Safeguard Your System

Get peace of mind with DuPont Water Solutions' System Optimization Services℠ (SOS)

Sustaining High Performance Long Term

Each water treatment system is unique, as are the challenges you face as you try to keep your systems running at peak efficiency.

What is not unique are the impacts of an inefficient system. From downtime to make repairs, replace components, or clean a fouled system, to increased energy and chemical costs, to lost manufacturing capacity, a damaged or poorly operating water treatment system impacts the bottom line. That's why you shouldn't wait until your water treatment system is broken before you call the experts.

DuPont Water Solutions' System Optimization Services℠ (SOS) put a global team of highly skilled, experienced scientists and technicians at your disposal. Our team can run a battery of sophisticated assessments using state-of-the-art equipment and methods to identify critical issues affecting your ion exchange, reverse osmosis, and ultrafiltration systems. More important, our technical experts can use the data to suggest corrective actions that can help get you performing at peak efficiency.

More Than Just Test Results

Our technical experts interpret the data and provide you a complete report with a description of the tests performed, the implications of our findings on your operation, and suggestions for how to enhance your system performance.

Choose from a Wide Range of Services

SOS Services℠ place our extensive knowledge and experience at your disposal so you don't have to face unexpected system problems alone. Our service support can lighten the burden of system start-up and staff training, as well as assist with ongoing operation and maintenance.

SOS Services℠ include:

- RO element and UF module testing
- Membrane and fiber fouling composition
- Membrane and fiber characterization
- Ion exchange resin analysis
- Water analysis
- Technical field support
- Comprehensive overall service and support

Membrane Testing Services

DuPont Water Solutions offers troubleshooting and membrane element and module testing and evaluation services to help diagnose the root cause of system underperformance and maximize your overall operation. Our battery of tests will determine your elements' or modules' suitability for continued operation or troubleshoot problems in reverse osmosis (RO), nanofiltration (NF), or ultrafiltration (UF) systems. Our experts will then interpret the data and provide a complete report describing the tests performed and the implications of the test results on your operation, and suggest ways to enhance your system performance.

RO, NF, and UF evaluation includes:

Non-Destructive Testing

- Physical Inspections of RO/NF Element or UF Module
  Noninvasive test to observe the physical integrity of the element or module and identify potential foulants.
- Performance Testing
  Noninvasive test to determine how the element or module is performing at standard test conditions compared to new product specifications.
- Probing
  - Probing profiles (RO element) or integrity test (UF module) to see the rate of vacuum decay, indicating either mechanical integrity or a leak of the membrane element.
  - UF module- and fiber-integrity tests to identify potential leaks by holding pressurized air in the feed side of the module.
- Cleaning Recommendations
  Evaluation of a visual inspection and performance test indicating what type of cleaning would be most effective.
  - Optional add-on service: Technicians may perform different cleaning cycles in order to improve performance of the element or module.

Destructive Testing

- Dye Testing
  To determine the cause(s) and the location of salt passage, the RO element is operated with a pressurized dye solution.
- Element or Module Autopsy and Membrane Analysis
  Invasive analysis that requires the RO element to be cut lengthwise to unroll and inspect the status of the membrane sheet and other element materials. UF modules require cutting of the shell to access membrane fibers for analysis.
- Determination of Fouling, Scaling, or Chemical Damage
  - Verification of scaling
  - Biofouling indicators
  - Organic fouling
  - Membrane chemical degradation
  - Elemental analysis of the membranes (identification of metals, silica, etc.)
  - Identification of halogens or other qualitative indicators of chemical attack

Ion Exchange Resin Analyses

Our ion exchange resins and adsorbents testing and evaluation services determine the performance and condition of current system operation and, if needed, can troubleshoot and identify the root cause for challenges. We also can retest resins that have been warehoused beyond their recommended storage period. As with our membrane analyses, DuPont experts also interpret the data and provide you a complete report with a description of the tests performed and the implications of the test results on your operation, and suggest ways to enhance your system performance.

Ion exchange evaluation includes:

- Microscopic Bead Examination
  A sample of the resin is placed under a microscope and photographs are taken to be included in the report. This important examination helps determine the physical integrity of the beads, whole bead or whole unbroken bead content, and can help with visualization of contaminants or fouling of the resin surface.
- Particle Size Distribution
  A sample of the resin is tested with a light-blocking device, which has been calibrated to determine the particle size distribution of ion exchange resins. The particle size distribution is reported to show the bead harmonic mean size, uniformity coefficient, and percent through/retained on standard screen sizes.
- Total Exchange Capacity (TEC)
  This test measures the total number of ion exchange sites per volume of resin. Fully regenerated resin is titrated to obtain milliequivalents of capacity per milliliter of resin.
- Total Exchange Capacity as Received (TEC as Received)
  This test measures the number of ion exchange sites that are in the regenerated (H^+ or OH^-) form. If the sample is submitted as regenerated resin, this result can be compared against the total exchange capacity to determine the efficiency of regeneration. If the sample is submitted as an exhausted resin, this result can determine the extent of exhaustion.
- Salt-Splitting Capacity (SSC)
  This test measures the strong base (quaternary amine) sites on an anion resin. Salt-splitting sites are necessary to remove weak acid species such as bicarbonate and silica. A reduction in SSC is typically indicative of an increase in weak base capacity.
- Water Retention Capacity (WRC)
  This test measures the inherent moisture content of the ion exchange resin. A fully hydrated resin sample is centrifuged or buchnered to remove free water. The resulting sample is weighed before and after drying to determine the water content. Elevated water content indicates degradation of the polymer chain, while depressed water content typically results from accumulation of foulants in the beads.
- Organic Fouling
  The degree of organic accumulation on the anion resin is measured. Elevated organic loading can result in extended rinse-down following regeneration, reduced total throughput to silica break, and eventual permanent loss of strong base capacity by conversion to weak base capacity.

Plant Operational Analyses

DuPont also provides a comprehensive Plant Operational Analysis Report, which can identify and recommend actions to address any reverse osmosis or ion exchange system issues.

- **Inorganic Fouling**
  Inorganic contaminants, such as iron, calcium, and silica, can be identified using atomic absorption (AA), X-ray fluorescence (XRF), inductively coupled plasma (ICP), spectrophotometry, or other analytical methods.
- **Mass Transfer Coefficient (MTC) Testing**
  This test measures resin kinetics (a resin's ability to quickly remove ions from solution). As resins age, the rate of exchange may not be fast enough to remove all ions before flow reaches the bottom of the bed, thus exhibiting poor operating performance while maintaining a high total exchange capacity. Surface fouling can also inhibit the kinetics of resins. For strong base anion resins, sulfate (which is a slow kinetic exchanger due to its size) is used to challenge the resin. For strong acid cation resins, sodium is used.
- **Resin Cleaning Tests**
  This analysis evaluates the resin using the standard testing and will usually indicate if a resin would benefit from cleaning (e.g., to remove organics, iron, or silica). After cleaning, the resin is retested to evaluate the degree of success and then we make recommendations for remediation.

Water Analysis

A full water analysis is available with specific breakdown and balance of cations/anions, pH, silica, metals, and total organic carbon (TOC).

Available Resin Analyses for Water Treatment Applications*

	Softening	Demineralization		Condensate Polishing		Ultrapure Water		General		
	Strong Acid Cation	Strong Acid Cation	Strong Base Anion	Strong Acid Cation	Strong Base Anion	Strong Acid Cation	Strong Base Anion	Weak Base Anion	Weak Acid Cation	Mixed Bed
Total Exchange Capacity (TEC)	●	●	●	●	●	●	●	●	●	●
Water Retention Capacity (WRC)	●	●	●	●	●	●	●	●	●	●
Microscopic Bead Examination (MBE)	●	●	●	●	●	●	●	●	●	●
Salt-Splitting Cap. (SSC) or Strong Base Cap.			●		●		●	●		●
Weak Base Capacity (WBC)			●		●		●	●		●
Total Exchange Capacity (TEC), as Received		●	●	●	●	●	●	●	●	
Organic Loading			●					●		
Iron Loading	●	●		●						
Cation/Anion Ratio				●	●	●	●			●
Particle Size Distribution	●	●	●	●	●	●	●	●	●	●
SO_4^{2-} MTC-Kinetics Test			●		●		●			●
Na^+ MTC-Kinetics Test		●		●		●				●
Ultrapure Water UPW) Specific Tests · Resistivity rinse test · TOC rinse test · UPW kinetics						● ●	● ●			
Whole Bead	●	●	●	●	●	●	●	●	●	●
Site Analysis – $\%OH^-$, $\%CO_3^-$, $\%Cl^-$, $\%SO_4^{2-}$					●		●			●
Metals, ppm level		●		●	●					●

* Not all tests are run for every sample received; DuPont experts will determine the most appropriate tests required to define the condition of the resin.

Powering performance worldwide.

With a large global manufacturing footprint, strong R&D expertise and technical support services and systems, we supply high market volumes with high quality. DuPont partners with you, our customer, to understand unmet needs and develop tailored solutions.

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Contact us to schedule your analysis today.

To request SOS, please contact your account manager or technical service representative.

If you are do not have a direct contact, please provide the information in email form and send to sos@dupont.com. Upon receipt of your request, we will connect you to the appropriate account manager and/or technical service representative to discuss your request.

Have a question? Contact us at: dupont.com/water/contact-us

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