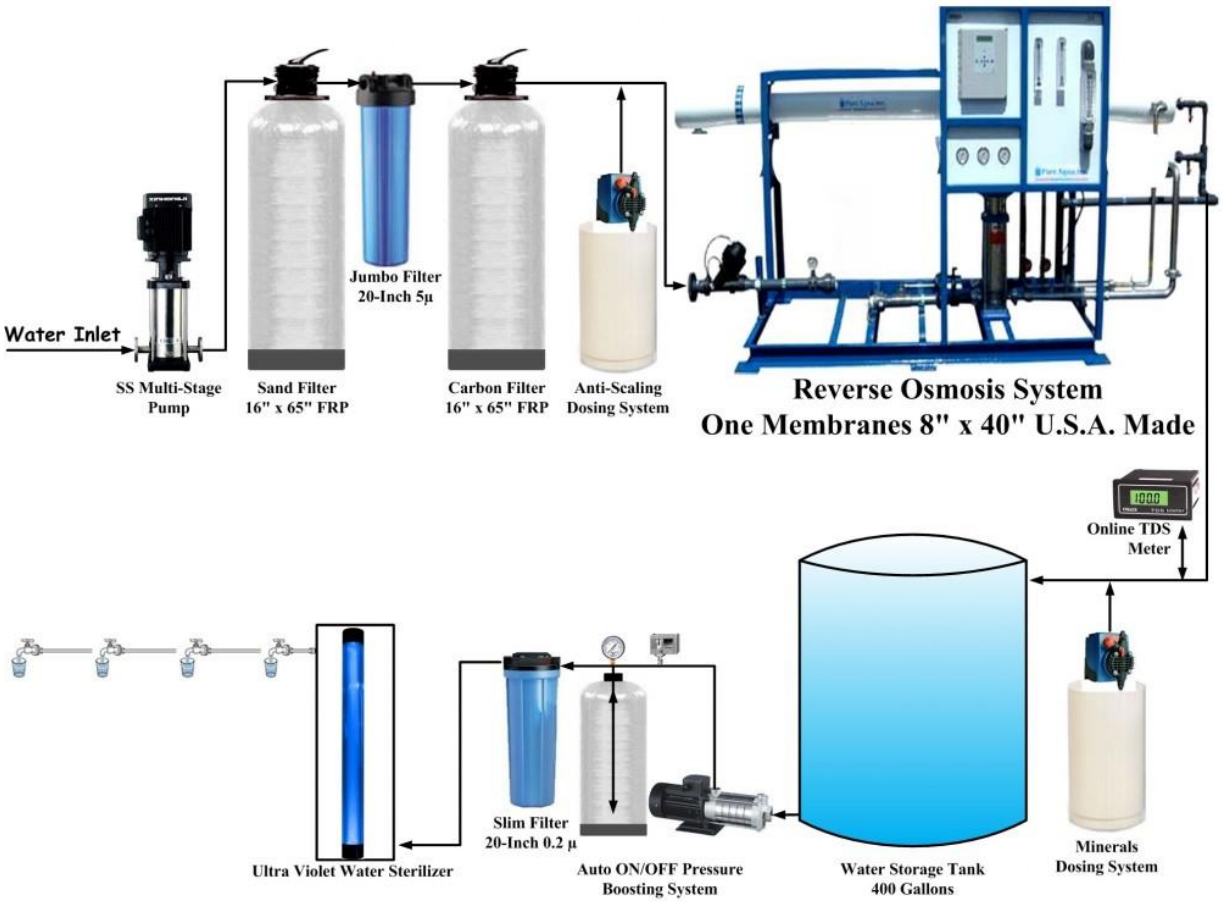
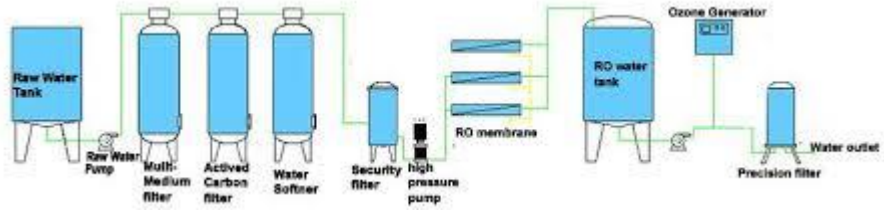
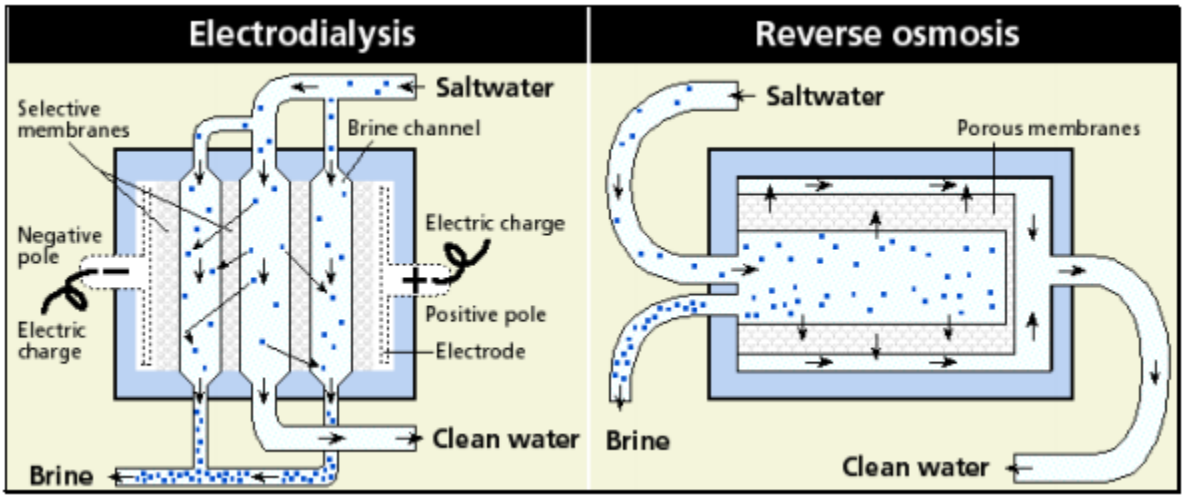
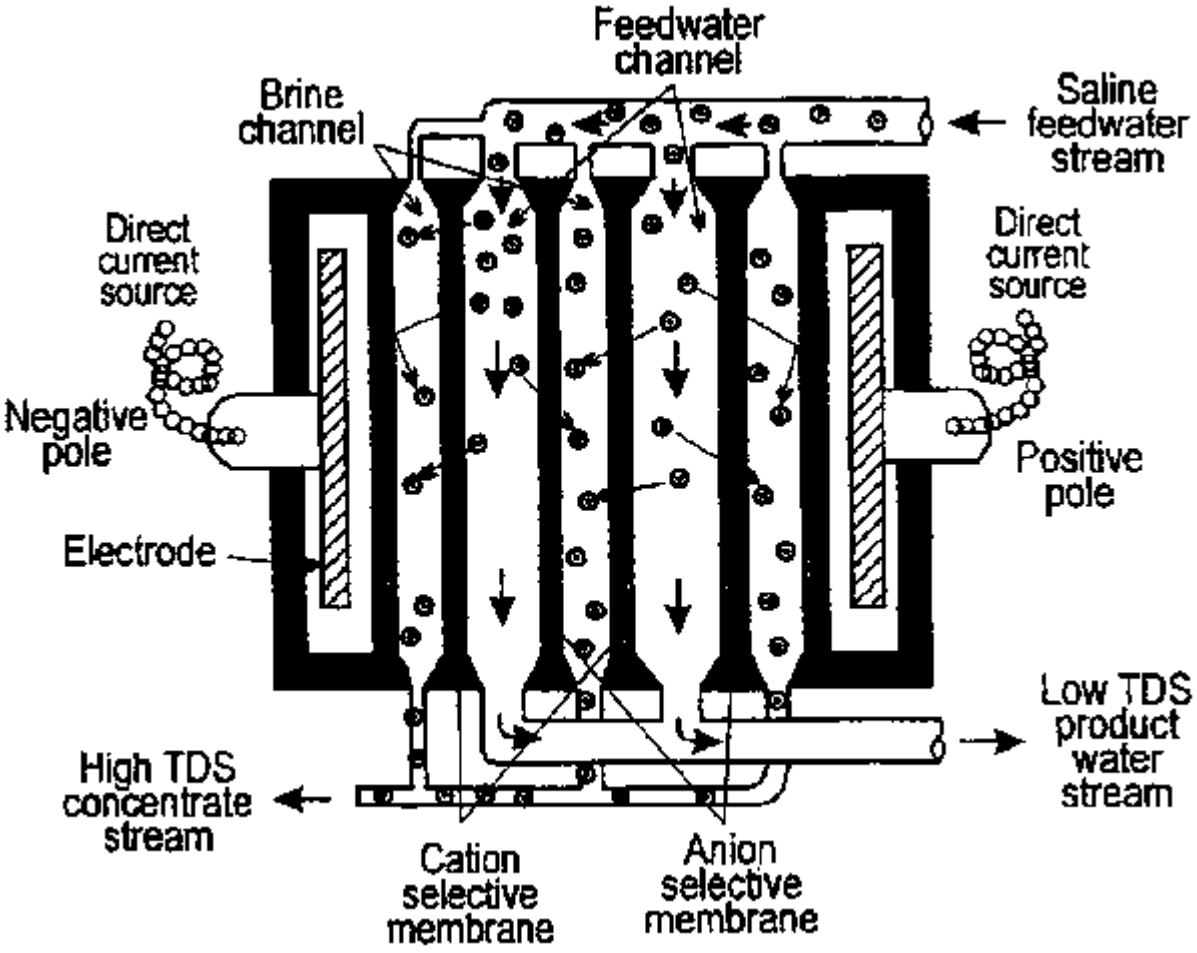

sand filter
carbon filter
membrane housing
water softener
pressure gage
flow meter
corductivity meter
control cabinet
frotec.en.alibaba.com
security filter
high pressure pump

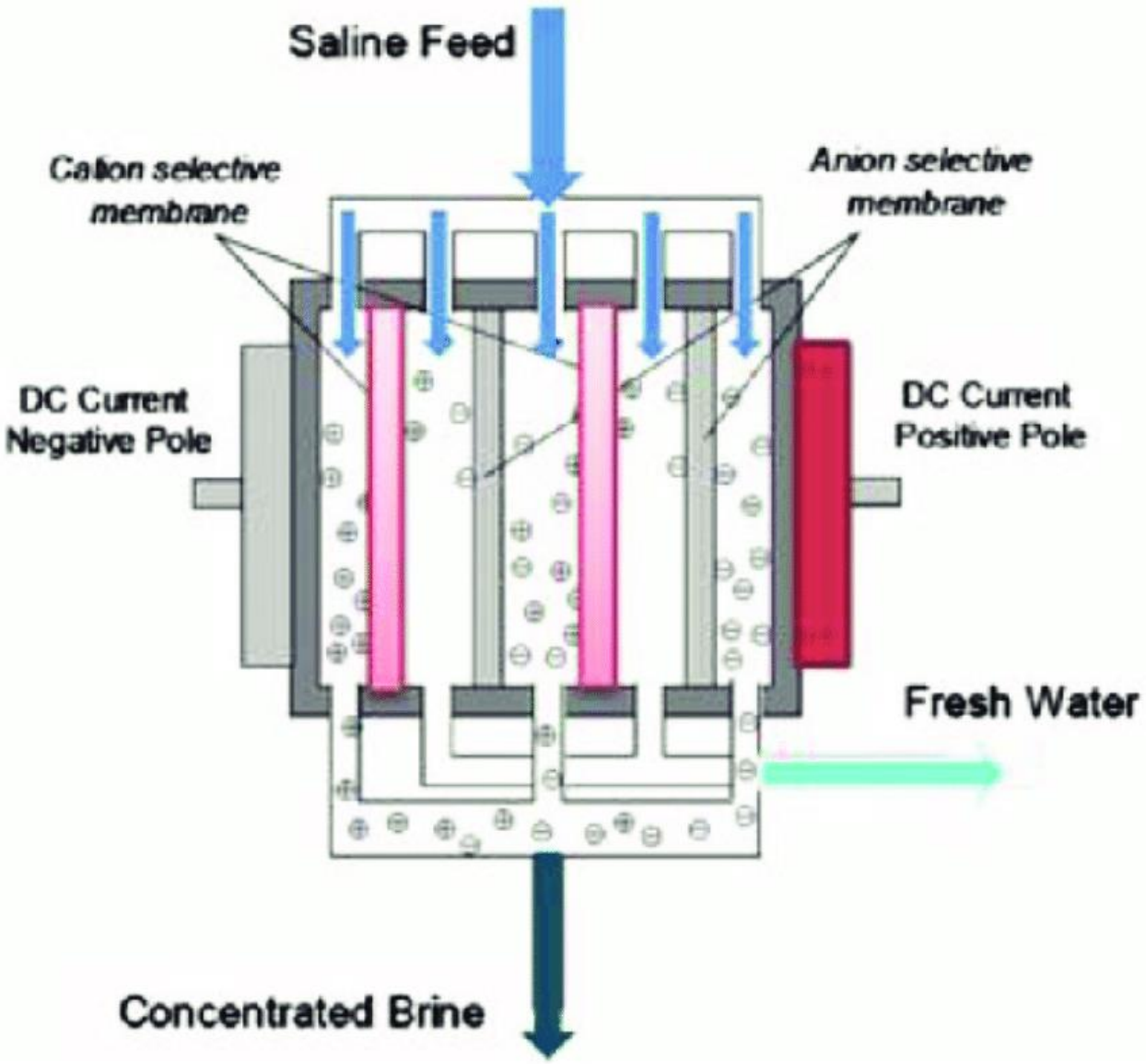
REVERSE OSMOSIS WATER PURIFICATION SYSTEM FOR DRINKING
Capacity: 1000 Ltr/hr

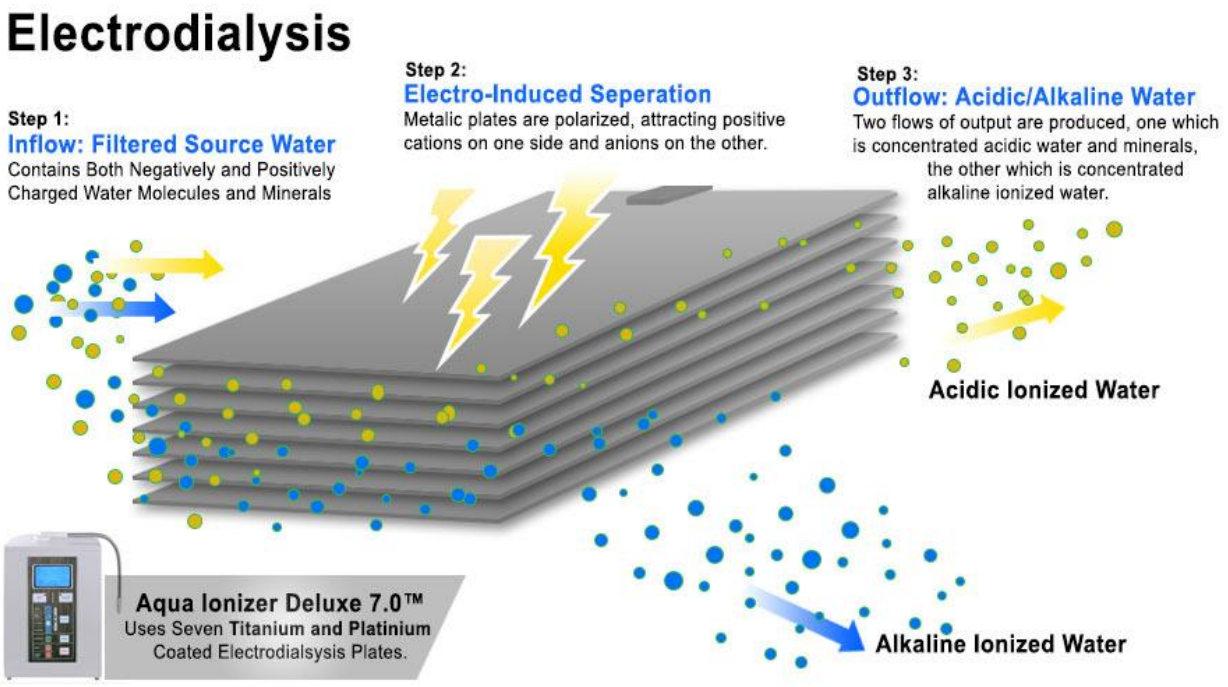





Electrodialysis
Reverse osmosis
Saltwater
Selective membranes
Brine channel
Electric charge
Negative pole
Positive pole
Electric charge
Electrode
Clean water
Brine
Saltwater
Porous membranes
Brine
Clean water

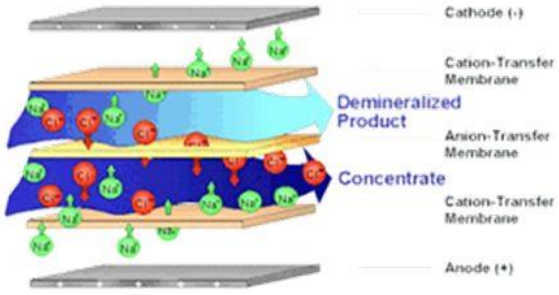

Feedwater channel
Brine channel
Saline feedwater stream
Direct current source
Direct current source
Negative pole
Positive pole
Electrode
Low TDS product water stream
High TDS concentrate stream
Cation selective membrane
Anion selective membrane


Saline Feed
Cation selective membrane
Anion selective membrane
DC Current Negative Pole
DC Current Positive Pole
Fresh Water
Concentrated Brine

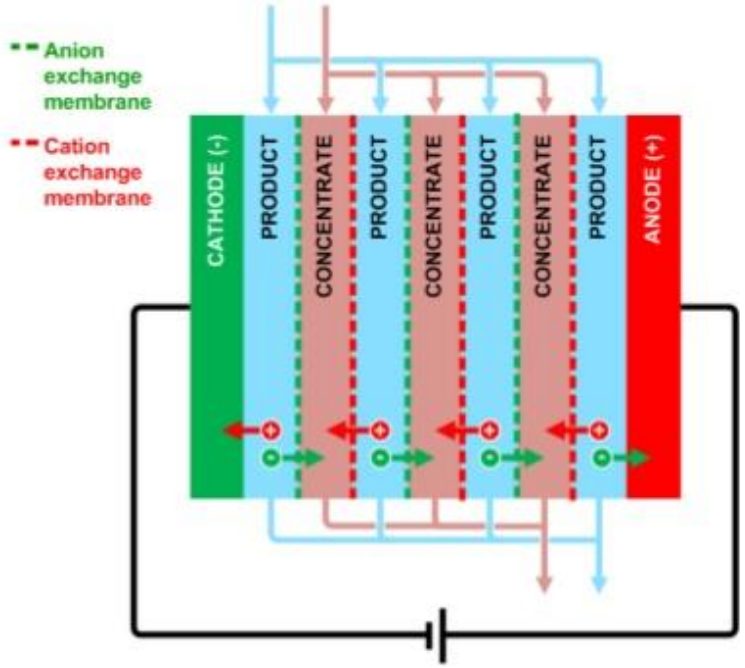


Electrodialysis (ED)

- Operation by which ions diffuse through ion-exchange membrane under the influence of electric potential
- Ion exchange membranes
  - AEM: quaternary amines
  - CEM: carboxylates, sulfonates
- Plate and frame stacks
- Efficient for desalination of brackish water



Operating Principle

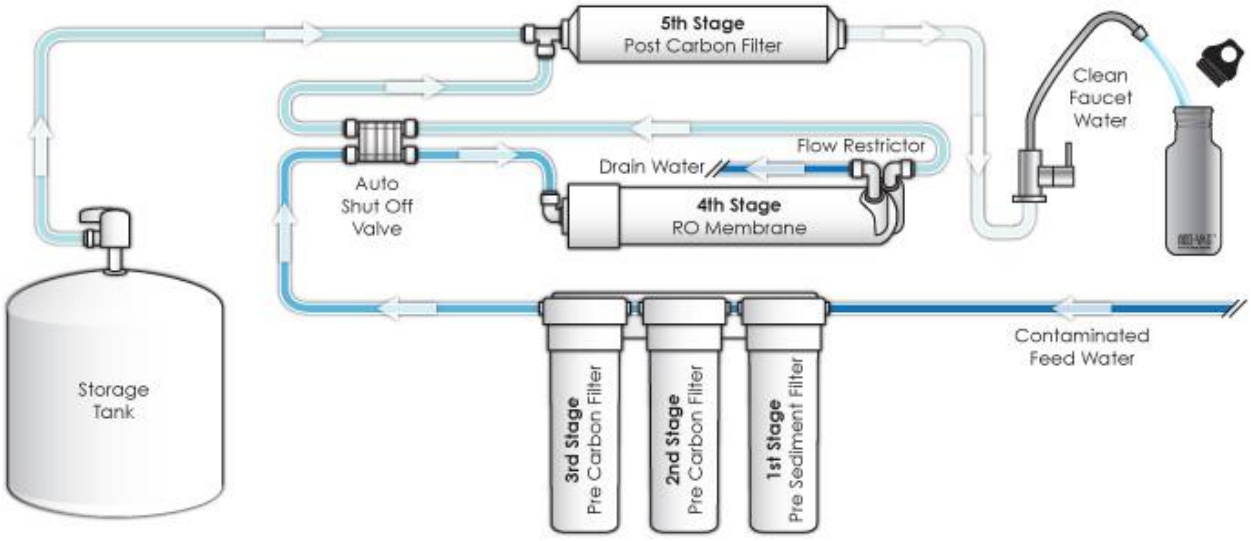


- Water flows parallel to the membranes.
- Positive ions flux through cation exchange membranes towards negatively charged cathode.

- Negative ions flux through anion exchange membranes towards positively charged anode.

- Water does not flux through the membranes.
- Product stream becomes purer while concentrate stream becomes more concentrated with ions.

Saltworks™



Reverse Osmosis (RO)

- a water purification technology that uses a semipermeable membrane.
- Also called membrane desalination process.
- Saltwater is forced through membrane sheets at high pressures.
- Pressure applied depends upon molar concentration
- Membrane sheets are designed to catch salt ions.

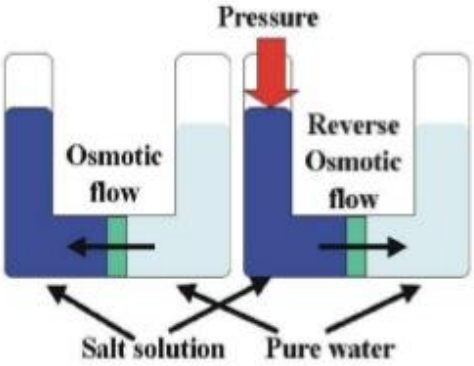
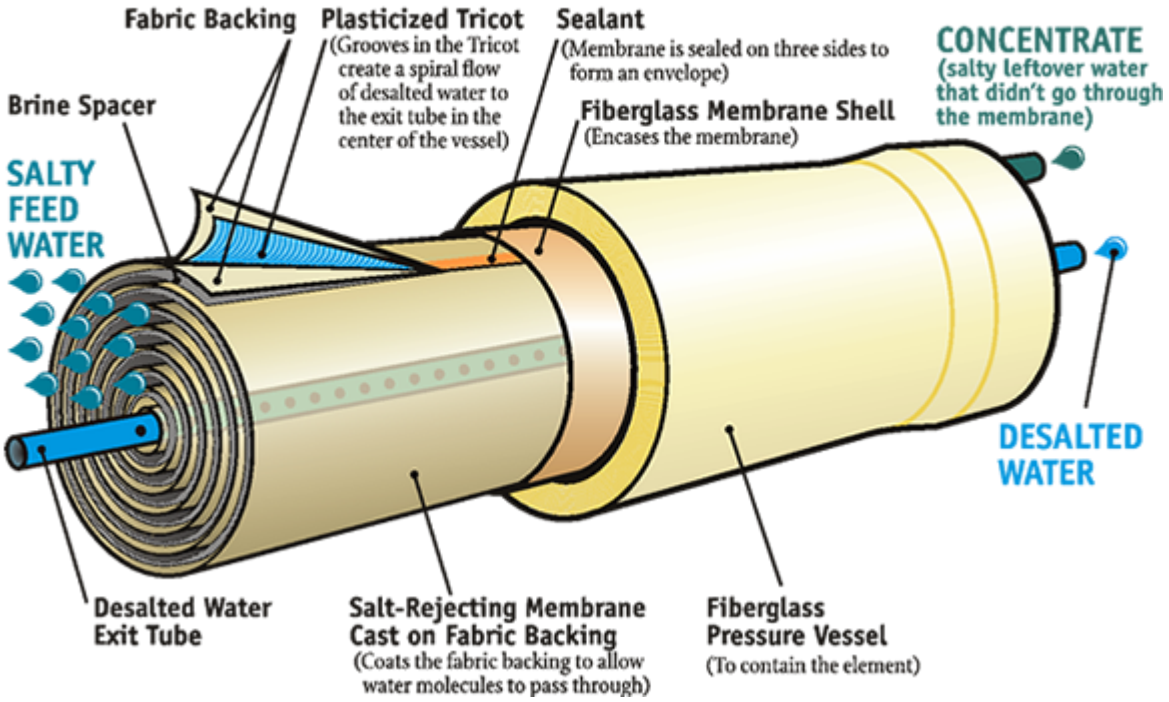
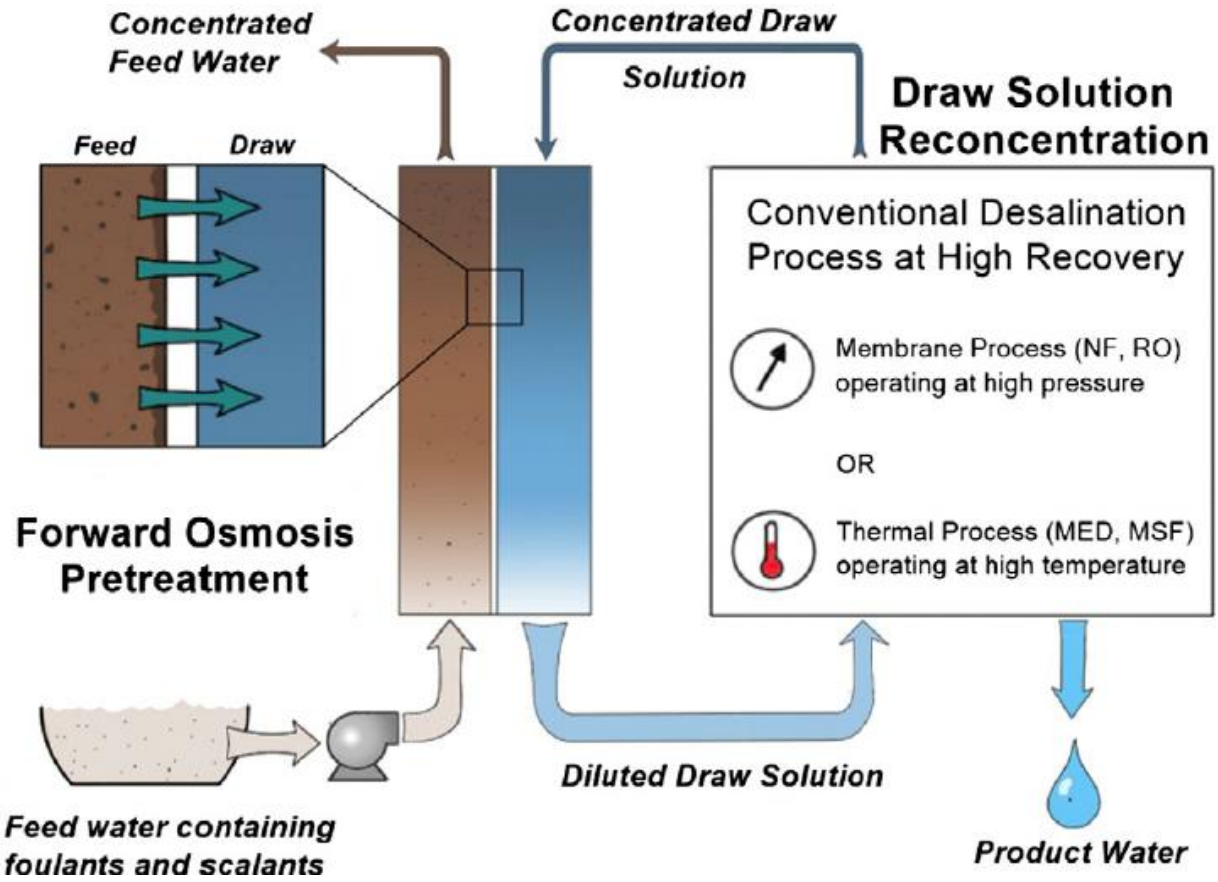
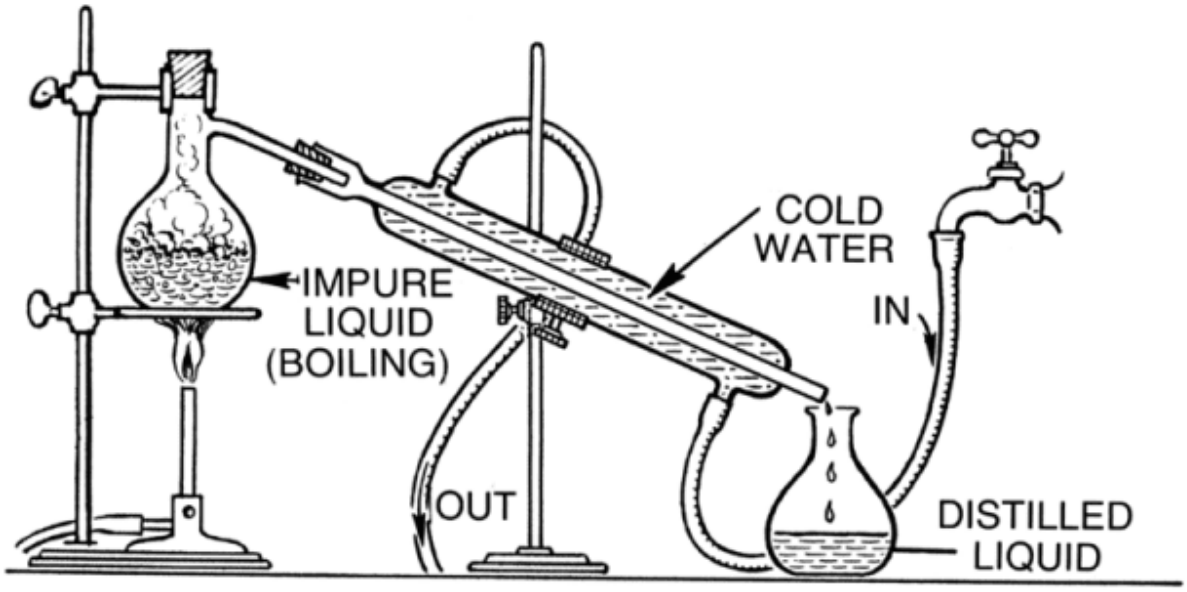


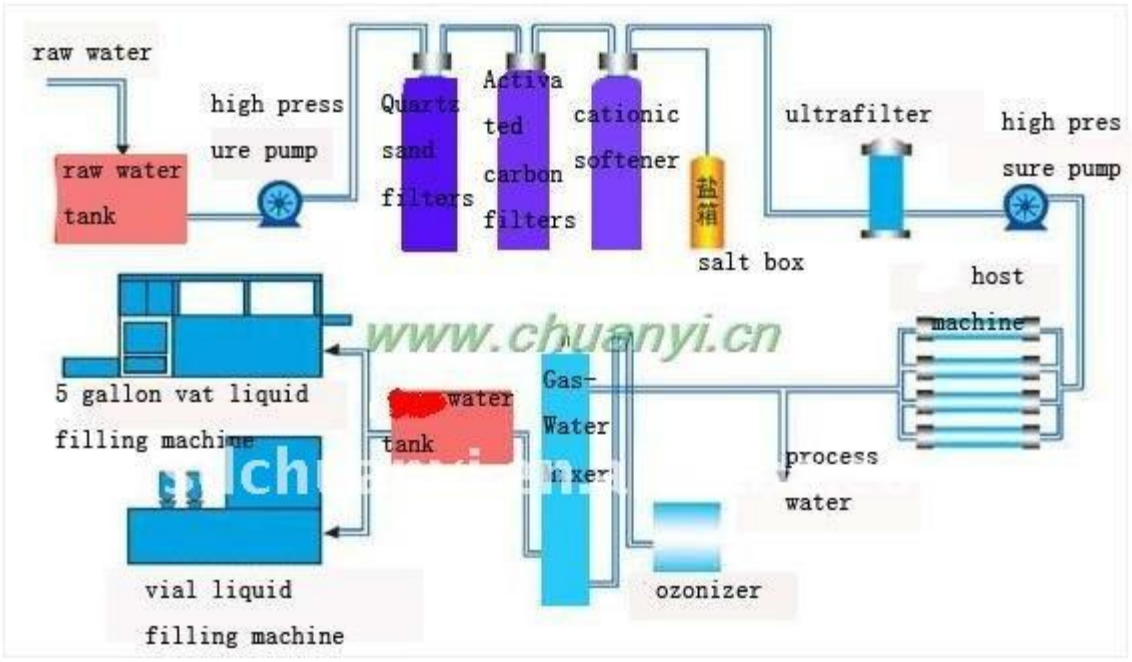
Fig: Osmotic and Reverse Osmotic flow

Reverse Osmosis Membrane Element inside a Pressure Vessel




Concentrated
Feed Water
Concentrated Draw
Solution
Draw Solution
Reconcentration
Feed
Draw
Conventional Desalination
Process at High Recovery
Membrane Process (NF, RO)
operating at high pressure
OR
Thermal Process (MED, MSF)
operating at high temperature
Forward Osmosis
Pretreatment
Diluted Draw Solution
Feed water containing
foulants and scalants
Product Water

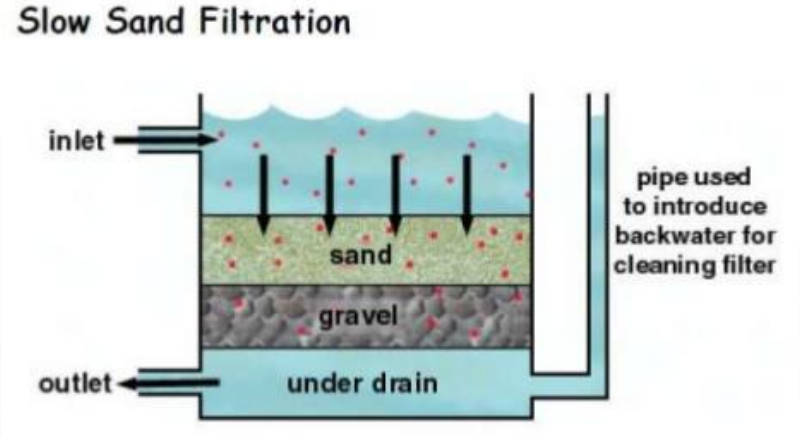

COLD
WATER
IN
IMPURE
LIQUID
(BOILING)
OUT
DISTILLED
LIQUID



SLOW SAND FILTERS:

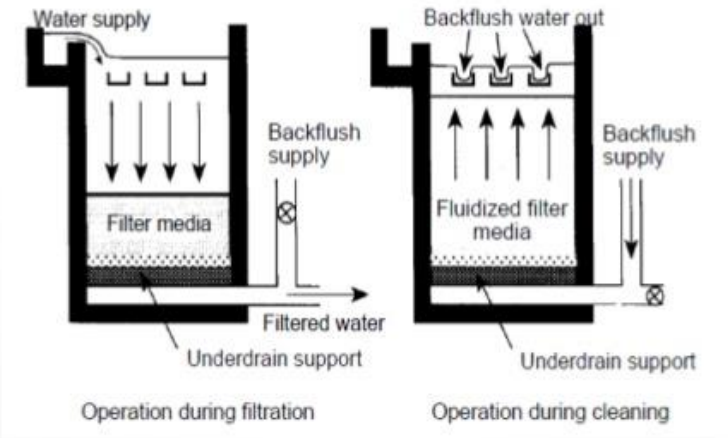
Purpose:

The water is allowed to pass slowly through a layer of sand placed above the base material and thus the purification process aims at simultaneously improving the biological, chemical, and physical characteristics of water.



Filter media of sand:

- Filtering medium: sand (effective size of sand particles 0.4-0.7 mm, coarse sand)
- Depth of sand bed: 1-1.5 feet deep
- Clogging of filters by suspended impurities and bacteria: Loss of Head
- Cleaning by back-washing daily or weekly for 15 minutes



Backwashing of filters

❖Filters are employed to remove particles from liquids. Water treatment filters that can be backwashed include rapid sand filters, pressure filters and granular activated carbon (GAC) filters.

❖filters are backwashed according to the proprietary arrangement of pumps, valves and filters associated with thedischarged without treatment to a sanitary sewer system or is treated and recycled within the filtration system.

❖Spent backwash water is either plant

Backwashing of granular media filters involves several steps. First, the filter is taken off line and the water is drained to a level that is above the surface of the filter bed. Next, compressed air is pushed up through the filter material causing the filter bed to expand breaking up the compacted filter bed and forcing the accumulated particles into suspension. After the air scour cycle, clean backwash water is forced upwards through the filter bed continuing the filter bed expansion and carrying the particles in suspension into backwash troughs suspended above the filter surface.

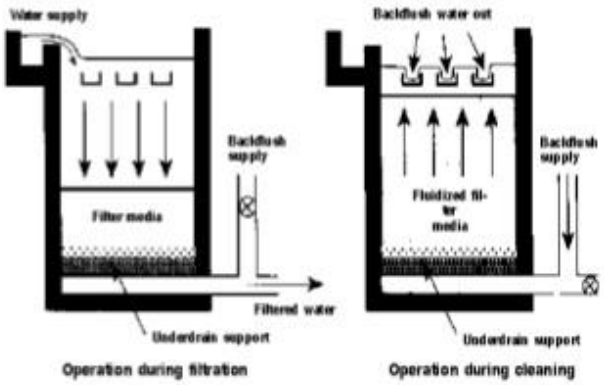
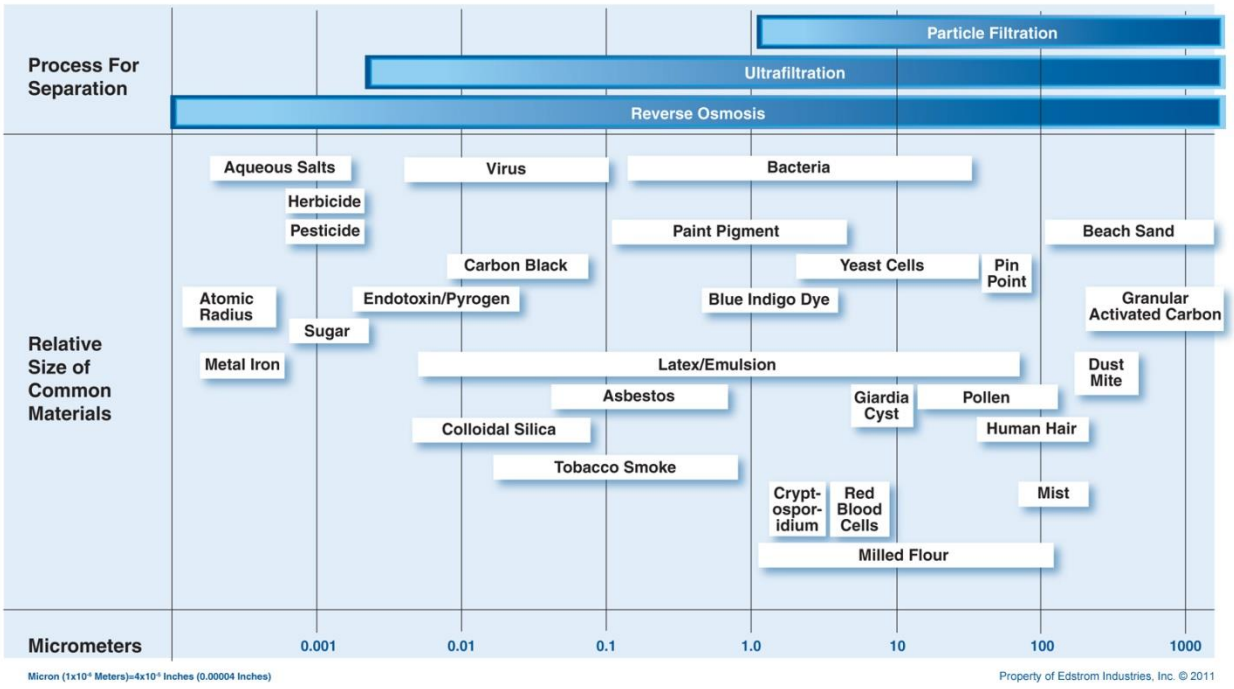
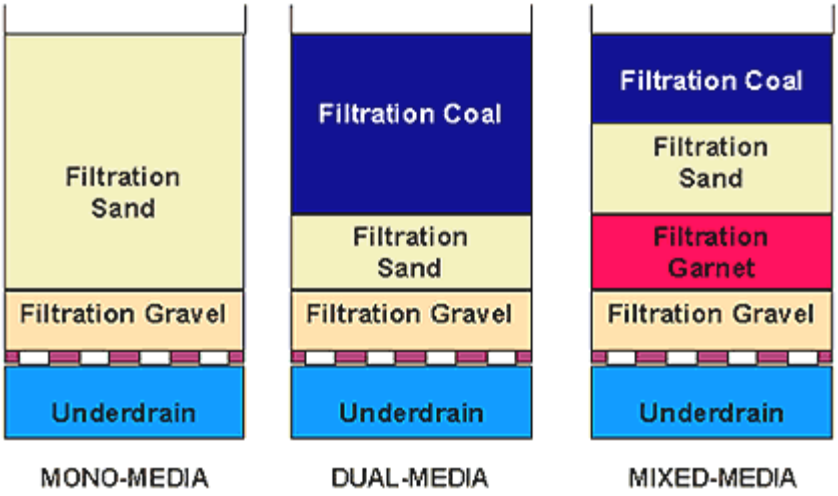


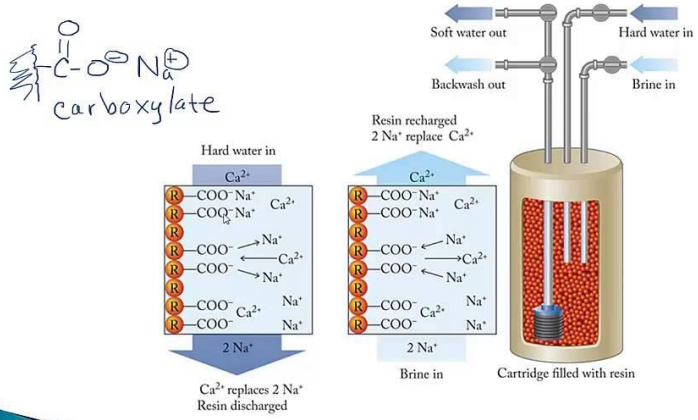
Figure 2. Cross-section of a rapid sand filter.

Water Purification Spectrum

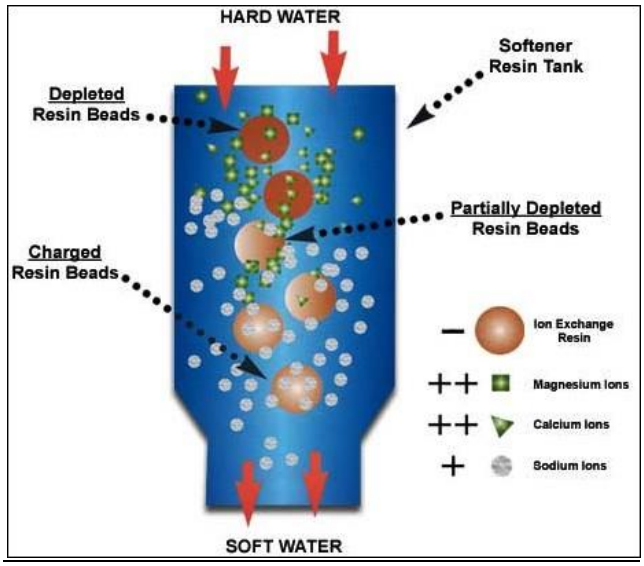


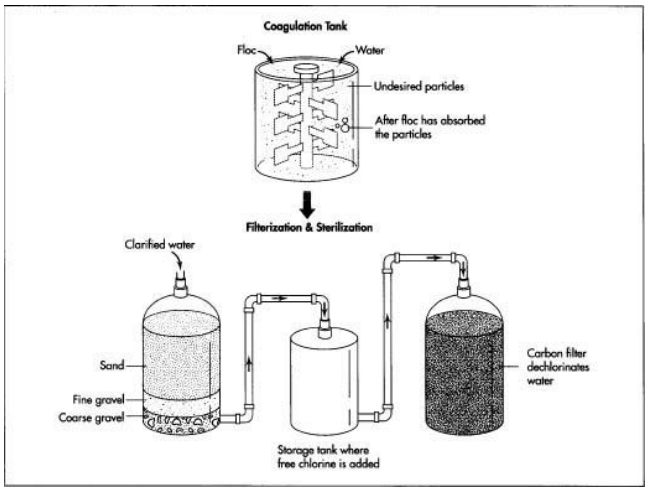


Ion Exchange to Soften Water

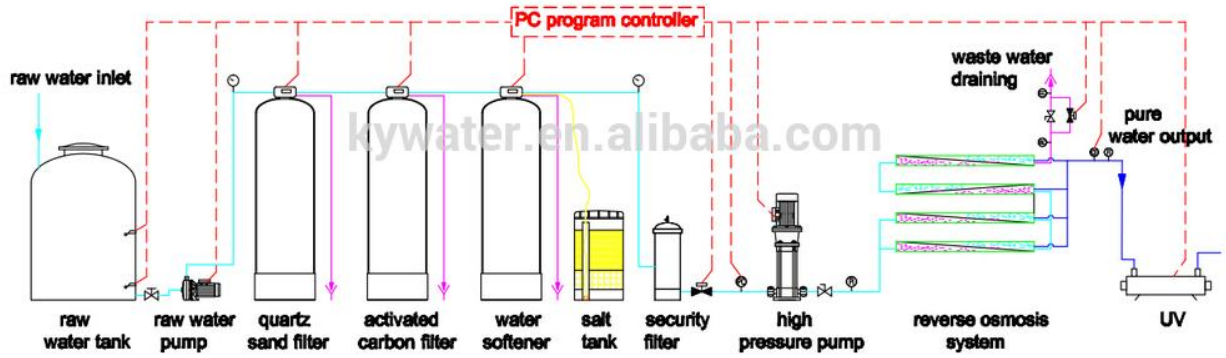


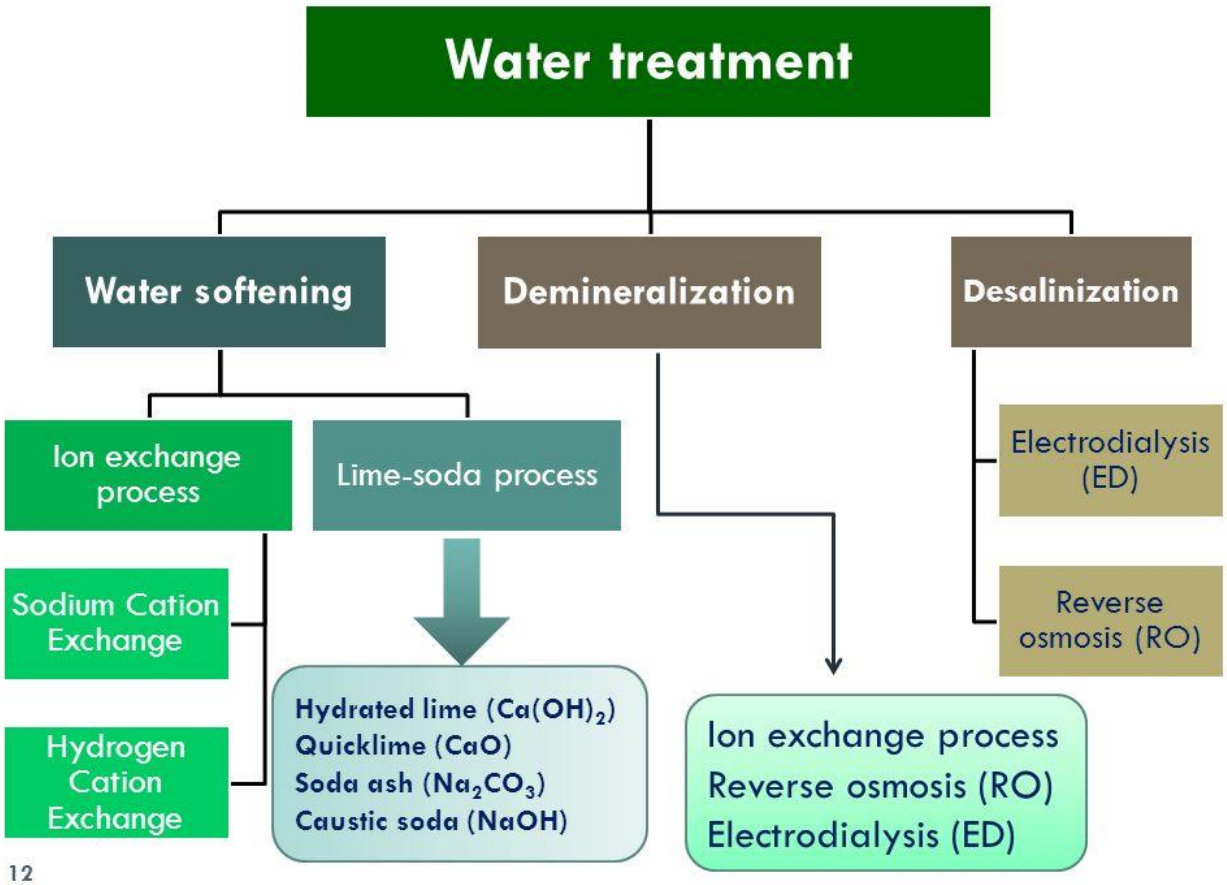
carboxylate

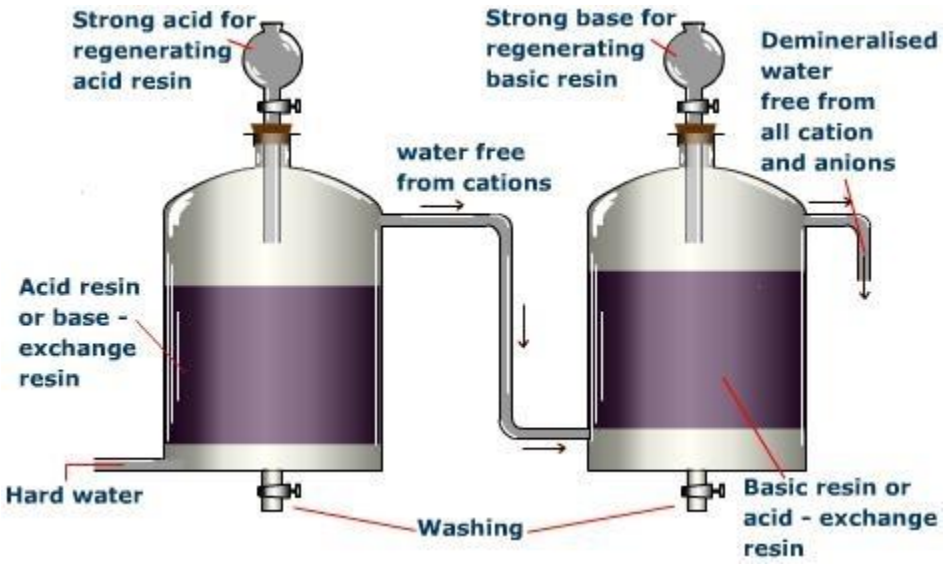


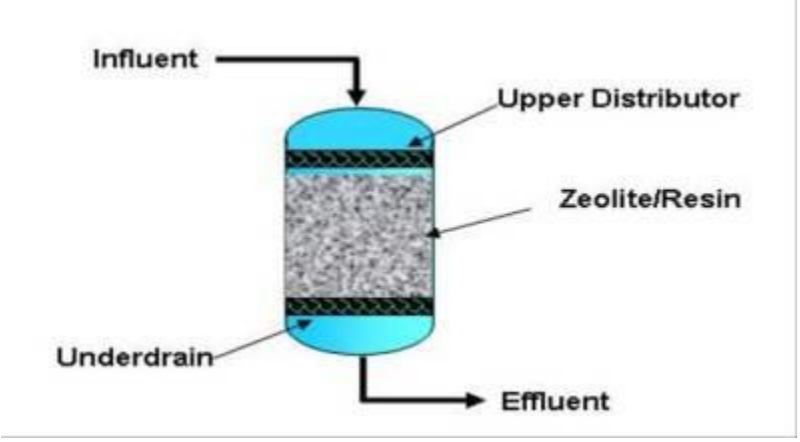


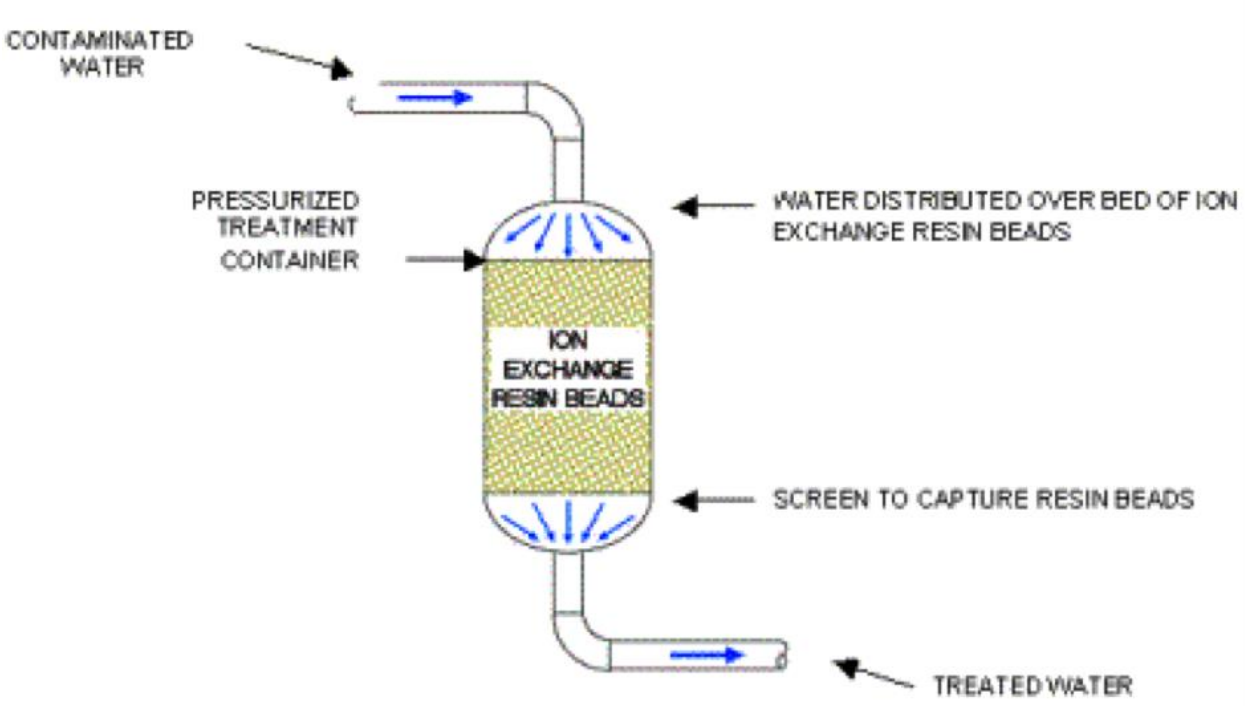
RO system process flow diagram





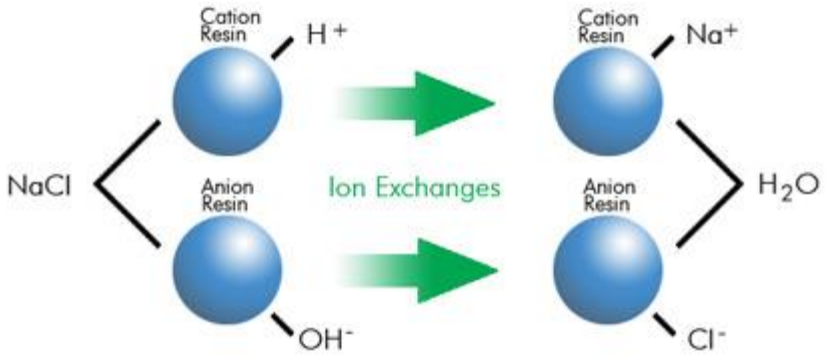

Strong acid for regenerating acid resin
Strong base for regenerating basic resin
Demineralised water free from all cation and anions
water free from cations
Acid resin or base - exchange resin
Hard water
Washing
Basic resin or acid - exchange resin

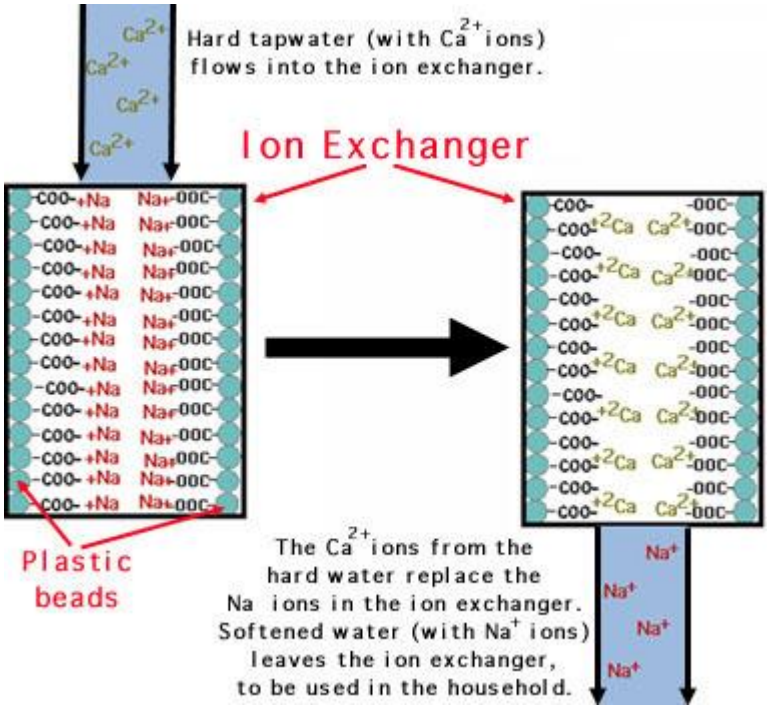

Influent
Upper Distributor
Zeolite/Resin
Underdrain
Effluent

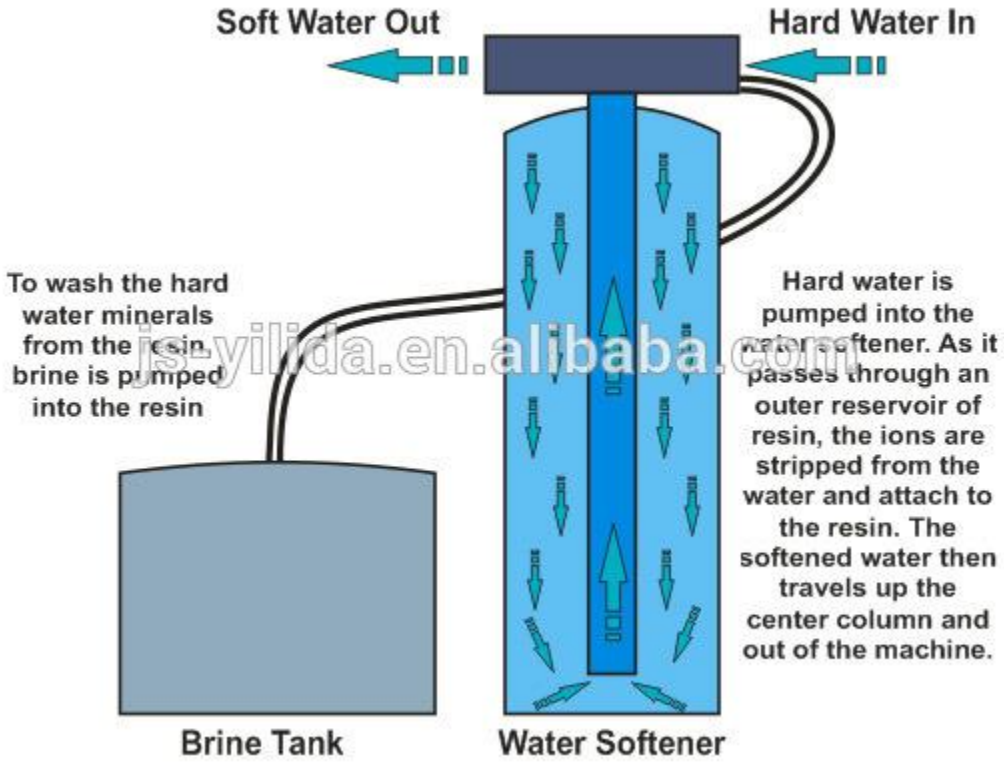


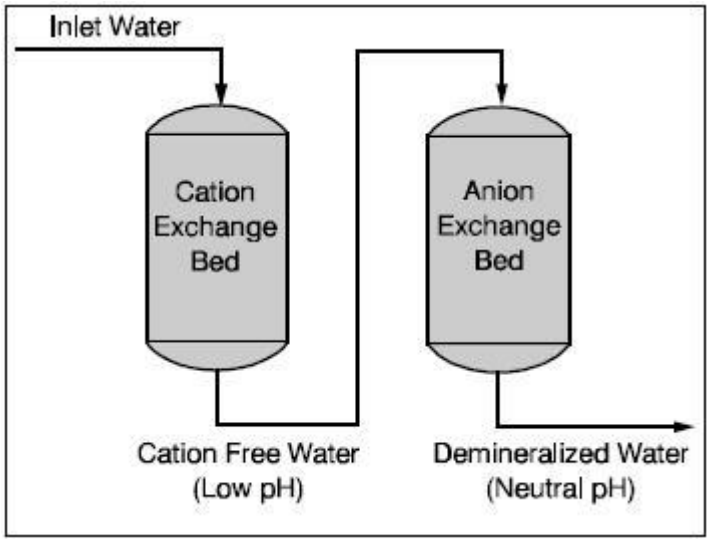
ION EXCHANGE TREATMENT PROCESS


For Separation & Replacement
For Hydrometallurgy Gold Refining
For Biochemical Pharmacy
Antibiotics Extraction
For Fruit Juice & Sweetener
For Pure Water Preparation
For Drink Water Treatment
For Wastewater Treatment
For Plant/Herbal Extraxtion
For Purification & Enrichment


Cation Resin
H +
Cation Resin
Na+
NaCl
Anion Resin
Ion Exchanges
Anion Resin
H2O
OH-
Cl-







Softening of Water

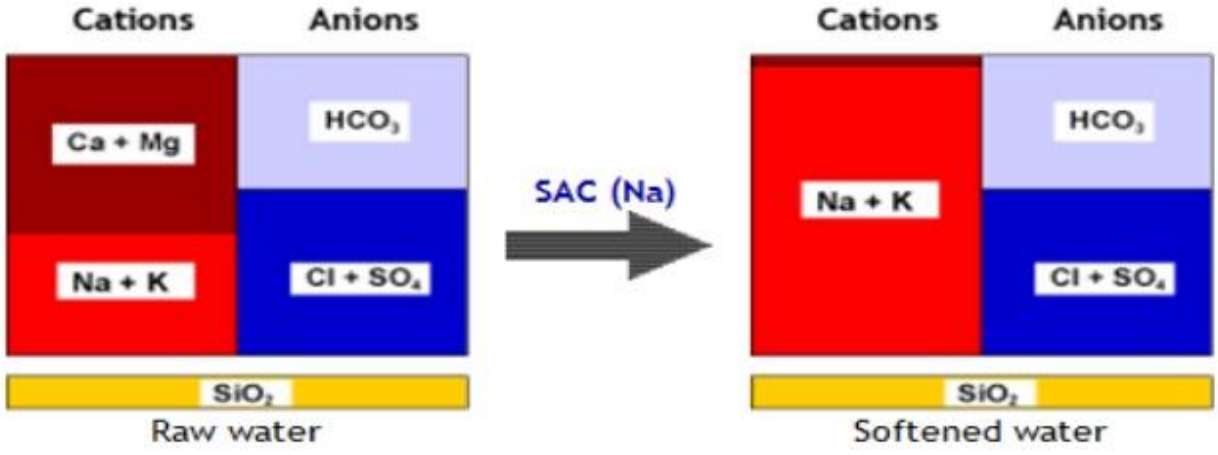
- Strongly Acidic Cation (SAC) exchange resin in sodium form is used in the water softening

  $2\ R\text{-}Na + Ca^{++} \rightarrow R_2\text{-}Ca + 2\ Na^{+}$ (here R represents resin)

- The resins, when exhausted, are regenerated with NaCl

  $R_2\text{-}Ca + 2\ Na^{+} \rightarrow 2\ R\text{-}Na + Ca^{++}$

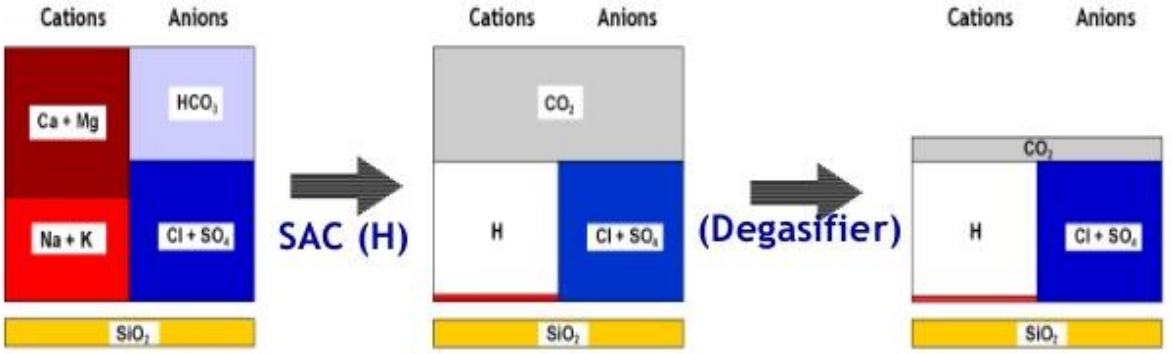
- A small residual hardness still remains in the water



Decationisation

- Practiced as a 1st stage of demineralization
  - sometimes used for condensate polishing
- Strongly acidic cation (SAC) exchange resin in H^+ form is used for the exchange of all cations with H^+ ions

  $R\text{-}H + Na^+ \leftrightarrow R\text{-}Na + H^+$
  - During regeneration (by using strong acid, HCl/H_2SO_4) the reaction is reversed $(R\text{-}Na + H^+ \leftrightarrow R\text{-}H + Na^+)$
- In the 2nd step, a degassifier is used to remove the CO_2



Raw water

Decationized water

Decat + degassed water

Ion Exchange

- Ion exchange uses a resin that removes charged inorganic contaminants like arsenic, chromium, nitrate, radium, uranium, and fluoride.
- It works best with particle-free water and can be scaled to fit any size treatment facility.
- Ion exchange is most often used to remove hardness (cation resin) or nitrate (anion resin).
- In both instances, it can be regenerated with salt water.
- The use of ion exchange to remove radionuclides (an atom with an unstable nucleus) is complicated by the fact that these materials accumulate in the resin and occur at high levels in the regenerant, greatly complicating operations.
- Activated carbon is generally preferred for removing organic contaminants, whereas ion exchanges often best for removing **inorganic soluble molecules**

Types of Ion Exchange Resin / Acid Cation Resins

Strong Acid Cation Resins

- Behaving like strong acid
- highly ionized in both the acid (R-SO3H) and salt (R-SO3Na) form.
- Metal salt can be converted to the corresponding acid.

  2(R-SO3H)+ NiCl2 --> (R-SO4),Ni+ 2HCI (5)
- They can be used for entire range of pH and are utilized for water softening (calcium and magnesium removal).
- The regeneration takes place by contact with a strong acid solution (hydrochloric or sulphuric)

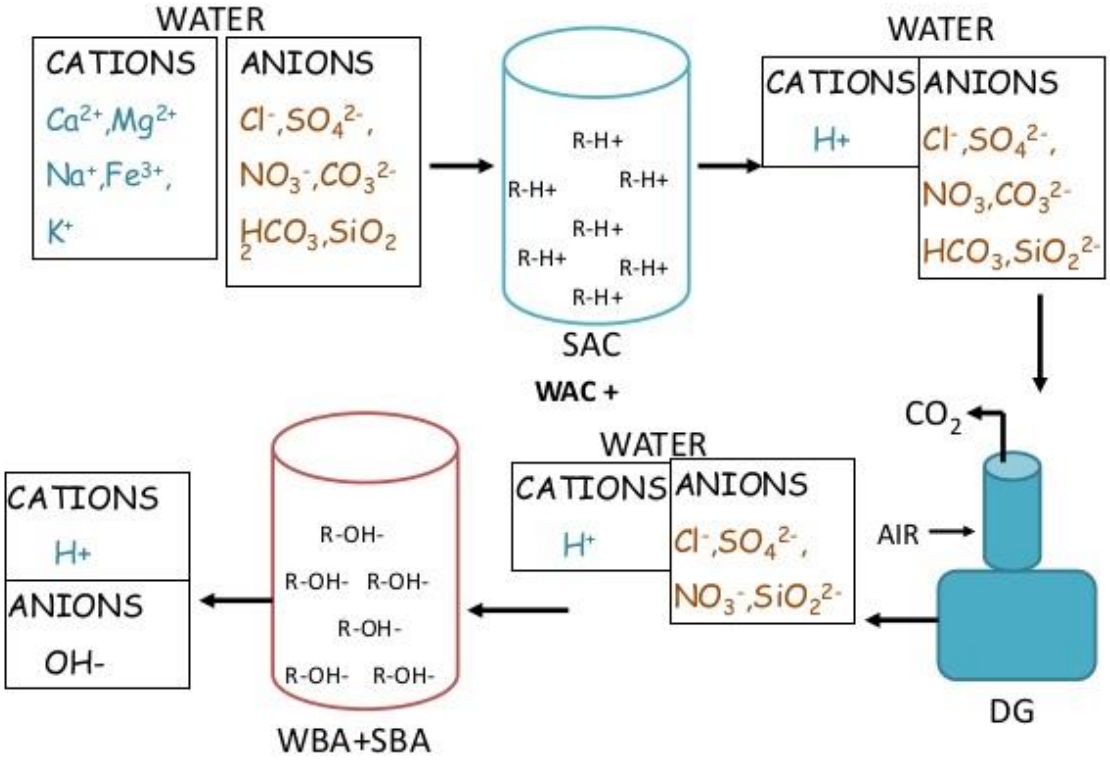
Weak Acid Cation Resins

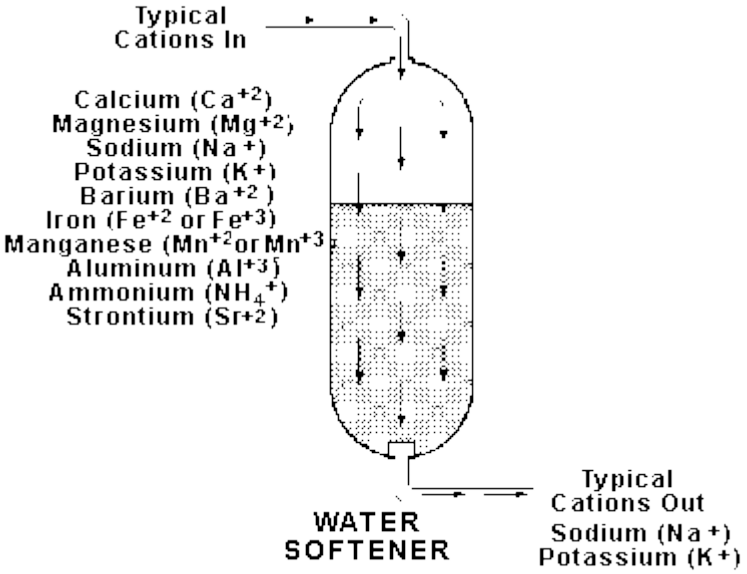
- Carboxylic acid (COOH) acts as the ionizable group in weak acid cation resins.
- They show more affinity for hydrogen ions. This results in the regeneration of the hydrogen form with less acid than is required for strong acid resins.

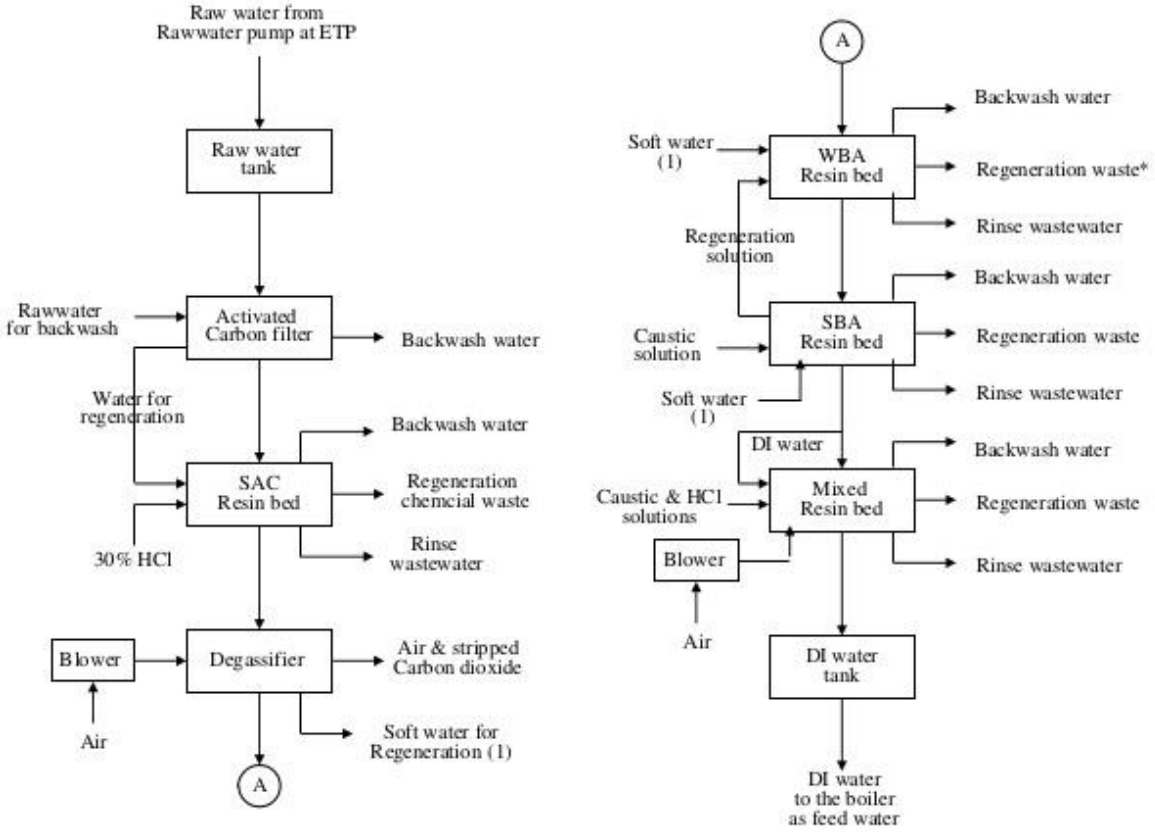
Ion Exchange

- The ion exchange process percolates water through bead-like spherical resin materials (ion-exchange resins).
- Ions in the water are exchanged for other ions fixed to the beads.
- The two most common ion-exchange methods are softening and deionization.
- Ion exchange materials are insoluble substances containing loosely held ions which are able to be exchanged with other ions in solutions which come in contact with them.
- Exchanges take place without any physical alteration to the ion exchange material.
- Ion exchangers are **insoluble acids or bases** which have salts which are also insoluble, and this enables them to exchange either positively charged ions (cation exchangers) or negatively charged ones (anion exchangers).
- Many natural substances such as proteins, cellulose, living cells and soil particles exhibit ion exchange properties which play an important role in the way the function in nature.

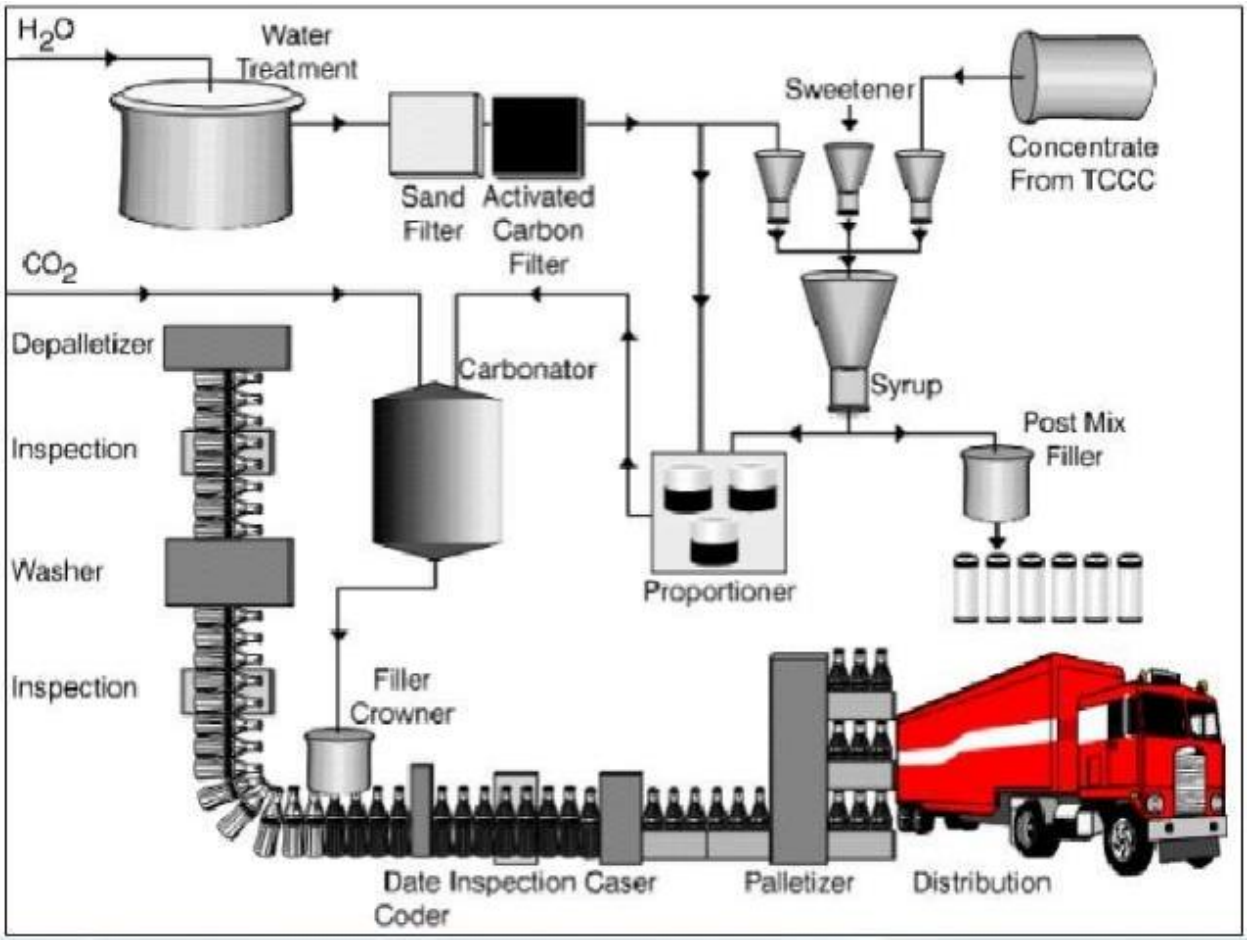
ION EXCHANGE - PROCESS CHEMISTRY



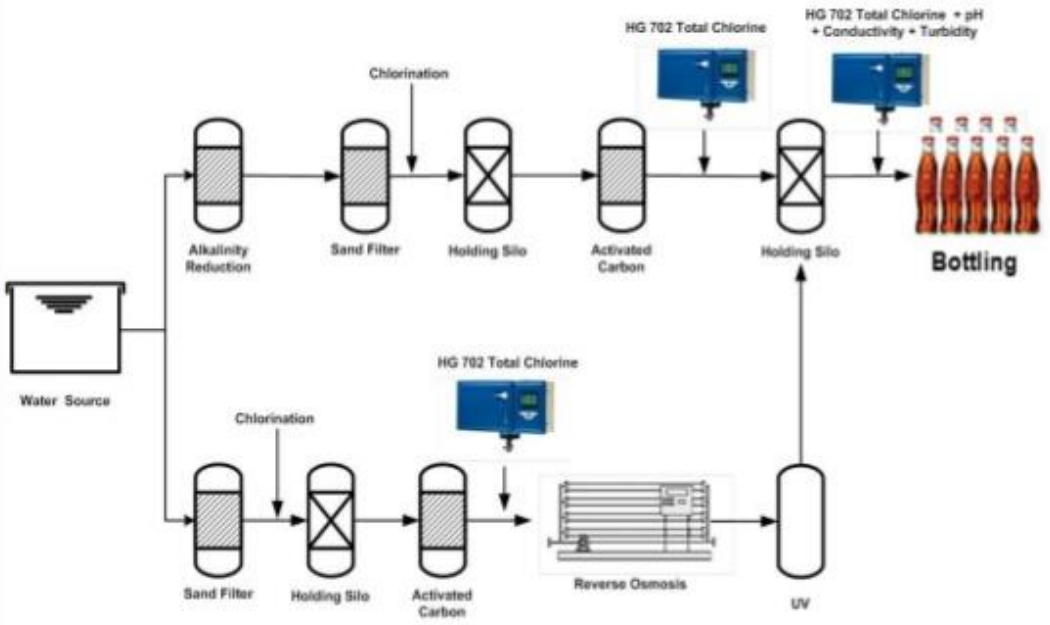




Demineralized Water Plant


H_2O
Water Treatment
Sand Filter
Activated Carbon Filter
Sweetener
Concentrate From TCCC
CO_2
Depalletizer
Carbonator
Syrup
Post Mix Filler
Inspection
Washer
Proportioner
Inspection
Filler Crowner
Date Coder
Inspection
Caser
Palletizer
Distribution

Coca-Cola Israel Water Monitoring Process



Process – Over View