

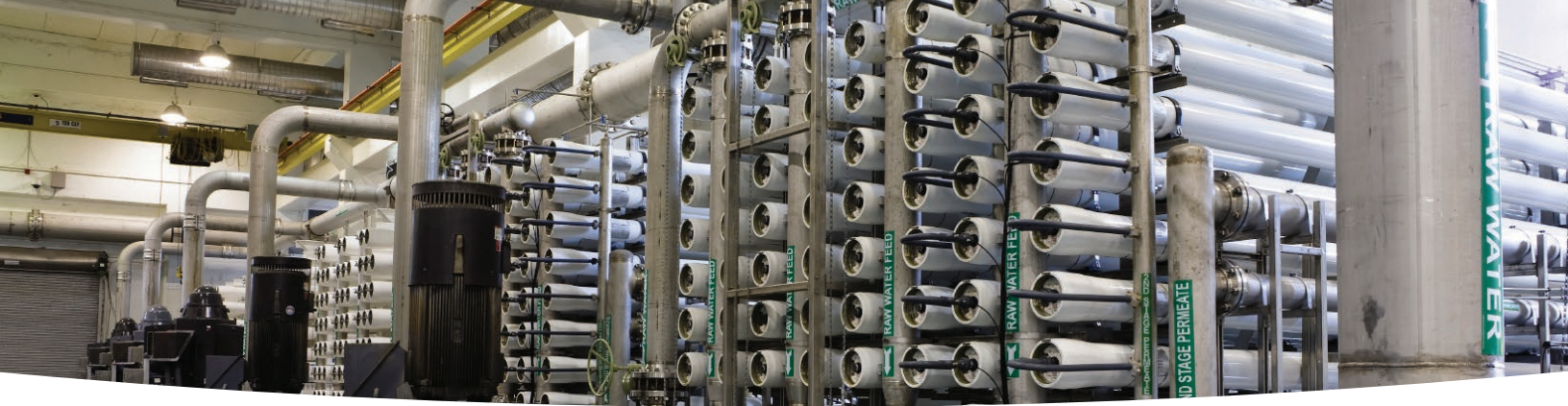


Reverse Osmosis (RO) Water Treatment Products



Selection, Dosage and
Cleaning Guide

Nouryon



Desalination and reverse osmosis scale control

Our time proven technology and water treatment expertise is now available for the Desalination and Reverse Osmosis market. Long recognized as a leader in process water and cleaning applications, Nouryon is pleased to offer a range of proven products for scale control in membrane applications. These customized products – the VERSAFLEX® RO product line – are designed to provide outstanding performance for severe service and general purpose applications including the control of CaCO₃, CaSO₄, BaSO₄, calcium phosphates, heavy metals, silica and silicates.

This brochure provides an overview of our antiscalant product range, application guidelines and general strategies for membrane cleaning.

Product	Total solids	pH	Dose (as product)	Notes and recommendations on use
Calcium carbonate scale				
VERSAFLEX RO 9110	35	3-4	2-4 ppm	<ul style="list-style-type: none"> Preferred product Controls scale in waters with LSI¹ of up to approximately 2.8 Also prevents calcium sulfate scaling
VERSAFLEX RO 7110	40	4-5	2-4 ppm	<ul style="list-style-type: none"> LSI of up to approximately 2.8
Calcium sulfate scale				
VERSAFLEX RO 9110	35	3-4	0.25-0.5 ppm	<ul style="list-style-type: none"> Controls scale in waters with SI = 5.9 to 6.1 Induction time of up to 150 minutes Delays precipitation up to 2X as long as competitive products Also prevents calcium carbonate scaling
Barium sulfate scale²				
VERSAFLEX RO 6310	44	6.0	50-100 ppm	<ul style="list-style-type: none"> Sulfonated maleic copolymer for barium sulfate scale inhibition; not effective for carbonate scales
VERSAFLEX RO 7310	35	2.8	50-100 ppm	<ul style="list-style-type: none"> Patent pending multifunctional copolymer; compatible with methanol and other solvents-good for blending with other products
VERSAFLEX RO 6320	42	5.0	25-50 ppm	<ul style="list-style-type: none"> Acrylic/maleic copolymer for severe scaling conditions including barium sulfate; not compatible in very high salinity brines
VERSAFLEX RO 7110	40	4-5	50-100 ppm	<ul style="list-style-type: none"> Patented multifunctional polymer with excellent brine compatibility
Calcium phosphate scale and heavy metal control				
VERSAFLEX RO 5410			1:1 for PO ₄ 2:1 for Fe	<ul style="list-style-type: none"> Patented Sulfonated Copolymer for Silt and Iron Inhibitor Dispersant Effective inhibition of PO₄ based scales
Silica scale				
VERSAFLEX RO 7510	42	5.5	5-20 ppm	<ul style="list-style-type: none"> Controls silica at > 300 ppm Recommendations based on standard boiler and cooling water conditions. Reverse Osmosis performance not yet verified.

¹ LSI = Langelier Saturation Index

² These products have been tested for high brine (oilfield) applications, and show good efficiency.

* VERSAFLEX RO 5410, VERSAFLEX RO 9110, VERSAFLEX RO 7110, and VERSAFLEX RO 7510 have ANSI/NSF Standard 60 certification for use as drinking water chemical additives in Reverse Osmosis Antiscalants and Distillation Antiscalants.

General guidelines for antiscalant application and dosing

The key to good RO operation is a well maintained pretreatment system. For example, all media filters should be clean and free of channeling.

Residual flocculants and/or coagulants from upstream treatment (cationic molecules or polyelectrolytes) can cause problems when they combine with polymeric antiscalants (anionic molecules). Avoid this problem by keeping the media filters in good condition and not overfeeding the flocculants/coagulants.

Antiscalant should be dosed upstream of the RO, typically before the cartridge filters. This assures adequate mixing of the antiscalant prior to entering the RO. Alternatively, inject the antiscalant and other treatments at least 10 pipe diameters before the high pressure pump or in a section of piping that has multiple bends and/or elbows.

A high quality metering pump will give a smoother, more controlled product dose and better control than a diaphragm pump.

Take care when diluting solutions for use in "day tanks." Proper measuring and mixing is a must in these circumstances. Be aware that dilution/day tanks often contribute to biological fouling. They must be kept clean and well maintained.



General guidelines for membrane cleaning

Membrane cleaning is typically done every 3 to 12 months in well operated systems. Cleaning should be performed as indicated by your membrane supplier or when:

- The normalized permeate flow drops by 10%.
- The normalized salt passage increases 5-10%.
- The normalized pressure drop (feed – concentrate) increases by 10-15%.

The key to maintaining good performance is to clean as soon as possible after performance begins to decline. Initial fouling of a membrane surface will change the flow within the system and encourage further and more complex fouling to occur.

RO cleaning formulations and guidelines

Cleaning formulations are offered as guidelines only. No claims are made regarding efficacy or membrane compatibility. Always follow the membrane manufacturer's guidelines for pH, time and temperature limitations. When in doubt about a formulation, test it on a pilot scale membrane prior to using on full scale systems or contact your membrane manufacturer for more information.

Acidic (low pH) cleaners

Formula (w%)	Approximate pH	Used to remove	Notes
2% citric acid	3-4	<ul style="list-style-type: none"> • CaCO₃ • Metal oxides/hydroxides • Inorganic colloids 	<ul style="list-style-type: none"> • Mild cleaner
0.5% H ₃ PO ₄	1-2	<ul style="list-style-type: none"> • CaCO₃ • Metal oxides/hydroxides • Inorganic colloids 	<ul style="list-style-type: none"> • Mild cleaner
0.2 - 0.5% HCl	1-2	<ul style="list-style-type: none"> • CaCO₃ • Metal oxides/hydroxides • Inorganic colloids • Sulfate Scales (Ca, Ba, Sr) 	<ul style="list-style-type: none"> • Heavy duty cleaner
1.0% Na ₂ S ₂ O ₄ (sodium hydrosulfite)	4-6	<ul style="list-style-type: none"> • Metal oxides/hydroxides 	<ul style="list-style-type: none"> • Acrid smell • Reducing agent • Use in well ventilated areas

Caustic (high pH) cleaners

Formula (w%)	Approximate pH	Used to remove	Notes
2% STPP (Na ₅ P ₃ O ₁₀) 0.11% Witconate™ 1223L	10.0	<ul style="list-style-type: none"> • Biofouling • NOM fouling 	<ul style="list-style-type: none"> • Mild cleaner
2% STPP (Na ₅ P ₃ O ₁₀) 0.026% Witconate 90 Flake	10.0	<ul style="list-style-type: none"> • Biofouling • NOM fouling 	<ul style="list-style-type: none"> • Mild cleaner
0.1% NaOH 0.1% Witconate WAC LA	11.5	<ul style="list-style-type: none"> • Organic colloids • Biofouling • NOM fouling 	<ul style="list-style-type: none"> • Heavy duty cleaner • May cause foaming
0.1% NaO		<ul style="list-style-type: none"> • Silica fouling 	
0.1% 2 Na ₂ CO ₃ 3 H ₂ O ₂ (sodium percarbonate) Add as booster to other formulations	11.5	<ul style="list-style-type: none"> • Dry product • Assists in removal of organic colloids, biological fouling and NOM fouling 	<ul style="list-style-type: none"> • Heavy duty cleaner

Typical cleaning steps include:

1. Flush the system with good-quality, chlorine free water. Use permeate, deionized or similar quality water for the flush. This is done at low pressure.
2. Prepare cleaning solution in a CIP (clean-in-place) tank. Use high quality water for dilution. Check pH and temperature. Preheat if required. DO NOT EXCEED MANUFACTURER'S LIMITS FOR YOUR MEMBRANE. The cleaning tank should be fitted with a cartridge filter to remove particulate debris as it is cleaned.
3. Displace standing water in the membranes then recirculate the cleaner through the membranes using low pressure and low flow for 15-30 minutes.
4. Soak the membranes in cleaning solution for 1 to 15 hours. If possible, recirculate the solution periodically to maintain the temperature.
5. Take care to maintain the pH throughout the cleaning procedure.
6. Turbid, discolored or foul smelling cleaning solutions should be discarded and replaced with fresh solutions. This may happen in heavily fouled systems.
7. Rinse the system with high quality water.

Additional cleaning information:

- Each stage of the system should be cleaned separately.
- It is recommended that systems are cleaned first with high pH cleaners, then with low pH cleaners.
- Be sure to rinse the system to a pH of 6.5-8.5 after each cleaning step.
- A final flush with a non oxidizing biocide such as DBNPA will help to prevent biological fouling.

ALWAYS follow the membrane manufacturer's guidelines for pH, time and temperature limitations.

Contact us directly for detailed product information and sample requests.

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For more information visit surfacechemistry.nouryon.com

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