

QUALITY FLOWS.

Novel Feed Spacer Technology
Towards Enhanced RO Element Performance

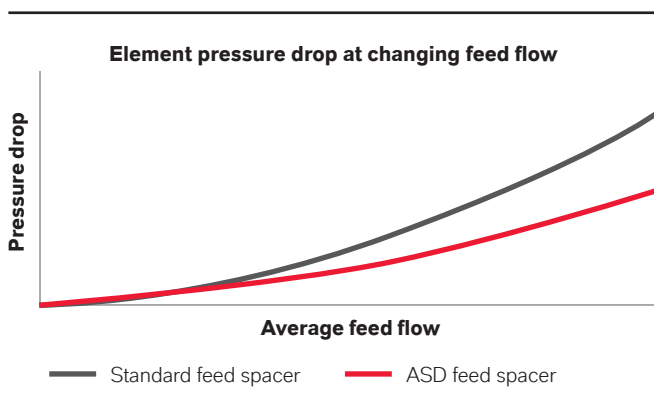
QUALITY WORKS.

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Innovative Lewabrane® – RO Elements for Brackish Water Treatment

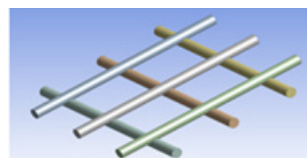
Key features

Lewabrane® ASD types like RO B400 LE ASD, RO B400 ULP ASD, and RO B400 FR ASD are reverse osmosis (RO) elements assembled with a tailor-made feed spacer based on alternating strand design (ASD). The key feature of such spacer geometry is a minimized pressure drop, which corresponds to lower power consumption during operation. Optimized for applications in brackish water, these elements have standard geometries (length: 40 inches, diameter: 8 inches) and are designed for a wide variety of low energy (LE), ultra low pressure (ULP), and fouling resistance (FR) applications.

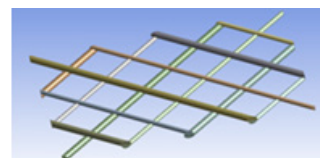


Performance and design of feed spacers

The feed spacers incorporated in the membrane elements are multifunctional. They create space between the membrane surfaces for fast-flowing water, support the membrane in the process, and cause turbulent water flow. Although turbulent flow helps to lower salt concentrations at the surface of the membrane, and to reduce the extent of concentration polarization, it also causes an increased pressure drop compared, for instance, to laminar flow. The optimal design of the feed spacers, therefore, is of critical importance to the properties of the elements and their performance in the application. Filaments or strands of different thickness are used for the new feed spacers in contrast to standard type feed spacers with equal strands. The product family is named after this alternating strand design (ASD). The design is shown in the following picture.



Standard feed spacer



Alternating strand design (ASD)

Advantages during operation

ASD type products are made with a 34 mil ASD type feed spacer, which offers a low pressure drop as its key feature. The impact on, for instance, the specific energy (kWh/m³) required for water production can be easily calculated by using **LewaPlus**[®] design software, which has been updated with the corresponding new **Lewabrane**[®] ASD types. Get your free license today and download the latest version by following the link: lewaplus.lpt.lanxess.com.

Computational fluid dynamics (CFD) calculations done during development have shown minimized areas for low-flow water velocity within the feed channel, which is seen as an essential parameter to further decrease the risk of bio-fouling in particular. This corresponds to dwell times of an RO element in operation being extended.

The combination of the ASD feed spacer with the proven **Lewabrane**[®] brackish water reverse osmosis (BWRO) membrane results in high-performance products suitable for any number of brackish water applications. The used BWRO membrane is characterized by a good balance between a high rejection profile (beside NaCl performance index) and permeate flow. Individual data sheets and additional documentation are available at lpt.lanxess.com – please download the latest documents.

Contact

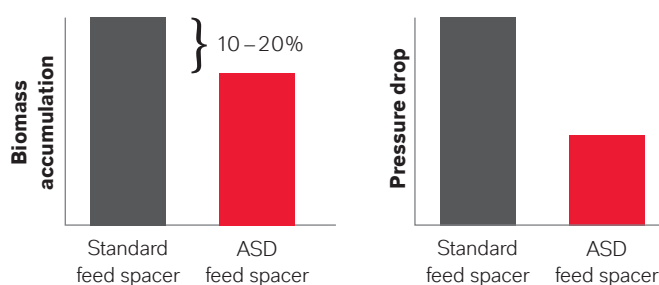
LANXESS Deutschland GmbH
Liquid Purification Technologies
Kennedyplatz 1
50569 Cologne
Germany
Phone: +49 221 88850
E-mail: lewabrane@lanxess.com

Benefits of precise manufacturing

Beside improving the parameters of the pressure drop and low-flow water velocity, the ASD feed spacer is manufactured in an optimized way through a polymer extrusion process. The surface roughness of the spacer strands has been significantly reduced, which will hinder the adsorption of bacteria.

The open structure of the ASD feed spacer in general reduces clogging of the feed channel and ultimately allows good cleanability in the event of, for example, scaling or organic fouling occurring during operation of the RO element. This was confirmed by a flow cell experiment with biomass accumulation^[1].

Pressure difference during biomass accumulation



[1] Araújo P, Kruithof J, Loosdrecht MV, Vrouwenvelder J 2012. The potential of standard and modified feed spacers for biofouling control. *Journal of Membrane Science*. 403–404, 58–70.

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