



PURESEP
Water Technologies

Products & Services

ION EXCHANGE/ DEMINERALISERS

Ion exchange systems are used to remove a variety of ions & contaminants from water sources or process fluids in chemical, pharmaceutical & food industries.

PURESEP's two-bed demineraliser range includes stainless steel, steel lined & FRP vessels loaded with SAC resins. Vessels sizes range from 0.1 - 2.0m diameter.

Synthetic resin beads installed in vertical columns are arranged in series or parallel configuration to suit process flow & quality requirements.

There are two basic groups of resins which selectively remove either positive ions (Cation resins) or negative ions (Anion resins). Both cation & anion resins are manufactured in a variety of forms with specific process performance & characteristics.

Skid mounted two-bed demineraliser



Product water quality is between 25 - 0.5 $\mu\text{S}/\text{cm}$ conductivity, depending on feed water quality & resin format.

Mixed-bed columns are a combination of cation & anion resins, used as stand alone systems or more commonly down stream of two-bed demineralisers. Mixed-bed columns are supplied as exchange bottles or with media separation & chemical regeneration system.

Standard demineralisation resins will remove the majority of dissolved ions & ionic material in a feed stream by exchanging cations (eg Na^+ , K^+ & Ca^{2+}) for H^+ & anions (eg Cl^- , CO_3^{2-} & PO_4^{3-}) for OH^- .

Selectivity of ion removal in this process is dependant on concentration, molecular size & charge.

Demineralisation systems typically consist of cation columns followed by anion columns, known as a 'two-bed' systems, with resin regeneration with acid (cation) or caustic (anion) in forward flow (co-current) or back flow (counter-current) direction.

The effluent generated contain a high concentration of salts which are normally neutralised by mixing or by passing through a neutralising media prior to discharge to drain.

For high purity applications mixed-bed columns used to produce demineralised water $<0.1 \mu\text{S}/\text{cm}$ conductivity.

Process control systems for back wash, regeneration, rinse & service cycles, range from stager controlled multi-port valves through to PLC control panels with



Process control panel

actuated valves. Regeneration sequence is initiated by inline conductivity & pH sensors.

PURESEP's ion exchange systems are available with ancillary equipment including pump skids resin traps, effluent neutralisation, water & chemical storage.

ION EXCHANGE/ DEMINERALISERS

PURESEP's ion exchange systems provide **treatment solutions** for a wide range of specialist water treatment and product purification applications.

Each application utilises a specific grade of ion exchange or absorption resin with a regeneration program to ensure repeatable batch treatment & product quality.

Drinking water treatment: Food grade resins combined with sanitisation systems ensure compliance to FDA & DWI directives.

Organic scavenging: Strong base anion (SBA) resin, resistant to organic fouling, is used to remove -ve charged organic species in feed water streams; regeneration using sodium chloride.

Colour removal: Strong base anion resins installed in packed bed columns & acrylic anion resins are used to decolourise sugar solutions & fruit juices.

Nitrate removal: Strong based anion resin in chloride (Cl) form if used to remove nitrate in a feed water; regeneration using sodium chloride.

Desalination of product: A combination of cation & anion resins installed in packed bed columns are used to remove flavour tainting ions from a range of products including: **alcohol, sugar, glucose, fructose, gelatin, citric acid, lactic acid & sorbitol.**

Semiconductor grade water: High purity grade mixed bed resin polishers for removal of impurities down to parts per trillion (ppt).

Heavy metal removal & recovery: Ion specific selective cation resins enable removal & recovery of **boron, cadmium, copper, lead, nickel, strontium & gold** from waste water or process streams.

Radioactive waste: Specific ion selective resins are used to concentrate trace elements in to small volumes for disposal.

Condensate polishing: Temperature resistant strong acid cation (SAC) & mixed bed resins allow condensate treatment to occur at elevated temperatures; systems are regenerated with backwash, acid & caustic treatment.

Pharmaceutical processing: Synthetic resins with absorptive properties enable both refining & separation of **antibiotics, amino acids, nucleic acids & peptides** in laboratory & process scale systems.

Reaction catalysts: Ion exchange resins act as process catalysts in a variety of **petrochemical & chemical** applications, including **MTBE & octane enhancing** chemical production.

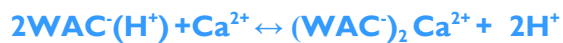
PURESEP stock a wide range of resin grades & provide onsite resin loading & disposal services.



DEALKALISATION

Dealkalisation is used to remove hard ions, associated with alkalinity (temporary bicarbonate hardness), from a feed water source. Dealkalisation systems are often used as a pre-treatment to softeners when a water source contains high levels of alkalinity.

The two stage dealkalisation process includes base exchange followed by carbon dioxide (CO₂) gas stripping. The exchange process, using vertical columns of ion exchange resin beads, in a weak acid cation hydrogen form (WAC·H⁺), occurs as below:



The temporary hard ions removed in this process remain attached to the charged sites on the resin beads, while the H⁺ ions acidify the water (pH 3.6 - 5.6) & reacts with the bicarbonate ions (HCO₃⁻) to form a solution of carbon dioxide & water as below:



The secondary treatment process uses a gas stripping column to remove the carbon dioxide from the water stream. When the resin column capacity is reached the pH of the outlet water is >5.6.

Hydrochloric acid (28%) is used to regenerate the WAC resin exchanging hard ions with H⁺ ions.



Hydrochloric acid bulk storage & fume scrubber

PURESEP's dealkaliser range includes steel lined & FRP vessels loaded with WAC resins. Vessels sizes range from 0.1- 2.0m diameter.

20m³/hr duplex dealkaliser



Gas stripping columns come complete with water sump & blower, to reduce CO₂ levels down to 5 mg/l, with optional outlet pH correction dosing pump & sensor.



Gas stripping columns

Process control systems for back wash, regeneration, rinse & service sequence cycles, range from stager controlled multi-port valves through to PLC control panels with actuated valve assemblies. Initiation of the regeneration sequence is via an inline pH sensor.

Additional system components include chemical storage tanks complete with integral fume scrubbers & effluent treatment to ensure the acidic regenerant waste is neutralised prior to discharge to drain.

SOFTENERS

Water softening is primarily used to reduce the amount of scale forming salts, such as calcium (Ca^{2+}) & magnesium (Mg^{2+}), from a feed water source to prevent down stream scaling & accelerated corrosion of process lines or equipment.

Scale forming salts, commonly known as hard ions, are sparingly soluble & have a tendency to precipitate on to contact surfaces in the form of carbonates, sulphates & hydroxides.

The softening process is known as base exchange, whereby hard ions are exchanged with soft ions, such as sodium (Na^+) & potassium (K^+) which do not form scale.

The exchange process using vertical columns of ion exchange resin beads, in a strong acid cation sodium form (SAC^-Na^+), occurs as below:



Hardness ions removed in this process remain attached to the charged sites on the resin beads, while the soft ions pass into the outlet water stream.

Eventually the resin capacity is exhausted at which point a saturated salt solution, >80% brine, is used to reverse the reaction and regenerate the resin charged sites with soft ions.

Salt saturator with level inspection & dust extraction



PURESEP's industrial softener range includes steel lined & FRP vessels loaded with SAC resins. Vessels sizes range from 0.1 - 2.0m diameter.

Self contained duplex softener



Salt saturators & brine tanks are an integral component of any softener system with air check valve, brine draw & fill lines.

Process control systems for back wash, regeneration, rinse & service sequence cycles, range from stager controlled multi-port valves through to PLC control panels with actuated valve assemblies. Initiation of a regeneration sequence is via timer, totaliser or in-line hardness monitor signal when outlet quality exceeds 0-2 mg/l total hardness.



Hardness monitor

PURESEP's softener systems are available as stand alone process plant, with ancillary equipment including buffer tanks & pump skids, or can integrate with an existing process system as pre- or post- treatment.



PURESEP
Water Technologies

*Puresep Water Technologies Ltd
Bromyard Road Trading Estate
Bromyard Road, Ledbury
Herefordshire, HR8 1NS
United Kingdom*

*Phone: +44 (0) 1531 636 328
Fax: +44 (0) 1531 634 012*

*Email: info@puresep.com
Web: www.puresep.com*

