Water Surgery: Demand of Present World to overcome the disastrous future of Water

Satyendra Pratap Singh[1], Rajan Tiwari[2], Ashutosh Tiwari[3], Mohd. Ali Ashraf[4]
Assistant Professor[1], Student[2,3,4]
Mechanical Engineering Department
Rajarshi Rananjay Sinh Institute of Management & Technology Amethi (U.P), 227405, India

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Abstract-The 70% of world is covered with the water in which only 2.5% of the fresh water ispresent on the earth and rest water is saline and ocean based even only 1% of the fresh water is easily accessible with much of it is trapped in the glacier and snow field. Most relative fact is that while three quarter of the earth's surface is covered with water less than 1%is the (0.37% to be exact)of that water is drinkable further more ground water ,where we place pumps for well ,only 0.28% of fresh water across globe. Drinking water is the most important need of present world and to overcome the disastrous diseases like diarreahea, typhoid and jaundice we have to purify the water at nano level. In power plant various types of water treatment is required to overcome the cavitations problem, corrosion, wavy edges etc. to solved out all these problems of water related treatment we have presenting a triple layer water surgery in present scenario , by the help of this paper triple layer purification process coming under implementation through this paper.

Key word-Graphene, Biotron, Nutritron, DMF tank, MGF tank

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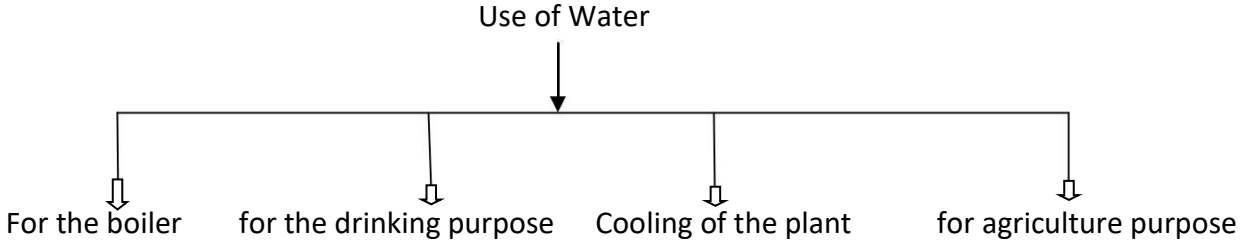
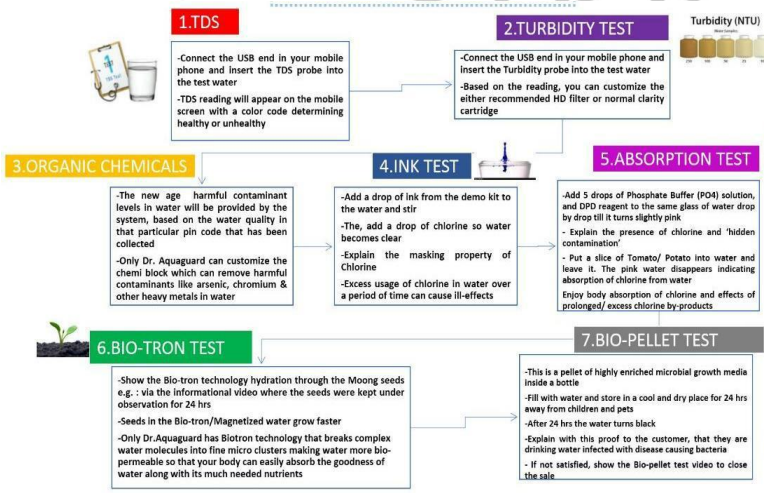
1. **Introduction**-The increasing population is a factor which effect on our resources .According tothe UN population fund .the world begins to run out of fresh water by 2050 because of the expected population growth to9.3 billion. All of projected growth from the present population of 6.1billion.Here we are going to introduce a phenomena by which we can purify the sea water to fulfill the human need .The phenomena use the following material for purify the water and make the water human compatible-Graphene, Biotron, Nutritron to make the water purify and also lock the minerals of the water which makes human healthy. This water can be also used as Agriculture purpose, plant cooling and for the boiler purpose.

2. **Element**-Graphene,Biotron,Nutriton,DMF tank,MGF tank,Solinoid shell(ROmembrane),Microcartridge filter, low pressure side motor, High pressure side motor.



3. **Graphene**-It is the allotrope of the carbon in the 2d atomic scale, hexagonal lattice in which oneatom forms each vertex. It is the basic structural element of other allotropes, include graphite, charcoal, carbon nanotubes and fulleranes.These above element are useful for the trapping of impurities, from the water. Here we use the Graphene based membrane, to make the water filtration and desalination more efficient and sustainable. The Graphene oxide sheet is able to block the passage of salt iron in membrane base in base sea water desalination process. The spacing between the sheet effects to salt ion to trapped .the space of sheet must be right. The optimal space between the Graphene sheet could be 0.6nm to 0.7nm.The AFM (Atomic force microscopy) is used to probe the edge of each Graphene sheet to obtain the measurement of the exact height of space between each sheet. Then combined the statically analysis with the AFM to revel the relationship between the amount of chemical used to make the layered reduced Graphene oxide membrane known as reducing agent and which result the spacing between each Graphene layer . Graphene is a lattice of the carbon atom so thin, it's considered to be 2D.the filter can filter out any particle bigger than one nanometer .which is about 1000000 times smaller the width of human hair. Holes with a diameter of the 1nm are big enough to let water molecules to shift through however enough to stop any undesired chemical. It can purify the water but it cannot beak the big cell of water into the small cell which is beneficial for our body for this we introduced biotron.

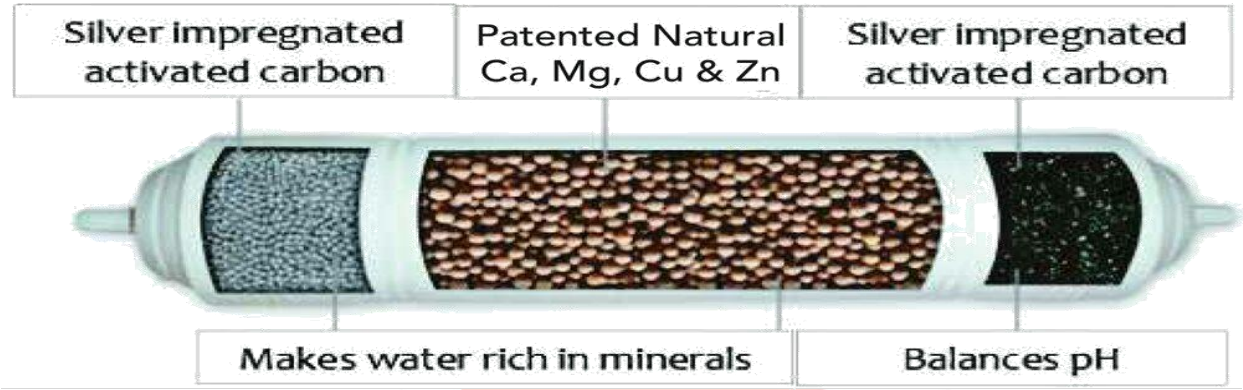
4. **BIOTRON**-for the healthy life healthy drinking water is essential .water contains the mineralssuch as calcium, Mg, Fe, Zn, K, and other which is necessary for our well being body. In water purification technique all other purifiers removes the essential minerals and depleting or cousing the nutritional value of drinking water. But by the use of biotron we can retains all the minerals which is essential for the body. It is simply defined as a environment which is designed to provide uniform experimental condition whose aim is to producing uniform organism for use in experiment. The cartridge which made by biotron it breaks the complex molecule into fine cluster like copper, zinc etc which are essential for our body. It is required for the fluid balance, blood & bone development and necessary to maintain the healthy nervous system. The body



Metabolism and regulating muscles not only fit us but also provide tp fight with many health issues. The minerals like micronutrients (copper, zinc) & magnesium and calcium plays vital role in health safe guard. The vital minerals not only enhance the taste of water but also health and body function.

Benefits-The biotron helps to break the big cell of water and convert into the small cell which can be easily absorb by the body cell. It helps body to absorb the goodness of the water along which it much needed minerals and micronutrients.

5. **Nutritron**: It fortifies the drinking water with essential mineral like Ca,Mg,while micronutrient like Cu,Znbalance ph level of water.



A large part of our daily requirement of nutrition comes from the taking healthy food andvarious other resources. However healthy water also plays a vital role on them. A combination of silver impregnated activated carbon with natural calcium magnesium copper and zinc slowly releases essential natural mineral in water which helps to balance the ph level of the water to ensure you to get your daily dose of healthiness.

Working of the nutrients on the health of human

Minerals	**Working**
Calcium (ca)	Building and maintain the strong bone. It help to prevent osteoporosis.
Cupper (cu)	It keeps immune system healthy and act as an antioxidant.
Magnesium(mg)	It helps heart rhythm to be steady and per motes normal blood pressure.
Zinc(zn)	It is essential for body immune system ,cell division ,cell growth, wound healing and stimulate the insulin action

6. Water Handling Plant

Water handling plant is used to handle water treatment process .in which water is make purify with the help of different process. The thermal power station is a power plant in which heat energy is converted into a electric power. In most of the place turbine is steam driven. Water is heated turns into the steam and turns a spin the steam turbine which drives an electric generator after its passes into turbine the steam is condensed in condenser and recycles where is heated. The water is also used for the cooling purpose of plants, turbine, and other machinery parts.

The water which is used for producing steam in the boiler should be pure by different process which is given below -

- DM plant
- Softening plant
- RO plant

These process use for the cleaning the scalen, hardness, TDS, of water.

Different purifier used for the different types of the water tds value:

- **RO water purifier**-It is used where the water is drawn from the bore wells and other localsource with high tds level leading to salty or brackish taste.
- **UV water purifier**-It is used where the water is sourced from lake, river and supplied by themunicipal corporation .this water is not salty and thus it does not contain high tds.

7. RO PLANT

It is also known as reverse osmosis plant in which the water is purified and maintaining its pH level is maintained according to the machinery and the tubes of the boiler. Water is passes by different process to overcome its impurities.

NEED- Raw water ,DMF tank,IMF Tank,dosing(HCL and antiscalen),MCF,RO membranefilter,Degasser tank,Feed pump,DM plant.

Pictorial representation-

Raw water. → DMF Tank. → IMF Tank → dosing (HCL and antiscalen)
MCF → RO filter → Degasser tank → feed pump → DM tank

Raw water: we get raw water from ponds, lake, boring, etc

DMF TankA dual media filter is used for removal of turbidity and suspended solid 10 micronto 20 micron Dual media filters provide very efficient particle removal under the conditions of high filtration rate. Inside a sand-anthracite filter is a layered bed of filter media. The bed is graded from bottom to top as follows: Having the filter media graded this way enables the sand anthracite Filter to run for longer times before a backwash is necessary. A sand anthracite filter or multi-media filter consists of 2 main parts:.

- A composite pressure vessel with Multiport Valve.
- Graded beds of sand and anthracite.

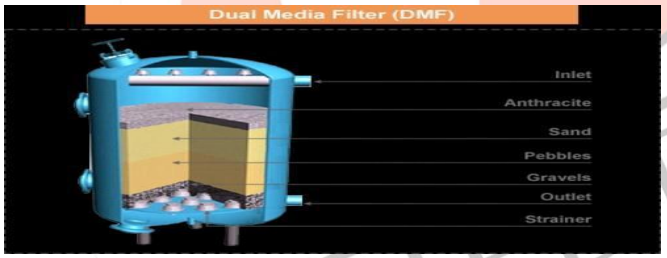
  Sand is used to remove the suspended particles and anthracite is used to remove the odor and color etc. to make the water fit for different applications. Gravels and pebbles are provided to support to both the media. Periodically, the sand-anthracite filter will backwash, which changes the water flow through the sand-anthracite filter.

Applications:

- Side stream filtration of cooling
- Waste Water treatment
- Boiler feed water.

Salient Features:

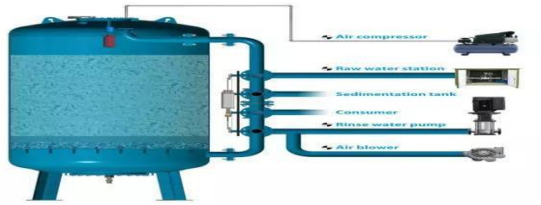
- High Filtration efficiencies
- Filter up to 10 -20 Microns
- FRP, MSRL, MSEP & SS Vessel available.
- Standard and effective sand- anthracite media
- Low Pressure drop across the vessel
- Air scouring available for high flow pressure vessel
- Manual, Semi Automatic and Automatic features are provided



DMF TANK

8. **IMF Tank-**Ironmedia filter Manganite (greensand) is a black filter medium used for removingsoluble iron, manganese and hydrogen sulphide from well water supplies. It also has the capability of removing radium and arsenic. The presence of iron is probably the most common water problem faced by consumers and water treatment professionals. Small amounts of iron are often found in water because of the large amount of iron present in the soil and because corrosive water will pick up iron from pipes. Clothing washed in water containing excessive iron may become stained a brownish color. The taste of beverages, such as tea and coffee, may also be affected by iron.

We are offering Iron Removal Filter that is designed utilizing mild steel welded pressure vessel fitted with M. S. control pipe & C. I. diaphragm valve, strainers, sampling cock, pressure gauge, air compressor and first charge filter media. These filters are highly efficient and reliable products.

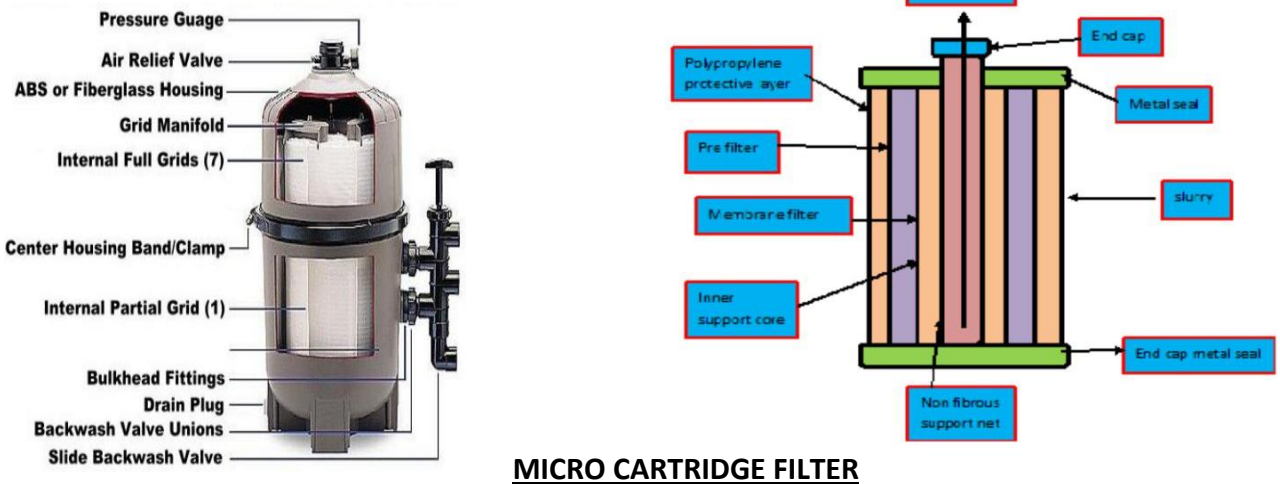


IMF TANK

9. **MICRO CARTRIDGE FILTER**-Physical filtration is the removal of solid material from thewater using a water filter. Cartridge filters are simple, modular filters that are inserted into housing and can be used to remove particles, or sometime chemicals, from the water. Cartridge filters can be composed of a number for materials.

Some may be made from wound strands of a material such as polypropylene.

ITS WORKING- Solid suspended in the water gets trapped on the cartridge filter. The filter willbe rated to remove particles of a certain size – for many supplies; several filters in descending order of particle removal size will be needed. A typical choice would be a 20 micron filter followed by a 5 and / or 1 micron filter, but the exact choice depends on the quality of the supply and the substance(s) that need to be removed. The filter should be clearly marked with its size rating. As long as they are installed and used correctly, cartridge filters can remove sediment, metals and some microorganisms from the water. It is necessary to make sure that the filters are correctly sized for the flow of water you require, otherwise they may block. Cartridge filters work best in situations where there is not much solid material in the water supply and little iron or manganese (less than about 300 micrograms per liter) of iron. Filters containing loose media may need to be used where there is a significant quantity of sediment
in the water or higher concentrations of iron and manganese. In order to remove Clostridium with certainty, a filter rated at 0.5 micron will be needed. For Cryptosporidium this should be 1 micron. Some filters are impregnated with carbon to remove low concentrations of the organic compounds that cause odor in water.



MICRO CARTRIDGE FILTER

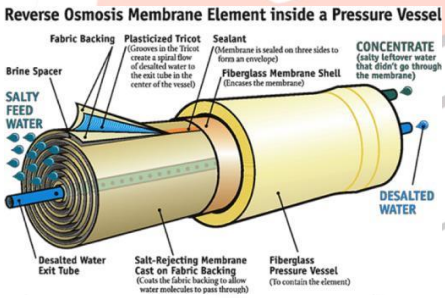
10. **RO FILTER**-The full form of RO is 'Reverse Osmosis'. First we will explain how Reverse Osmosisworks. Reverse Osmosis uses RO membranes to purify water. An RO membrane is like a very, very fine cloth, so fine that it can filter out from water chemical molecules. A molecule is at least a thousand times smaller than the smallest of viruses, bacteria or germs. The image below is used to explain what is RO Reverse Osmosis. The holes or pores of an RO membrane, through which water is filtered out, is so small, that it traps not only the smallest of bacteria or virus but also blocks chemical molecules like that of salt.

The RO pore size diagram below shows a graphical representation of the hole size of an RO Membrane compared with the size of common impurities in water. This helps us to understand how an RO water purifier works.RO membranes have very fine holes called pores, through which pure water molecules can flow through but will not allow larger molecules of salt to pass through.

The diagram shows the size of the RO membrane pore in the centre as 0.0005 microns which is slightly larger than a water molecule, so water molecules pass through an RO membrane pore.

Sodium Chloride molecule at 0.0007 micron is larger, and will not pass through the RO membrane pore. Germs, Viruses, and organic molecules which are very much larger than the RO pore cannot pass through the RO membrane pore. So when dirty water is kept under pressure on one side of the RO membrane, only pure water will pass through the RO membrane pore.

Not all water is passed through the RO membrane pore in a RO water purifier, only about 50% of the dirty water is allowed to pass through the RO membrane as pure water. The balance 50% of the water is flowing over the surface of the membrane continuously and is rejected or thrown out. The impurities remain in this reject RO water which is thrown out into the drain. This explains how RO works in water purifiers



RO filter

11. **DEGASSER TANK**-It is used to remove the carbon dioxide from the water which is purified bythe RO.For a small amount of entrained gas in a drilling fluid, the degasser can play a major role of removing small bubbles that a liquid film has enveloped and entrapped. In order for it to be released and break out the air and gas such as methane, H2S and CO2 from the mud to the surface, the drilling fluid must pass degassing technique and it can be accomplished by the equipment called degasser which is also a major part of a mud systems. A degasser is a device used in drilling to remove gasses from drilling fluid which could otherwise form bubbles.

12. **DM PLANT**-It is also known as demineralization tank. Demineralization is the process ofremoving mineral salts from Water by using the ion exchange process. Demineralised Water is Water completely free (or almost) of dissolved minerals as a result of one of the following processes :

- Distillation
- Deionization
- Membrane filtration (reverse osmosis or nanofiltration)
- Electrodyalisis

Demineralized Water also known as Deionized Water, Water that has had its mineral ions removed. Mineral ions such as cations of sodium, calcium, iron, copper, etc and anions such as chloride, sulphate, nitrate, etc are common ions present in Water. Deionization is a physical process which uses specially-manufactured ion exchange resins which provides ion exchange site for the replacement of the mineral salts in Water with Water forming H+ and OH- ions. Because the majority of Water impurities are dissolved salts, deionization produces a high purity Water that is generally similar to distilled Water, and this process is quick and without scale buildup. De-mineralization technology is the proven process for treatment of Water. A DM Water System produces mineral free Water by operating on the principles of ion exchange, Degasification, and polishing. Demineralized Water System finds wide application in the field of steam, power, process, and cooling.

Principle:
Raw Water is passed via two small polystyrene bead filled (ion exchange resins) beds. While the cations get exchanged with hydrogen ions in first bed, the anions are exchanged with hydroxyl ions, in the second one.

Process:
In the context of Water purification, ion-exchange is a rapid and reversible process in which impurity ions present in the Water are replaced by ions released by an ion-exchange resin. The impurity ions are taken up by the resin, which must be periodically regenerated to restore it to the original ionic form. (An ion is an atom or group of atoms with an electric charge. Positively-charged ions are called cations and are usually metals; negatively-charged ions are called anions and are usually non-metals).

Cations(strong Acid caution)

Calcium (Ca2+)

Magnesium (Mg2+)

Sodium (Na+)

Potassium (K+)

Anions (strong base Anion)

Chloride (Cl-)

Bicarbonate (HCO3-)

Nitrate (NO3-)

Ion Exchange Resins :

There are two basic types of resin - cation-exchange and anion-exchange resins. Cation exchange resins will release Hydrogen (H+) ions or other positively charged ions in exchange for impurity cations present in the Water. Anion exchange resins will release hydroxyl (OH-) ions or other negatively charged ions in exchange for impurity anions present in the Water.
The application of ion-exchange to Water treatment and purification. There are three ways in which ion-exchange technology can be used in Water treatment and purification :
First, cation-exchange resins alone can be employed to soften Water by base exchange; secondly, anion-exchange resins alone can be used for organic scavenging or nitrate removal; and thirdly, combinations of cation-exchange and anion-exchange resins can be used to remove virtually all the ionic impurities present in the feed Water, a process known as deionization. Water deionizer's purification process results in Water of exceptionally high quality

Deionization:

For many laboratory and industrial applications, high-purity Water which is essentially free from ionic contaminants is required. Water of this quality can be produced by deionization.The two most common types of deionization are :

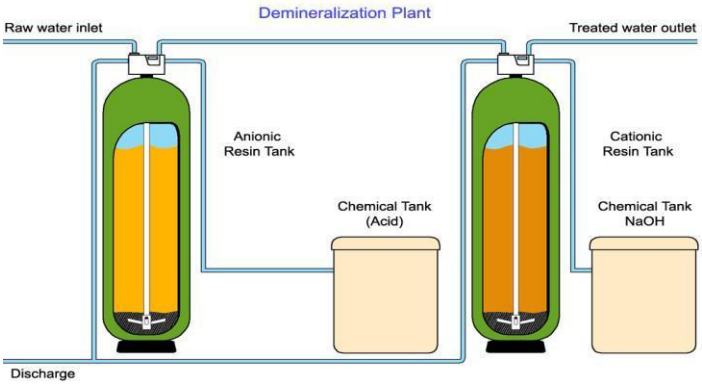
- Two-bed deionization
- Mixed-bed deionization

Two-bed deionization:
The two-bed deionizer consists of two vessels - one containing a cation-exchange resin in the hydrogen (H+) form and the other containing an anion resin in the hydroxyl (OH-) form. Water flows through the cation column, whereupon all the cations are exchanged for hydrogen ions. To keep the Water electrically balanced, for every monovalent cation, e.g. Na+, one hydrogen ion is exchanged and for every divalent cation, e.g. Ca2+, or Mg2+, two hydrogen ions are exchanged. The same principle applies when considering anion-exchange. The decationised Water then flows through the anion column. This time, all the negatively charged ions are exchanged for hydroxide ions which then combine with the hydrogen ions to form Water (H2O).

Mixed-bed deionization:
In mixed-bed deionizers the cation-exchange and anion-exchange resins are intimately mixed and contained in a single pressure vessel. The thorough mixture of cation-exchangers and
anion-exchangers in a single column makes a mixed-bed deionizer equivalent to a lengthy series of two-bed plants. As a result, the Water quality obtained from a mixed-bed deionizer is appreciably higher than that produced by a two-bed plant. Although more efficient in purifying the incoming feed Water, mixed-bed plants are more sensitive to impurities in the Water supply and involve a more complicated regeneration process. Mixed-bed deionizers are normally used to 'polish' the Water to higher levels of purity after it has been initially treated by either a two-bed deionizer or a reverse osmosis unit.

Electrodeionization EDI:

Electrodeionization Systems remove ions from aqueous streams, typically in conjunction with reverse osmosis (RO) and other purification devices. Our high-quality deionization modules continually produce ultrapure Water up to 18.2MW/cm. EDI may be run continuously or intermittently.



MIXED BED TANK

A Mixed Bed unit is provided to treat contaminate condensate. In M.B. Unit the cation and anion resin beads are mixed together. In effect, it is equivalent to a number of two-step demineralizers in series. In a mixed-bed demineralizer, more impurities are replaced by hydrogen and hydroxyl ions, and the water that is produced is extremely pure. The conductivity of this water can often be less than 0.06 microns per centimeter. M.B. Unit is a MSRL vertical pressure vessel fitted internally with top distributor, bottom and middle collecting system. Externally it is fitted with frontal pipe work and control valves.

- Durability
- High Efficiency
- Reliability
- Accuracy

SOFTNER PLANT

This plant is used for the removing of hardness from the water. In this plant there are following step were used -

- **Brine solution charging**
- **MGF Tank**
- **Softener tank**

13. Water softening

Idealized image of water softening process involving replacement of calcium ions in water with sodium ions donated by a cation-exchange resin. Water softening is the removal of calcium, magnesium, and certain other metal cations in hard water. The resulting soft water is more compatible with soap and extends the lifetime of plumbing. Water softening is usually achieved using lime softening or ion-exchange resins.

Hard water

The presence of certain metal ions like calcium and magnesium principally as bicarbonates, chlorides, and sulfates in water causes a variety of problems. Hard water leads to the buildup of lime scale, which can foul plumbing, and promote galvanic corrosion. In industrial scale water softening plants, the effluent flow from the re-generation process can precipitate scale that can interfere with sewage systems. The slippery feeling experienced when using soap with soft water occurs because soaps tend to bind to fats in the surface layers of skin, making soap molecules difficult to remove by simple dilution. In contrast, in hard-water areas the rinse water contains calcium or magnesium ions which form insoluble salts, effectively removing the residual soap from the skin but potentially leaving a coating of insoluble stearates on tub and shower surfaces, commonly called soap scum. Which of these effects is considered more or less desirable varies from person to person, and those who dislike the sliminess and difficulty of washing off soap caused by soft water may harden the water by adding chemicals such as baking soda, calcium chloride or magnesium sulfate.

Lime scale in a PVC pipe

Methods:

The most common means for removing water hardness rely on ion-exchange resin or reverse osmosis. Other approaches include precipitation methods and sequestration by the addition of chelating agents.

Ion-exchange resin devices

Conventional water-softening appliances intended for household use depend on an ion-exchange resin in which "hardness ions"—mainly Ca^{2+} and Mg^{2+}—are exchanged for sodium ions. As described by NSF/ANSI Standard 44,ion-exchange devices reduce the hardness by replacing magnesium and calcium (Mg^{2+} and Ca^{2+}) with sodium or potassium ions (Na^{+} and K^{+})."Ion exchange resins, in the form of beads, are a functional component of domestic water softening units.

Ion exchange resins are organic polymers containing anionic functional groups to which the divalent cations (Ca^{++}) bind more strongly than monovalent cations (Na^{+}). Inorganic materials called zeolites also exhibit ion-exchange properties. These minerals are widely used in laundry detergents. Resins are also available to remove carbonate, bi-carbonate and sulfate ions which are absorbed and hydroxide ions released from the resin.[citation needed]

When all the available Na^{+} ions have been replaced with calcium or magnesium ions, the resin must be re-charged by eluting the Ca^{2+} and Mg^{2+} ions using a solution of sodium chloride or sodium hydroxide depending on the type of resin used. For anionic resins, regeneration typically uses a solution of sodium hydroxide (lye) or potassium hydroxide. The waste waters eluted from the ion-exchange column containing the unwanted calcium and magnesium salts are typically discharged to the sewage system.

Lime softening: Lime softening is the process in which lime is added to hard water to make itsofter. It has several advantages over the ion-exchange method but requires full-time, trained personnel to run the equipment.

Chelating agent

Chelators are used in chemical analysis, as water softeners, and are ingredients in many commercial products such as shampoos and food preservatives. Citric acid is used to soften water in soaps and laundry detergents. A commonly used synthetic Chelators is ethylenediaminetetraacetic acid (EDTA).

Distillation and rain water

Since Ca2+ and Mg2+ exist as nonvolatile salts, they can be removed by distilling the water. Distillation is too expensive in most cases. Rainwater is soft because it is naturally distilled during the water cycle of evaporation, condensation and precipitation.

Reverse osmosis

Reverse osmosis (RO) takes advantage of hydrostatic pressure gradients across a special membrane. The membrane has pores large enough to admit water molecules for passage; hardness ions such as Ca2+ and Mg2+ remain behind and are flushed away by excess water into a drain. The resulting soft water supply is free of hardness ions without any other ions being added. Membranes have a limited capacity, requiring regular replacement.

Non-chemical devices

Some manufacturers claim that their electronic devices affect the interaction of minerals with water so that the minerals do not bind to surfaces. Since these systems do not work by exchanging ions, like traditional water softeners do, one benefit claimed for the user is the elimination of the need to add salt to the system. While particle size reduction and plant growth promotion have been claimed, such systems do not remove minerals from the water itself. Rather, they can only alter the downstream effects that the mineral-bearing water would otherwise have. Examples are remediation of calcium scaling and remediation of salt crusts in soil. These systems do not fall within the term "water softening" but rather "water conditioning".

Similar claims for magnetic water treatment are not considered to be valid. For instance, no reduction of scale formation was found when such a magnet device was scientifically tested.

The above methods, of distillation and reverse osmosis, are the most widely used two non-chemical methods of water softening.

BRINE SOLUTION-This solution is used for the charging of the raw water, which is mix with aratio of 10% of water. After that the water is passed through the MGF and after that in the softener tank where the hardness is removed. After that water is stored in the softener tank from where it is supply to the plant for the cooling.

14. Conclusion:

TDS in different water

water	TDS value
Brackish water	1000 mg/l to 10,000mg/l
Saline water or Salt water	More than 10,000mg/l
Sea water	TDS is greater than 35000mg/l

Some techniques for the reducing the concentration of water

By mixing the two different concentration of the water

Let‘s take two different sample of 1Liter

Whose hardness is x_1 and x_2

If we take z_1 ml sample of first sample and z_2 ml of the 2nd sample then the hardness of the resultant solution will be x_3.then x_3 become

$X_3=(X_1Z_1+X_2Z_2)/(Z_1+Z_2)$

E.g.=$7m^3$@440ppm and $2m^3$@825ppm

Z1=$7m^3$ Z2=$2m^3$ x1=440ppm x2=825ppm

Resultant(x)=(440*7+825*2)/(7+2)

X=525.55ppm

By this we can decrease the tds of two mixture of water and then we can reduce the tds by the different processes which are discussed. With the help of this we can use the sea water by mixing with the different other water and then we can utilize the sea water for the different purposes.

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16. Author Profile:

a) Satyendra Pratap Singh

He received the B.Tech. Degree in Mechanical Engineering in 2015. He is now withRajarshi Rananjay Sinh Institute of Management & Technology, Amethi as an Assistant Professor in Mechanical Engineering Department. He secured All India 12th position in Dr. APJ Abdul Kalam Technical University with an excellent record of cracking GATE for consecutively 3 times. He has published 5 International papers with different Journal. He is appointed as reviewer in 3 international Journals.

b) **Rajan Tiwari**

He is pursuing the B.Tech in Mechanical Engineering from Rajarshi Rananjay Sinh Institute ofManagement &Technology, Amethi. Currently, He is a student of Fourth Year (B. Tech). He has published International papers in IJAERS with impact factor 5.87.

c) Ashutosh Tiwari

He is pursuing the B.Tech in Mechanical Engineering from Rajarshi Rananjay Sinh Institute ofManagement &Technology, Amethi. Currently, He is a student of Fourth Year (B. Tech).

d) Mohd. Ali Ashraf

He is pursuing the B.Tech in Mechanical Engineering from Rajarshi Rananjay Sinh Institute ofManagement &Technology, Amethi. Currently, He is a student of Fourth Year (B. Tech).