

**FREQUENTLY ASKED QUESTIONS ABOUT IONPURE VNX MODULES**

**[1] Ionpure already has CEDI modules, why was the VNX module developed?**

The VNX module was developed to reduce the cost of building high flow rate CEDI systems and to make it easy to choose a clean, environmentally compatible technology over chemically regenerated mixed bed ion exchange systems.

The ability to connect modules end-to-end and then stack them using the innovative Flexmount housing/saddle configuration greatly reduces the cost associated with the piping and support structure of conventional CEDI systems.

**[2] How is the design of the VNX modules different from LX modules?**

The VNX modules use the thick-cell configuration that has been proven in Ionpure LX modules. The spacers are stacked up in a conventional plate-and-frame arrangement, with alternating product and reject compartments. The spacers themselves are shaped like disks, so the VNX can be described as a “stacked disk” device within a cylindrical housing.

**[3] Why still use plate-and-frame? Isn't spiral wound better?**

The plate-and-frame configuration gives much more even distribution of both fluid flow and current flow than the spiral wound configuration. This is very important for both performance and module longevity. Ionpure has proven that plate and frame is the best possible configuration for a CEDI device.

**[4] Does the VNX module provide the same performance that other LX modules have been recognized for?**

The VNX modules utilize the same contact time as the LX modules and therefore provide the same or better product water quality.

VNX modules are also rated for 100 psig (7 bar) feed water pressure, and are guaranteed to be leak-free.

**[5] How can you guarantee that the VNX modules will never leak over many years of operation?**

Ionpure LX modules demonstrated the success of the double O-ring design and extremely strong (self-supporting) thick-cell CEDI spacers. Ionpure VNX modules incorporate these features and add a housing with an O-ring seal at each end, creating a triple O-ring seal. This design ensures reliable, leak free operation for many years.

**[6] Do VNX modules require injection of salt into the concentrate stream?**

No. VNX modules use ion exchange resin filler in the product, concentrate and electrode compartments (protected by Ionpure patents). This resin is much more conductive than the solution, and allows passage of sufficient DC current even when feeding a very low conductivity solution.

Competitive CEDI devices use resin in only the product compartments, with open screens in the concentrate and electrode compartments. In such cases when the feed conductivity is low the stack resistance increases. Injection of salt into the concentrate and electrode compartments is usually required to provide desired amperage and performance.

**[7] Do VNX modules require concentrate recirculation?**

No. The design innovation of putting seals on both sides of the product compartment allows the use of thinner concentrate compartments. In addition, the improvement in mass transfer created by the use of resin in the concentrate permits the use of lower velocity in these compartments. The combination of these two features allows single-pass operation at water recovery of up to 95%.

**[8] Why do you claim that Ionpure CEDI modules are less susceptible to concentrate biofouling than other CEDI modules?**

VNX modules use resin filled concentrate compartments (fed by open channels) instead of the more common screen-type concentrate spacers. The screens are prone to biological fouling of the inlet/outlet sections, where the filaments overlap (as is also seen on the similar RO feed spacers). Also, because VNX modules were designed to allow the use of single-pass operation. This avoids the need for concentrate recirculation, which has been recognized to contribute to biofouling.

**[9] Why is electrical insulation so important in CEDI devices and how has this been addressed in the VNX design?**

It is very important to ensure that the DC voltage applied to the electrodes follow only the intended path through the CEDI spacer resin bed. If there are alternate current paths – for example, through salt bridges or contact of water inside the module with metallic, grounded components such as tie bars or side supports – then electrical short circuiting can occur. This could result in blowing power supply fuses, or even in permanent module damage.

We have included extensive electrical safety features in both LX and VNX modules, including tie bar sleeves with elastomer seals, O-ring spacer seals, self-supporting spacers, non-metallic conduit for crossover wires, and junction boxes for power supply connections.

**[10] Will the Ionpure VNX product line now replace the LX product line?**

No. Ionpure will continue to sell and support the LX product line.

The LX modules are ideal for low flow systems and retrofit of competitive systems. The LX HWS modules are the best choice for pharmaceutical applications that require hot water sanitization.

VNX modules are more cost effective for large systems, 150 gpm or more.

**[11] What single word summarizes the reason that Ionpure CEDI products are superior?**

**Experience.** We realize that it is important for a CEDI device to provide longevity as well as consistent product water quality. Ionpure first-hand experience with all types of CEDI devices – thin cell, thick cell, mixed bed, layered bed, separate bed, plate and frame and spiral wound. The lessons learned through our industry-leading 20 years of experience with CEDI technology have been applied to continuously improving our CEDI modules. We believe they are the most robust CEDI devices available.

**[12] What else does Ionpure offer to OEMs who are building CEDI systems?**

**Technical and Engineering Support.** Our industry-leading 20 years of experience with CEDI technology applies to the process knowledge required to make CEDI systems perform reliably, as well as the device knowledge required to build a robust product. We have applied CEDI technology for treatment of: RO permeate, softened tap water, wastewater, urea, fruit juice, steam condensate, antifreeze, and sugar solutions. Our experience and expertise is second to none.

Ionpure has a complete package of technical and engineering information to support OEM's and other turnkey providers in building cost effective CEDI systems. A

knowledgeable technical support team has been assembled to assist with system and process design.

**[13] Some of your competitors claim their designs accommodate the rebuilding of modules in the field. Do you claim the same?**

For 17 years we have been building CEDI devices that can be rebuilt in the field. But we have come to realize that it is better to build robust devices which will have a long life and therefore avoid the need for frequent rebuilding. We have also found that when rebuilding is necessary, better results are obtained when it is done at the factory. Therefore we do not sanction field rebuilding of VNX modules.

We guarantee our modules for three years. Our extensive experience in the design and manufacture of CEDI devices allows us to stand behind our product to make these statements.