

# Industrial Utility Water

DuPont Multi-Tech Solutions



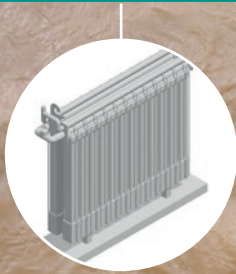
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# DuPont Water Solutions Portfolio

The broadest in the industry

**MemPulse™**  
MBR



**DuPont™**  
Ultrafiltration



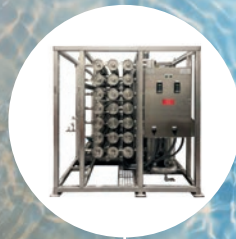
**FilmTec™**  
Reverse Osmosis  
Nanofiltration



**DuPont™**  
Electro-  
deionization



Wastewater



Ultrapure Water

**OxyMem™**  
MABR

**DesaliTec™**  
SOAR CCRO

**DuPont™**  
**Amber Series**  
Ion Exchange Resins



# Industrial Utility Water Needs and Challenges

- **Water is a critical vector** of nearly all industries, directly impacting both production uptime and profitability.
- The manufacturing industry accounts for **16% of global water demand**, increasing to 22% by 2030.
- The United Nations Sustainable Development Goals 2030 target to substantially **increase water-use efficiency** across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from increasing water shortages.



Chemical



Data Centers



Food & Beverage



Pharma



Petrochemical



Power



Pulp & Paper



Steel



Textile

## DuPont can help industrial customers address their key challenges



Optimize water footprint to battle **constrained water access**



Ensure consistent water quality under **feed water quality fluctuations and complexity**



Secure trouble-free operation to **minimize unplanned downtime** and maximize production



Provide solutions for **limited footprint and mobile units**



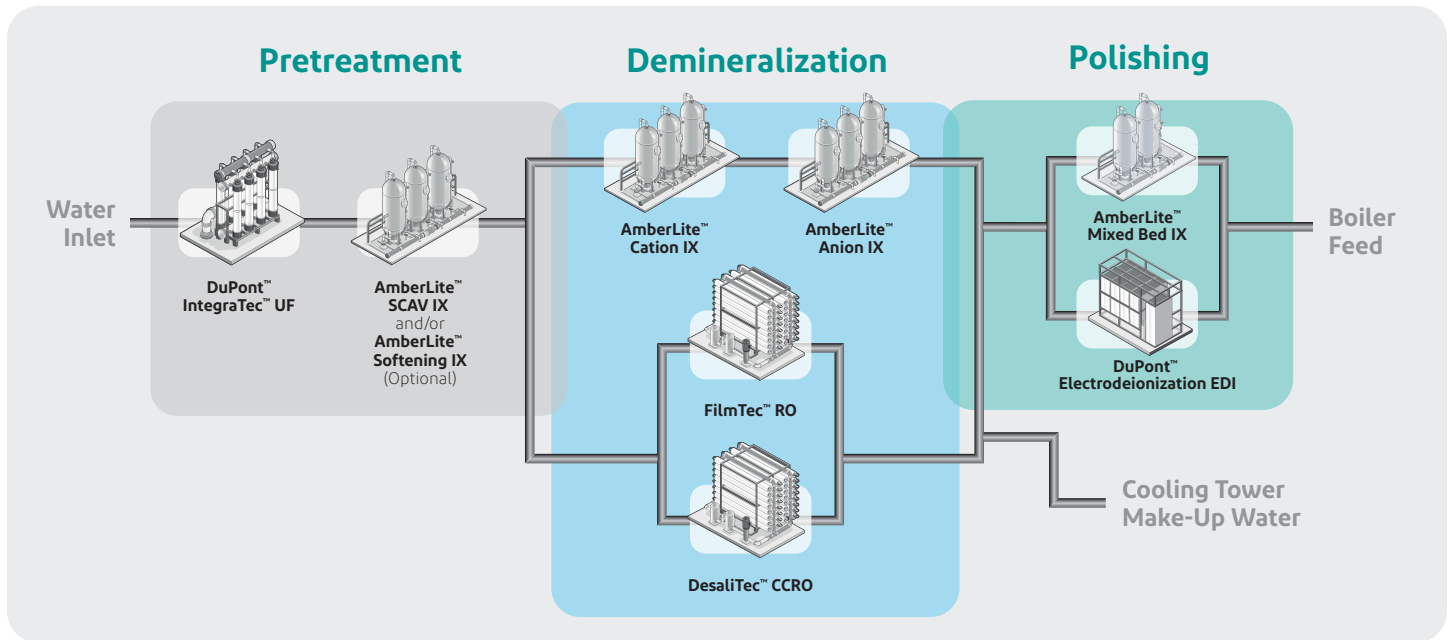
Reduce or even eliminate chemical consumption to **achieve more environmentally-friendly operations**



Optimize energy consumption to **reduce manufacturing cost and carbon footprint**

# DuPont Multi-Tech Solutions for Industrial Utility Water

At DuPont Water Solutions, we develop integrated and effective solutions that meet the world's growing water and energy demands. Our diverse portfolio of technologies and solutions addresses a broad range of water treatment applications and is designed to help you overcome water challenges to produce your desired quality and quantity of industrial utility water.



## DuPont can adapt the solution to meet specific customer needs

Our best-in-class technical team supported by R&D has accumulated decades of experience across all technologies to create solutions that address a broad variety of challenges. Our understanding of water chemistry and the complexity of individual constituents enables us to recognize project needs and critical requirements.



**High recovery schemes for limited water availability sites** with closed-circuit RO (CCRO) combined with the appropriate pre-treatment and polishing technologies



**Chemical-free or minimum chemical usage solutions for plants facing sourcing problems or targeting to optimize EH&S profile** with UF, RO, mechanical CO<sub>2</sub> and O<sub>2</sub> removal, and EDI



**Robust and reliable solutions to mitigate inlet water quality fluctuations** with a combination of our DuPont™ AmberLite™ HPR series resins for demineralization or fine tuned polishing, among other possible schemes.

# Suspended Solids Removal with Ultrafiltration

DuPont™ IntegraTec™ Ultrafiltration (UF) module is a pressure-driven purification process that separates particulate matter from soluble compounds using ultrafine membrane media.



## Why choose DuPont™ IntegraTec™ Ultrafiltration Modules?

1. **Reduced total cost of ownership:** robust long-term performance due to the exceptional chemical resistance of the durable PVDF material.
2. **Reduced operation costs**
3. **High-efficiency and reliable operation:**
  - a. High quality permeates due to 0.03 µm nominal pore size and narrow pore size distribution
  - b. Less fiber breakage due to the excellent mechanical strength and chemical durability
  - c. High water recovery due to the high efficiency of cleaning and low cleaning requirements

## Key Products

Type	Product Name	Surface Area (m <sup>2</sup> )	Best Used For
Rack Solutions	IntegraTec™ XP 51 IP IG	51	• Containerized or small size plant
	IntegraTec™ XP 77 IP IG	77	• Medium to large size plant
	IntegraTec™ XTP 100 IP IG	100	• Medium to large size plant requiring lower footprint and CAPEX
Open Platform Modules	IntegraTec™ XP 51 IG	51	• Containerized or small size plant
	IntegraTec™ XP 55 UXA	55	• Replacement for other competitive PVDF modules
	IntegraTec™ XP 77 IG	77	• Medium to large size plant
	IntegraTec™ XTP 100 IG	100	• Medium to large size plant requiring lower footprint and CAPEX



For more information about our full ultrafiltration portfolio, please check out the DuPont™ Ultrafiltration Capabilities brochure:



# Total Organic Carbon Removal with Ion Exchange Resins

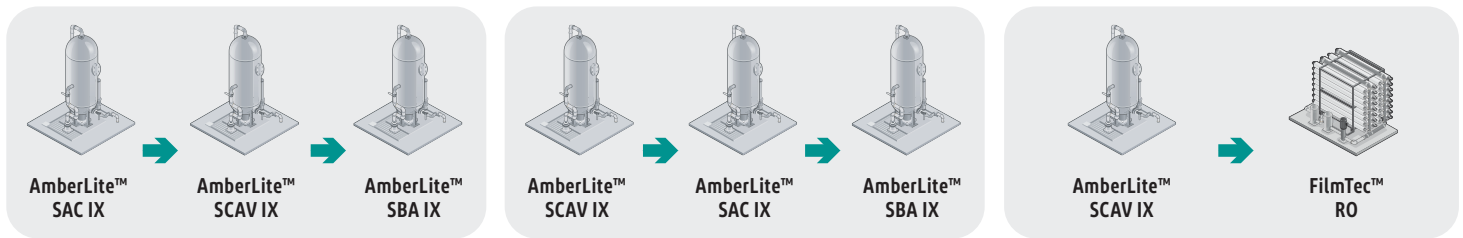
**DuPont™ AmberLite™ SCAV Resins** are organic traps that remove natural organic matter (NOM) from feedwater to protect the demineralization system from fouling-related operational issues and also reduce total organic carbon (TOC) in the treated water.

## Key Features

- Outstanding adsorption capacity of undesired NOM species during service
- High physical stability and excellent fouling resistance
- Offerings for conventional brine regenerated systems or new scavenger technology utilizing acid or caustic



## Typical Design



### AmberLite™ SCAV1 or SCAV2

- Fouling protection and quality improvement
- Flexible and adjustable operation
- Switch operation from highest TOC capacity to highest TOC quality if circumstances ask for it
- Use of standard bulk chemicals for regeneration – no brine
- Can fit into every existing system

### AmberLite™ SCAV3 or SCAV4

- Fouling protection and quality improvement
- Regenerated with brine
- Helps protect primary strong acid cation (SAC) from suspended solids upsets
- Helps reduce TOC and protects downstream anion resins from fouling

### AmberLite™ SCAV3 or SCAV4

- Reverse osmosis fouling protection for less cleanings
- Regenerated with brine
- Helps reduce TOC

## Key Products

DuPont Resin	Features	Best Used For
<b>AmberLite™ SCAV1</b>	Acrylic gel	Removal of hydrophobic and hydrophilic NOM species for high free mineral acidity (FMA) waters at acidic pH. Waters with medium to high TDS when the ratio of TOC to sulfate (ppm C/meq SO <sub>4</sub> ) is less than 3.
<b>AmberLite™ SCAV2</b>	Acrylic macroporous	Removal of high load hydrophilic and hydrophobic NOM for low FMA waters at acidic pH. Waters with low to medium TDS when the ratio of TOC to sulfate (ppm C/meq SO <sub>4</sub> ) is greater than 3.
<b>AmberLite™ SCAV3 Cl</b>	Styrenic macroporous	Removal of large, complex, hydrophobic NOM and color species (such as humic and fulvic components) and general polishing of organics remaining after bulk removal at neutral to alkaline pH. Recommended choice for drinking water production.
<b>AmberLite™ SCAV4 Cl</b>	Acrylic macroporous	Removal of high load hydrophilic and hydrophobic NOM at neutral to alkaline pH, with excellent resin lifetime and long, stable performance even under challenging operational conditions. The go-to organic scavenger for the bulk removal of NOM, and especially useful as RO pretreatment.

# Softening & Dealkalization with Ion Exchange Resins

**DuPont AmberLite™ Ion Exchange** softening resins remove cations associated with hardness (such as calcium and magnesium) from feedwater to avoid scale formation caused by precipitation of sparingly soluble salts like calcium carbonate. Ion exchange resins (IX) can also remove bicarbonate alkalinity associated with scaling.

IX softening consists of using a strong acid cation (SAC) resin in the sodium form to replace hardness ions with sodium ions. For softening high TDS waters, a high capacity weak acid cation (WAC) resin in the sodium form is used. And for dealkalization and partial softening of water, a weak acid cation resin in the hydrogen form is used to remove hardness associated with alkalinity and convert bicarbonate alkalinity to CO<sub>2</sub> which can be later removed by degasification. Alternately, a strong base anion (SBA) resin in the chloride form can also dealkalize by exchanging carbonate and bicarbonate anions for chloride ions.



## Key Benefits

- Prevent scaling in downstream RO and avoid complication and expense of using antiscalants
- Prevent scaling in downstream process by removing or reducing hardness and or bicarbonate alkalinity
- Protect RO and/or UF by using strong acid cation resin softeners to also remove certain cationic polymers present from upstream coagulation systems.

## Typical Design



## Key Products

DuPont Resin	Features		Best Used For
<b>AmberLite™ IRC120 Na</b>	SAC	Gel	General purpose softening resin for co-flow systems
<b>AmberLite™ HPR1100 Na</b>	SAC	Gel	Softening resin with excellent physical stability and low rinse profile. Compatible with all system technologies.
<b>AmberLite™ IRC200 Na</b>	SAC	Macro	Highest physical stability for harsh application such as hot process softeners and other systems involving appreciable oxidative potential or high temperatures. For co-flow systems.
<b>AmberLite™ IRC83 H</b>	WAC	Macro	High-capacity dealkalization and softening resin with improved operating capacity demonstrated in high-TDS Na-form operation. For co-flow systems.
<b>AmberLite™ HPR8300 H</b>	WAC	Macro	High capacity dealkalization and softening resin with demonstrated improved operating capacity over other available WAC resins. Compatible with all system technologies.
<b>AmberLite™ HPR4100Cl</b>	SBA	Gel	The go-to Type II SBA resin. Compatible with all system technologies.

# Demineralization with Ion Exchange Resins

**DuPont™ AmberLite™ Ion Exchange Resins** for demineralization are used to remove all cations, anions and large organic contaminants from feed water. IX demineralization consists of at least 2 resin beds: a hydrogen form strong acid cation resin followed by a hydroxide form strong base anion resin. A degassifier may be used between them to remove bicarbonate alkalinity reducing anionic load. Weak acid cation and/or weak base anion resins may also be incorporated depending on level of hardness, TOC and alkalinity.

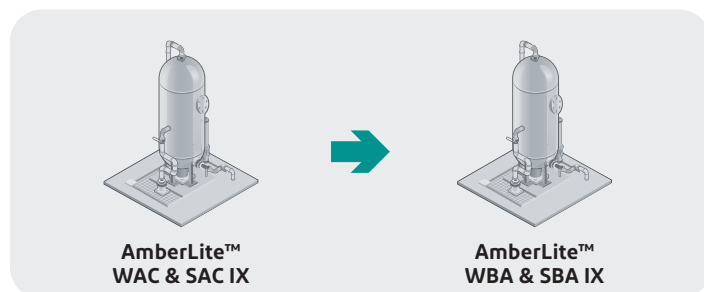
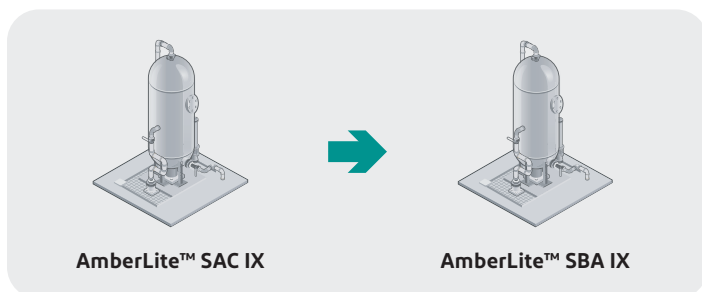
DuPont has over 80 years of experience manufacturing the widest range of industry-leading, reliable ion exchange resins from world-class manufacturing facilities.

## Key Features

- Reduce key ionic contaminants down to microgram per liter concentrations required for steam generation.
- Save up to 40% in OPEX and receive up to 10x better water quality by using reverse flow beds over conventional co-flow systems.
- Further reduce cost by 25% using AmberPack™ and Upcore™ packed beds which use less regenerant and service water.



## Typical Designs of IX demineralization systems



## Key Products

DuPont Resin	Features	Best Used For
<b>AmberLite™ HPR1200 H</b>	SAC	Designed to be the go-to high quality gel SAC resin. Compatible with all system technologies.
<b>AmberLite™ HPR1300 H</b>	SAC	Higher crosslinked DVB gel SAC resin for layered beds or where very low sodium leakage and conductivity is a chief concern. Compatible with all system technologies.
<b>AmberLite™ HPR8300 H</b>	WAC	High Capacity WAC resin for improved chemical efficiency. Compatible with all system technologies and bed configurations including layered beds.
<b>AmberLite™ HPR9500</b>	WBA	Good organic fouling resistance and high kinetics yielding good operating capacity even in low temperature operations. Offers a quick start up in a single bed or when paired with and OH-form SBA in layered bed systems. Compatible with all system technologies.
<b>AmberLite™ HPR4200 Cl or OH</b>	SBA	Designed to be the go-to high quality SBA resin. Good balance of capacity and strength and silica leakage. Compatible with all system technologies and bed configurations including layered beds.

# Demineralization with Reverse Osmosis Brackish Water Elements

**Reverse Osmosis (RO) Elements** are pressure-driven purification products that separate ions, dissolved salts, and minerals using a semi-permeable membrane.

**FilmTec™ Prime RO Portfolio** The next generation of FilmTec™ brackish water RO (BWRO) elements were designed specifically for industrial utility water treatment.

- Key Benefits**
- **PROven:** Based on historical FilmTec™ BW30 chemistry and over 40 years of manufacturing experience
  - **PROgressive:** Continuous innovation to reach unparalleled performance, durability, and cleanability
  - **PROductive:** Up to 20% in energy savings and improved permeate quality by up to 60%
  - **PROficient:** Outstanding performance and durability compared to alternative options
  - **PROminent:** Global sustainability benefit of up to 85,000 Metric Tons of CO<sub>2</sub> emissions reduced per year

FilmTec™ Prime RO 8" Elements	Salt Rejection (%)		Flow gpd (m <sup>3</sup> /d)	Spacer (mil)	Features
	Stabilized	Minimum			
FilmTec™ BW30 PRO-365	99.55	99.35	10,000 (38)	28	• High rejection & high-performance industry-standard BWRO membrane elements • Consistent water quality and higher rejection and flow than previous generation BW30 products
FilmTec™ BW30 PRO-400	99.6	99.4	11,000 (42)	28	
FilmTec™ BW30 PRO-400/34(i)	99.6	99.4	11,000 (42)	34	
FilmTec™ BW30XHR PRO-400/34(i)	99.8	99.6	11,500 (43.5)	34-LDP	• Extra high rejection BWRO membrane elements • Exceptional permeate quality including excellent silica, boron, nitrate, TOC and ammonium rejection
FilmTec™ BW30XHR PRO-440	99.8	99.6	12,650 (48)	28	

**FilmTec™ ECO RO Portfolio** FilmTec™ ECO Elements offer excellent rejection with significantly lower energy and reduced chemical consumption than traditional brackish water reverse osmosis elements

- Key Benefits**
- **Enhanced permeate water quality:** exceptionally robust performance over a longer element life
  - **Lower energy consumption:** up to 33% energy savings compared to the standard brackish water products
  - **Improved operational efficiency:** up to 40% higher salt rejection and up to 40% savings in regeneration costs for downstream MB systems

FilmTec™ ECO 8" Elements	Salt Rejection (%)		Flow gpd (m <sup>3</sup> /d)	Spacer (mil)	Features
	Stabilized	Minimum			
FilmTec™ ECO PRO-400(i)	99.7	99.4	11,500 (43.5)	34-LDP	• High rejection, low energy • Excellent element robustness and wide cleaning range • Tough water quality (ECO PRO-400(i))
FilmTec™ ECO PRO-440(i)	99.7	99.4	12,650 (48)	28	
FilmTec™ ECO PLATINUM-440(i)	99.7	99.4	12,650 (48)	28-LDP	

**FilmTec™ Fortilife™ RO portfolio** The FilmTec™ Fortilife™ brackish water RO (BWRO) product family offers solutions for industrial-users to improve water efficiency by incorporating membrane and element design innovations that enable systems to clean less, recover more, and waste less.

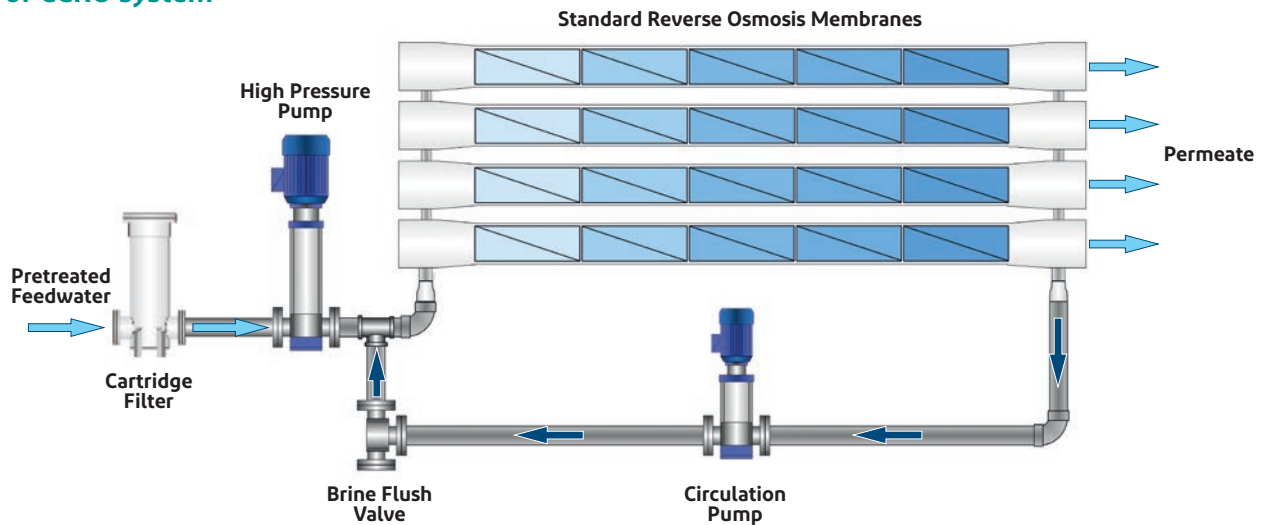
- Key Benefits**
- **Reduce water costs and lower operating expenses**
  - **Achieve sustainability goals**
  - **Minimize biofouling problems**

FilmTec™ Fortilife™ RO 8" Elements	Salt Rejection (%)		Flow gpd (m <sup>3</sup> /d)	Spacer (mil)	Features
	Stabilized	Minimum			
FilmTec™ Fortilife™ CR50(i)	99.6	99.4	11,000 (42.0)	34-LDP	Long-lasting lifetimes, contaminant resistant
FilmTec™ Fortilife™ CR100(i)	99.8	99.6	11,500 (43.5)	34-L2DP	Ultra-low pressure drop element designed with durable, biological fouling resistant membrane
FilmTec™ Fortilife™ CR200	99.7	99.4	12,500 (47.3)	34-L2DP	Ultra-low pressure drop element designed with high productivity, durable, biological and organic fouling resistant membrane

# High Recovery Demineralization with Closed Circuit Reverse Osmosis

The patented **DesaliTec™ SOAR Closed Circuit Reverse Osmosis (CCRO)** system works by circulating water through a single stage of membrane elements until the desired recovery level is achieved instead of using complex traditional multi-stage methods. Brine is periodically replaced with fresh feedwater without stopping permeate flow. Recovery is flexible and can be set at the system control panel. The cross flow required for RO membrane operation is controlled with an internal circulation pump. Frequent and complete brine flushing prevents scale precipitation and disrupts biofouling, making very high recovery rates possible even with mineral-laden or contaminated feedwaters.

## Design of CCRO system



## Key Benefits

- **Flexibility** – DesaliTec™ SOAR CCRO systems automatically adapt to changing feedwater and allow the operator to modify recovery, cross flow, and flux in real time.
- **Reliability** – DesaliTec™ SOAR CCRO systems naturally mitigate the fouling and scaling that typically plagues reverse osmosis systems. Automated operation with online monitoring provides additional protection.
- **Maximum Recovery** – DesaliTec™ SOAR CCRO systems come with an industry-leading maximum recovery, operating at up to 98% recovery, allowing you to achieve your sustainability goals.
- **Energy Savings** – DesaliTec™ SOAR CCRO systems apply the optimal pressure to maintain constant permeate flow, reducing the average energy consumption by up to 35%.
- **Return On Investment** – DesaliTec™ SOAR CCRO systems minimize the largest cost associated with reverse osmosis system operation, wastewater disposal, which can be reduced by 50% to 75%.

## Key Products

FilmTec™ SOAR RO 8" elements	Area ft <sup>2</sup> (m <sup>2</sup> )	Features
FilmTec™ SOAR 3000	400 (37)	Lowest energy (lowest pressure)
FilmTec™ SOAR 4000	400 (37)	Low energy, high fouling resistance
FilmTec™ SOAR 5000	400 (37)	Great rejection, medium pressure, highest fouling resistance
FilmTec™ SOAR 6000	440 (41)	High rejection (medium pressure)
FilmTec™ SOAR 7000	440 (41)	Highest rejection (highest pressure)

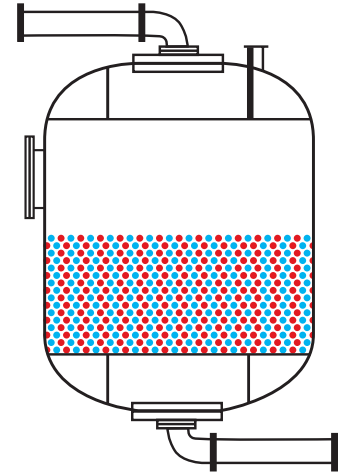
# Polishing with Ion Exchange Resins

**DuPont™ AmberLite™ Mixed Bed (MB) Ion Exchange Resins** are the standard final polishing step for boiler make-up water and are a critical part of steam condensate treatment. MB polishers remove low ppm to ppb range contaminants but can also protect a system in the event of condenser leaks, thereby improving plant reliability.

DuPont offers a wide selection of polishing resins including premixed resins for non-regenerable systems. We have the world-leading ion exchange brands that offer superior strength and quality for high performance in working and polishing MB applications.

## Key Benefits

- Great combination of trace contaminant removal, reliability, and cost effectiveness
- Great balance between performance, stability, efficiency, and lifetime, with uniform particle size resins that minimize pressure drop while optimizing separation for effective regeneration



## DuPont™ AmberLite™ Resin Pairs for Mixed Bed

DuPont Resin	AmberLite™ HPR650 H	AmberLite™ HPR1300 H	AmberLite™ HPR1200 H	AmberLite™ HPR2800 H	AmberLite™ HPR252 H	AmberLite™ HPR2900 H
AmberLite™ HPR550 OH	O					
AmberLite™ HPR4700 OH		O	A			
AmberLite™ HPR4200 OH		O	O			
AmberLite™ HPR4800 OH		O	O			
AmberLite™ HPR9000 OH	O			O		
AmberLite™ HPR900 OH		O		O	O	
AmberLite™ HPR9200 Cl		A		A		A

O = Optimum, A = Acceptable

## DuPont™ AmberLite™ Pre-Mixed resins

DuPont Resin	Features	Best Used For
AmberLite™ MB9L H/OH	SAC/SBA	Non-regenerable, premixed resin characterized by a highly cationic exchange capacity. The light color enables visualization upon exhaustion. The reference mixed bed for electro-erosion applications.
AmberLite™ MB20 H/OH	SAC/SBA	Premixed resin developed for the production of high-purity water in general-purpose polishing applications. The reference mixed bed for service deionization.
AmberLite™ MB6113 H/OH	SAC/SBA	Non-regenerable, premixed resin developed for the production of high-purity water. A color indicator allows easy visualization of the exhaustion point of the resin. The reference mixed bed for the production of demineralized water in small cartridge systems.

# Polishing with Electrodeionization (EDI)

**DuPont™ Electrodeionization (EDI)** is a continuous and chemical-free process of removing ionized and ionizable species from the feedwater using DC power. DuPont™ EDI modules optimize performance, maintain continuous product quality and can produce up to 18 mega ohm-cm high purity water with high silica and boron removal.

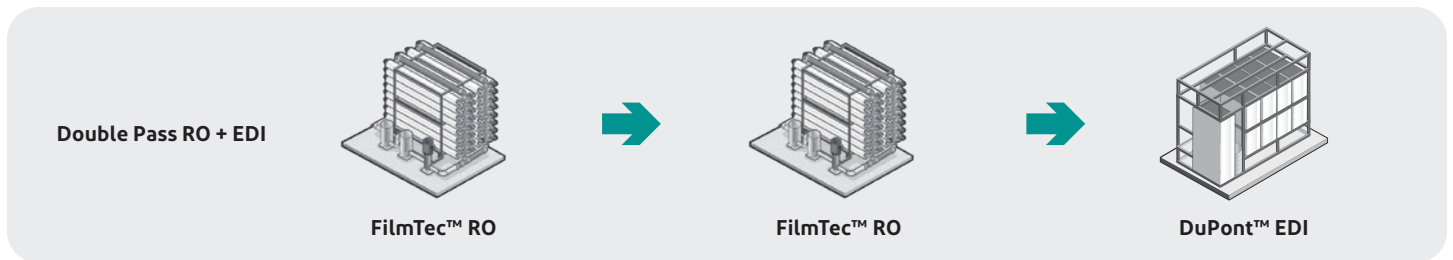
The patented DuPont™ EDI module utilizes a unique, leak free, low maintenance spiral-wound design containing membrane and ion exchange resins sealed in a high-strength fiberglass-reinforced plastic (FRP) pressure vessel.

## DuPont™ EDI Advantages

- Eliminates the need for hazardous regeneration/neutralization chemicals
- Is a clean technology, the only consumable is electricity
- Is a continuous process, there's no need for offline regeneration
- Smaller footprint than conventional DI
- Situational cost advantages

## Typical Designs

EDI is typically used to polish reverse osmosis (RO) permeate and to replace conventional mixed bed ion exchange by eliminating the need to store and handle hazardous chemicals used for resin regeneration and associated waste neutralization requirements.



## Key Products

DuPont™ EDI	Features
<b>Model EDI-310</b>	<ul style="list-style-type: none"> <li>• Produce water up to 18 megaohm-cm for high-purity and ultra-pure industrial water applications.</li> <li>• Allow system integrators to build systems that have both lower capital and operating costs when compared to conventional mixed bed ion exchange.</li> </ul>

## Reference List

No.	Location	Industry	Feedwater	Technology	Product	Capacity, (MLD)	Commissioning year
1	China	Steel	Surface water	RO	BW30XHR PRO-400/34	4	2024
2	China	Power	Seawater	RO	BW30XHR PRO-400	30	2025
3	China	Power	Wastewater	UF	IntegraTec SFP-2880	4	2024
				RO	BW30XHR PRO-400/34i		
4	Thailand	Petrochemical	Surface water	UF	IntegraTec SFP-2880	5.8	2011
				RO	ECO PRO-440i		
5	Philippines	Power	Seawater	UF	IntegraFlux 2880XP	15	2021
				RO (Seawater)	SW30XFR-400/34i		
6	Indonesia	Power	Seawater	RO (Brackish)	BW30XHR-440i	2	2016
				UF	SFP-2860		
7	Indonesia	Petrochemical	Surface water	UF	SFP-2880	1.5	2018
				RO	BW30-400		
8	Indonesia	Mining	Seawater	UF	IP77	3.4	2024
				RO (Seawater)	SW30HRLE-440		
				RO (Brackish)	BW30PRO-400		
9	India	Distillery	Surface water	UF	IntegraTec XP 77 IG	2.3	2024
				RO	Fortilife CR50		

# Expertise Beyond the Product



## Design Software

- The industry's first fully integrated modeling software program to integrate our leading technologies – UF, RO, CCRO, IX



## Online Normalization Tool

- FT-Norm PRO – makes the normalization process simple to accomplish but robust enough to allow for effective monitoring of UF and RO systems



## Webinars

- Water Education Resource
- Provides insight on Application, Technology and Design Best Practices
- 30+ Webinars Available Online



## Value Calculators

- Cost Savings Calculator
- Resin Replacement Calculator
- Sustainability Navigator



## R&D Capabilities

- 4 world-class R&D centers
- Real world testing conditions
- Industrial scale assets
- Best-in-class analytical lab
- Cooperation with key institutions
- Product and application experts
- Customer collaboration projects



## System Optimization Services

- Testing, evaluation, and troubleshooting of IX, RO, NF and UF systems, water analysis
- Suggest corrective actions to enhance system performance
- FilmTec™ Fortilife™ DIRECTOR™, the biofilm quantification method

# You can learn more about our products here

Just scan QR-code



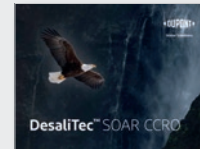
Ion Exchange Resins for Industrial Water Treatment



Prime RO Webpage



DesaliTec™ SOAR CCRO



DuPont™ Ultrafiltration Capabilities



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**Water Solutions**  
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