

Water

Water for Industries

- 1. Water for alcoholic distilleries**
- 2. Water for boiler**
- 3. Water for sugar industries**
- 4. Water for paper mills**
- 5. Water for alcoholic breweries**
- 6. Water for dye industries**
- 7. Water for cooking**
- 8. Water for laundries**

Sources of Water

1. Surface Water

a. Lake

b. River

c. Sea

d. Ocean

2. Underground Water/subsurface water

Main Quality Characteristics of water

1. Alkalinity:

a. HCO_3^- = Bicarbonate Alkalinity

b. CO_3^{--} = Carbonate Alkalinity

c. OH^- = Carbonate Alkalinity

2. Hardness

a. Temporary hardness



b. Permanent hardness



c Total Hardness

Temporary hardness + Permanent
hardness

Units of Hardness

$1\text{mg/L} = 1\text{ppm} = 0.1\text{French} = 0.07\text{ degree Clark}$

3. Total Solids-

The quantity of non volatile substances present in water in a colloidal and dispersed state called total solids

It is expressed in mg/kg

Ex.- Sulphate residue - MgSO_4 , CaSO_4

Carbonate residue- MgCO_3 CaCO_3

Fixed residue- MgO CaO

Mineral residue- SiO_2 , Al_2O_3

iv) Transparency:

The concentration of suspended solids characterizes the transparency.

It is determined by weight method and type method.

v) Silica Content:

The concentration of silicic acid measured as Silica present in natural water is called silica content.

Potability of water

-Suitable for drinking purpose

-Purity of water

- (i) The presency of Mn and Fe with appreciable concentration impart colour of the water.
- (ii) Algae
- (iii) Corrosion of metal pipe
- (iv) Bacteria (Bacteria reduces SO_4^{2-} to S^{2-} which produces H_2S).
- (v) Organic matter.
- (vi) Industrial wastes and sewage.
- (vii) Certain microbes etc.

2.	Turbidity	10	May be relaxed up to 25 in the absence of alternate.
3.	pH	6.5 to 8.5	May be relaxed up to 9.2 in the absence.
4.	Total Hardness	300	May be extended up to 600
5.	Calcium as Ca	75	May be extended up to 200
6.	Magnesium as Mg	30	May be extended up to 100
7.	Copper as Cu	0.05	May be relaxed upto 1.5
8.	Iron	0.3	May be extended up to 1
9.	Manganese	0.1	May be extended up to 0.5
10.	Chlorides	250	May be extended up to 1000
11.	Sulphates	150	May be extended up to 400
12.	Nitrates	45	No relaxation
13.	Fluoride	0.6 to 1.2	If the limit is below 0.6 water should be rejected. Max. limit is extended to 1.5.
14.	Phenols	0.001	May be relaxed up to 0.002
15.	Mercury	0.001	No relaxation
16.	Cadmium	0.01	No relaxation
17.	Selenium	0.01	No relaxation
18.	Arsenic	0.05	No relaxation
19.	Cyanide	0.05	No relaxation

A) Sterilization and Disinfection of water

Chemical Method

i)Aeration: Reaction of water with air.

a)Natural aeration b)Artificial aeration

ii)Use of potassium permanganate: Use of potassium permanganate to purify water.

iii) Ozonization: Ozone gives nascent oxygen which act as a germicide.

iv)Belching powder method: Disinfection of water by belching powder method is cheapest and effective.

Physical Method:

i)Boiling: Disinfection of water after 10-15min.boiling.

ii)Exposure to sunlight: Sunlight is useful to destroying bacteria.

iii)Irradiation with ultrasound: Oscillation at frequencies over 20,000Hz are termed as ultrasonic. It is useful to destroying bacteria.

B) Softening of water

The process of removing hardness of water is known as softening of water.

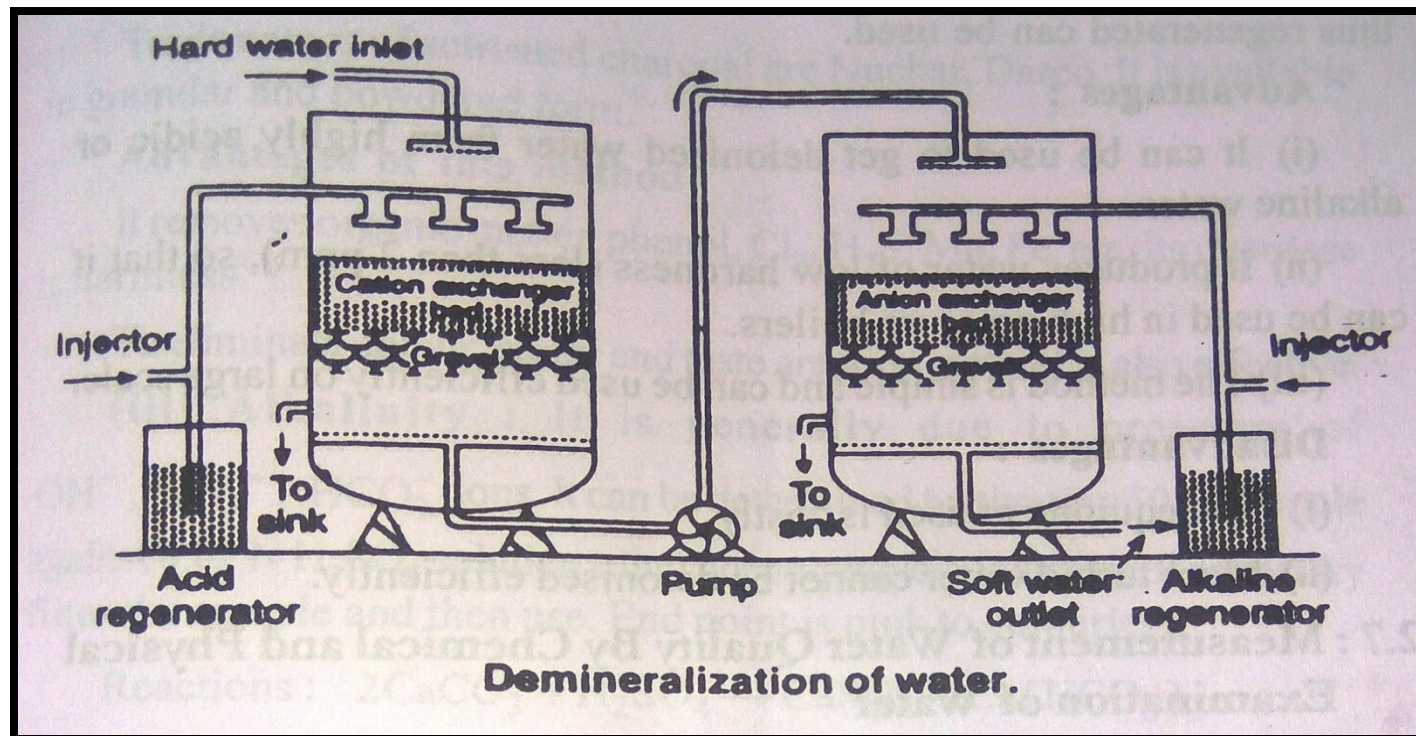
- a) Lime-soda process b) Clarks process c) Permutit or Zeolite process
d) Ion exchange process

Ion exchange process:

Principle:

The substance which are able to exchange ions with solution of electrolytes termed ion exchangers.

Two type ion exchangers a) Cation-Amberlite IR-420 b) Anion- Amberlite 400



Process:

Regeneration of columns

Cation exchange columns can be regenerated passing dil. HCl

Anion exchange columns can be regenerated passing dil. NaOH

Advantages :

1. Obtain deionized water
2. Produces water for low hardness water
3. Simple method

Disadvantages:

1. Costly method
2. Turbid water cannot deionised

Water Quality Parameter:

1.Colour

2.Taste

3.Alkalinity

4.Turbidity

5.Suspended Solids

6.Hydrogen ion concentrations

7.Acidity

8.Dissolved Oxygen(DO)

9.Biological Oxygen Demand(BOD)

10.Chemical Oxygen Demand(COD)

Thank you.....