Power & Water

BRIEF

Stabilising Reverse Osmosis (RO) Performance in Saudi Arabia and the GCC

Advanced pre-treatment for high-challenge industrial and reuse feedwaters.

Across Saudi Arabia and the wider GCC, reverse osmosis underpins desalination, industrial water supply and an increasing share of water reuse. Many systems operate continuously, at high recovery, and are now part of reuse or zero-liquid-discharge (ZLD) configurations. In practice, feedwaters are often complex - containing suspended solids, fine colloids, organics, oils and residual polymers - meaning RO performance is highly sensitive to upstream variability.

Limitations of conventional pre-treatment approaches

Conventional pre-treatment based on chemical coagulation, polymer dosing and media or cartridge filtration can struggle to perform consistently when feedwater quality fluctuates or operating stress increases.

Common challenges include:

- Elevated SDI and MFI (silt density and fouling indices) despite clarification and filtration
- Polymer carryover blinding cartridge filters and RO membranes
- Fouling and scaling leading to higher cleaning-in-place (CIP) frequency
- Increased energy use and shortened membrane life
- Sludge generation and disposal challenges linked to chemical and polymer use

The practical gap between design and operation

This highlights a clear gap between design-stage expectations for pre-treatment performance and what is required in practice to protect RO membranes, stabilise operation and control costs over time.

In practice, this means upstream treatment is required that can manage feedwater variability directly, rather than relying on conventional dosing and filtration and ongoing chemical adjustment.

Deployment and Integration within the RO Process

Soneco® is deployed upstream of RO systems as an advanced, low-chemical pre-treatment step, integrated ahead of solids separation and final filtration to reduce contaminant load before water reaches sensitive membranes. The system is based on electrocoagulation, which generates coagulant in-situ to bind fine particulates and dissolved contaminants so they can be removed through conventional solids separation.

Soneco® enhances this process using targeted ultrasound, improving coagulation efficiency, removing organic material and reducing operating cost compared to standard electrocoagulation systems. By maintaining stable pH during treatment, the process reduces reliance on additional pH correction chemicals and simplifies day-to-day operation.

About Power & Water

Power & Water is a UK water technology company specialising in enhanced electrocoagulation for advanced water and waste water treatment. The patented Soneco® system generates coagulant on site using metal plates, enabling controlled coagulation and solids separation without liquid chemical dosing. Systems are configured to suit site-specific water chemistry and operational requirements and are equipped with in-line monitoring to enable automated influent-responding control.

Visit our website to find out more: **powerandwater.com**

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OPERATIONAL AND COMMERCIAL ADVANTAGES

In RO pre-treatment applications, Soneco® supports:

- **Stable RO feed quality, with reduced SDI and turbidity.**
- **Lower reliance on chemical coagulants and polymers.**
- **Reduced CIP frequency and improved membrane life.**
- **Improved plant availability and more predictable operation.**

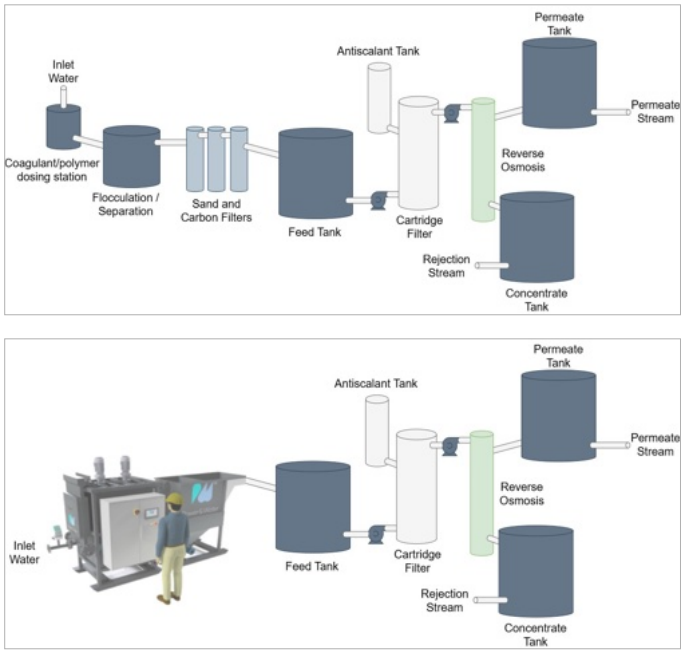
The system simplifies day-to-day management by reducing handling, adjustment and safety risks.

Integration with smart digital control platforms enables real-time monitoring of key parameters such as turbidity, SDI and conductivity, supporting predictive maintenance and stable long-term operation -particularly important for large-scale and remotely operated facilities.

These benefits translate into lower operating costs, reduced energy consumption and greater confidence in long-term asset performance.

Deployment scenarios include

- New-build and retrofit RO plants
- Industrial reuse and ZLD schemes
- Modular or decentralised treatment systems
- Sites where footprint, operational simplicity and resilience are critical



Conceptual deployment of Soneco upstream of RO: reducing upstream coagulant and polymer dosing to improve feedwater stability and protect RO membranes.

By combining contaminant destabilisation, aggregation and removal within one automated process, it simplifies upstream treatment while reducing reliance on liquid coagulants and polymers.

Typical Integration: Raw / Process Water → Screening / Equalisation (EQ) → Soneco® (Sono-Electrocoagulation) → Solids Separation (DAF, Clarifier/Filter) → Cartridge Filtration → Reverse Osmosis → Reuse / Product Water /Discharge.

This integrated approach is particularly well suited to RO applications where feedwater variability, consistency of performance and ease of operation are critical.

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Industrial Operating Experience – Upstream Load Reduction

Hanson UK, part of Heidelberg Materials, operates large cement and aggregates processing sites across Europe where water treatment must perform reliably as part of continuous industrial production.

Soneco® was deployed upstream to manage variable process water, reduce reliance on coagulants and polymers, and enable reuse without disrupting production. Operational data showed consistently high removal performance under variable industrial conditions (including >90% reduction in suspended solids and turbidity), with stable pH and no requirement for correction chemicals.

For Hanson, this delivered a robust upstream load-reduction step, stablising water quality ahead of downstream polishing and membrane-based treatment.

GLOBAL PRIZE FOR INNOVATION IN WATER

"Saudi Arabia's Vision 2030 emphasizes strengthening long-term water security through innovation, more efficient treatment solutions, water reuse and reduced environmental impact across the water sector. By improving treatment performance while lowering chemical and energy intensity, Power and Water's innovative Soneco® technology directly supports these objectives and contributes to more resilient, resource-efficient water treatment."

Nasser B. Alsubaie - Saudi Water Authority - Global Prize for Innovation in Water (GPIW)

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