Introduction to RO Membrane Solutions Italmatch Chemicals







• Founded in 1997



Markets we serve



Lubricant Oil, MWF, Grease and Fuel Additives



Advanced Water Solutions



Flame Retardants and Plastic Additives



Personal Care & Specialty/ Performance Products



Italmatch Chemicals – Advanced Water Solutions

Introducing the new AWS business





SOLUTIONS FOR DESALINATION

FLOCON[®] & DEQUEST[®]

- Full range of NSF/ANSI 60 approved RO/NF antiscalants for sea water, brackish water, and specialty applications
- Acidic, alkaline and neutral membrane cleaners
- Online product selection and dose rate recommendation software
- Real time dose rate monitoring system
- Membrane approvals/compatibility letters from major membrane manufacturers

ALBRIVAP[®] & BELGARD[®]

- NSF/ANSI 60 and KIWA certified antiscalants for thermal desalination (MSF and MED)
- Albrivap[®] and Belite[®] range of antifoams

QUALIFLOC / QUALIPOL

- Full range of liquid emulsion polymers; PAM and PAC/polymer combinations
- Specialty acrylamide-free grades (patented)



SOLUTIONS FOR IWT & PROCESS



Scale prevention Global brands: BELCLENE[®], BRICORR[®], DEQUEST[®] and MAYOQUEST[®]

- Phosphonates
- Polymers

High performance products for prevention of scale build up across multiple Industrial Water Treatment applications

Corrosion inhibition Global brands: BELSPERSE[®], BELCOR[®]

Designed to prevent damage of manufacturing equipment and boilers through metal corrosion

Microbial control Global Brands: BROMICIDE[®], LIQUIBROM[®], BELLACIDE[®]

Highly effective oxidizing and non-oxidizing biocides for prevention of hazardous microbial growth



SOLUTIONS FOR OIL & GAS



DEQUEST® and MAYOQUEST® phosphonates Effective CaCO3 and BaSO4 scale control throughout the system Field strength additives and formulations Best in class quality

BELLASOL® polymers

Specialty scale inhibitors and dispersants for production and unconventional STIMSqueeze[™] for longer-lasting and secondary protection Field strength and winterized HIPPO range for high iron environments Frac fluid compatible with no loss of performance

BELLACIDE® biocides

Cost effective control over SRB, GAB, APBs Compatible with anionic and cationic FRs New solutions for recycled water with higher solids contents Specific offer for Canada (PMRA registered)



AWS Global Manufacturing Footprint and Key Blending Locations





Research and Technical Support









Italmatch Desalination Solutions – Reverse Osmosis Process





Dequest® SPE Antiscalant NSF ANSI 60

Dequest® & SPE Membrane Cleaners, Biocide

Corola-t Software & Flodose Software

Technical Support





Dequest® SPE Antiscalant NSF ANSI 60

DEQUEST®	CaCO,	CaSO,	BaSO	CaPO	CaF2	SrS0	SILICA	METAL OXIDES
SPE 0001	~	•		•	~			•
SPE 0106	~	~			~			•
SPE 0108	•		~	~	•	~	~	•
SPE 0109		•	~	~		~	~	~
SPE 0111	~	•		•	~			•
SPE 0133	•	~	~		~			~
SPE 0134	~	•	~		~		~	~



Complete Range of Ready to Use Antiscalant Solutions for Sea Water , Brakish Water and Waste Water Reverse Osmosis Treatment





Ready to use Reverse Osmosis Cleaners for CIP Application

SPE 0560 - Acidic Liquid/powder SPE 0561 - Alkaline Liquid/Powder SPE 0569 - Neutral Liquid^{*}













Reverse Osmosis Pilot Plants for:

- Antiscalant Performance Evaluation
- Membrane Compatibility Tests





Italmatch Desalination Solutions – Practical Applications



- Reverse osmosis is one of the finest levels of filtration available.
- The RO membrane generally acts as a barrier to all dissolved salts and inorganic molecules, as well as organic molecules with a molecular weight greater than approximately 100.
- Water molecules, on the other hand, pass freely through the membrane creating a purified product stream.
- Transmembrane pressures for RO typically range from 75 psig (5 bar) for brackish water to greater than 1,200 psig (84 bar) for seawater



Reverse Osmosis (RO)





Reverse Osmosis (RO) Membrane





Reverse Osmosis (RO)





Reverse Osmosis (RO)









Particulate Fouling – Feed End

Causes

- Silt
- Filter media
- Corrosion debris
- Foreign objects

Solution

- Identify foulant
- Review pre-treatment
- Cartridge filtration
- Good maintenance schedule



Colloidal Fouling – Feed End

Causes

- Organic matter
- Silica
- Iron colloids
- Aluminium colloids
- Chemical incompatibility

Solution

- Review pre-treatment
- Coagulation / Flocculation
- Filtration
- Antifoulant / Dispersant



Biological Fouling – Feed End to Concentrate End

Causes

- · Microbes in feed water
- Bacterial contamination in pre-treatment system
- System layup
- Incorrect biocide application
- Contamination in dosing tank

Solution

- Identify biofouling
- Review pre-treatment
- · Review biocide use
- Sanitisation



Scaling

Scale Formation – Concentrate End

Causes

- Solubility of inorganic salts exceeded
- · Recovery too high
- · Change in feed water source
- Insufficient / Incorrect antiscalant

Solution

- Identify scale
- Reduce recovery
- Check water analysis
- Correct antiscalant
- Use Flodose

Scaling of a reverse osmosis membrane can occur when one or more sparingly soluble salts, present in the feed are concentrated within the membrane element beyond their solubility limit.







Scaling Indices

Scaling indices have been developed to predict the formation of calcium carbonate based on :

Equilibria of carbonic acid and alkalinity corrected for temperature and dissolved solids.

eg: Langelier (LSI), Ryznar (RSI), Stiff-Davis (SDSI)

Scaling indices are used in combination with knowledge of other system parameters to diagnose fouling problems.





Water Characteristics by LSI and RSI

Index		Tendency of Water	
LSI	RSI		
2.0	<5.0	heavily scale forming	
0.5	5 to 6	slightly scale forming	
0	6 to 6.5	balanced or at CaCO ₃ saturation	
-0.5	6.5 to 7	non-scaling	
-2.0	7 to 8	undersaturated	



- Antiscalants are not substitute for an effective pretreatment system
- Antiscalants are not dosed in isolation
- Accurate water analysis is required
- Use Corola[®] T antiscalant projection software for antiscalant selection and dose
- Antiscalant dosing



Antiscalants

Antiscalants are not Substitute for an Effective Pretreatment

- Antiscalants will not prevent feed end fouling due to poor pre-treatment
- Antiscalants will not recover a system fouled through poor pre-treatment
- Antifoulants / Dispersants will reduce colloidal fouling, but are not designed to substitute for poor pre-treatment



Accurate Water Analysis is Required

- Before a dose recommendation can be made it is
 important an accurate water chemistry is available
- It is also important to have the RO plant Percent Recovery to enable the analysis of the concentrate water to be calculated



<u>Use Corola[®] - T antiscalant projection software for antiscalant selection and dose</u>

- Once RO plant details and water chemistry are available, Corola[®] T software can be used to predic scaling indices and give dosage recommedations.
- However, Corola[®] T can only be a guide and more accurate data fed in to the system, the more accurate the recommendations



Antiscalant Dosing

Italmatch antiscalants are miscible with water in all proportions



They can be applied as neat product or as a solution



If applied as solution, permeate water should be used at a minimum solution strength of 10%



Recommended injection point is to feed water, after any filter equipment



Dosing should be continuous and proportionate to the feed water flow, to maintain the recommended dose level



SPE antiscalant - Multifunctional Molecules

Proprietary blends which offer multiple properties in single product.



- Sequestration / Chelation
- Threshold effect Scale Inhibition
- Crystal distortion
- Dispersion
- High calcium tolerance, pH stability and high compatibility across a wide pH and temperature range

Leading to a more effective and cost competitive antiscalant vs. industry's average











Antiscalant breaks the structure of the crystal during the growing phase. Weaker crystal structure is generated, which is easily removed by the flow.





The additive binds salt surface and avoids other particles interacting closely. Particles remains in suspension. Threshold Effect M+ Х-M+ 0 Crystal Х-M+ Х-M+ Х-M+ Distortion M+ M+ Х-M+ Х-Х-Х-M+ M+ **CRYSTAL Dispersant Property**



Reverse Osmosis





- All RO systems require cleaning
- Cleaning frequency will vary from site to site
- Acceptable cleaning frequency 3 12 months
- If cleaning is more frequent, improve pre-treatment
- Clean system while fouling is light and before:-
 - Normalised permeate flow drops 10%
 - Normalised salt passage increases 10%
 - Normalised pressure drop increases 10 15%



- The mixing tank and system should be constructed of fibreglass reinforced plastic or polypropylene (non corroding)
- The mixing tank should have an immersion heater and temperature gauge and mixer
- Ensure all return lines are below tank water level to minimise foaming
- Ensure 5-10 micron cartridge filters are fitted to pump outlet



Application and dosage level

- a 2-3% solution of DEQUEST[®] SPE0561 should be used, diluting SPE0561 with good quality water.
- the DEQUEST[®] SPE0561 solution should be alternately soaked and circulated around the membrane system for at least 4-6 hours.
- working with increased temperature will also improve the cleaning performance.
- when using DEQUEST[®] SPE0561 some foaming might occur
- the membrane manufacturer's guidelines with respect to pH and temperature should always be respected
- on completion of the cleaning, the membrane should be thoroughly flushed to ensure the complete removal of cleaning solution before the system is returned into operation

General product information

DEQUEST® SPE0561 is a general purpose membrane cleaner.

- It is effective against most organic foulants typically found in Reverse Osmosis
- (RO), nanofiltration (NF) systems.
- an effective cleaner for a wide range of organic based foulants
- effective against aluminium based, clay and colloidal silica foulants
- liquid product easy to use
- can be used with polyamide and cellulose acetate membranes
- is approved by the major membrane manufacturers







Application and dosage level

- 3-4% solution of **DEQUEST**[®] SPE0560 should be used, diluting SPE0560 with good quality water
- the DEQUEST[®] SPE0560 solution should be soaked and circulated around the membrane for a minimum of 1-2 hours
- when using the DEQUEST[®] SPE0560, the pH of the cleaning solution will stabilize at 3,7. If the pH increases above pH 4,2, the solution should be discarded and replaced by fresh solution
- it is recommended that membranes should be cleaned at 25-30°C
- the membrane manufacturer's guidelines with respect to pH and temperature should always be respected
- on completion of the cleaning, the membrane should be thoroughly flushed to ensure the complete removal of cleaning solution before the system is returned into operation

General product information

DEQUEST® SPE0560 is an inorganic scale and iron deposit remover for use in Reverse Osmosis (RO), nanofiltration (NF) membranes.
an effective cleaner for a wide range of inorganic salts
product for removing iron deposits
pH ensures the optimum solubility of iron salts and aluminium based foulants
can be used with polyamide and cellulose acetate membranes
is approved for use by the major membrane manufacturers.





Membrane Biocide-Non Oxidizing

- A biofilm can appear on a membrane surface within three days, in systems using biologically active feed
- Biologically active systems may require sanitising every three days in summer
- Preventative sanitisations are more effective than corrective disinfections







Feed End – Biological Fouling

Sanitisation	Intermittent Treatment (Slug Dosing)
Clean the system with SPE0561 and if required SPE0560	Flocon B38 can be used on a regular basis to control biofilm growth between sanitisations
Prepare a 400 mg/l solution of Flocon B38 by dissolving 10 mls/25 liters of permeate water	Flocon B38 is pumped directly into the feed water at a rate of 360 mls/m3 for 30 minutes
Circulate around the system for 30 minutes	Once or twice weekly treatments will control biofilm
Flocon B38 is very effective at removing biofilm in multi-stage systems, to prevent foulant removed from one stage passing into the next	During treatment permeate should be directed to drain



PRODUCT AND TECHNICAL SUPPORT HIGHLIGHTS

- Product performance & specifications
- Antiscalant monitoring
- Drinking water approvals
- Membrane compatibility references
- Cleaners
- Product development
- Software development











Why choose Italmatch?

Innovation is always in the pipeline

We are constantly adapting and researching, delivering a constant flow of new ideas.

- 20% of the solutions we provide have been developed by our research team within the past five years
- Over 100 patents granted, with 30 patent families
- 40 trademarks
- 30-strong research, development and technical support team

Meet your sustainability and regulatory goals

We are passionately committed to helping our customers meet todays (and tomorrow's) increasingly demanding sustainability targets and regulatory requirements, especially by conserving water, minimizing waste and promoting energy efficiency.

Solutions, not just products

We don't just supply chemicals, we provide solutions (often bespoke) to specific problems. Every solution is backed by authoritative laboratory and field-based technical support and dedicated customer service. Often solutions are delivered by locally-based service companies - our carefully selected expert partners.





Q&A



THANK YOU & STAY SAFE

