Water Technology

The Care And Handling of Resin

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Feature
Here's what to do before and after it's put into service.

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Much has been written about how to care for ion exchange resins while they're in service, but what's often overlooked is how resin should be handled before use and how it should be disposed of afterward.

It's sometimes inconvenient to load resins into a vessel as soon as they're received. Luckily, ion exchange resins may be stored for long periods in sheltered, reasonably well-ventilated areas where the ambient temperature is between 40 and 100 F. Under these conditions, little concern arises regarding resin shelf life.

Resins are normally shipped in the non-regenerated "salt" form -- the sodium form for cation resins and the chloride form for anion resins. In most cases these resins can be stored for years without ill effects.

The regenerated form of cation resin (the hydrogen or acid form) and the regenerated form of anion resin (the hydroxide or base form) may have shorter shelf lives. Avoid exposing them to high temperatures. Anion resin stored in the hydroxide form can exchange its ions for carbon dioxide in the air; the exchange sites involved then change to the carbonate form, reducing the resin's effective capacity and the water quality of effluent when the resins are used.

Mixed-bed resins used for high purity (less than 18 megohm resistivity) water can't tolerate conversion of their anion component to the carbonate form and must be protected from contact with air. Because resin drum liners are usually made from polyethylene that's slightly porous to air, it's a good idea to use two liners in drums of high-purity, mixed-bed resin when the resin is to be stored longer than a month.

Resin Rehydration

During shipment, resin can dry out. Dried resin must be rehydrated properly to prevent osmotic shock and potential damage. To do so, immerse it in a 20 percent salt solution for about 20 minutes. Then displace this solution with a solution of about 5 to 10 percent salt for another 20 minutes. Lastly, rinse the resin with water to remove the salt solution.

Following rehydration, cation or anion resins used for demineralization should be regenerated twice. Resins to be used in the salt cycle, like sodium-form cation resin for softening or chloride-form anion resin for dealkalizing, need only be backwashed and drained before being put into service.

In areas where temperatures drop below freezing, avoid subjecting resins to repeated freezing and thawing. Regardless of the resin's form, numerous cycles of freezing and thawing can break down its structure. One or two occurrences won't usually harm it provided it thaws gradually at room temperature. Don't attempt to speed the process with direct heat.

It's generally best to use unregenerated "salt-form" resin within five years and regenerated resins within one year.

Resin Loading

The flow and pressure drop characteristics of a resin bed and the overall performance of an ion exchanger depend on the way resin is loaded into the tank. After removing old resin or before filling a new vessel with resin, follow these steps:

* **Rinse** the inside of the resin vessel to remove dirt and old resin. Inspect the internals and the lining for damage or wear. If there's a supporting layer of gravel, measure it to ensure it's at the proper height. If it's disturbed, level it off.

* **Fill** the vessel halfway with water. Use de-cationized or softened water if available. Add new resin through the manway to the vessel, but don't damage the internals. If resin is in bags it can be dumped a bag at a time through the manway; if it's in drums, an eductor can usually be used to suck it from the drums and blow it into the vessel.

* **Open** the backwash water valve to backwash the resin, draining water through the open manway at 3 to 6 gallons per minute per square foot of cross sectional surface area.

Backwash rate is subject to the type of resin used and the backwash water temperature; check the backwash expansion curves in the manufacturer's literature. Backwash for about 30 minutes and watch the resin level through the open manway from which the water flows. Above all, don't backwash out any whole beads.

* **Drain** the water through the rinse outlet valve until the water level is several inches above the bed. Measure the distance from the top of the vessel to the top of the resin bed. Calculate the bed height and record it for future reference. Then slowly fill the vessel with water, venting off trapped air. Follow with a double regeneration.

Loading resin into a mixed-bed unit is more complicated. The cation resin bed height must be exactly positioned at the mid-bed regenerant collector. To achieve this, first load the cation resin component of the mixed bed according to the procedure previously detailed, adding or subtracting cation resin at the end to get the exact resin volume needed. Then load the anion resin by adding more water to the vessel and repeating the resin loading procedure.

Sometimes mixed-bed resins are delivered premixed, ready to use. When loading them, little or no water can be present in the vessel. A layer of water in the vessel causes the resin components to separate during loading, with the cation resin forming a layer on the bottom. This leads to low-pH, high-conductivity effluent when the mixed bed is put into service.

Resin Longevity

The operating life of ion exchange resin depends on several factors. Attrition losses can be attributed to chlorine in the water; mechanical, osmotic or thermal shock; temperature; dissolved oxygen; and other operating conditions.

Because many variables are involved, it's difficult to anticipate operating life. Maintenance of the ion exchange system also counts. Nonetheless, certain values can be used as a rule of thumb for "average" systems (see table).

Resin Disposal

Ion exchange resins are non-hazardous. The material safety data sheets of standard ion exchange resins indicate they have a zero rating for toxicity, fire and reactivity hazard. However, this only applies to new, uncontaminated resins; materials collected on the resin beads during service can change the resin's hazard rating.

For example, if a resin is used to remove heavy metals from a wastewater stream, it's considered a hazardous material. Check with authorities before disposing of resin that may have been in contact with heavy metals or other hazardous materials.

Ion exchange resins used to process tap water or potable water sources normally contact only non-hazardous dissolved solids such as hardness and alkalinity. These resins can normally be disposed of as ordinary trash, but check first!

Resins should be disposed of in their exhausted, salt form. This may require rinsing the bed with several bed volumes of 5 to 15percent sodium chloride solution. Otherwise, cation resins in the hydrogen form may have too low a pH for disposal, while anion resins in the hydroxide form may have too high a pH.

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