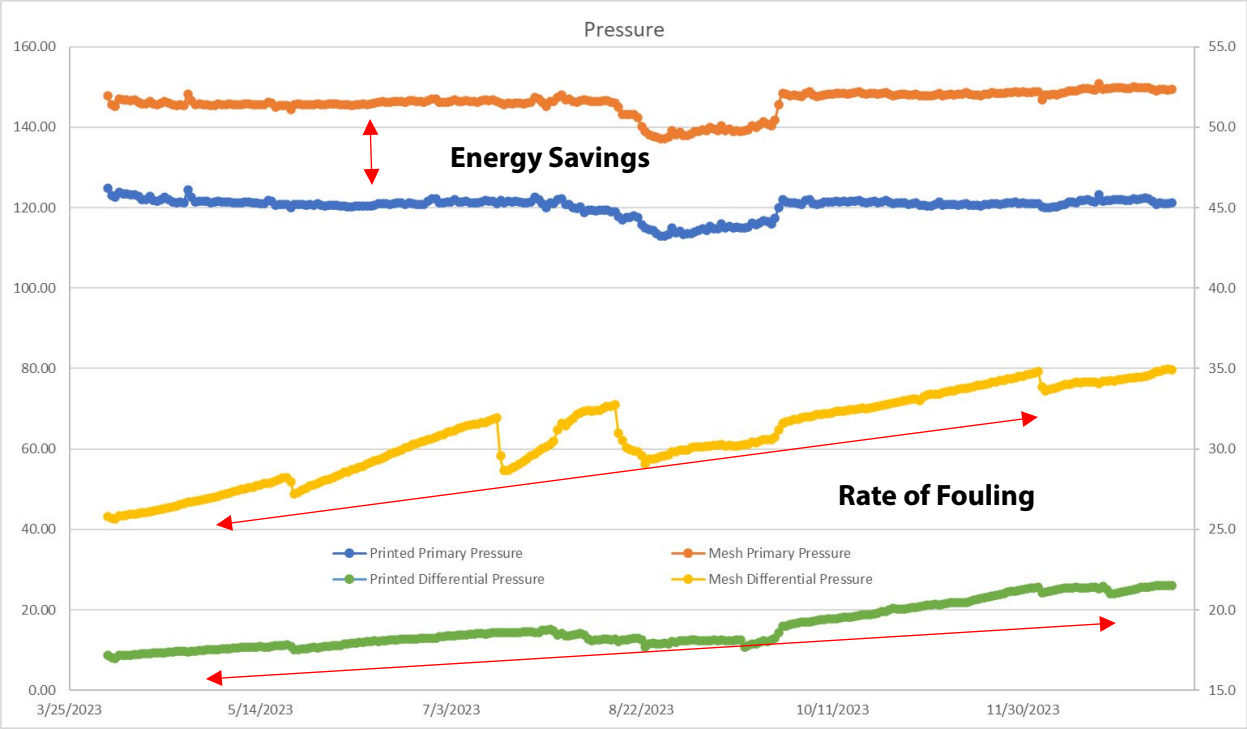
Solution:

To best meet Micron's decarbonization/sustainability goals before installation in the pilot location, the Aqua Membranes team developed a specific plan to create a printed spacer pattern and RO product that would work best for the application. This pattern became what is now known as our AM-BW505-ECO1.0 product. To make this decision, the Aqua Membranes team worked on various printed patterns followed by lab scale tests and CFD modeling before concluding. Only after this were Aqua Membranes Printed Spacer elements installed in the fab in Boise, ID, in collaboration with the team at Micron.

Results:

After six months of continuous operation, Aqua Membranes exceeded the desired targets. It was found that printed spacers had a 20% difference in energy consumption compared to the

mesh spacers. That translates to tons of carbon emissions and thousands of dollars saved over each element's life. Additionally, we saw a DP increase difference of 4x with mesh increasing in DP of 6.03psi while printed was .6psi. This indicates a strong fouling/scaling resistance for printed spacers compared to mesh. So, using printed spacers, Micron can expect to clean their membrane elements 4x less frequently and extend the time between replacements by years. Lowering the chemicals consumed, membranes needed annually, and labor costs associated with cleaning/replacing elements. All while producing permeate at a quality that meets the requirements of the Fab. Over time, this reduces capital expenditures in plant operations and moves the needle on Micron's sustainability goals.



Conclusion:

Aqua Membranes' reverse osmosis technology has shown that in operation, printed spacers offer a massive upside to a greener future in the Semiconductor manufacturing industry without sacrificing water quality. Due to the results of this pilot, if Micron installed printed spacers in other fabs worldwide, they would be an industry leader in their water treatment. By partnering with Aqua Membranes, Micron will save millions of dollars in OPEX and move the needle in meeting its sustainability goals.

Contact us: sales@aquamembranes.com Or Visit our website: aquamembranes.com