



DOWEX™ Ion Exchange Resins

Procedure for Removing Iron from Cation Resins

Introduction

Iron has a complex chemistry and may be present in the feedstream as inorganic precipitates (oxides/hydroxides), as cationic species or as organometallic complexes. Three possible cleaning procedures are described:

- Air-brushing, which involves agitating the resin by injection of compressed air at the bottom of the bed, followed by backwash. This is used in condensate polishing and other water treatment applications such as make up demineralization to remove insoluble, loose and easy to loosen particulate iron (crud).
- HCl treatment to remove crud and soluble contaminants.
- Treatment with the reducing agent sodium dithionite ($\text{Na}_2\text{S}_2\text{O}_4$) to convert Fe(III) to the more soluble Fe (II). This is used in water softening and other applications, where acid can damage the materials of construction, or when the iron is fixed on the resin as a very stable oxide (Fe_3O_4) that is difficult to dissolve with HCl.

The detailed cleaning steps have to be adapted to each regeneration process (coflow, different types of counterflows).

Used, mechanically weak resins, may suffer from large osmotic (fast swell/shrink) and mechanical (air scrubbing) strains. It is to evaluate carefully if a further resin damage is not more probable than the chances of success. It is advisable to use gradual changes in solution concentrations and to minimize the mechanical stress.

Air Brushing

The recommended procedure is as follows:

1. Lower the water level down to 10 cm above the resin level.
2. Air-brush the bed at 50-80 m/h for 15 minutes.
3. Backwash the bed at maximum expansion for 15-30 minutes.
4. Regenerate the resin as usual in coflow or with double the amount of acid in counterflow.

If the particulates are heavy, backwashing may not be effective in removing them. In this case, solids can be driven down to the bottom of the bed and particulates smaller than the nozzle/screen opening can be removed through the drain using the following procedure:

1. Lower the water level down to 10 cm above the resin level.
2. Air-brush the bed at 50-80 m/h for 30 seconds.
3. Drain the bed for 30 seconds while adding water from the top.
4. Repeat steps 2 and 3 10 to 20 times.
5. Backwash the bed at maximum expansion for 15-30 minutes.
6. Regenerate the resin as usual in coflow or with double the amount of acid in counterflow.

The air brushing should be followed by further treatments as described below if exchanged or deposited iron remains on the resin.

HCl Treatment

If possible, the acid injection in step 2 and the displacement in step 4 should be made upflow into the resin bed to move the bed and increase contacting. If only downflow injection is possible, backwash the bed to loosen and clean it prior to the treatment and then lower the water level down to 10 cm above the resin level.

1. Backwash the resin at maximum expansion for 15-30 minutes.
2. Pass 2 bed volumes of a 10% HCl solution for about 30 minutes.
3. Leave to soak for 2-4 hours.
4. Displace with 2-3 bed volumes water.
5. Rinse out with 3-5 bed volumes DI water.

Treatment with a Reducing Agent (Na₂S₂O₄)

If possible, the chemical injection in step 2 and the displacement in step 4 should be made upflow into the resin bed to move the bed and increase contacting. If only downflow injection is possible, backwash the bed to loosen and clean it prior to the treatment and then lower the water level down to 10 cm above the resin level.

Do not use air brushing to agitate the resin bed as this will impair the reducing agent performance.

1. Exhaust the resin.
2. Put resin into exhausted form by treating with a 2-5% brine solution for strong acid cation resins, or with a 0.5% caustic solution in upflow direction for a weak acid cation resin (take care to allow for resin swelling).
3. Backwash the bed at maximum expansion for 15-30 minutes.
4. Pass 1 bed volume of a 5% Na₂S₂O₄ solution for 30 minutes.
5. Leave to soak for two hours.
6. Pass another bed volume of a 5% Na₂S₂O₄ solution for 30 minutes.
7. Leave to soak up to 24 hours if possible.
8. Displace with 2-3 bed volumes water.
9. Rinse out with 3-5 bed volumes DI water.
10. Double regenerate the resin (same concentration at double the contact time).

DOWEX™ Ion Exchange Resins For more information about DOWEX resins, call the Dow Liquid Separations business:

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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.

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