

Electrodeionisation

Waterex uses electrodeionisation (EDI) as the demineralisation process of choice to remove dissolved ion salts from water. Waterex use EDI modules as polishers to demineralise permeate from reverse osmosis (RO) arrays without resorting to the use of chemical reagents.

EDI is utilised to produce demineralised water in place of traditional or other technologies that include regenerable mixed bed deionisation, ion exchange, and two pass reverse osmosis.

The EDI modules combine two well established water purification technologies, electrodialysis and ion exchange deionisation. Through this revolutionary technique, dissolved salts are removed with low energy cost and without the use of hazardous reagents. This compact clean technology uses the ion exchange process efficiently to remove ionised species from water by exchanging them for H^+ and OH^- ions. Water passes through one or more chambers filled with ion exchange resins held between cation or anion selective membranes. The membranes are used to isolate ions from their counter-ions. Where carbon dioxide needs to be removed membrane technology is used in combination with the EDI.

The result is a high quality demineralised water, up to 18 megaohm/cm, which can be readily produced continuously at substantial flow rates. Permeate flowrates up to 1,400 m^3/h can be achieved using up to 99% recovery. When used in combination with RO, 99.9% of ions can be removed from feed water.

Waterex supplies stand alone skid mounted PLC controlled EDI plants, with the pre-treatment reverse osmosis plant if required. Package plants can be installed in customised air conditioned containers.

Applications

Waterex uses EDI to provide solutions for many applications including:

- High purity water for power station turbines and high pressure boilers
- Pharmaceutical water
- Reduction of ionisable SiO_2 and total organic carbon
- Laboratory water



Streams Produced

The RO feed to the EDI module produces three separate outlet streams:

- Product stream - over 90% of the feed flowrate
- Concentrate stream - typically less than 10%
- Electrolyte stream - typically less than 1%

The concentrate stream is typically recycled to the RO feed stream but may be sent to drain.

The electrolyte stream flows past the anode and cathode sequentially through a gasketed monofilament screen removing unwanted chlorine, hydrogen and oxygen from the electrodes so is typically sent to drain.

Carbon dioxide that may be produced is stripped using membrane technology.

Advantages of Electrodeionisation

The major advantage of using EDI over standard ion exchange system is that very high quality water is produced using less than 95% of the chemical products often used to realise similar products. Other advantages include:

- Using an EDI system after an RO plant effectively replaces chemically regenerated deionisers and the need for chemical usage
- EDI systems are mechanically simple when compared to typical ion exchange systems
- EDI systems can be used in continuous operation with no need for shutdowns or halts for routine regular ion regeneration
- Handling and environmental issues concerning acid and caustic chemicals used for ion exchange is avoided
- Very few automated valves or complex control sequences are needed that require supervision by an operator
- EDI modules require little space and can be easily skid mounted
- A relatively small amount of electric power is needed
- Lower capital costs are realised due to the absence of chemical storage, pumping, and regeneration equipment

