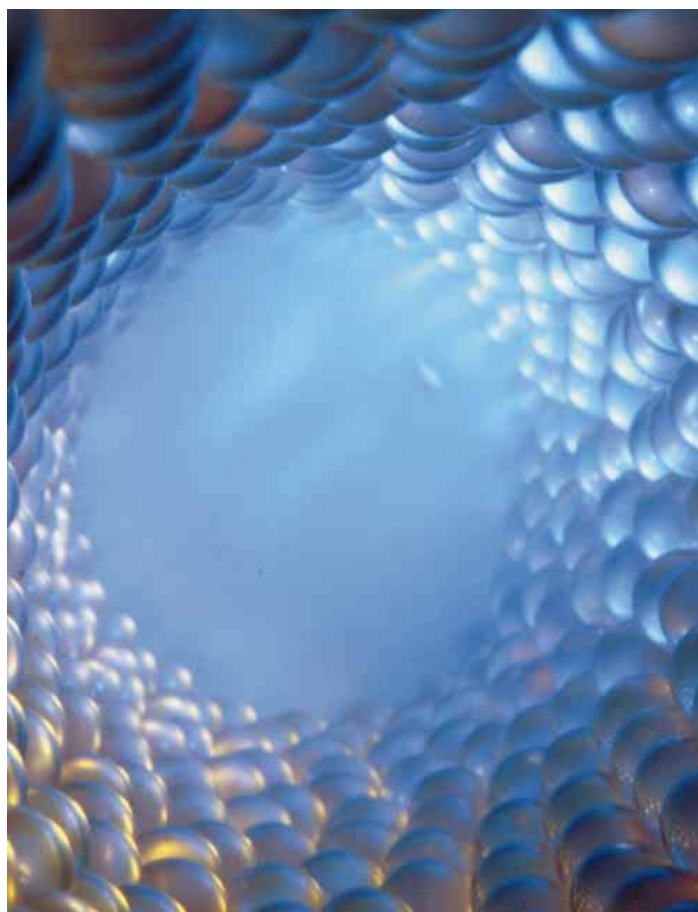




**Dow  
Liquid  
Separations**

## **DOWEX Ion Exchange Resins**

Products, Applications, and  
Technical Resources



# Proven Ion Exchange Solutions You Can Trust

DOWEX\* ion exchange resins are products of Dow Liquid Separations, a globally recognized leader in separations technologies and solutions for industrial, municipal, commercial, and consumer water applications, as well as a variety of specialty separations.

In 1983, Dow was the first to manufacture, commercialize, and launch gel-type uniform particle size (UPS) ion exchange resins. Today, Dow is the first and only supplier to offer a comprehensive line of both gel and macroporous UPS anion and cation exchange resins.

The line of DOWEX resins includes a variety of DOWEX MONOSPHERE\* and DOWEX MARATHON\* resins that deliver significant performance advantages over conventional resins with normal or Gaussian particle size distribution. DOWEX UPS resins offer premium performance when used in either multiple-bed or mixed-bed demineralization, as well as in such demanding applications as boiler condensate polishing, secondary polishing of rinse water used in semiconductor processing, rad waste treatment in nuclear power plant operations, and other applications with critical water purity standards.

The UPCORE\* upflow countercurrent regeneration system, offered by Dow Liquid Separations, utilizes DOWEX UPCORE resins tailored to fully deliver the advantages of countercurrent regeneration technology to your ion exchange system without the problems associated with other countercurrent technologies.

In the following pages, we'll profile our resin products for you. But first here's a brief overview of the polymer structures we use to produce resins for the broad spectrum of ion exchange applications.

## Capacity, Stability, and Strength

Most DOWEX resins have structures based on styrene copolymerized with divinylbenzene (DVB). Styrene/DVB structures are the preferred matrices for ion exchange resins because they offer significant capacity and stability advantages. However, some DOWEX resins have other structures that allow you to take advantage of the specific properties and performance of these matrices.

The line of DOWEX resins includes gel (or microporous), as well as macroporous resins. Both types of resins have significant advantages if properly applied. Gel-based resins are typically the resins of choice for standard water treatment applications because of their inherently greater capacity and better regeneration efficiency. Macroporous resins are generally preferred in more aggressive applications where their highly cross-linked structure is an advantage.

How do these structures translate into specific Dow resin products suitable for your applications? Here's an overview of the line of DOWEX products available to you...

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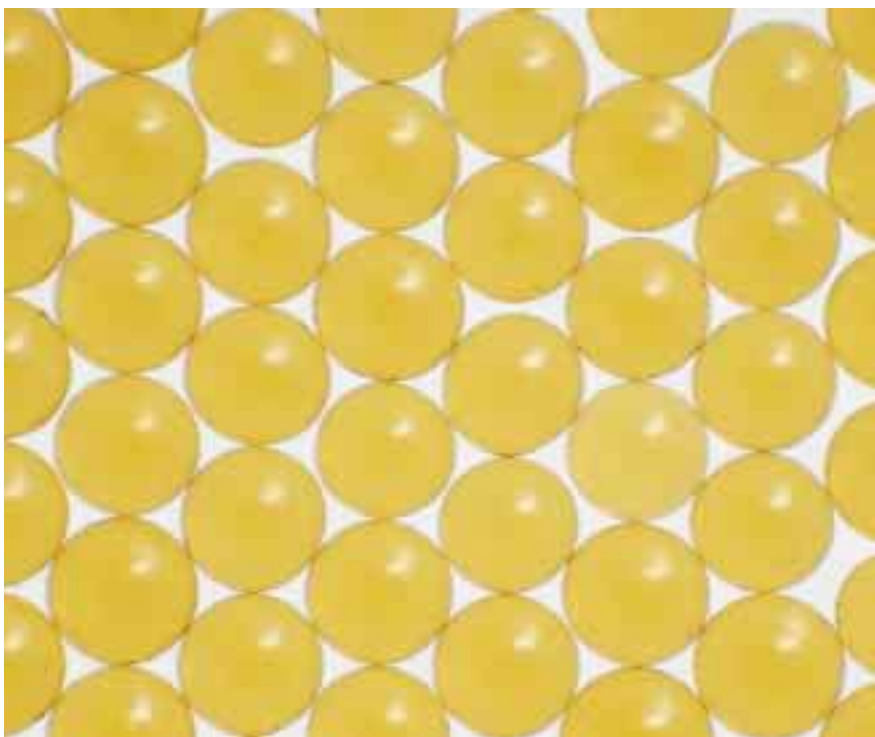
# A Complete Family of Resins

High performance DOWEX anion and cation resins are considered among the leading resins in their respective classes. For most applications, there's a DOWEX ion exchange resin specifically designed to provide the capacity, stability, and efficiency you require. By choosing the right DOWEX resin, you'll get highly efficient and effective dealkalization, softening, mineral acid removal, and/or TOC removal, as dictated by your specific water supply and water quality requirements.

In addition, there are DOWEX resins available for specialized applications. For example, DOWEX GUARDIAN\* resins meet the stringent iron removal and TOC cleanliness requirements of deep bed condensate polishing in boiling water reactor (BWR) nuclear power plants.

## **DOWEX MONOSPHERE and DOWEX MARATHON Uniform Particle Size Resins**

We pioneered the use of uniform particle size (UPS) resins in the early 1980s with the development of our monodisperse resin production technology. Unlike conventional Gaussian (or polydisperse) resins, DOWEX UPS resins contain no very small beads that can be lost during backwashing and thereby reduce resin bed capacity. And, because DOWEX UPS resins contain no large beads, they provide more surface area per unit volume, resulting in improved resin bed kinetics and more efficient and effective resin rinses.



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Until recently, only gel type resins were available as uniform particle size resins. Now, however, we have applied the advantages of monodisperse resin production technology to create DOWEX macroporous resins. Dow is the first and only supplier to successfully develop a comprehensive line of macroporous UPS anion and cation exchange resins.

Uniform particle size resins are a proven way to optimize the performance and economy of demineralizers and condensate polishers:

**In demineralization,** DOWEX MARATHON and DOWEX UPCORE UPS resins operate more efficiently and economically than conventional resins, yielding longer runs and greater operating economy.

**In mixed-bed condensate polishing,** properly matched DOWEX MONOSPHERE UPS resins make it technically possible to achieve near perfect cation/anion separation during regeneration, providing more thorough and effective regeneration and improved water quality through reduced resin cross-regeneration.

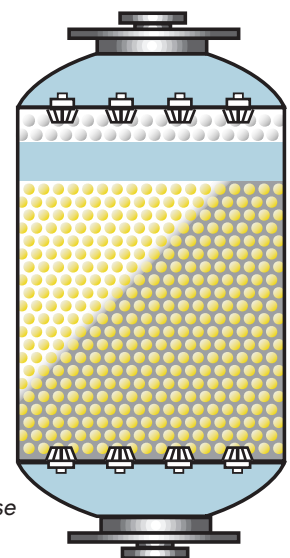
## The UPCORE System

The UPCORE system is a modern downflow service, upflow regeneration technology that uses DOWEX UPCORE UPS resins in packed-bed ion exchange vessels. Compared to cocurrent and other blocking flow countercurrent systems, the UPCORE system uses regenerant chemicals more efficiently, significantly reduces waste water volume, and minimizes effluent postprocessing effort...to reduce your operating expense.

The UPCORE system is not encumbered by system sensitivity, limited vessel volume utilization, additional hardware requirements, and control complexity problems commonly associated with air and water hold-down systems and other packed bed countercurrent systems. More importantly, with the UPCORE system, your resin beds clean themselves with each regeneration, so downtime for resin transfers and backwash operations is eliminated, physical stress on your resins is reduced, and resin loss is minimized.

## Advantages of the UPCORE System

- *Greater efficiency*
- *Greater vessel utilization*
- *Lower operating costs*
- *Self-cleaning*
- *Simple vessel design*
- *Lower overall retrofit and new system expense*





## FILMTEC Elements Complete The Picture

In addition to the line of DOWEX ion exchange resins, we also offer FILMTEC® reverse osmosis (RO) elements, the leading brand of elements for water purification systems. This combination of products gives us the unique ability to provide you with unbiased system recommendations. And, it means we can offer you fully integrated solutions combining both technologies to achieve the optimum balance of performance, productivity, and economy in your system.

The line of FILMTEC elements includes RO elements for brackish water and seawater treatment, as well as semiconductor grade RO elements for production of ultra pure water used in semiconductor processing. FILMTEC nanofiltration (NF) elements are also available for applications where the high salt removal capability of RO elements is not needed or desired.

FILMTEC membrane elements are manufactured by FilmTec Corporation, a wholly owned subsidiary of The Dow Chemical Company

# Choose a DOWEX Resin For Your Application

## Demineralization

DOWEX MARATHON resins for demineralization provide highly efficient and effective dealkalization, softening, mineral acid removal, and TOC removal. These uniform particle size resins are specifically designed to give you maximized demineralizer operating capacity. The results are longer service runs, more efficient regeneration, faster rinse with less water, longer service life, and excellent resistance to organic fouling. Specify DOWEX MARATHON resins for demineralization applications, including...

- Fossil and nuclear power plant boiler feedwater
- Cooling tower water treatment
- Feedwater for industrial boilers and cogeneration plants

## Condensate Polishing

Condensate polishing allows reuse of steam condensate from power plant boilers to reduce the overall cost of producing purified boiler feedwater. Condensate polishers, operated as either regenerable or non-regenerable mixed beds, repurify condensate that is already largely free of impurities. Therefore, pairs of anion and cation resins are required. These paired resins must provide "clean" operation, fast kinetics, and particle size characteristics that allow the pair to be effectively separated, regenerated, then remixed within the polishing vessel.

DOWEX resins for condensate polishing applications are predominantly gel-type resins. Gel resins offer fast exchange kinetics necessary to ensure effective mixed bed performance under productive service flow conditions.



*Director services are available to help you plan, install, and maintain your ion exchange system.*

Because DOWEX MONOSPHERE resins feature uniform particle size distribution, they are particularly well-suited for condensate polishing service. The narrow range of particle sizes in each individual resin allows us to establish and maintain optimum size relationships between the cation and anion resins. When matched pairs are operated together in the mixed bed, this optimized size relationship ensures exceptional separability and more effective regeneration. Other advantages of our UPS resin technology in condensate polishing include higher capacity, faster kinetics, shorter rinse time, and less resin loss. When you select DOWEX MONOSPHERE resins, your decision is backed by more than 15 years of exceptional performance in this demanding application.

## Softening

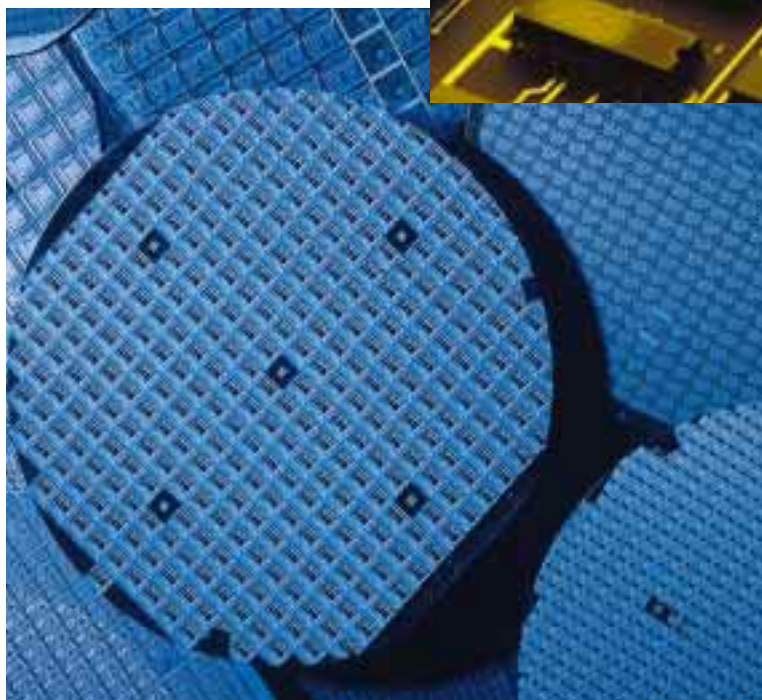
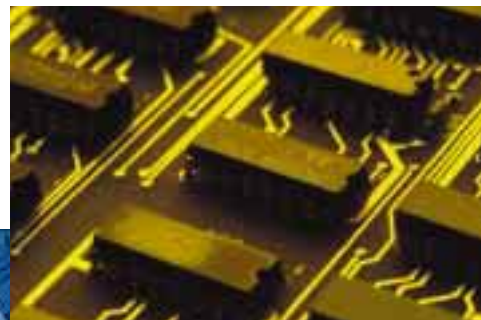
Calcium and magnesium “hardness” ions in domestic, commercial, institutional, and industrial water supplies result in scaling in pipes and reduce the efficiency of detergents. Conventional softener systems operate very inefficiently, however, wasting large amounts of water and salt. DOWEX cation resins for softener applications are high capacity, gel-type strong acid cation resins with good physical and oxidative stability for more efficient operation in typical water softeners.

## Ultra Pure Water

Our ultra pure water grade ion exchange resins offer the high degree of cleanliness, separation performance, and economy that are essential in ultra pure water service. These resins are characterized by low TOC and rinse profiles to a resistivity of 18.2 megohm.cm. In mixed beds, DOWEX cation and anion resin pairs are designed to increase removal capacity for silica, boron, and other weak acid anions.

DOWEX MONOSPHERE resins with uniform particle size distribution deliver faster kinetics, shorter rinse times, better regeneration and longer resin life in ultra pure water systems.

As the supplier of both DOWEX ion exchange resins and FILMTEC elements, we provide integrated, optimized solutions for the production of ultra pure water. By taking advantage of our years of experience with both technologies, semiconductor manufacturers can more easily achieve the 18.2 megohm.cm level of resistivity required to rinse today’s highly integrated circuits.



## Sweeteners Processing

The remarkable size uniformity of DOWEX MONOSPHERE ion exchange resins results in improved performance in deashing and separation systems. These resins provide increased syrup processing service time, reduced sweet-water and wastewater, longer resin life, and lower operating costs. In chromatographic separation systems, they yield higher recovery, higher purity, and more economical separations.

## Specialty Applications

Whether you are formulating motor fuel additives or pharmaceuticals, it's likely a DOWEX product can meet your separations requirements. DOWEX products are used in a wide range of specialty applications including motor fuel oxygenates processing and laboratory column separations.

DOWEX etherification catalyst products for production of MTBE, TAME, and ETBE motor fuel oxygenates boost reactor performance and reduce total process operating costs. One product in particular, DOWEX MONOSPHERE M-31 catalyst, has been proven to offer superior performance and economic advantages over standard catalysts, and even matches or exceeds the performance of so-called supersulfonated catalysts in most processes.

DOWEX fine mesh spherical resins are used in fine chemical and pharmaceutical column separations. Produced by selectively controlling the suspension polymerization technology we use to produce our standard 16-50 mesh industrial resins, DOWEX fine mesh resins consist of whole, spherical beads that provide excellent kinetic and packing properties in chromatographic separations—without the problems associated with ground or granular resins.

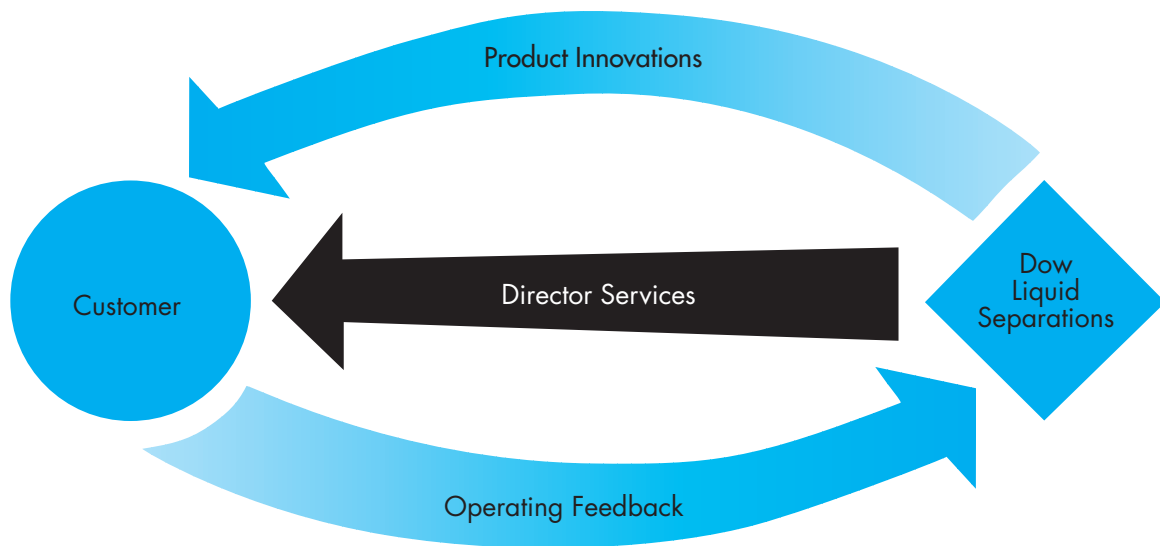


# DIRECTOR Services

We want to make the experience of doing business with us as comfortable and convenient for you as possible. That's why when you choose DOWEX resins, you receive the expert support of the ion exchange professionals on our Technical Service and Development team. We also offer a full range of DIRECTOR\*\* water treatment services, which are designed to ensure that you get optimum performance from your system. DIRECTOR services place our extensive liquid separations knowledge

and experience at your disposal so you don't have to face unexpected system problems alone. And these fee-based services can lighten the burden of your system start-up and staff training, as well as the ongoing operation and maintenance of your system.

DIRECTOR water treatment services also benefit you in another, less direct, but very important way. By using DIRECTOR services, you provide information to us about the challenges you face, so we can direct our resources to develop the solutions you need.



*Mutual information sharing helps you avoid and solve operating problems and helps us develop new solutions for emerging needs.*

\*\*Service Mark of The Dow Chemical Company

## Take Advantage of These DIRECTOR Services...

- Ion exchange resin sample analysis helps you troubleshoot system problems and maintain optimum performance.
- System technical field support is available to you by phone or on-site and includes help with system design, resin installation, system start-up, and resin maintenance and on-site troubleshooting.
- The CADIX software program for regeneration system analysis allows you to compare the economics of cocurrent and countercurrent regeneration schemes in your system. It also provides the opportunity to identify the specific benefits of incorporating the UPCORE countercurrent regeneration system in your operation.



- Operational training helps you achieve your system productivity and economic targets by providing the training your staff needs to properly operate and maintain your system.

In addition to DIRECTOR water treatment services, several other “extras” are available with your DOWEX resins...

- **Detailed product specifications**—not “typical properties”—are provided with each shipment of DOWEX resins we deliver to you, so you can confirm the quality of the resins you receive.
- The support of the **global Dow Liquid Separations organization** including complete sales, technical support, and other customer service worldwide.
- **Global product availability** from our highly controlled processing plants worldwide ensures you’ll receive exactly the product you expect, when and where you need it.

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## ...Plus Get The Information You Need

We have invested in a global information and support network that allows you to get the up-to-date information you need about DOWEX resins, fast and conveniently, anywhere in the world.

- **The Internet**—Look for information about the full range of DOWEX (and FILMTEC) products on the World Wide Web at [www.dow.com/liquidseps](http://www.dow.com/liquidseps) and download product data sheets and other information as you need it.
- **Mail, Fax, or Phone**—Our advanced customer information centers in Midland, MI (USA) and Amsterdam (The Netherlands), and customer service groups around the world, ensure that you receive complete information, promptly, and in the manner you prefer.
- **Our Global OEM Network**—The world's leading water treatment original equipment manufacturers specify our resins and membrane elements in their systems. We supply these OEMs with our advanced system and economic modeling software to help them to design ion exchange and membrane systems offering the optimum combination of performance, productivity, and economy.



## To Learn More...

To learn more about DOWEX ion exchange resins, simply fax the enclosed form, visit our Web site at [www.dow.com/liquidseps](http://www.dow.com/liquidseps), or contact the separations experts at the Dow Liquid Separations location serving your area of the world (listed on the back cover of this brochure). We're looking forward to hearing from you.

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