Ion Exchange-Principle

Ion Exchange resins are insoluble granular substances which have in their molecular structure acidic or basic radicals that can be exchanged. The positive or negative ions fixed on these radicals are replaced by ions of the same sign in solution in the liquid in contact with them.

The ion exchange is complete without:

- deterioration or solubilisation
- changing the total number of ions in the liquid before the exchange

Now days, the ion exchange substances are used almost exclusively under the name of resins. There are two categories of resins: the resins of the **gel** type and those of the **macroporous** or loosely cross-linked type. Their basic structure is identical: the macromolecular structure is obtained in both cases by co-polymerization. The difference between them lies in their porosity.

Gel type resins have a natural porosity limited to intermolecular distances. It is a **microporous** type structure

Macroporous type resins have an additional artificial porosity which is obtained by adding a substance designed for this purpose.

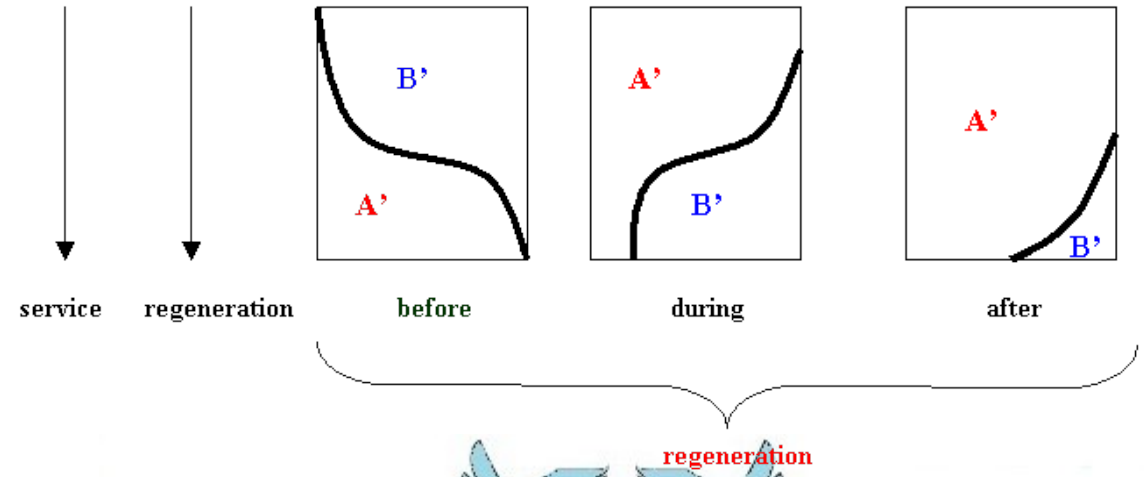
The exchanger is known as **monofunctional** if there is only one variety of radicals and it is called **polyfunctional** if the molecule contains various type of radicals.

Ion Exchanger - Regeneration

There are two types of regeneration: **cocurrent** regeneration and **countercurrent** regeneration.

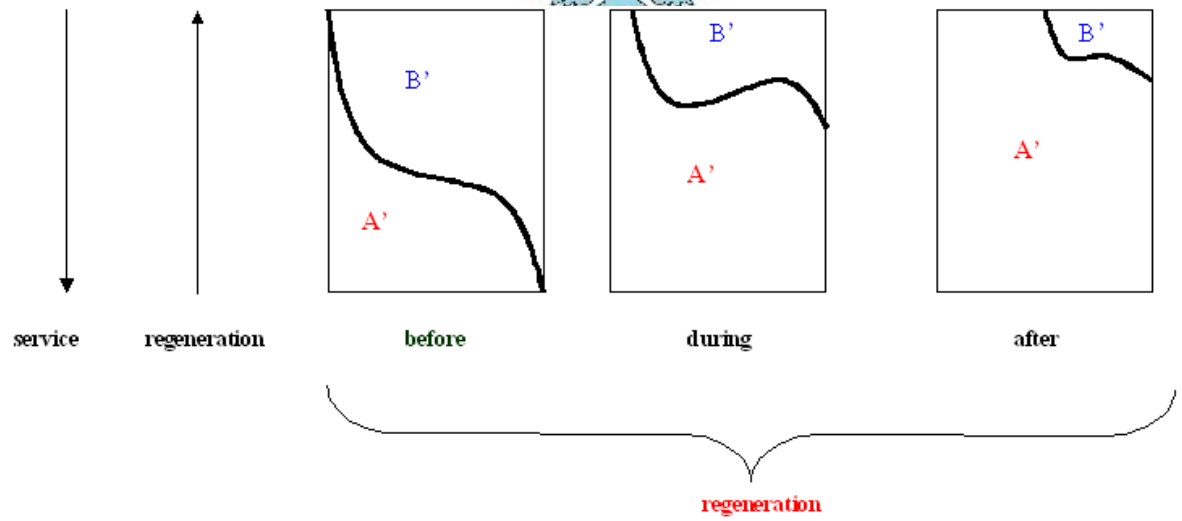
Cocurrent regeneration:

Regeneration is carried out by causing a concentrated solution of A' ions to flow through the exchanger in the same direction.



Coutercurrent regeneration:

Regeneration is carried out by causing a concentrated solution of A' ions to flow through the exchanger in the opposite direction.



Ion Exchanger-Vocabulary

Exchange capacity: This is the weight of ions that can be retained per unit volume

(or sometime per unit weight) of the exchange material concerned

Bed volume: volume per hours of liquid to be treated / volume of resin

Ion flux: Bed volume * salinity of water

Regeneration level: weight of reagent used / volume of ion exchange material

Regeneration rate: 100* (grams-equivalents of regenerating reagent)/ (grams-equivalents of the eluted ions)

Regeneration efficiency: This is the opposite ratio above

Ion leakage: This is the concentration of unwanted ion left in the treated liquid

Breakthrough: This is the maximum permissible ion leakage requiring the production cycle to be shut down.

Attrition: mechanical wear of the exchanger grains as they are being used.