**DuPont Ion Exchange Resins**

**Operation of Mixed Bed Polishers**

**Why Must We Mix and Separate the Resins?**

**Introduction**

Mixed bed units are used to demineralize water, principally when the feed water has a low salinity.

Mixed resins act like an infinite number of cation and anion exchange units: each layer of the mixed resin polishes the water produced by the layer just above. As each layer consists initially of SAC and SBA regenerated resins, the product of the exchange reaction is pure water.

Figure 1 represents a mixed bed unit in service, with mixed resins, and in regeneration, with separated resins after backwashing the bed.

![Diagram of mixed bed unit in operation and regeneration](image-url)

**Figure 1:** A mixed bed unit in operation and regeneration
Why are the resins mixed?

Here the cation exchange reaction:

\[ R_C - H^+ + Na^+Cl^- \leftrightarrow R_C - Na^+ + H^+Cl^- \]

And here anion exchange as a second step:

\[ R_A - OH^- + H^+Cl^- \rightarrow R_A - Cl^- + H^+OH^- \]

The product, H^+OH^-, is pure water (H_2O). Mixed resins are capable of producing treated water of excellent quality.

If resins were not mixed, leakage from the top layer of the bed would not be removed by the lower layer of the bed, which would be of a separate resin type. Quality of an unmixed mixed bed would be, at best, the same as separate columns with co-flow regeneration, or potentially even worse.

If resins were not mixed and the feed water contained some calcium, the calcium hydroxide and carbonate produced in the upper anion resin layer could precipitate in the bed before it reaches the cation exchange resin layer. A similar effect could occur with the presence of magnesium.

In order to achieve the pure water expected from a mixed bed, proper separation during regeneration and proper mixing prior to the service cycle is essential.

Note

Additional information on Mixed Bed Ion Exchange Units can be found in the Tech Fact:

- Recommended Operating Conditions for Mixed Bed Ion Exchange Units (Form No. 45-D01127-en)
- Regeneration of Mixed Bed Units (Form No. 45-D01129-en)

Have a question? Contact us at: www.dupont.com/water/contact-us

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