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THE CLEANING/DISINFECTION OF FOULED ION EXCHANGE RESINS

Ion exchange resins can become polluted or contaminated over time with suspended solids, slime, bacteria, or numerous other kinds of organic or microbiological matter. Precipitations can occur as a result of pH changes, and/or concentrations of relatively insoluble salts. Adsorption or ion exchange of other species which are not easily removed by the normal regeneration procedures can cause gradual performance losses due to accumulation and fouling of the resin sites. Typically, iron and manganese fouling of the ion exchange resin is the most common type of mineral fouling. Chemically flushing the resin bed should be accomplished after the cleaning and disinfection stage to assure complete and unobstructed flow through the resin beds during the chemical regeneration process.

PREVENTION MEASURES

It should be emphasized that regular cleaning treatments can prevent accumulation and severity of fouling conditions, which will extend the resin life appreciably.

Increased quantities of regenerant and increased frequencies along with elevated temperatures can reduce fouling by preventing contaminants from gaining permanent bonds with active resin bed sites.

The importance of regular cleaning operations cannot be overestimated or overstated.

After the Disinfection and Oxidation process described herein, and after chemically cleaning and regenerating the resin beds, and problems with flow rates or capacities are still experienced then read ‘Diagnosis’.

DIAGNOSIS

If, however, deterioration in equipment performance is experienced, the following can be contributory:

1) Loss of resin due to water hammer or excessive flows.
2) Change in feed water constituents. (increase in concentration of ions passing through the bed)
3) Faulty operating parameters or inadequate cleaning methods or frequencies.
4) Malfunction of regeneration hardware cycles or support hardware.
5) Severe resin pollution or degradation.

For troubleshooting purposes, investigate each one of the items listed in the same order of priority. As a last resort, laboratory testing of the resin bed (#5) should be done.

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DISINFECTION AND OXIDATION PROCEDURES

Under certain conditions when contaminated water sources in particular are being fed to ion exchange systems the resins may become fouled with bacteria, algae, proteins, or organic matter. This can be especially troublesome or problematic for certain types of industries, such as pharmaceuticals, food and beverage, hospitals, etc for the obvious reasons.

Perasan® 'A' or Perasan® 15% products from Enviro Tech (PAA) have been used quite successfully to clean and disinfect ion exchange resin beds without degrading the capacity or functionality of the various resins. These products can be used for water softening, cationic, anionic, or mixed resin bed systems without problem.

Research from Europe, South America, Canada and the US has shown peracetic acid to be very suitable as a broad-band disinfectant for deionizer resin beds. It is especially functional at ambient temperatures and the associated hydrogen peroxide aids the over-all oxidation capacity by removing proteins and amino acids from the ion exchange beds. Peracetic acid at concentrations > 1000 ppm have been shown to be very good bactericides, fungicides, sporocides, and virucides at ambient temperatures over relatively short periods. The spent solutions from the cleaning/disinfection process are very biodegradable, and convert to carbon dioxide and water within minutes or hours once released to water treatment effluent waters.

Basics to Know:
Perasan®, like all PAA products, is aggressive to soft metals such as black iron, brass and copper. Be sure to use synthetic material such as PVC or fiberglass or polypropylene or polyethylene plastics or stainless valves and piping. Do not use Perasan 'A' at less than 50-1 dilutions, as the excess H_2O_2 may damage resins.
Disengage or remove activated carbon filters, as carbon will remove an appreciable amount of PAA solution.
When cleaning or disinfecting the system be sure to work valves open and closed so as to expose all the piping and valves to the solution.
In some cases internal pressure will develop due to gassing. Do not exceed system designed capacity.
Hot or warm water up to 135° F may be used without concern for either the cleaning/disinfection step or the rinsing of the beds that follows.

Procedure:

1) Ensure anion resin beds are fully exhausted as Perasan® products perform best at pH values <8.
2) Make up 1 BV (bed volume**) of Perasan® by diluting Perasan® 'A' 50-1 with water (0.1% PAA). Dilute Perasan® 15% 60-1 up to 120-1 with water (2500-1250 ppm active peracetic acid)
3) Inject 1 BV of the solution at a flow rate of 4-5 BV/hr. Displaced solution should be run to drain.
4) When all Perasan® has been injected and a strong consistent residual of PAA is discharged, close the drain valve and soak resin beds for at least ONE HOUR. Open and close associated or integral valves during this process to contact all interior pipework. It is also a good idea to inject 1 BV of disinfectant solution after 30 minutes to ensure intimate contact with fresh cleaner/disinfectant solution.
5) Some resin beds that are severely fouled will generate oxygen or carbon dioxide gas which will increase internal system pressure. Do not let system over-pressurize beyond the system's maximum psi rating. Relieve pressure if necessary.
6) After the cleaning/disinfection time period, initiate a displacement rinse using raw water for at least 30 minutes at 5 BV/hr flow rate. Follow this with a fast rinse/flush at a flow of 10-20 BV/hr for 15 minutes.
7) Perform a chemical anti-fouling procedure (for iron or manganese) if required. Follow manufacturers instructions.
8) Regenerate resin beds as usual and return to service.

BV (Bed Volume) = 1 liter of solution per liter of resin within the system. (one gallon per gallon of resin, i.e.)