Water
& Process
Solutions

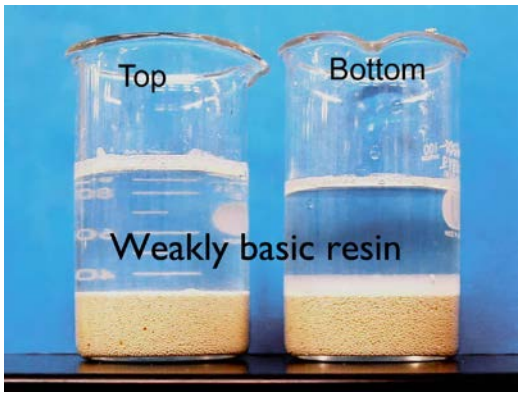
Ion Exchange Resins

Cleaning anion exchange resins fouled with silica
Hot caustic soda method

Introduction

Occasionally, some plants experience anion resin clumping due to silica polymerization.

Common operating symptoms include short run length and high WBA conductivity during the run (due to channeling), and the inability to backwash the bed. When the vessel is opened and samples are taken, the resin beads will be clumped together and a gummy substance may even be present, as seen in the picture on the right. This document is an explanation of the most probable cause, and ideas on how to correct the problem.



Most demineralizers that use weak base anion resins for water treatment also use strong base anion resins. In order to minimize the amount of caustic used to regenerate the resins, a technique known as thoroughfare regeneration is generally used. Thoroughfare regeneration is the use of waste caustic from the SBA vessel to regenerate the WBA resin (see the corresponding Tech Fact).

If significant amounts of silica are present when the thoroughfare begins, it will polymerize upon contacting the acidic WBA resin, leading to the problems described above.

First, the problem needs to be corrected. A variety of changes in SBA operating conditions may have caused the silica peak to shift, including changes in caustic concentration, regenerant temperature, or installation of new SBA resin.

Correcting the situation is usually accomplished by dumping additional caustic to the drain before the thoroughfare begins. To be confident that the right amount is dumped, an elution study can be performed. Layered bed configurations with SBA and WBA in the same vessel generally operate with lower caustic concentrations and more uniform flow rates and so they tend to be less prone to silica precipitation.

Finally, the anion exchange resin needs to be cleaned. A series of hot caustic soaks should remove most of the polymerized silica and allow continued operation. In some extreme cases, the weak base or strong base resin may need to be replaced.

Note that WBA clumping can also be caused by organics build-up on the resin or a combination of organics and silica.

Cleaning solution

Prepare approximately 8 bed volumes (m^3 solution per m^3 resin) of a solution containing ~ 8 % NaOH (i.e. ~ 80 g/L NaOH).

Recommended procedure

1. Backwash thoroughly the resin bed until effluent is clear.
2. Pre-heat the bed with hot water.
3. Heat the caustic soda solution to 50 – 60°C (120 – 140°F).
4. Percolate slowly 1.5 bed volumes of the caustic solution in about 30 minutes (i.e. 3 BV/h).
5. Make sure to maintain the solution level about 3 cm (1 in) above resin surface.
6. Allow the resin to soak overnight in the caustic solution (or about 8 hours).
7. Pass the remaining caustic solution at about 2 BV/h, at 50 to 60°C.
8. Rinse slowly with 3 bed volumes of demineralized water at about 2 BV/h, i.e. in 1 ½ hours.
9. Fast rinse with at service flow rate until effluent is neutral.
10. Return the resin bed to service.

See also

The classical **alkaline brine** treatment is also very effective at 50 to 60°C. See the corresponding Tech Fact.

Another Tech Fact gives general information on the removal of silica by ion exchange, with recommendations about regeneration procedures.

Warning

Adequate protection for all parts of the body should be provided whenever using caustic soda and the manufacturer's guidelines for handling this chemical should be carefully followed.

For more information about DOW Water and Process Solutions:

http://www.dowwaterandprocess.com

Warning: Oxidizing agents such as nitric acid attack organic ion exchange resins under certain conditions. This could lead to anything from slight resin degradation to a violent exothermic reaction (explosion). Before using strong oxidizing agents, consult sources knowledgeable in handling such materials.