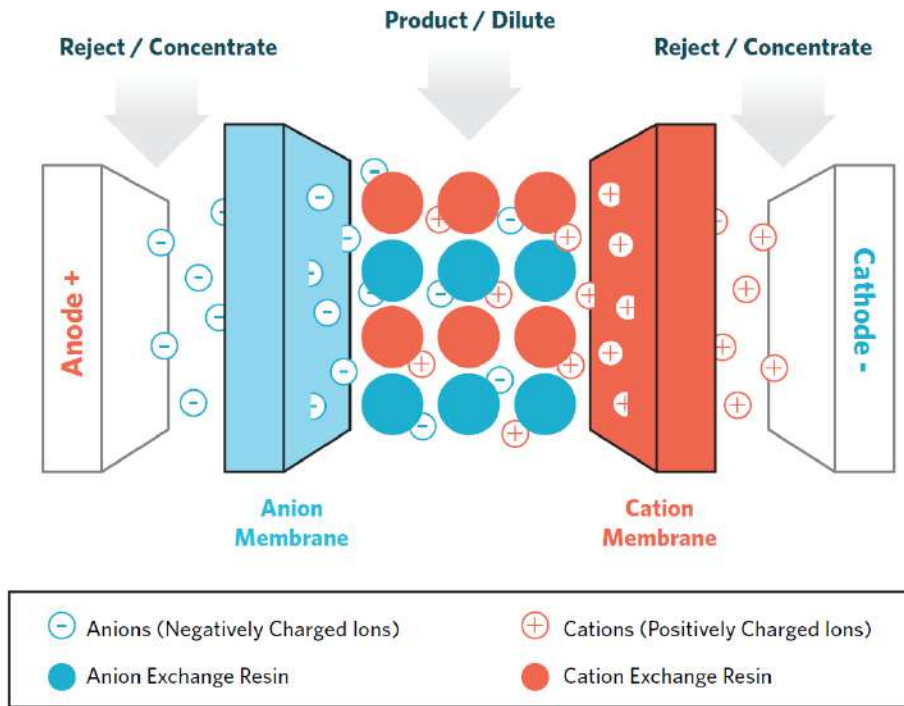


WHAT IS CONTINUOUS ELECTRODEIONIZATION (CEDI)?



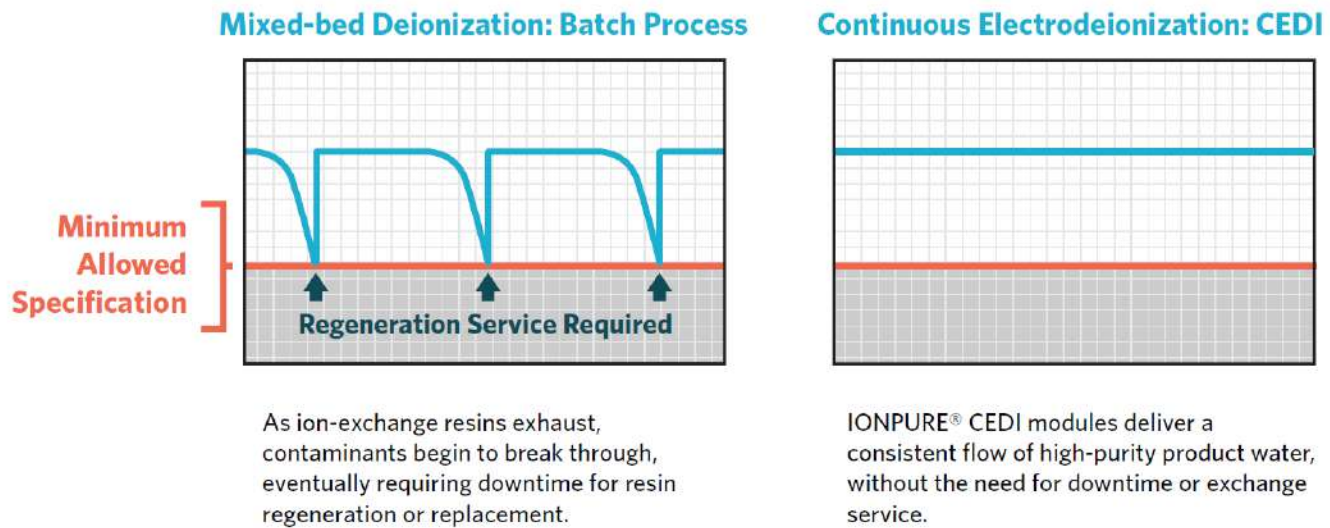
CEDI is a chemical-free, self-regenerating technology used to provide a consistent flow of high-quality deionized water.

With the growing costs of chemicals for regeneration and waste neutralization, and heightened safety concerns with handling hazardous chemicals, many industrial customers began seeking an alternative to cost-prohibitive, on-site regenerable ion exchange for creating ultrapure water. Evoqua's IONPURE® module offers that solution. The first to commercialize CEDI in 1987, we have provided thousands of modules that deliver ultrapure water at capacities ranging from 0.013 m³/h (0.06 gpm) to 22.7 m³/h (100 gpm).

In short, CEDI is a water treatment process that uses a combination of ion-exchange resins, ion-exchange membranes, and direct current to continuously deionize water without the need for chemicals. The avoidance of chemicals helps to reduce the systems' operating and maintenance costs and, therefore, improve your bottom line.



CEDI OR MIXED-BED DEIONIZATION (MBDI)



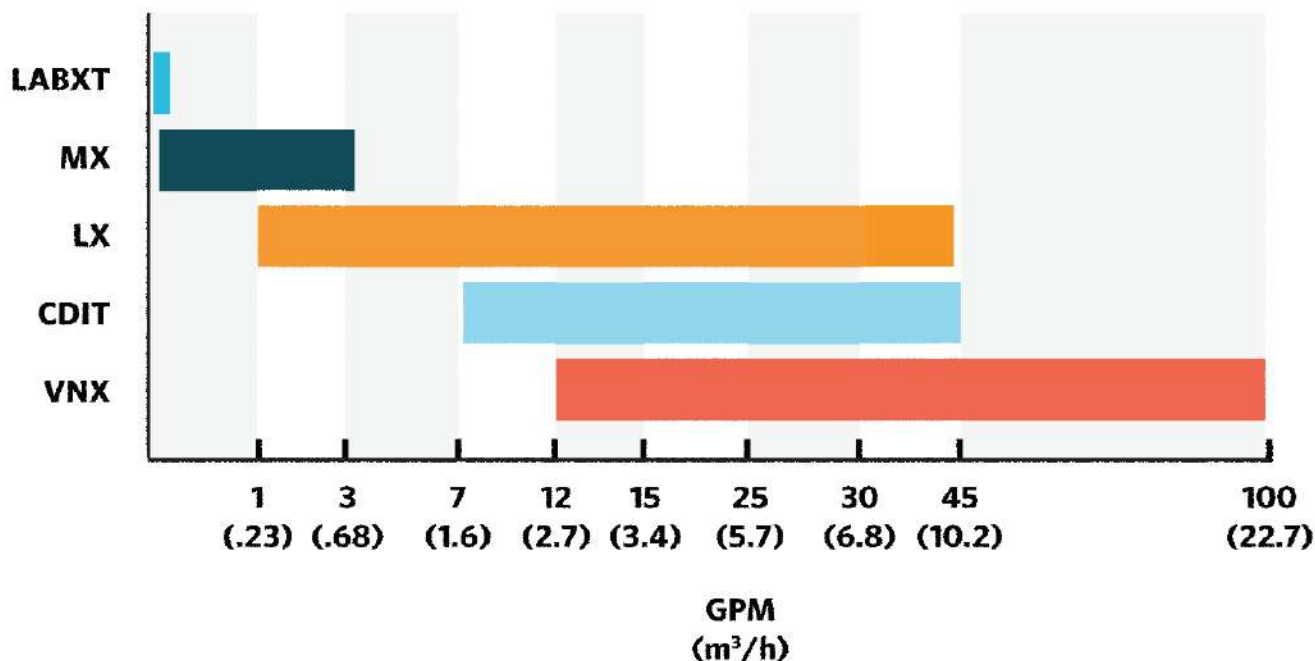
Since its commercialization, the use of CEDI technology has grown in popularity. Some of the major advantages of CEDI over traditional mixed-bed deionization systems include:

- No acid or caustic bulk storage, pumping, waste neutralization, or disposal issues
- Lower operating costs due to lower manpower requirements, as well as lack of chemical regeneration
- Smaller footprint
- Safer, more consistent operation

While both ion exchange and EDI use ion-exchange resins, the removal mechanisms are quite different. Conventional ion exchange utilizes chemically regenerated ion-exchange resins, which function in a capture (exhaustion cycle) and discharge (regeneration cycle) mode. This results in a breakthrough of ions at the end of the service cycle and a rinse out of regenerant at the beginning of the next service cycle. Capacity and selectivity are the most important resin properties in the mode of operation.

CEDI uses a reaction/transport mechanism to remove ions through resin under influence of a DC field. This requires a continuous path of like-charge resin beads. The transport is largely across the surface of the resin beads. Transport through resin bead (particle diffusion) can be limiting.

IONPURE® CEDI Module Flow Range



IONPURE® PRODUCT OVERVIEW

We have a full line of products varying in size to meet your requirements. Our product lines include:

VNX – high-flow applications; flow rates of 5.7 m³/h (25 gpm) to 22.7 m³/h (100 gpm)

LX – medium-flow applications; flow rates of 0.23 m³/h (1 gpm) to 7.7 m³/h (33.8 gpm)

LabXT & MX – low-flow and laboratory-flow applications; flow rates of .003 m³/h (0.013 gpm) to 0.75 m³/h (3.3 gpm)

Whether you want to eliminate chemical handling and regenerant waste or just need a system to help purify water for your supercritical boiler, rest assured that one of our CEDI modules will meet your needs. In addition, we're continuously developing new products or improving our existing modules to better serve our customers' needs. We also have an entire team of technical support experts available to troubleshoot any problems you may run into.

DISTRIBUTION

IONPURE CEDI modules and power products are distributed through a large base of highly trained and knowledgeable Original Equipment Manufacturers (OEMs), who know the ins and outs of our technologies. Our OEMs bid on projects and provide in-depth project specifications detailing the predicted performance of IONPURE CEDI modules for the application.

ADVANTAGES

Product – The most robust CEDI device with the simplest operation and maintenance

- The best product for your application

Experience – 35+ years of innovation, IONPURE CEDI modules have been adopted worldwide in many Power, Microelectronics, Pharmaceutical and other high-purity applications.

Support – A global network of trained and knowledgeable OEMs and regional support personnel

- The support you need when you need help



MARKET OVERVIEW

POWER GENERATION:

Power plants worldwide are switching out their conventional MBDI for IONPURE® CEDI modules to feed boilers for steam generation. Designed similarly to reverse osmosis (RO) systems, they're used in conjunction with RO as a polishing step for boiler feed water and cooling tower applications. For boilers, the modules provide deionized water to create the steam that turns the turbines. The following modules are used for power generation:

- VNX-EP, VNX-Max/Mini, and VNX-CDIT
- LX-X and LX-Z

MICROELECTRONICS:

Manufacture of semiconductor devices needs the highest purity water of nearly every industry, requiring extremely low levels of contaminants such as sodium, silica, and boron. The microelectronics industry demands low-maintenance technology that will operate efficiently with minimal downtime. Safety is also an industry concern, which is why more and more companies desire a system that will reduce its chemical usage. IONPURE VNX Ultra, E and EX modules are designed to deliver a continuous supply of ultra pure water without the use of chemicals or downtime due to service exchange.

PHARMACEUTICAL:

Many major multinational pharmaceutical companies use CEDI technology. The majority of the top 10 companies own and operate multiple hot water sanitizable LX-HI units. The IONPURE LX CEDI modules are the only ones on the market that allow instantaneous hot water sanitization without temperature ramping, continuous operation at up to 60° C (140° F) and 2 bar/30 psi feed pressure during sanitization. There's no need to re-torque these modules after installation/startup. IONPURE LX-X and LX-EU CEDI modules are also available for pharmaceutical applications where hot water sanitization is not required.

HYDROGEN APPLICATIONS

Our EDI modules are designed to meet or exceed the performance of ion exchange resin based systems in electrolysis systems.

- Makeup and polishing loops capability without the need for chemical regenerants
- LX-HI modules operate continuously at 60C unlike resin based systems limited to <48C
- Typical sodium and chloride removal $\geq 99.8\%$
- Continuous regeneration in EDI reduces downtime associated with chemical regeneration or exchange

BULK DEIONIZATION/GENERAL INDUSTRIAL:

IONPURE CEDI modules are used in a variety of general industrial applications to provide high-quality demineralized water.