

Wastewater Reverse Osmosis Elements

CUSTOMER BENEFITS

Veolia has spiral wound reverse osmosis membranes to handle all types of wastewater

Application

Wastewater treatment is at the center of many industry and community efforts toward sustainability. Reverse osmosis (RO) is a key enabling technology with RO permeate of such high quality that it can be reused widely. In the case of communities, examples of this are water for irrigation, groundwater recharge, indirect potable reuse, or direct potable reuse. For industrial facilities, the uses of wastewater RO permeate are widespread and varied with rarely a shortage of options. Industrial facilities also rely on wastewater reuse, and sometimes even the use of reverse osmosis to treat water for discharge, to secure a license to operate in the local community both by reducing the water demand placed on the local water supply but also in ensuring no harm is done to the environment through the industrial activity.

A commonality of wastewater applications is that they have higher fouling potential. In many applications, this is an increased amount of organics. In others, it is high concentrations of salts that can scale membranes quickly without proper design in both systems and the spiral wound RO elements themselves.

Product Offering Overview

Veolia has several spiral wound RO elements that can be used in wastewater applications all over the world. Veolia offers multiple variations of fouling resistant elements which focus on membrane chemistry and element construction. This includes membranes with the FR (fouling resistant) designation as well as the LF (low fouling) designation. Low fouling membranes have an even greater emphasis on membrane chemistry to deliver fouling resistance to organics.

Additionally, Veolia offers membranes that are specifically designed for brine concentration, which includes a new application commonly referred to as ultra-high pressure RO (UHPRO). These elements belong to the Industrial RO Series. Nanofiltration membranes are also often used in combination with reverse osmosis for wastewater treatment and particularly when resource recovery is an objective for the project. Veolia D-Series nanofiltration elements include a differentiated and proprietary 3-layer low fouling chemistry. The complete list in Table 1 reflects Veolia's clear priority in providing technology that enables wastewater reuse across all applications.

Table 1: Veolia elements with use in wastewater applications

Type of Spiral Wound Element	Product Name
Fouling Resistant	AG FR Series
Fouling Resistant with High Rejection	AG FR H Series
Low Fouling	AG LF Series
Brine Concentration & Ultra-High Pressure	Industrial RO Series
Nanofiltration	DK, DL, and Industrial NF Series

Fouling Resistant and Low Fouling Membranes

All of Veolia's fouling resistant and low fouling membranes provide reliability in the treatment of challenging wastewaters, but each offers a different combination of features and benefits so that the right solution can be provided for each unique project. Veolia experts are available to help guide this selection.

The AG FR Series of fouling resistant membranes has been a best-selling element for Veolia for many years due to its durability and cleaning effectiveness. This membrane offers a lower level of rejection when compared to the other AG FR H and AG LF membranes, but this specific balance of energy, cleaning efficiency, and rejection has proven to be extremely successful for our customers worldwide.

The AG FR H Series specifically offers membrane chemistry with higher initial and more stable lifetime rejection coupled with a feed spacer and membrane surface that has been optimized to minimize fouling and also be cleaned more efficiently. The more stable, and higher rejection over the life of the element allows customers to keep AG FR H elements in service longer, directly reducing operating costs. When coupled with reduced clean-in-place (CIP) frequency, AG FR H also provides reduced chemical and operating costs for the wastewater plant.

AG LF provides additional value by focusing primarily on membrane chemistry to prevent fouling from organics to reduce the frequency of CIP practices, again improving operating cost for the plant through reduced chemical consumption and less system downtime.

Table 2: Fact sheet specifications for various fouling resistant and low fouling membranes

Model	Average permeate flow gpd (m3/day)	Typical NaCl rejection	Minimum NaCl rejection
AG8040F-400 FR, 34	11,000 (41.6)	99.5%	99.1%
AG-400 FR H	11,000 (41.6)	99.8%	99.5%
AG-400 LF, 34	10,500 (39.7)	99.8%	99.3%

Testing conditions: 2000ppm NaCl solution at 225 psi (1,550 kPa) operating pressure, 77°F (25°C), pH 7 and 15% recovery.

Brine Concentration Membranes

The Industrial RO Series is specifically designed to maximize the concentration of the brine, inverting the common idea that the “product water” is the permeate. Veolia developed the specific membrane chemistry in approximately 2012 and has been practicing brine concentration with these membranes ever since in both standard and high pressure (ultra-high pressure) construction.

The Industrial RO Series includes a 35 or 50 mil feed spacer as part of a high-pressure assembly that is rated up to 120 bar. This construction is available with three different membrane types depending on the specific objectives. The Industrial RO7 element is the latest generation of products in this series and is designed to operate with Veolia’s ROTOWER* concept to drive brine concentration to industry leading levels, while operating at lower pressure and energy consumption than competitor elements. These elements were specifically designed to be used on water with more than 75 g/L TDS as is common in later stages of brine concentration systems. The Industrial RO5 element is the highest rejecting brine concentration membrane in the Industrial RO Series and is most often used in earlier stages of brine concentration systems when salt concentration remains low. To fully optimize the system, Veolia’s D-Series NF membranes can be used confidently as a form of pretreatment in challenging applications including those with high COD to optimize the performance of the brine concentration RO. More importantly to some customers, the use of D-Series NF elements enables the production of value-added pure salts through separation of monovalent and divalent ions. More information is available on brine concentration from the “Optimization and Value-Creation for Brine Concentration” brochure.



Contact Us

If you would like to learn more about how Veolia can provide an RO or NF solution for your drinking water needs, please visit our website.

Veolia Water Technologies

Please contact us via:

www.veoliawatertechnologies.com