

Iron/Heavy Metal Fouling of Anion Resins

Anion resins may become fouled with iron and other heavy metals such as calcium, copper and manganese in a variety of ways. For example, caustic soda solutions used for regeneration generally contain some iron. This iron precipitates and is filtered during the regeneration procedure. It is advisable to use rayon or mercury cell grade caustic having a low iron content (under 5 ppm). Some diaphragm grades that are low in chloride and iron are also suitable.

In certain cases, iron and copper may be held by the anion resin as an anionic complex. Some of these complexes are impossible to remove with caustic soda. The quickest method of removing these heavy metals is with hydrochloric acid.

1. Before the hydrochloric acid cleanup, the strong base anion resin should be brined with a 10% brine solution. If more than 5% of strong base anion resin capacity has been used for the removal of silica then the resin bed should be regenerated with caustic soda before brining the bed in Step 1 to avoid hardening of silica on the resin. Use 10 lbs. of salt per cubic foot of resin. This brining will prevent any damage to the resin due to the heat of neutralization between the regenerated resin and the acid solution and also avoid gassing problems (if the resin was in the exhausted carbonate or bicarbonate form).
2. Draw 10 lbs/cu. ft. of 30% HCl into the resin bed at a concentration of 5% at a flow rate of 0.25 to 0.5 gpm/cu. ft. and let bed soak in the acid solution.
3. If the fouling is severe, it may be necessary to let the resin soak for 2 - 8 hours. After eight hours there is little further benefit. However, using warm acid does help.
4. Following the acid rinse and soak of Step 3, rinse the resin bed with soft water or water from the cation unit and continue to rinse until all the acid has been removed from the resin bed.
5. Backwash the resin and regenerate with twice the normal dose of regenerant.

In cases of severe fouling, the bed should be air lanced and backwashed to remove loose debris before Step 1, using the following procedure:

1. Backwash the resin bed at the regular flow rate for 10 minutes and drain to bed level.

2. Air-lance for 30 minutes at 4 cubic feet of air per minutes per cubic foot of resin, backwash at the regular flow rate for 20 minutes and drain to bed level.

To treat an anion resin for iron, when unable to use hydrochloric acid, the following sodium hydrosulfite treatment is one alternative.

1. Backwash the resin bed to remove air bubbles.
2. Drain the water out leaving 1/2 a bed volume of water on top of resin.
3. Add enough of a concentrated sodium hydrosulfite ($\text{Na}_2\text{S}_2\text{O}_4$) such that when combined with the water above the resin bed, the resulting concentration is 4%.
4. Drain 1/2 bed volume solution from the bottom of the bed.
5. Agitate the resin and solution (but do not use air).
6. Allow bed to soak for 12 hours (if possible, if not, at least 4 hours).
7. Drain and rinse the bed.
8. Backwash the bed to remove any debris for 30 minutes.
9. Either double regenerate bed at this point or proceed with the organic fouling treatment.

NOTE: The sodium hydrosulfite has a short shelf life, so make only enough solution needed. Make sure adequate ventilation is provided — strong odors will be given off during this treatment.

