



FilmTec™ Fortilife™ CR100

How cleanings due to biofouling can be reduced by 36% in industrial wastewater treatment

The Problem

Biological fouling is one of the more challenging types of fouling to control in reverse osmosis (RO) systems. It is defined as the growth and accumulation of microorganisms and their respective extracellular polymeric materials (EPS) inside the feed channel of the spiral wound RO element. The feed channel becomes blocked and causes the feed-concentrate pressure drop (dP) across the RO pressure vessel to increase and the water permeability through the membrane to decrease. In addition to reducing the system efficiency, irreversible mechanical damaged to the elements may occur if the pressure vessel dP exceeds 3.5 bar. Clean-in-place (CIP) protocols employing aggressive chemicals are used to manage the system when biofouling occurs, but these may be necessary as frequently as every 1-2 weeks. In total, biofouling and frequent cleanings will affect energy and chemical consumption, element lifetime, water productivity and cost of water produced.

The Solution

The FilmTec™ Fortilife™ CR100 contaminant resistant RO elements offer relief to the end user who performs frequent cleanings due to biofouling. These elements are built on FilmTec™ RO characteristic performance standards, and offer greater fouling-resistance fueled by advances in membrane chemistry and module design for today's biofouling prone water types. A water treatment plant experiencing frequent cleanings due to rapid increase of the 1st stage differential pressure, a symptom of biofouling, can expect the following relative to leading fouling resistant products currently available in the market:

- Up to 50% reduction in the number of cleanings
- Effective and efficient cleaning of biofilm, organic compounds and scale, achieved through the ability to use a wide pH range during cleaning (pH 1–13)
- Up to 10% energy savings at the same water productivity

The 8-inch FilmTec™ Fortilife™ CR100 Elements offer 11,500 gallons of water per day with 99.7% stabilized salt rejection (99.4% minimum rejection) and a pressure drop of 0.1 bar at standard test conditions of 2,000 ppm NaCl, 225 psi (15.5 bar), 77 °F (25 °C), pH 8 and 15% recovery.

Case Study

A case study is presented that compares two lines of RO elements, each with seven elements in series operated in parallel to an existing RO plant treating wastewater from a steel and iron plant (Figure 1). The two trains contained 8-inch diameter FilmTec™ Fortilife™ CR100 and FilmTec™ BW30FR-400/34i Elements, respectively, and were operated with matching flux and recovery starting at 15 L/m²h and 48%. The industrial wastewater feed had a total dissolved solids (TDS) of 700-900 mg/L and a chemical oxygen demand (COD) of 40-60 mg/L.

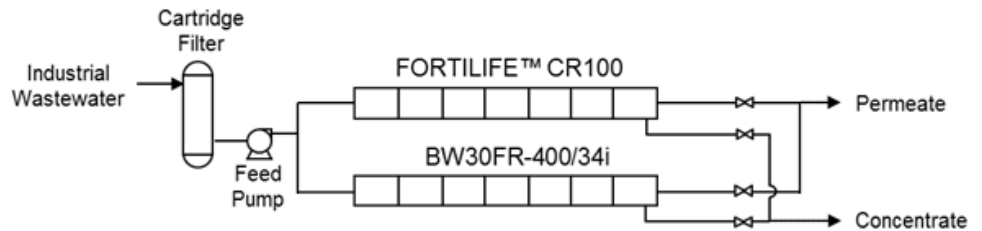


Figure 1: Industrial wastewater experimental plant

The feed-concentrate normalized pressure drop (dP) evolution over time for each line was monitored throughout the experiment (Figure 2). On average, the FilmTec™ Fortilife™ CR100 offered 64% more operating time between cleanings than the BW30FR-400/34i. This extended operating time corresponds to 36% less cleanings per year. Additionally, the initial pressure drop of the FilmTec™ Fortilife™ CR100 train of elements was reduced by more than 50% compared to the BW30FR400/34i Elements, offering improved flux balance and energy savings during operation.

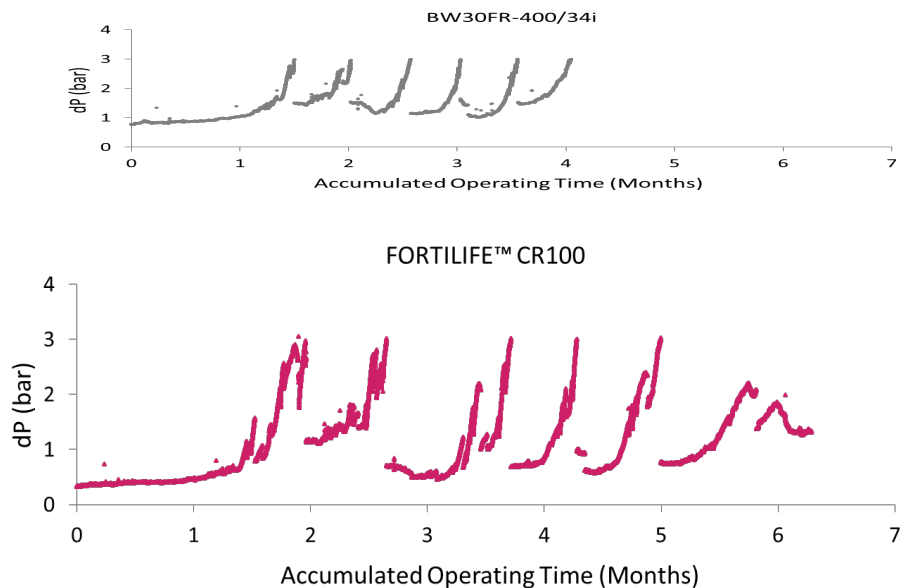


Figure 2: Pressure drop evolution between FilmTec™ Fortilife™ CR100 and BW30FR-400/34i

References

1. G. Gilabert-Oriol, C. Niewersch, G. Massons, A. Tsoutsoura, J. Johnson, Y. Cheng, T. Arrowood, Veronica Garcia-Molina, Improving the fouling resistance of Reverse Osmosis Elements (Submitted).
2. The DuPont Chemical Company, [FilmTec™ Fortilife™ CR100 Element](#) (Form No. 45-D01731-en).

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