Presentation

On

WTP

– 01 – Basic

Prepared By

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[Ameera Consultancy] (https://ameeraconsultancy.com/)

WTP – 01 – Basic

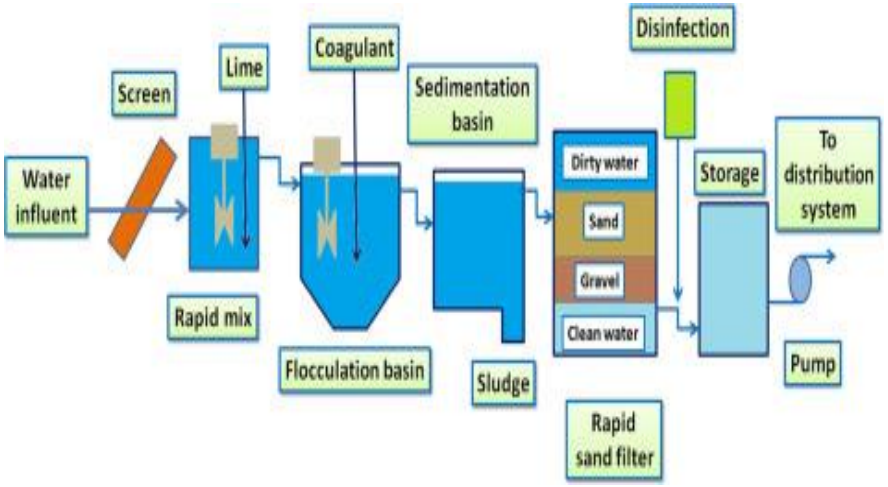
Introduction

Water Treatment is a process of

Removing Contaminants from **Water**

Process Including:

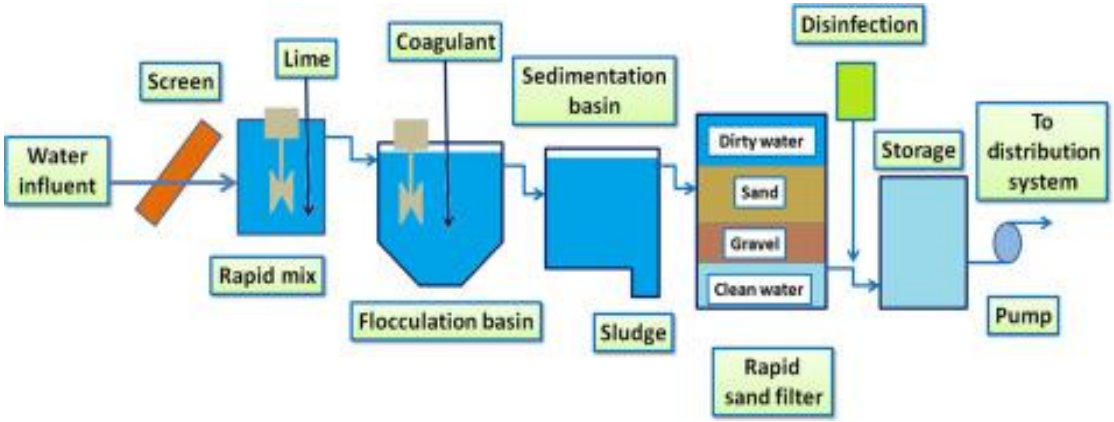
Physical Process
Chemical Process
Biological Process



Introduction

Whole Processing Includes:

01. Screening
02. Aeration
03. Coagulation, Flocculation
04. Sedimentation
05. Filtration
06. Disinfection
07. Softening



Screening

Screening performed **to Remove** the **Heavy Suspended Solid** from **Water**

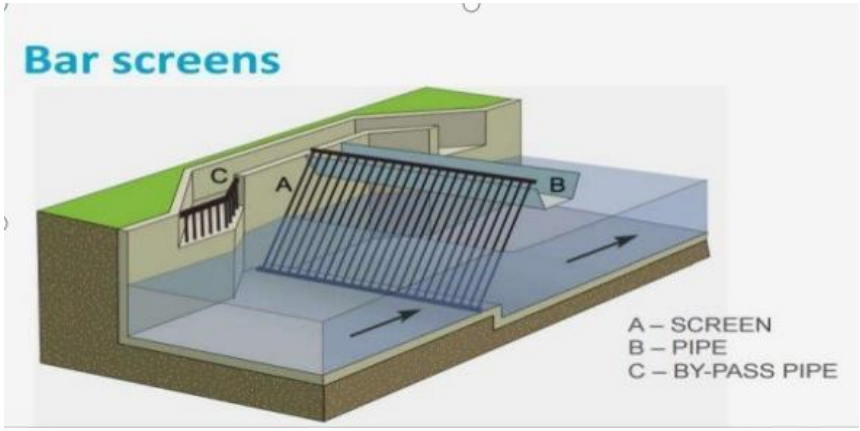
As like: Plants, Leaves, Stones, Debris etc.

Screening generally **Adopted** for treatment of **Surface Water**

Screening can be done by…

01. Coarse Screen

02. Fine Screen



Removal of any floating objects like leaves, branches, fishes, weeds etc. from water

Screening

Bar Screen Chamber

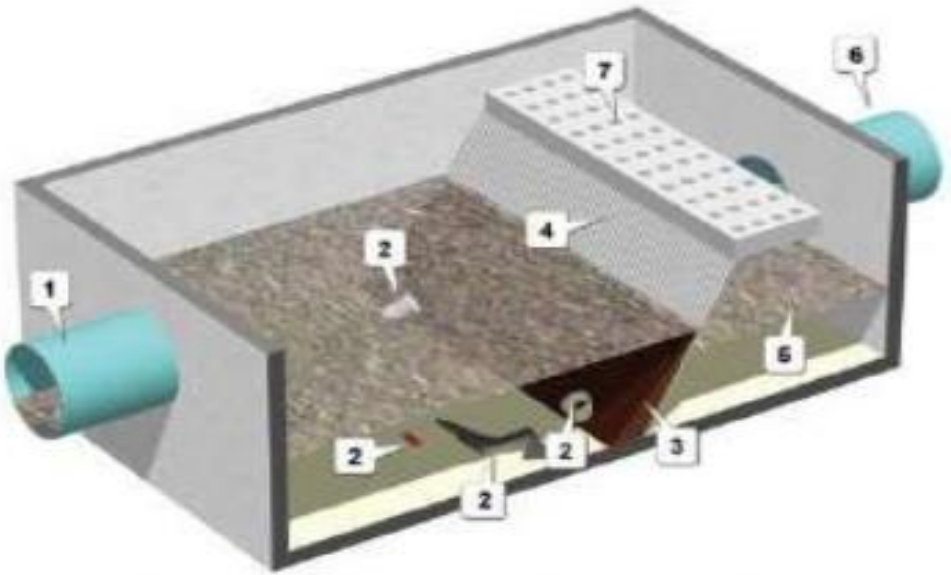


Figure 7: Bar Screen Chamber

1. Inlet Pipe
2. Debris
3. Sediments in Sewage Water
4. Grill
5. Screened Sewage
6. Outlet Pipe
7. Platform with Weep Holes

Coarse Screen

Coarse Screen

In the form of **Bar**

Bar Size **10mm-25mm**

Having Spacing of 2200mm (center to center)

Fine Screen

Fine Screen

In the form of **Wire Cruss**

Wire Cruss 10mm

Aeration

Aeration

Providing Air in the **Water**

Water must gets **Intimate Contact of Air**

Aeration Removes:

Undesirable Gases (CO_2, H_2S)

Undesirable Organic Matter

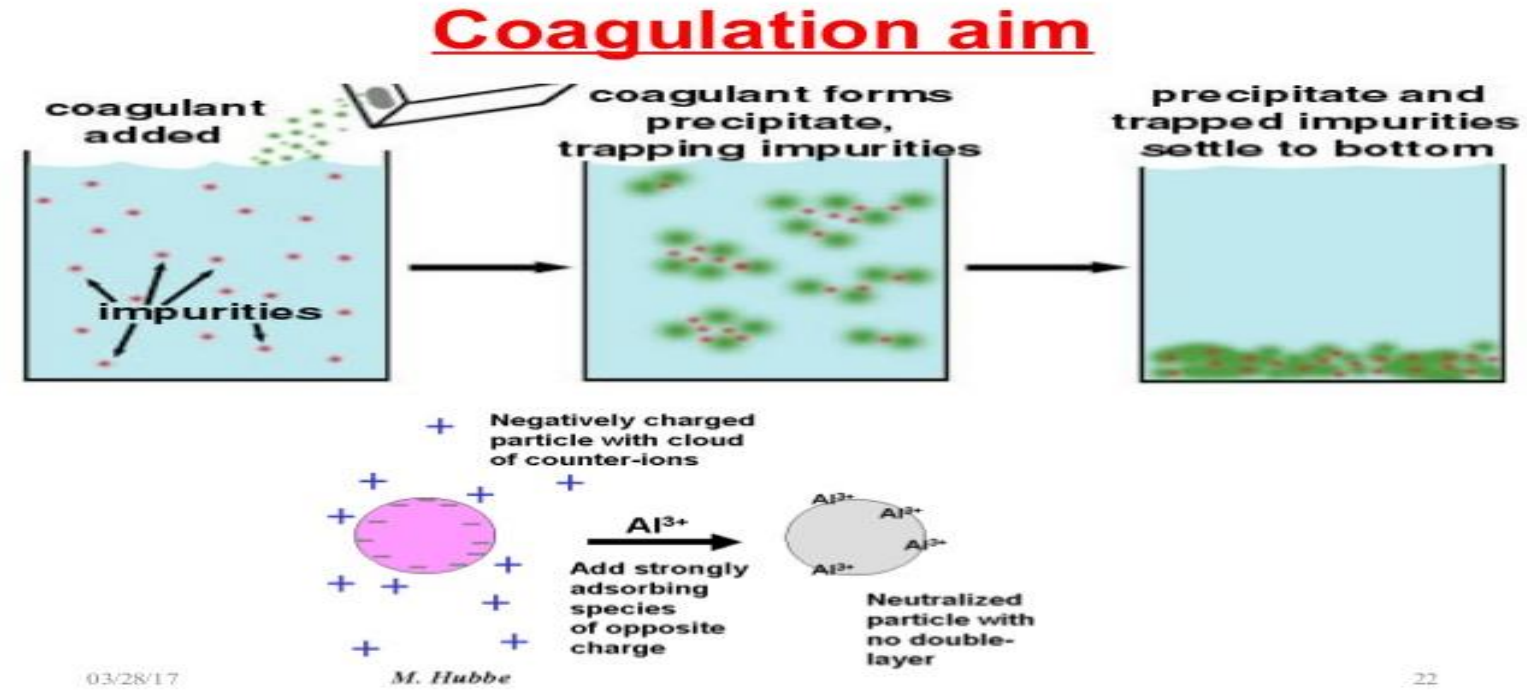
Aeration provides helping to **Proliferate Microbial Growth**

Coagulation

Coagulation

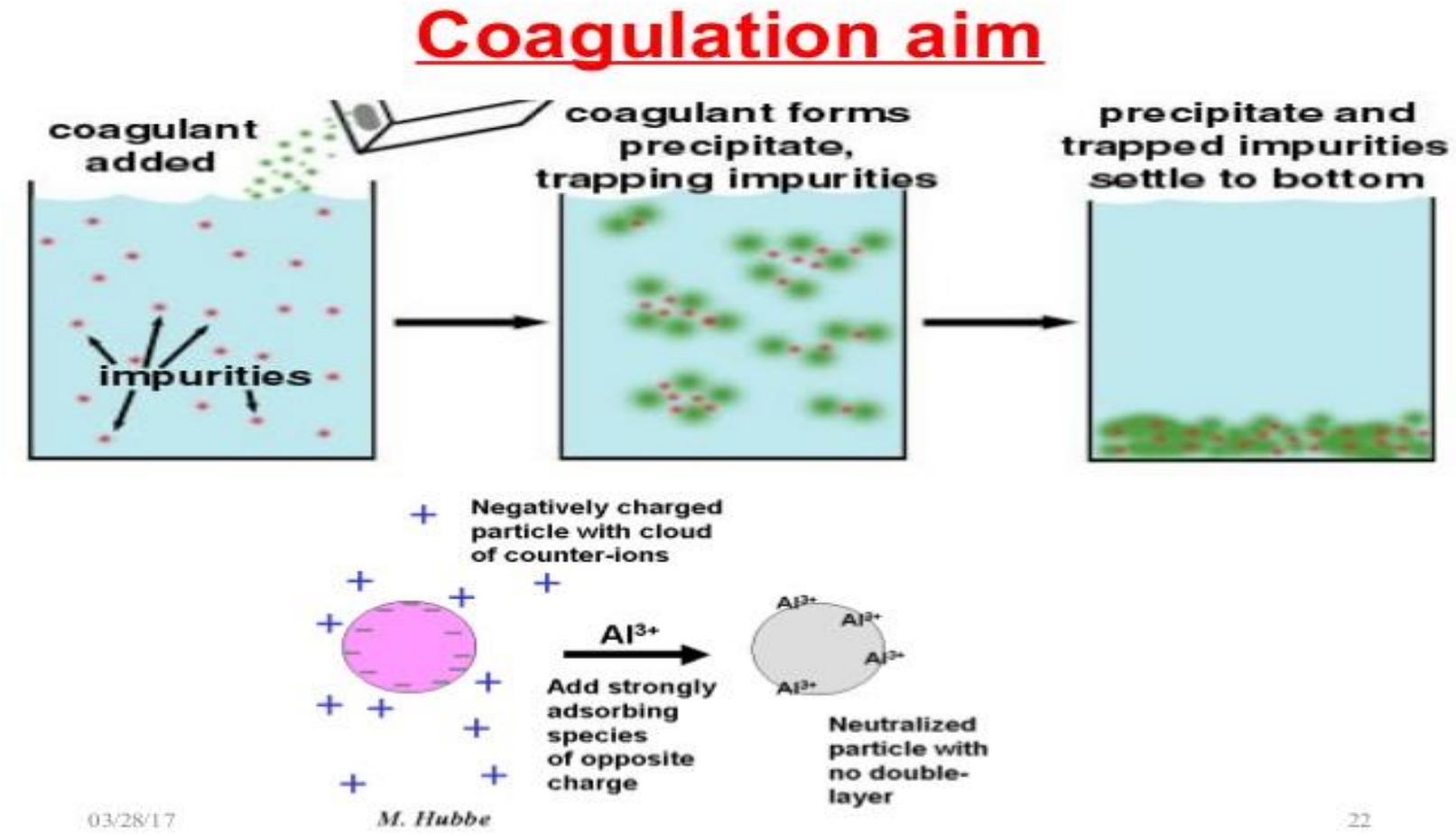
Destabilization of **Colloids** by **Chemicals** **(Coagulant)**

Coagulation is essentially a **Chemical Process**



Coagulation Aim

Coagulation Aim



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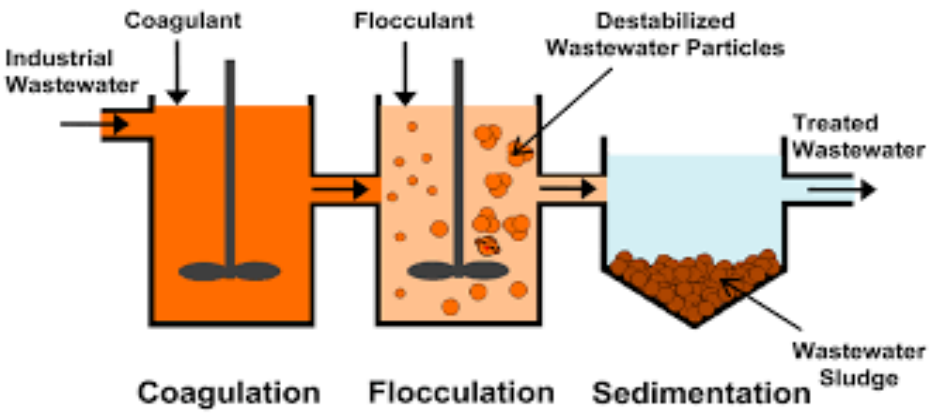
Flocculation

Flocculation is a slow mixing or agitating process in which the de-stablished colloidal particles are brought into intimate contact in order to promote floc formation

Rate of Flocculation Depends on:

- Types of amount of turbidity
- Types of coagulant
- Dosages of coagulant
- Mean velocity gradient in basin



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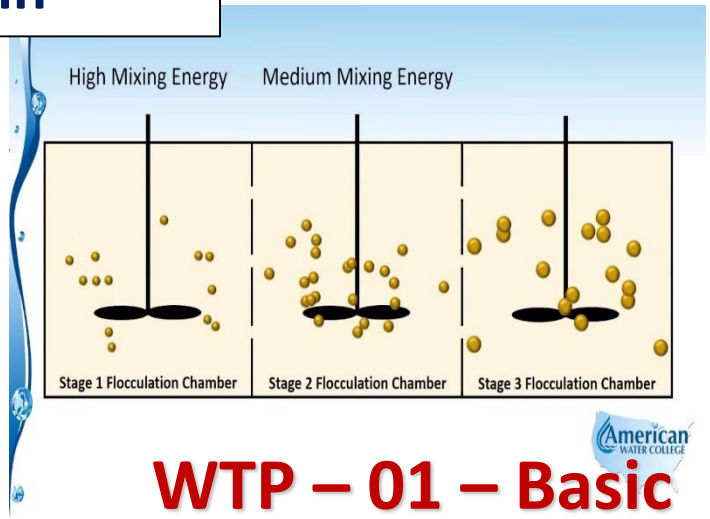

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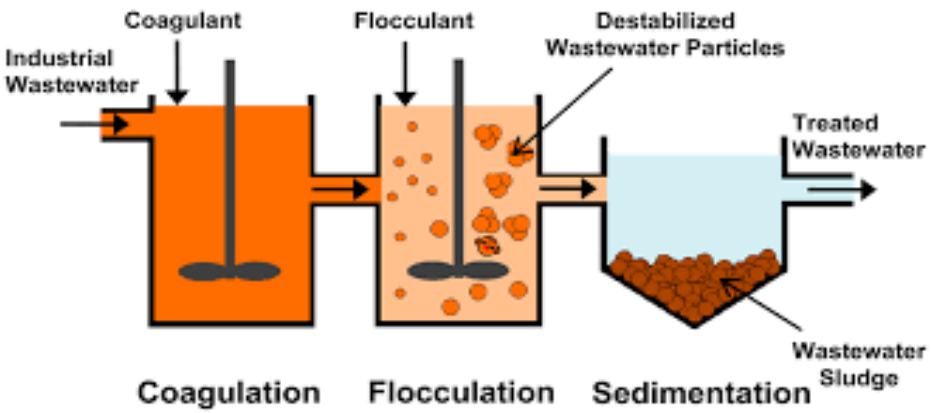
Flocculation

Flocculation is agglomeration of destabilized particles into a large size particles Known as flocs which can be effectively removed by sedimentation or flotation.

Flocculation performs to:

Naturalize Particles which are **in Contact**

Resulting in **Increasing** the **Particle Size**



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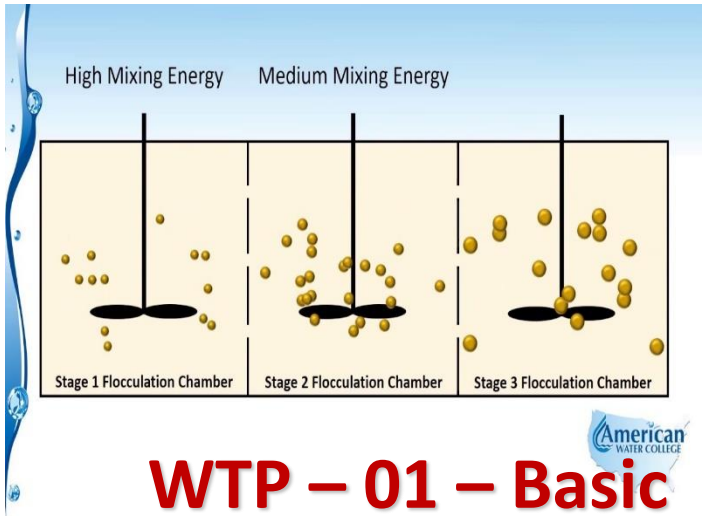

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Flocculation - Hydraulic

Horizontally Baffled Tank Flocculation

a. Mixing basin with baffle walls
i. Horizontal or round end type:

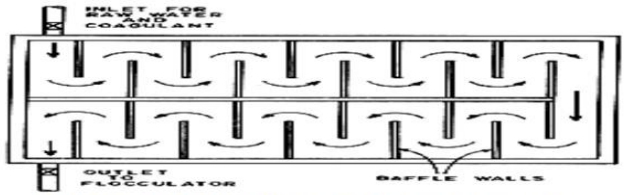
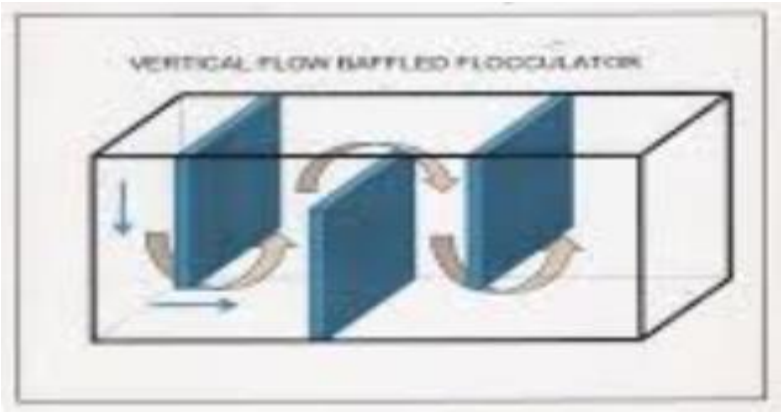


Fig 6.12 Horizontal or round type mixing basin
(Source: Modi, 1998)

Vertically Baffled Tank Flocculation

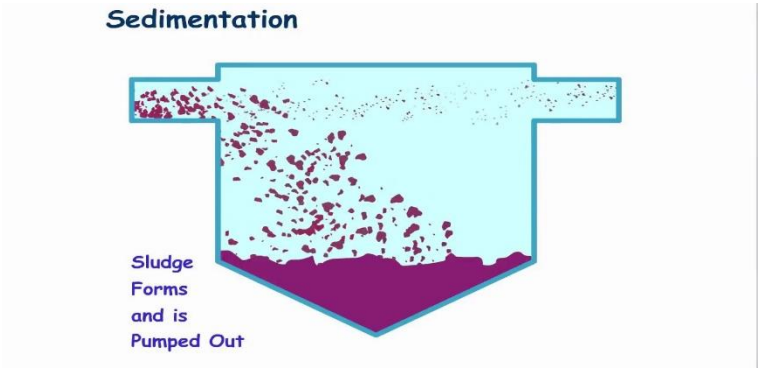


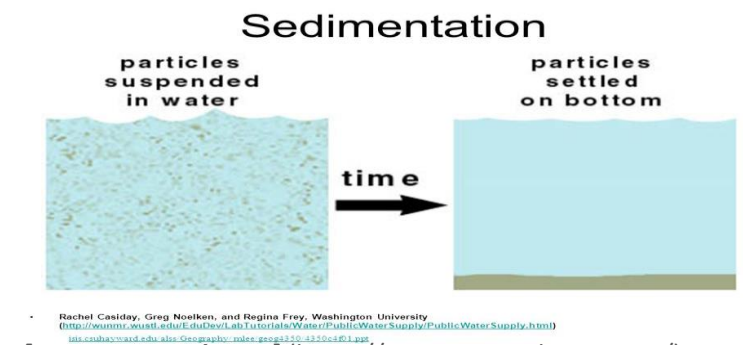
Sedimentation

Sedimentation

Removing **Suspended particle** from **Water** **(having higher SG)**

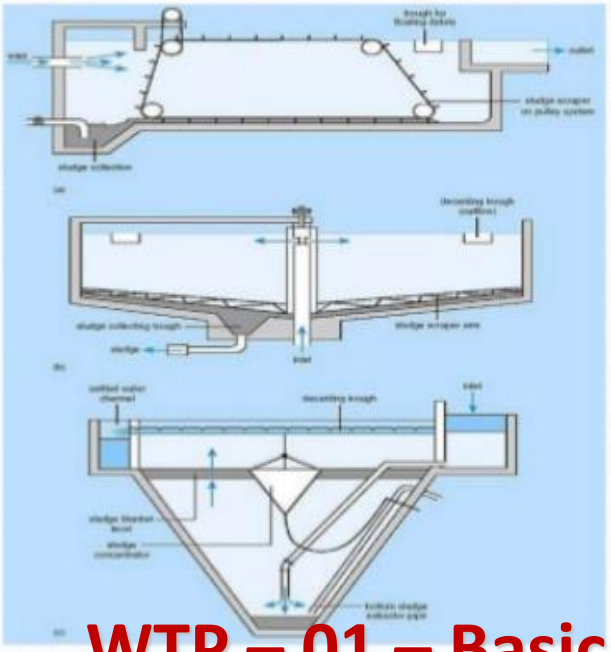
Suspended Particles could **Not be Removed by Screening**





Shape of sedimentation tank

1. Rectangular tank with horizontal flow.
2. Circular tank with radial or spiral flow.
3. Hopper bottom tank with vertical flow.



Filtration

Filtration

Removing the **Fine Suspended Particle** from **Water**

Process of **Passing Water** through the **Granular Beds**

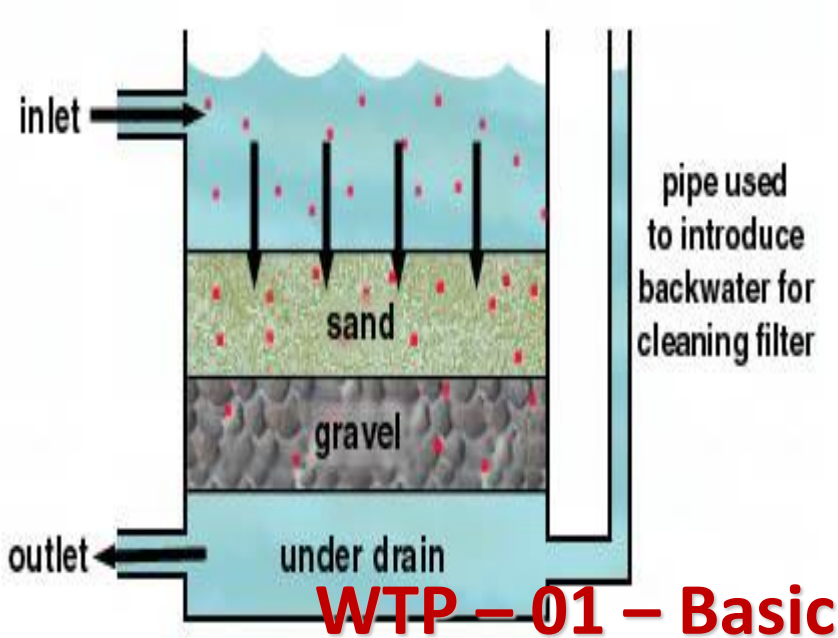
Also **Remove organic matter, microbes, minerals etc.**

Types of Filtration

Slow Sand Gravity Filter

Rapid Sand Gravity Filter

Rapid Pressure Sand Filter



Filtration

Slow Sand Gravity Filters

Treatment for **Raw Water** to **Portable Water**

Typically **01 – 02 meters Deep**

Periodically cleaning by removing, cleaning, replacing the upper few inches of biologically active sand

Slow sand filter (SSF)

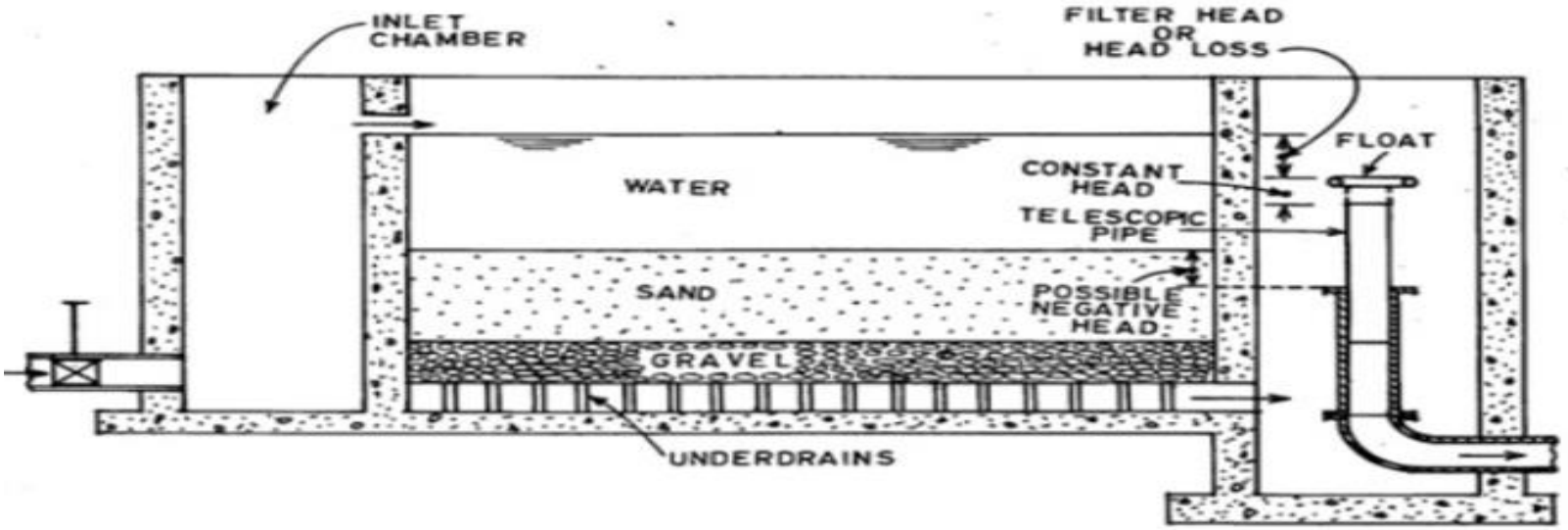
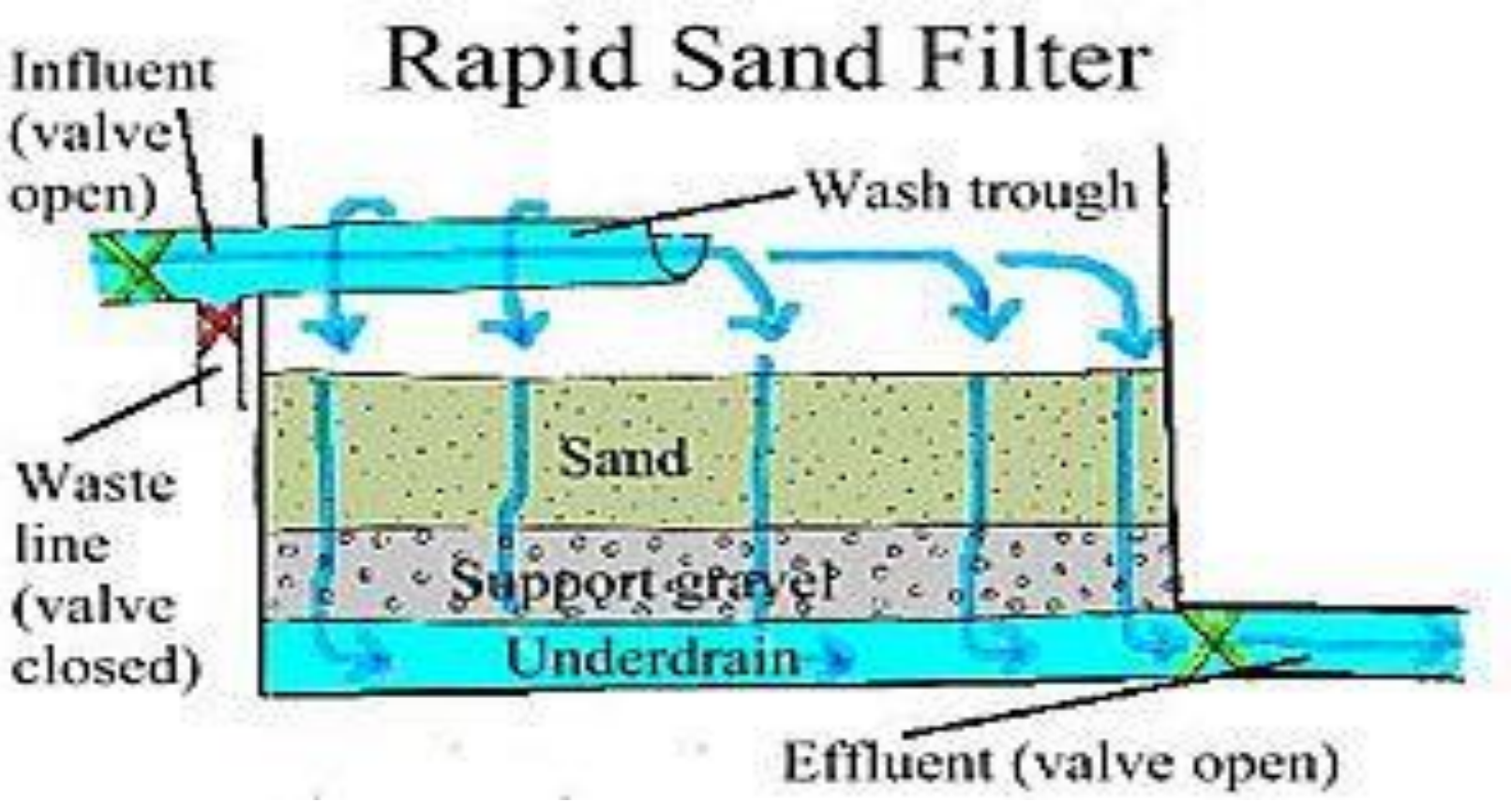


Fig 6.19 Section of slow sand filter *(Source: Modi, 1998)*

Filtration

Rapid Sand Filters

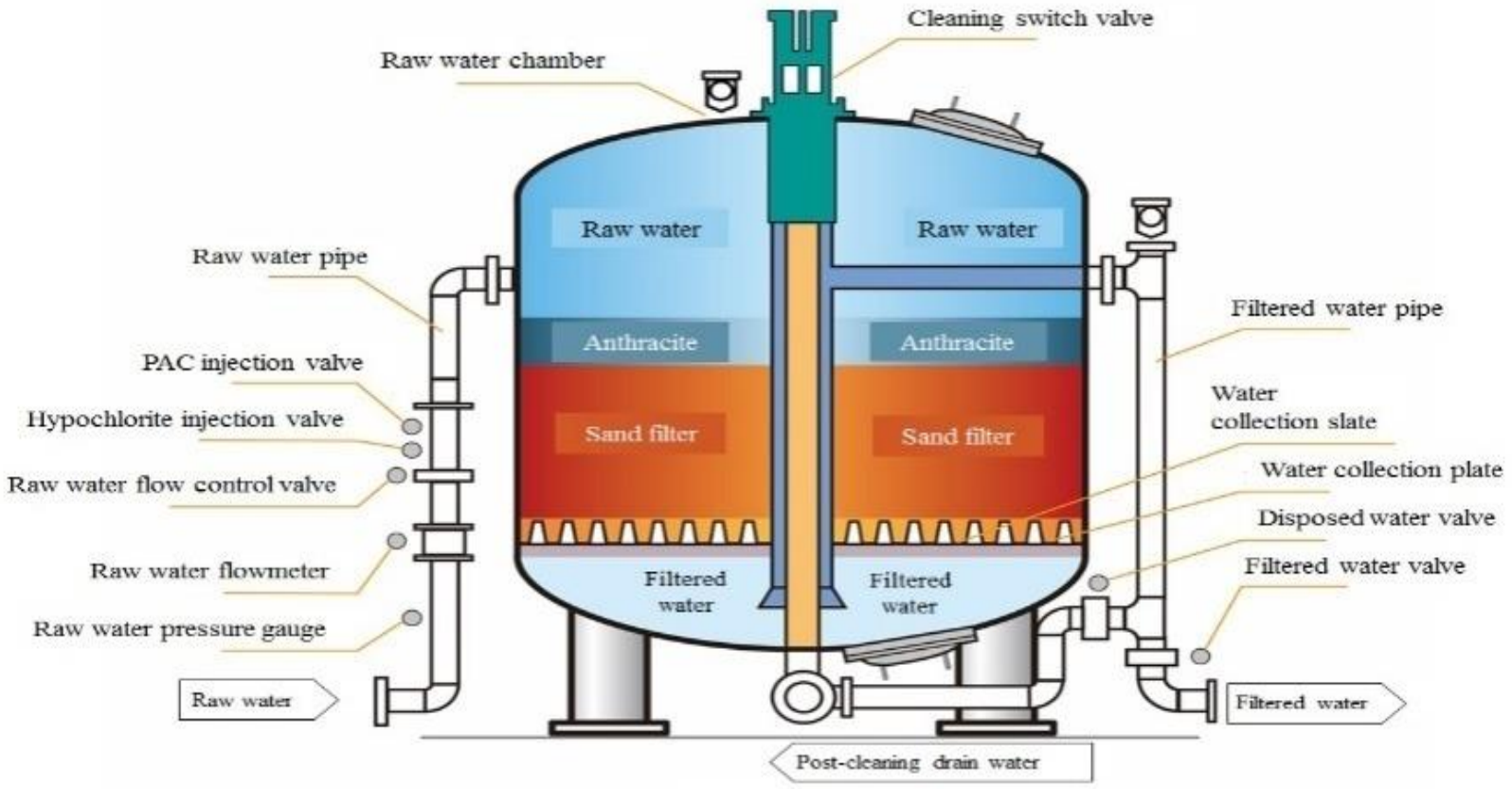
Removal of Large Suspended Particles



Filtration

Rapid Pressure Sand Filters

Removal of Large Suspended Particles



Types of Treatment Process

SN	Types of Treatment	Treatment Unit	Unit Name	Impurities Removed
01	Physical Treatment	Physical	Screening	Large submerge & floating matter
		Physical	Grit Chamber	Grit
		Physical	Clarifiers	Silt, sand and other heavier matter
02	Chemical Treatment	Chemical	Chemical Reactor	Dissolved Chemicals
03	Biological Treatment	Biological	Trickling Filter	Dissolved Organic Chemicals
		Biological	Activated Carbon	
		Biological	Digester	
		Biological	Rotating Biological Contactors	

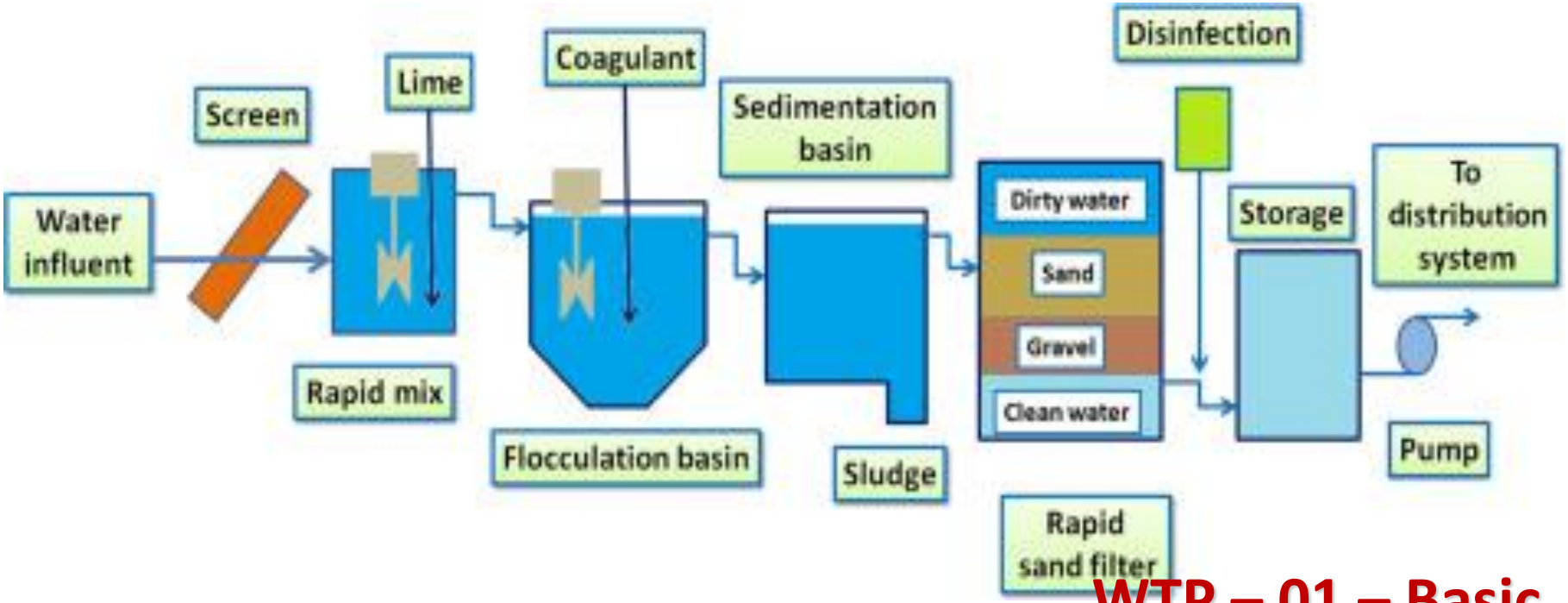
Disinfection

Disinfection

Chlorination, ozone, ultraviolet light, and chloramines = **Primary Methods for Disinfection**.

KMnO4, photocatalytic disinfection, nano-filtration, and chlorine dioxide…**Can also be Used**.

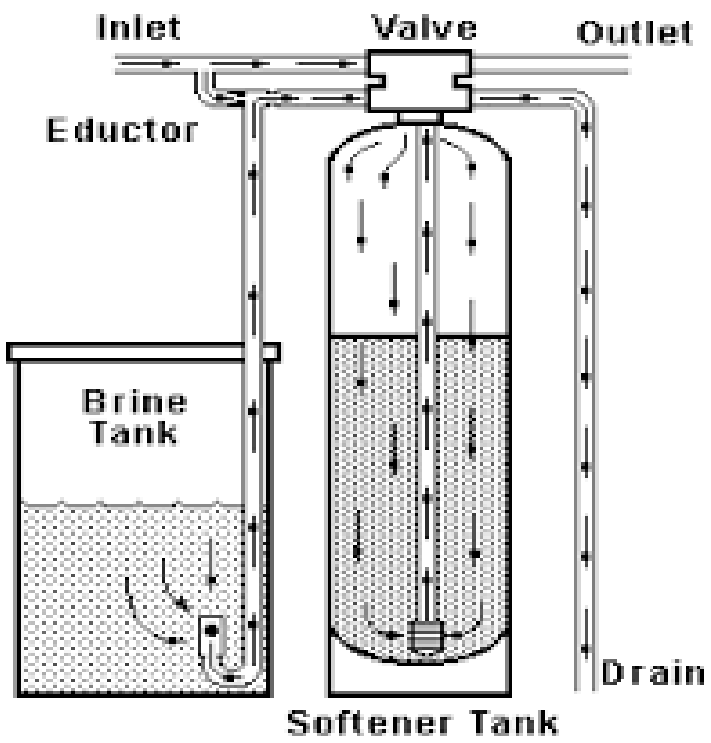
Common Methods: UV, chlorine, unscented bleach and chloramines, distillation, ozonation and boiling [at the time of crisis]

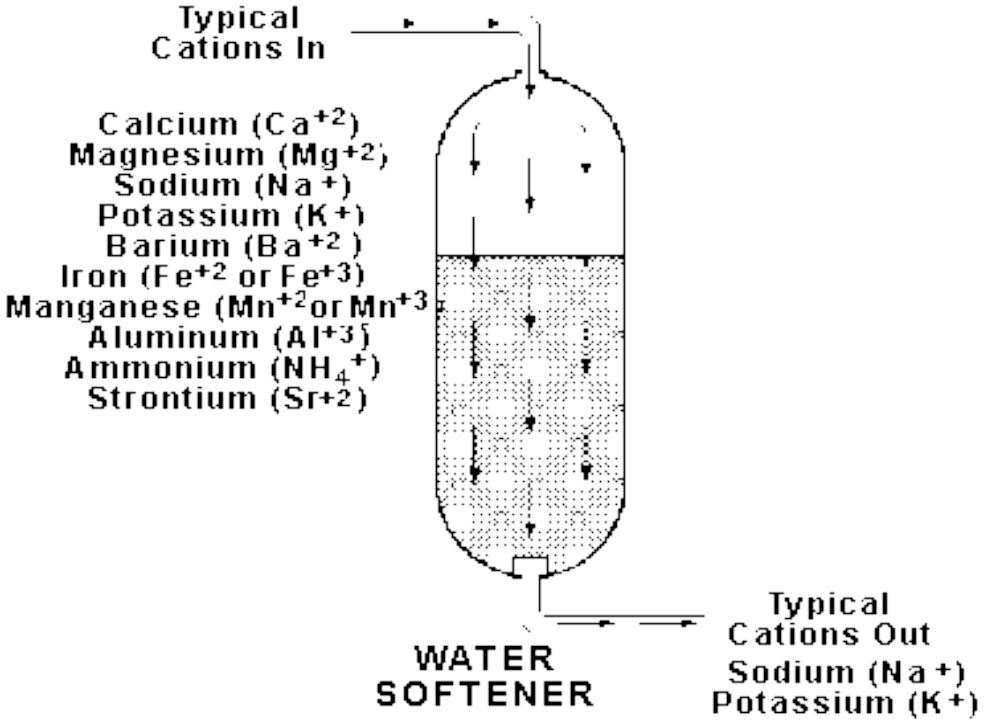


Softener

Softener

The aim of softener is to **remove hardness** from water. Hardness caused by the **presence of high concentrations of dissolved minerals**, specially **calcium and magnesium** which are **treated through Ion-Exchange**. Basically, an ion-exchange resin is placed on the softener tank. **Ion-Exchange resin removes calcium, magnesium and other minerals** from water.

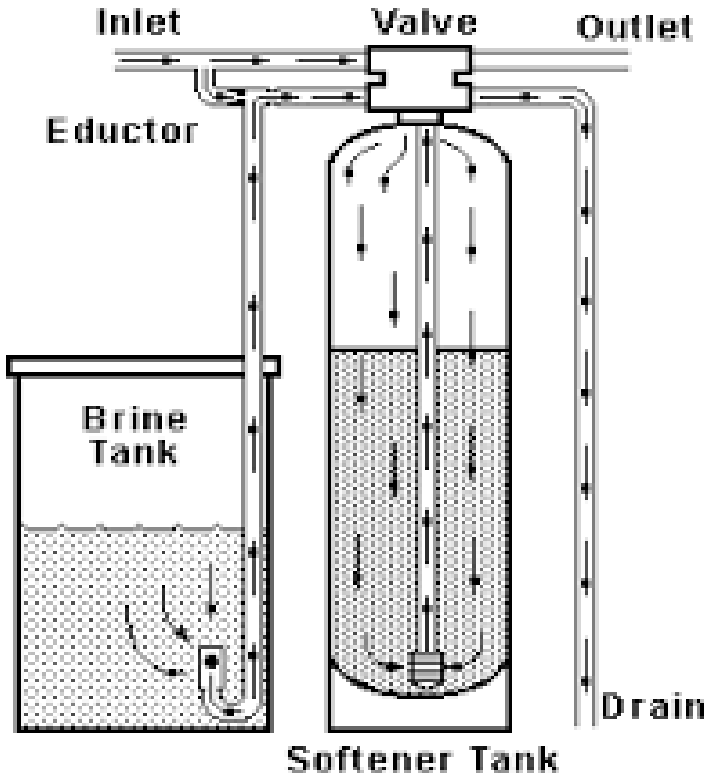


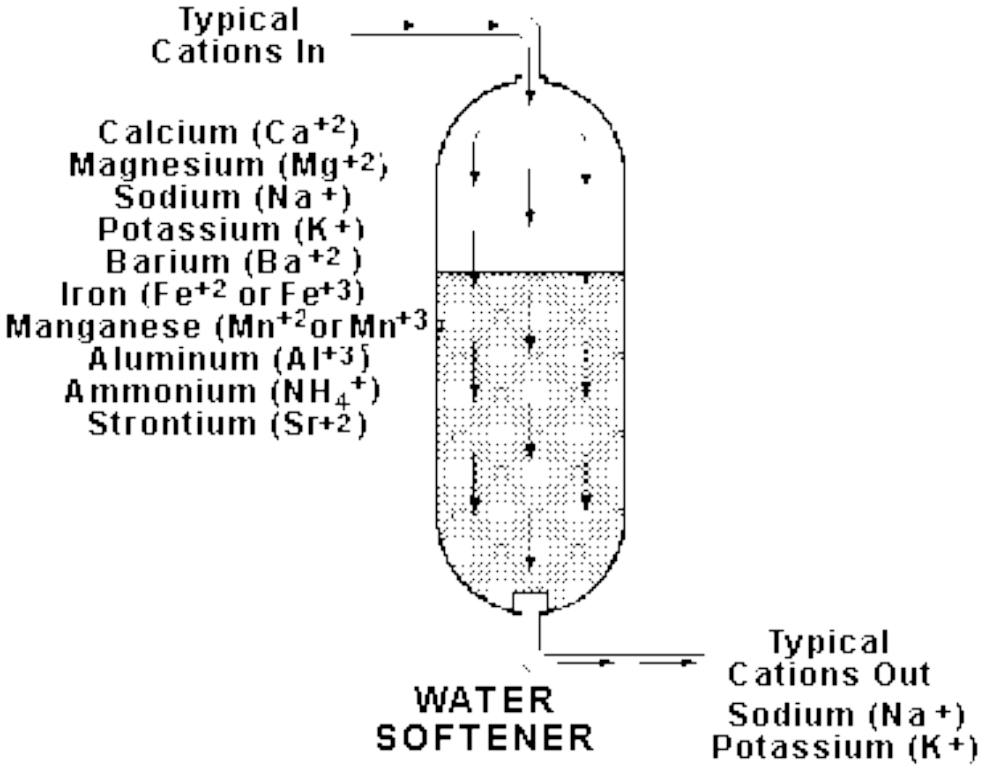


Softener Regeneration

Softener Regeneration

Water **Softener Regeneration** is the process through which the water softener **Flushes out the minerals it catches from the hard water**. So, it can continue to soften new water as it comes through.

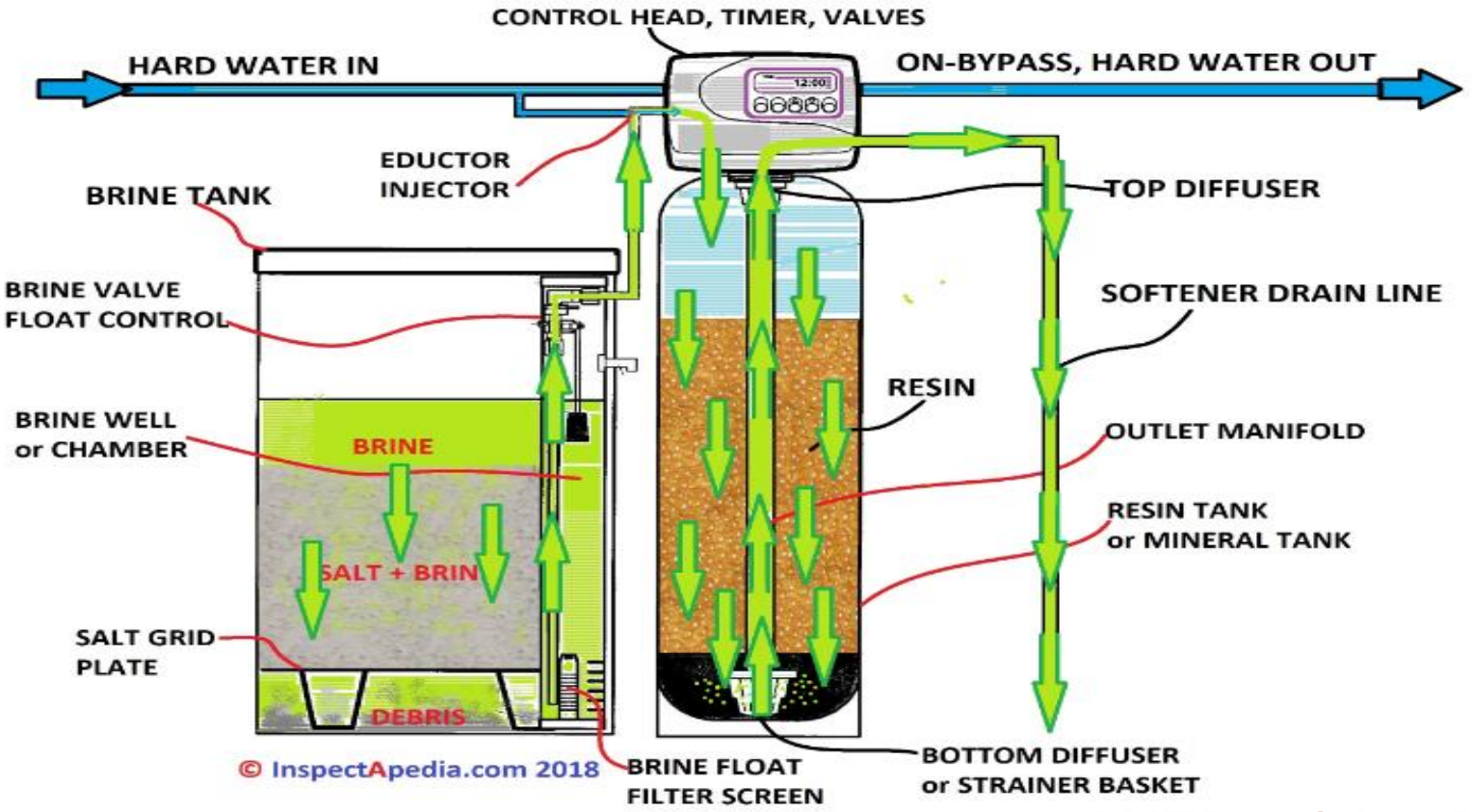




Softener Regeneration

Softener Regeneration

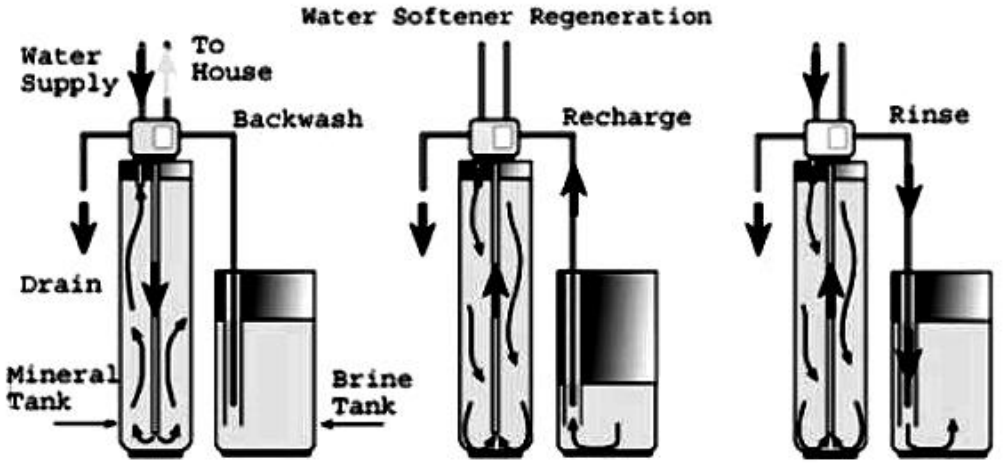
When Hard Water passes through water softener, calcium and magnesium-ion are **Replaced with Sodium Ions**.



Softener Regeneration Process

Softener Regeneration Process

- A **Brine Water** [strong salt water] is prepared.
- **Brine Solution** use to **Flow through the Resin Tank**. The resin beads get rinsed & exchanging of sodium ions with hardness particle is accomplished.
  [This is done in a backwash process.]
- Brine solution and hard water minerals then **Finally Flushed from the Tank**.



Any Question…!?

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