PRACTICAL GUIDE

Regeneration
Start-up Procedure and Normal Regeneration

START UP PROCEDURE

Before the first regeneration, the resins must be thoroughly backwashed to remove from the resin bed any particles or debris.
If demineralised water is available, the first regeneration is identical to a normal regeneration, except for the quantity of regenerant that must be twice the normal amount. In such a case, the simplest way is to double the injection time for each regenerant.

If demineralised water is not available, the initial regeneration must be done beginning always with the cation exchange column. This is because any hardness contained in the raw water may precipitate with caustic soda, so that decationised water must be used for the regeneration and rinse of the anion exchange column.

If soft water is available on the site, use it rather than raw water containing hardness for the first regeneration. After the first regeneration, using raw or soft water, the water produced by the ion exchange system will not be as good as that of the subsequent cycles, but will be of sufficient quality to clean the pipes, tanks and other parts of the system.

Regenerate the cation column normally, except that the dilution water will be raw water, and continue the acid displacement and fast rinse as prescribed. Then, use the water from the cation column (i.e. decationised water) to dilute the caustic soda and rinse the anion column after its regeneration.

N.B.: Another alternative is to use a cation exchange resin in the regenerated form. In this case make sure to calculate the volume based on the Na form taking into account the reversible swelling. Preferably, the anion resin should be loaded into its column using decationised water, i.e. after cation resin regeneration.

SCHEMATICS OF REGENERATION

The regeneration schematics shown here are valid for any regeneration, including the initial one. There may be however a few differing details:

Backwash

In counterflow regenerated plants, the resin should not be backwashed after each run. It should be thoroughly backwashed before the initial regeneration, and then only when necessary, e.g. when the pressure drop across the resin bed exceeds more than 1.5 times its normal value, or when large amounts of suspended matter have entered the bed.

Regenerant dilution

Caustic soda must be diluted with demineralised water. Only for the first regeneration, when such water is not available, must NaOH be diluted with decationised water, as shown above in steps 5 and 6. For subsequent regenerations, these steps must be done with demineralised water. Acid must be diluted with decationised or demineralised water. It is often simpler in design and operation to use demineralised water throughout. For the initial regeneration only, softened water or filtered water can be used.
**Packed beds**

Amberpack and some other packed bed systems operate exactly the opposite way: the service run is performed upflow, and regeneration is downflow. All principles presented here remain valid for such systems. Only the direction of flow must be reversed in each step. Backwash, when required, is done upflow, in an auxiliary column.

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**Example of regeneration schematics**

![Regeneration Schematics](image)

*This example is for downflow loading, upflow regeneration with bed holddown*

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