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Case study on municipal water treatment in Ford City, Pennsylvania, USA

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Drinking water production at municipal water treatment plant – combining IX and RO leads to superior results

Application and system design

The Ford City, Pennsylvania municipal water treatment plant has been providing water for residential purposes since 1920 using conventional chemical treatment methods. In 2015, the plant identified a need for a new system that would bring total dissolved solids (TDS) below 375 mg/l and hardness (Mg, Ca concentration) below 175 mg/l.

The resulting new water treatment facility consists of a water softening stage using ion exchange (IX) technology paired with a reverse osmosis (RO) system using **Lewabrane® RO B400 LE ASD** membranes to meet TDS requirements. The softening removes the carbonate hardness before the effluent is split into two streams. One stream is fed to the RO system, and the other blended with the RO permeate. The treated water goes into a storage tank with a capacity of 1.5 million gallons (5,680 m³). To prevent scaling formed by sulfates, antiscalant is continuously added to the reverse osmosis influent. This is essential to achieving the requested high recovery rate without the danger of salt precipitation. Lastly, chlorination is used as a final disinfectant step for the treated water.

At a glance

Application	Drinking water production
Location	Pennsylvania, USA
Product	Lewabrane® RO B400 LE ASD
Number of elements	60 pieces
Production capacity	270 GPM (61.3 m ³ /h)
Water type	Brackish well (SDI <5)
Installation	2017

Membrane performance

The Ford City RO system was designed using the **LewaPlus®** design projection software, modelling both the WAC (weak acid cation) softening step and the split stream RO step. The RO system design was optimized with two stages utilizing a 7–3 array, with six membranes in each pressure vessel, operating at a recovery rate of 82%. The RO system has an overall permeate flow rate of 270 GPM (61.3 m³/h). This permeate is blended with softened city water at 170 GPM (38.6 m³/h), yielding a finished, treated water stream of 440 GPM (100 m³/h). The plant has two RO systems, which alternate in operation on a day-to-day basis.

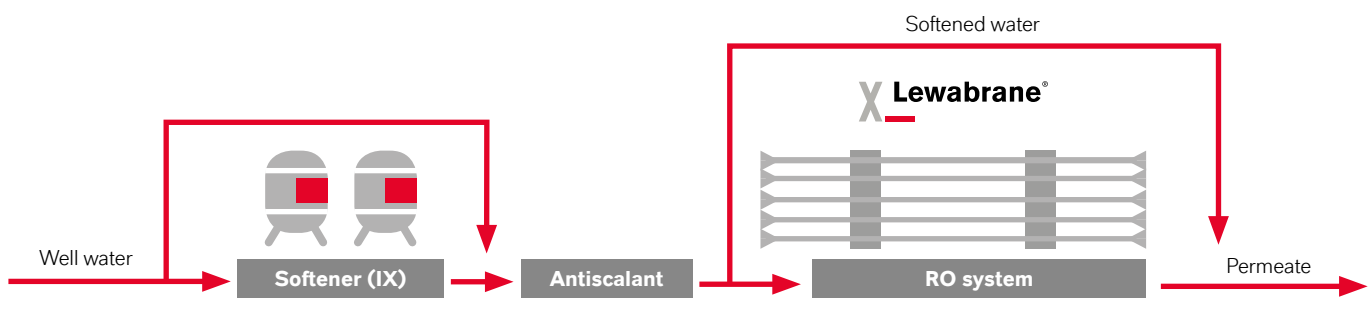
The current Lewabrane® RO B400 LE ASD elements were installed in September 2017 and have been running at a steady state with no major issues. The RO system has been functioning properly, maintaining a 16.2 gfd (27.6 l/m²h) average operating flux, and an 82% recovery rate. No significant increases in feed pressure have been observed since start-up.

The Lewabrane® RO B400 LE ASD membrane element is prepared with an innovative 34 mil feed spacer, designated ASD, for alternating strand design. This novel feed spacer technology offers alternating thick-thin strands, increasing feed channel porosity and reducing dormant flow areas. It has been proven to lower biofouling and reduce feed pressure buildup. The ASD spacer is highly recommended for municipal applications where biofouling may become an issue.

Conclusion

The Lewabrane® RO B400 LE ASD membrane used at the Ford City plant has low energy (LE) requirements from higher permeability (for savings in power consumption) and a unique alternating strand design (ASD) feed spacer technology that improves membrane lifetime and cost performance. This was proven at Ford City plant, where the membranes have performed with no significant scaling or fouling since installation. The feed pressure and pressure drop readings (approx 3 psi/pc) are normal. Permeate quality is within specification. An 82% recovery rate has been maintained, and final treated water quantity and quality are meeting the clients requirements. The Ford City operating staff are pleased with the IX and RO system performance.

Ford City municipal plant system diagram



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LANXESS
Energizing Chemistry

LANXESS Deutschland GmbH
Liquid Purification Technologies
Kennedyplatz 1
50569 Cologne, Germany
Phone: +49 221 8885-0
E-mail: lewabrane@lanxess.com

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