WTP - 03 - Industrial Type

Water Treatment Plant – Industrial Type:

Water that will be used in production, mostly comes from the underground layers of water location. Generally, Bore Holes is the solution to pick the underground water into the process unit. Underground water then undergoes a treatment process which is termed as Water Treatment Plant [WTP]. It can also be termed as initial purification for processing.

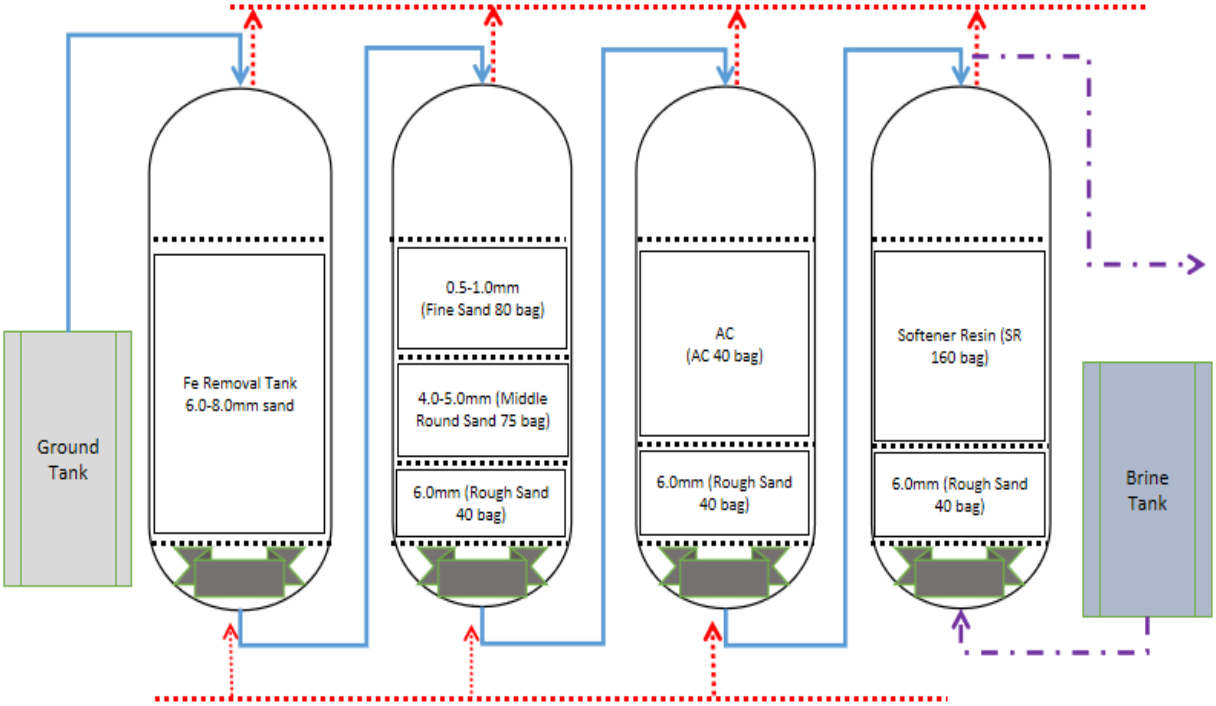

Figure: Water Treatment (Industrial Type)

It can be said that, liquid food contains about 90% of water. In that situation, quality of water is a must and necessity as well as it must meet the standards.

Why Industrial WTP is needed?

- To kill all pathogenic germs (Harmful to human health)
- To remove unpleasant taste & odor
- To remove dissolved gas, color of water
- Make water fit for domestic, industrial & commercial use
- To remove micro-organism & colloidal matters

A series of tank is generally used for industrial water treatment. Each tank of the series has its own functional characteristics to make the treated water.

Figure: Water Treatment (Industrial Type)

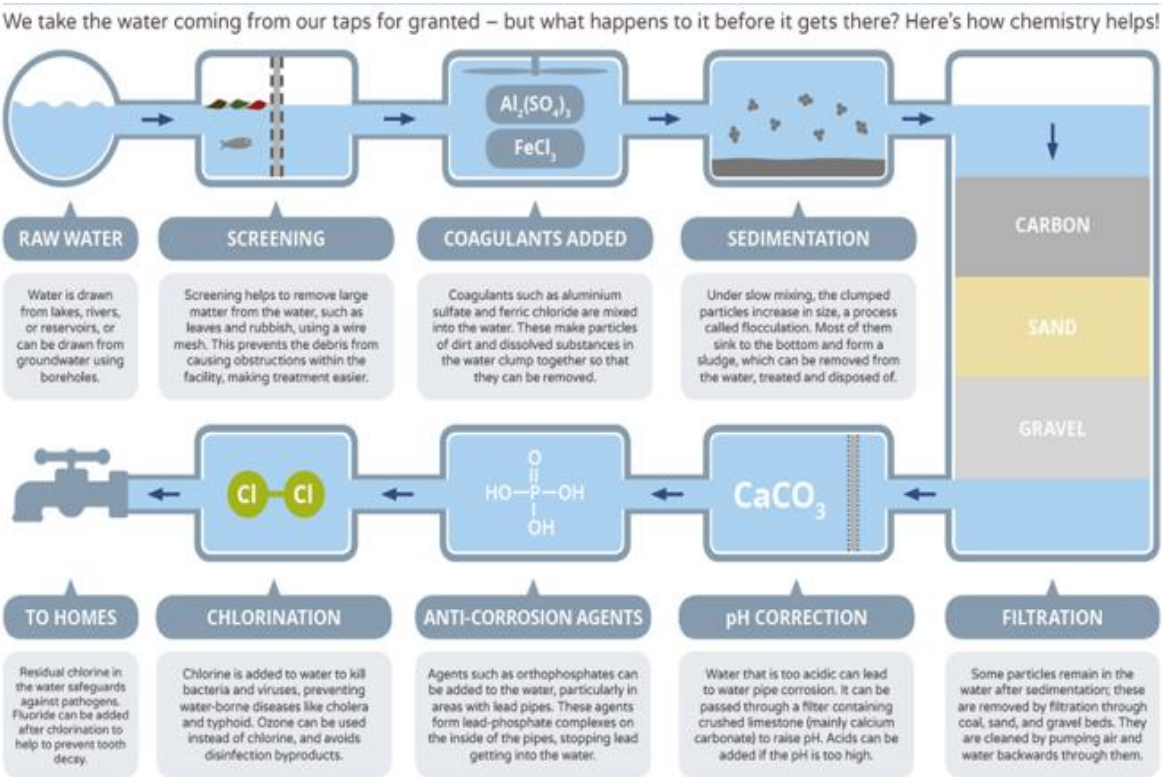

Figure: Water Treatment – from Reservoir to Home

Fe Filter:

Multi Media Filter is the best solution to remove iron from water for industrial purpose. The process helps to remove iron as well as turbidity, remove bad odors, remove some microbes, improve color as well as remove suspended particles in order to produce high quality. The media of iron filter is gravel and manganese green sand.

07 Ways to remove Iron from water:

- Iron Removal Filter
- Water Softener
- Chemical Oxidation
- Oxidizing Filters
- Shock Chlorination
- Catalytic Filtration
- Phosphate Treatment

Fe Filter – Function:

Filtration is the best way to remove Iron from water. Iron filters take the iron and transform it to Ferric Iron or rust [oxidation process], latterly the back wash process use to drain out the trapped iron.

Figure: Fe-Filter

Fe Filter – Merits:

The merits of Fe Filter are as follows.

- Removal of Iron from water
- Safeguard for next process [prevents blocking of RO membrane]
- Removes turbidity
- Cost effective

MGF [Multi Grade Filter]:

Multigrade Filter [MGF] consist of vertical or horrizontal pressure sand filters. It contains mutiple layer of Coarse & Fine Sand namely pebbles and gravels which has a fixed proporiton while constituting. The filter has an adequate pore dimension for entrapping suspended solids and some un-dissolved impurities.

MGF – Function:

Generally water use to pass throught the layers of filter media which contains graded sand, pebbles and grabels layers simulteniously. By this method the contaminanting elements gets entrapped and the filtered water passes into the production process. After a certain period the MGF has got lots of contaminants on to it & a general back wash system takes place to remove the entrapped contaminants.

MGF is a cost effective system & it can work under high pressure or higher specific flow rates.

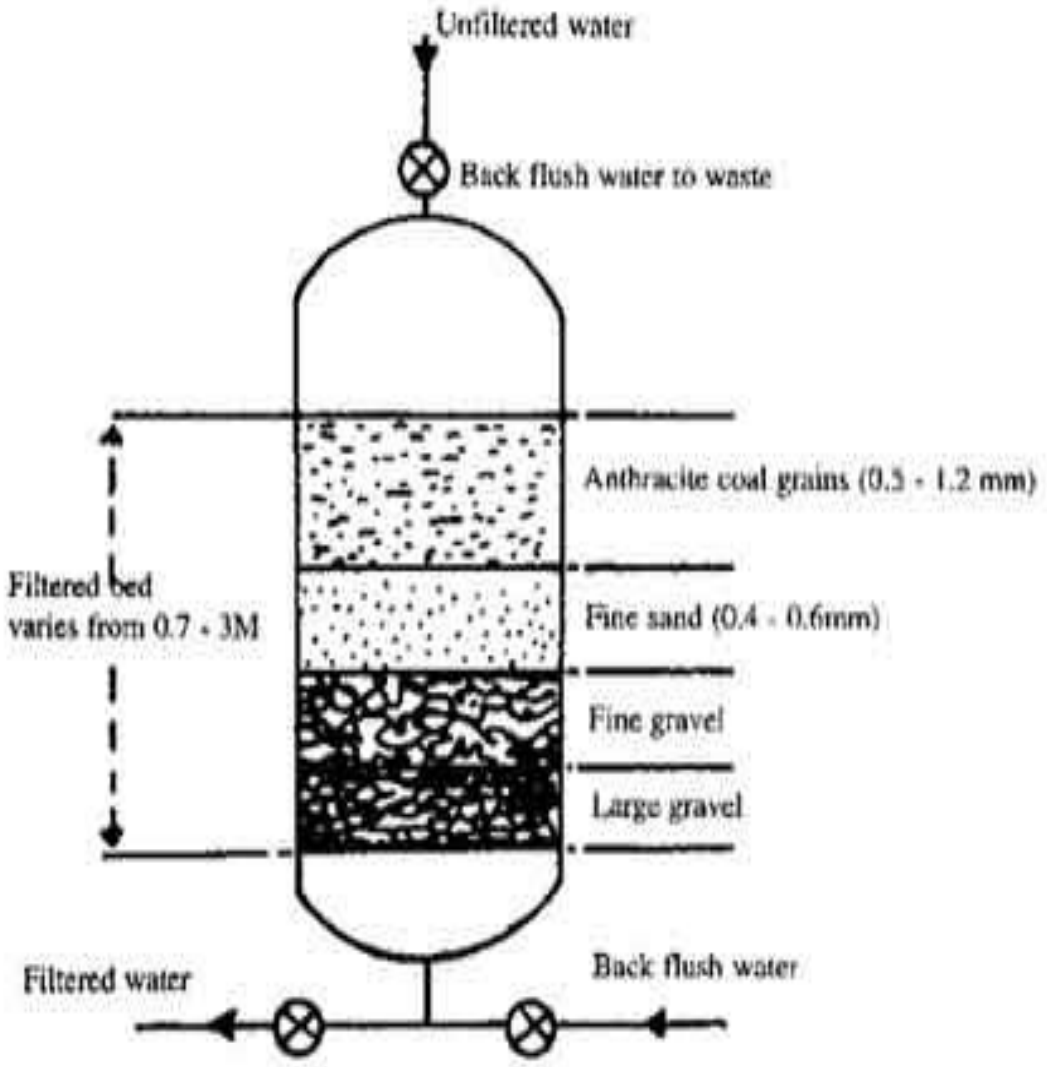

Figure: MGF [Multi Grade Filter]

MGF – Merits:

The merits of MGF are as follows.

- Reduce the level of Suspended Solids
- Reduce some Un-dissolved solids
- Safeguard for next process [prevents blocking of RO membrane]

Figure: MGF [Multi Grade Filter]

Application of MGF:

- Treatment of underground water
- Treatment of waste water
- While production of drinking water
- Pre-Filtration process for RO system

ACF [Activated Carbon Filter]:

Like MGF, the Activated Carbon Filter [ACF] is widely chosen for water system. ACF helps to remove the excess Chlorine [which is used to control microbes], bad odors from the water. It also acts as a safeguard for next process [prevents blocking of RO membrane].

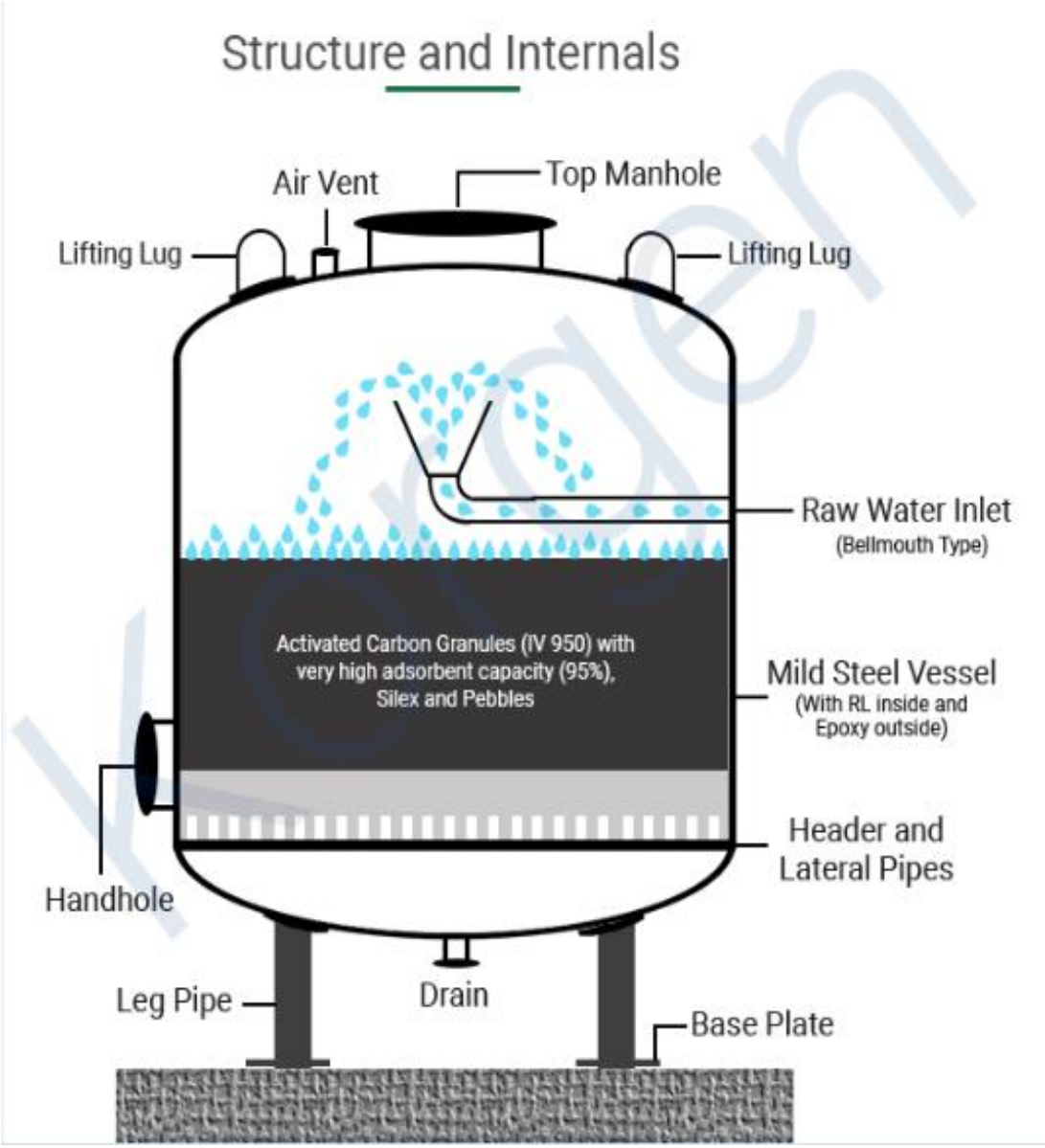

Figure: ACF [Activated Carbon Filter]

ACF – Function:

The main function of ACF is adsorption. The filter media adsorbs as well as do reacts with contaminants. While the bore well use to run, then a certain amount of chlorine is injected into water stream to control microbial growth. ACF generally used to remove the chlorine from the water by adsorption. The activated carton that is used in the tank is derived from the Coconut Shell, Bituminous Coal, Lignite etc. The carbon gets activated by applying 1000C – 11000C temp. in an anaerobic condition in presence of

specific chemicals or by steam. While industrial processing, the activated carbon regeneration can be done by applying steam sterilization as back wash system.

02 Types of Activated Carbon can be found.

- Granular Activated Carbon
- Powdered Activated Carbon

Granular Activated Carbon is widely used for drinking water. It is made by the steam activation of Coal. Specialist choose the coconut shell based activated carbon for ACF.

Powdered Activated Carbon is widely used for municipal waste water, industrial waste water, process water system. It is made by steam activation of Lignite Coal by maintaining a controlled system. It removes the BOD, COD, TOC, Toxic Organic Compounds from water.

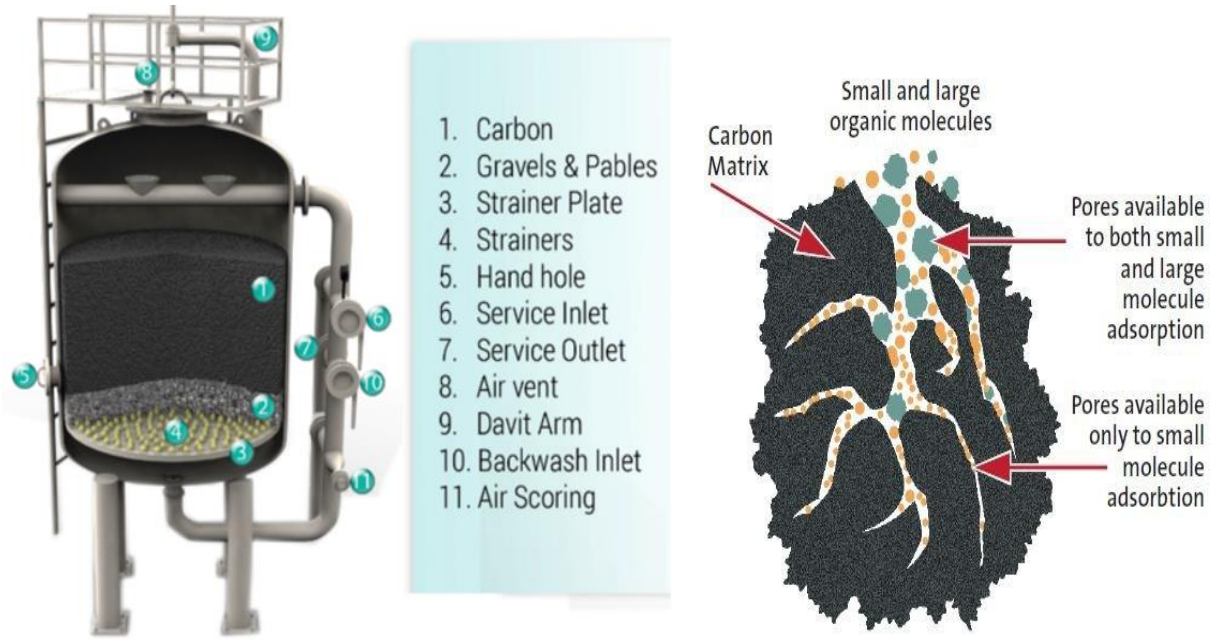

Figure: ACF [Activated Carbon Filter]

Activated carbon reacts very quickly with free chlorine and convert it to chlorides; where as a small volume of carbon is effective. A 05 times volume of carbon is needed to catalyze the removal of chloramines.

In the next picture, it can easily be understood the ACF – Operation, ACF – Backwash, ACF – Sterilization Process. In operation mode, ACF can remove the impurities. Whereas in backwash process, the entrapped impurities will take out from the tank. Finally, the sterilization process takes place to regenerating the activated carbon bed.

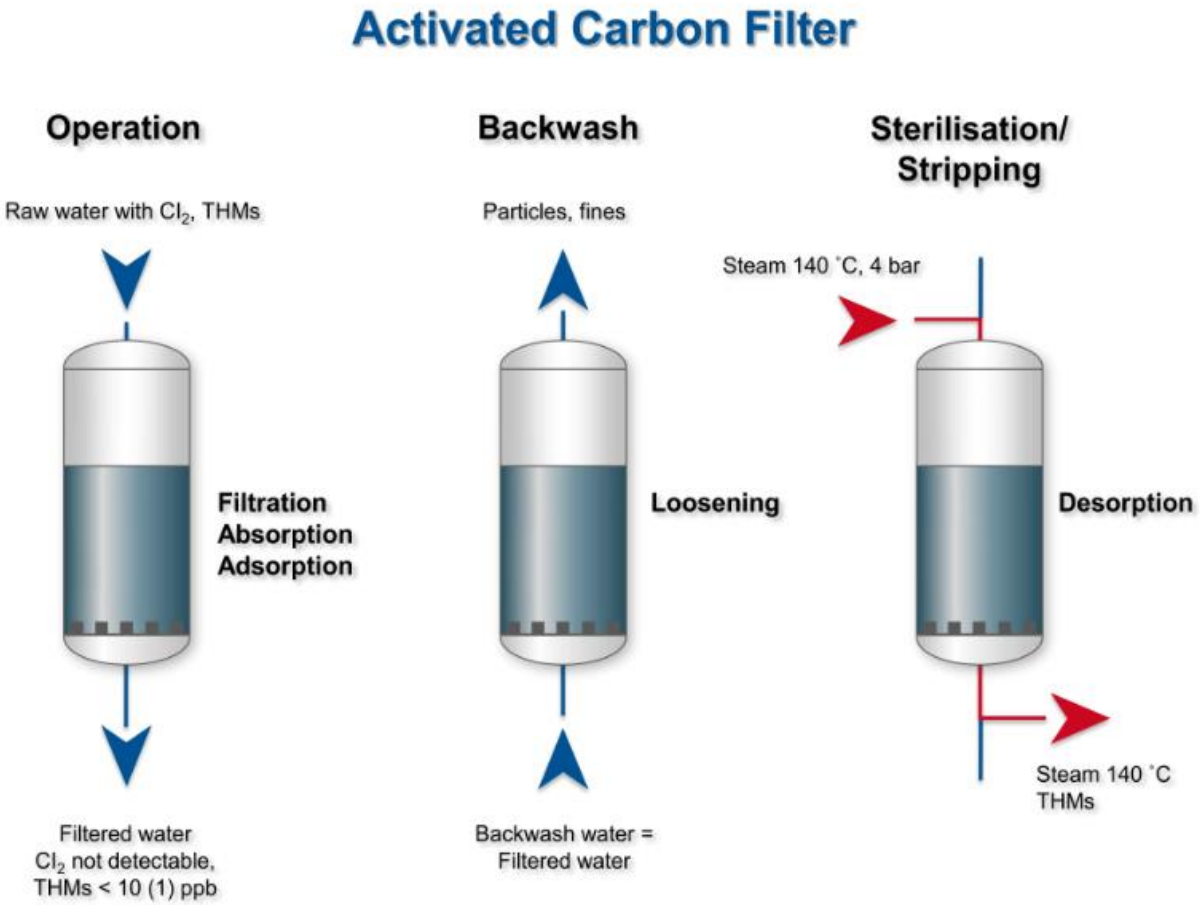

Figure: Activated Carbon Filter [Operation, Backwash, Sterilization]

ACF – Merits:

The merits of ACF are as follows.

- Removes Chlorine, bad odors in effective way
- Absorbing efficiency rating is 90%
- Filter replacement is not so frequent
- Cost effective

Softener:

Softener is a water filter that removes the hardness from water [hardness = presence of Calcium, Magnesium]. In industry, hard water tends to degrade the finished goods quality. Generally, the softener is an Ion-Exchange process. The resin-beads which are placed inside the softener use to trap the calcium, magnesium, certain other metal ions and other minerals from the water. It is also to be added that, hard water affects regular Process Operation, Boiler Operation, Chiller Operation, Cooling Tower Operation by generating visible scales.

Ion Exchange Resins are Organic Polymer which contains Anionic Functional Groups.

The back wash process is applied with fresh water through the resin in an opposite direction with a normal flow. This will take 10 – 20 minutes. By this back wash the entrapped solids get out from the system. This back wash also expands the resin bed for the next softening cycle.

Softener – Function:

Inside the softener, the ion – exchange resin is placed. Ion Exchange Resins are Organic Polymer which contains Anionic Functional Groups. These plastic beads are made from polystyrene. Same time they are charge with a sodium ion. Generally, the softener resin beads are anionic [having the negative charge]. Negative charge attracts and hold the positive charge.

As the calcium, magnesium ions are positively charged and the they get attracted by the negative charge of the resin beads; hence the calcium, magnesium ion gets stuck on the resin beads. As the hard water passes through the resin beads, so finally sodium ion is released.

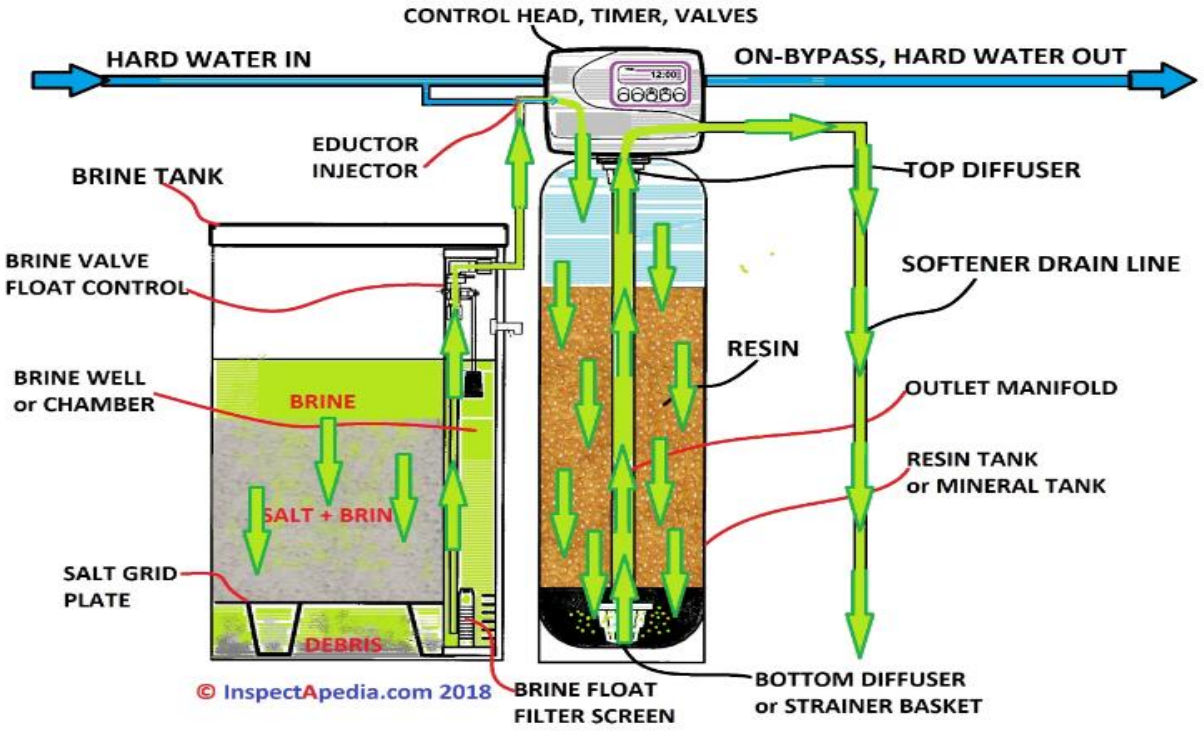

Figure: Softener

Softener Regeneration:

Softener Regeneration is the process by which the softener functionality is re-introduced for water system. Brine rinsing is the forwarding flow system of brine solution. NaCl salt concentration is used as 35 – 40% or as per the softener designer recommendation. The brining can continue for about 30 – 100 minutes or as per softener designer recommendation.

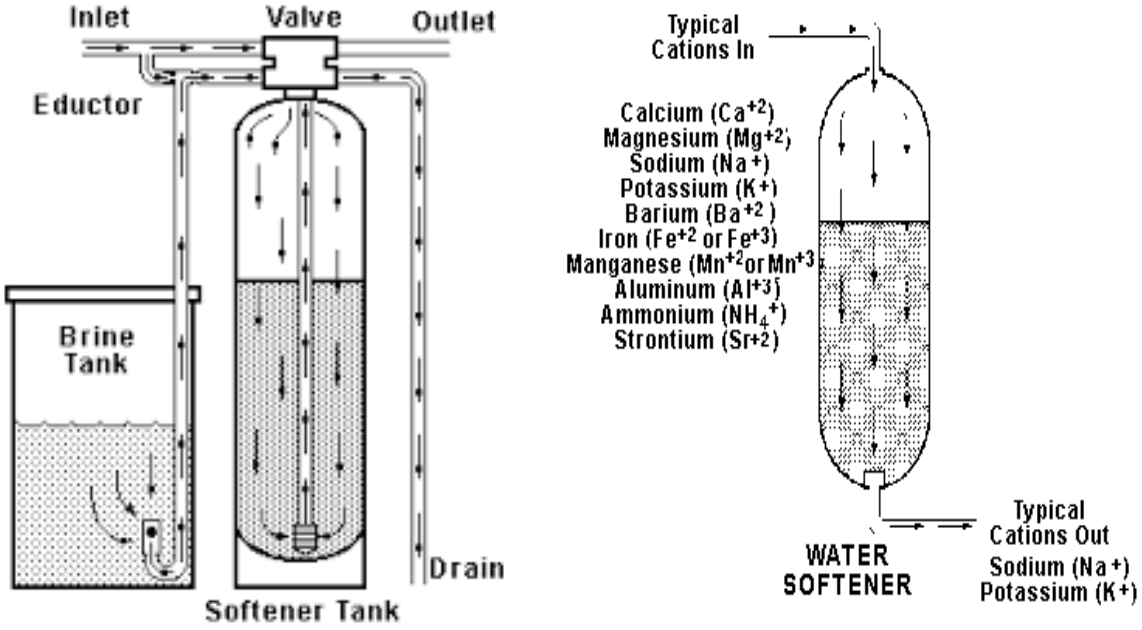

Figure: Softener

The frequency of softener regeneration will be declared by the softener designer. On the other hand, the user of the softener can also be a guideline. When the hardness parameter exceeds the softener user parameter, then the softener regeneration can take place.

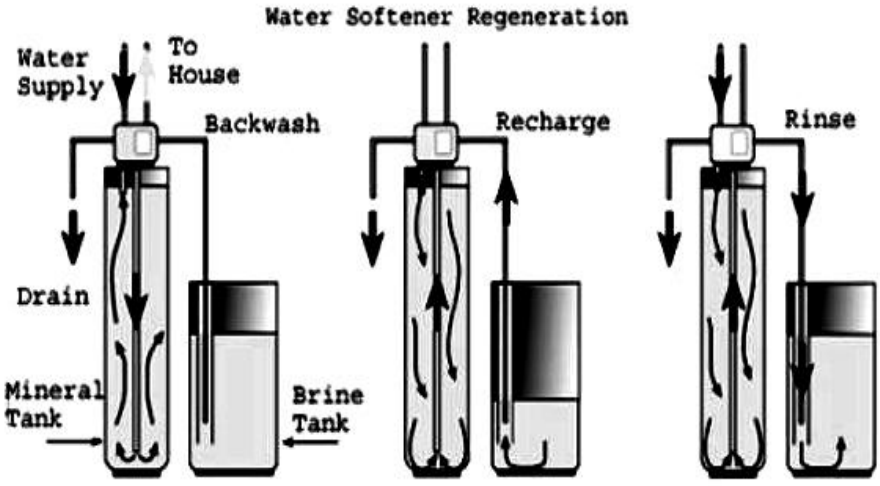

Figure: Water Softener Regeneration

Softener – Merits:

The merits of Softener are as follows.

- Provides desirable taste on drinking water
- Liquid products quality remains stable
- Reduces lime build up on plumbing system
- Clean, spotless process pipe lines
- Extend the life of the plumbing and process pipe line
- Improve efficiency of water using appliance