

**OPERATION - MAINTENANCE MANUAL
&
TROUBLE SHOOTING MANUAL FOR
540 KLD WATER TREATMENT SYSTEM**

**CLIENT: M/S. APARNA CONSTRUCTIONS AND ESTATES PVT.LTD.
BANJARA HILLS, HYDERABAD**

**PROJECT: APARNA HILL PARK LAKE BREEZE,
CHANDA NAGAR
HYDERABAD**

**PO NO: ACEPL_CONS\F\113-EXT.SER\S00680\ACE\WO\01129\1516\A0 (FRESH)
DT: 10.06.2015.**

REVOLVE ENGINEERS PVT. LTD.,

D.No: 7-1-282/C/1/52/C

Plot No-52, Lingaiah Nagar, Balkampet

Hyderabad-500 016

PH NO: 040-44545100-111

TELE FAX: 040-44545125

E Mail: water@revolveengineers.com

Chapter – A

Introduction of Filters

1.1 Filtration

Filtration is the process of passing liquid containing suspended matter through a suitable porous material (filtering medium) to effectively remove the suspended Impurities in the liquid.

Filtration is the final step in the solid removal process which includes coagulation, Flocculation and sedimentation. The purpose of filter as mentioned earlier is to remove the particulate impurities from the water being treated.

1.2 Types of Filters

In water treatment there are 3 types of filtrations

- 1) Inline filtration
 - 2) Conventional filtration
 - 3) Direct filtration
1. Inline filtration is one in which coagulant chemicals are added just prior to the water entering the filtration unit.
 2. Conventional filtration is a process commonly employed in municipal and large water treatments. Here all the pretreatment steps are included
 3. Direct filtration is similar to conventional filtration except that the step of sedimentation is omitted.



TECHNICAL DATA SHEET

SAND FILTER

1.3 Pressure Sand Filter

Pressure Sand Filters are closed cylindrical vessel either vertical or horizontal (mostly vertical) containing the filter media over a collector system. Water flows from top downwards percolating through the media and is drawn off through the collector system at the bottom. Cycle of operation are service, back wash with or without air scouring, short rinse to waste and return to service. Increase in pressure drop indicates that filter media is fouled and requires backwashing.

The following materials are normally used as filter media - Quartz sand, silica sand, anthracite, coal, garnet etc.

Filter which uses only sand is called sand filter. Filter which use two media (normally sand and anthracite) is called dual media filter. Multimedia filter uses more than three or more filter media. Dual media and multimedia filter operate at higher velocity and require less backwash water. Back wash water for filters should always be filtrate water.

SOFTENER:

Introduction :

Softening by ion exchange resin is also known as Base Exchange softening. It is the most common and probably the easiest method of removing hardness (that is calcium & magnesium) from water and renders the water suitable for utility purpose.

Process:

The softening process consists of passing raw water containing hardness through a bed of cation resin in sodium form. The hardness ions Ca & Mg are taken up by resin and in exchange sodium ions are relinquished from the resin. Raw water will continue to get softened till the resin gets exhausted. Bringing back the resin to its original form is called regeneration. Softener resin is regenerated by sodium chloride of 10—15 % Concentration.

TECHNICAL DATA SHEET

1. DATASHEET FOR PRESSURE SAND FILTER:

PARAMETERS	DATA
Description	Vertical Cylindrical
Flow	30 cum/hr
Filtration Velocity	26 m ³ /m ² /hr
Design Pressure	5 Kg/Cm ²
Working Pressure	3-3.5 Kg/Cm ²
MOC	MSEP
Internal Finish	Epoxy Paint
External Finish	Anti Corrosive Epoxy Paint
Size	1200 mm Dia X 1875 mm Ht
Shell Thickness	6mm
Dish Thickness	8mm
Make of Vessel	REPL
Supporting Media	Pebbles
Media	Various Sizes of Sand & Pebbles
Media Quantity	1945 Kgs.
Valve	Butterfly Valves
Frontal Piping	MS 'B' Class piping with Manually operated Butterfly Valves and GI Lateral arrangement
Quantity	1 No.

2. DATA SHEET FOR SOFTENER 1:

PARAMETERS	DATA
Description	Vertical Cylindrical
Flow	30 cum/hr
Raw Water Hardness	600 PPM
Outlet Hardness	<50-100 Ppm as CaCO_3
OBR	270 Cum
MOC	MSEP
Internal Finish	Epoxy Paint
External Finish	Anti Corrosive Epoxy Paint
Size	1800 mm Dia x 1875 mm Ht
Shell Thickness	6mm
Dish Thickness	8mm
Design Pressure	5 Kg/Cm ²
Working Pressure	3 Kg/Cm ²
Volume Of the Resin	2945 Ltrs
Resin	Sodium Based Cation Resin
Resin Make	Ion Exchange/ EQ
Salt required for Regeneration	590 Kgs
MOC	MSEP
Make Of Vessel	REPL
Valve	Butterfly Valves
Frontal Piping	MS 'B' Class piping with Manually operated Butterfly Valves and GI Lateral arrangement
Quantity	1 No.

3. DATA SHEET FOR SOFTENER 2:

PARAMETERS	DATA
Description	Vertical Cylindrical
Flow	30 cum/hr
Raw Water Hardness	600 PPM
Outlet Hardness	<50-100 Ppm as CaCO_3
OBR	270 Cum
MOC	MSEP
Internal Finish	Epoxy Paint
External Finish	Anti Corrosive Epoxy Paint
Size	1800 mm Dia x 1875 mm Ht
Shell Thickness	6mm
Dish Thickness	8mm
Design Pressure	5 Kg/ cm^2
Working Pressure	3 Kg/ cm^2
Volume Of the Resin	3140 Ltrs
Resin	Sodium Based Cation Resin
Resin Make	Ion Exchange/ EQ
Salt required for Regeneration	630 Kgs
MOC	MSEP
Make Of Vessel	REPL
Valve	Butterfly Valves
Frontal Piping	MS 'B' Class piping with Manually operated Butterfly Valves and GI Lateral arrangement
Quantity	1 No.

4. DATA SHEET FOR BRINE SOLUTION TANK:

PARAMETERS	DATA
Capacity	3500 Ltrs.
Type	Vertical Cylindrical
MOC	MSFRP
Make	REPL
Qty	1No

5. DATA SHEET FOR CHLORINE DOSING SYSTEM:

PARAMETERS	DATA
Capacity	0-6 LPH with manual adjustment
Type	Electronic Diaphragm Type
MOC	Poly Propylene
Pump Make	Edose
Mixing Tank Volume	100 ltrs.
MOC	HDPE
Qty	1No
Make	REPL

6. DATA SHEET FOR DIGITAL FLOW METER :

Description	
Make	Aster / eq
Size	100 NB
Quantity	2Nos

OPERATION OF THE SOFTENERS :

- The water coming from filter is enters into softener1 i.e.,30 cum/hr passing through each softener. By monitoring flows by **Digital flow meters** at the softeners outlet flow.
- In this operation of regeneration first Softener to be regenerated after volume arrives its OBR ie.270 CUM as well as Designed Hardness 50ppm -100ppm. Regeneration process is takes around 1.30Hrs.
- After finishing first softener regeneration then we will start second softener. Same procedure will repeat to the second Softener. Second Softener will cross its OBR and designed Hardness for 1.30Hrs only for very first regeneration operation.
- Regeneration:
 - For Softener 1:
 - **Preparation of Brine solution:** 590 Kgs of salt, 2945 liters water is used to stir it to dilute the salt completely. For valves operation, follow as per manual and soak for 15min. Then
 - **Rinse:** 20min.
 - Now the system is ready for service.
 - For Softener 2:
 - **Preparation of Brine solution:** 630 Kgs of salt, 3145 liters water is used to stir it to dilute the salt completely. For valves operation, follow as per manual and soak for 15min. Then
 - **Rinse:** 20min.
 - Now the system is ready for service.

Chapter –B

Operation of the Pressure Sand Filter:

Introduction

Filtration is the final operation in clarification process. In small & medium size water treatment plants filtration unit may be given without coagulation also.

Start up of Pressure Sand filter:

- 1) Check all equipment and see that they are ready for operation
- 2) Lubricate all mechanical equipment
- 3) Start the bore well pump and fill the water in Raw water storage tank
- 4) Start the raw water pump
- 5) Open inlet Valve V1 and Air release valve V6 (see drawing and valve nomenclature)
- 6) Close V2,V3 And V5
- 7) Open Backwash outlet valve V2, and then slowly open backwash inlet valve V3&V5
- 8) Carry this operation for 10 minutes.
- 9) If the unit has been idle for long time or is being backwashed for first time then duration of backwash should be longer.
- 10) Open Rinse- Inlet Valve V1, V4 & V5 till clear Effluent starts flowing.
- 11) Close V5.
- 12) The unit is ready for service.

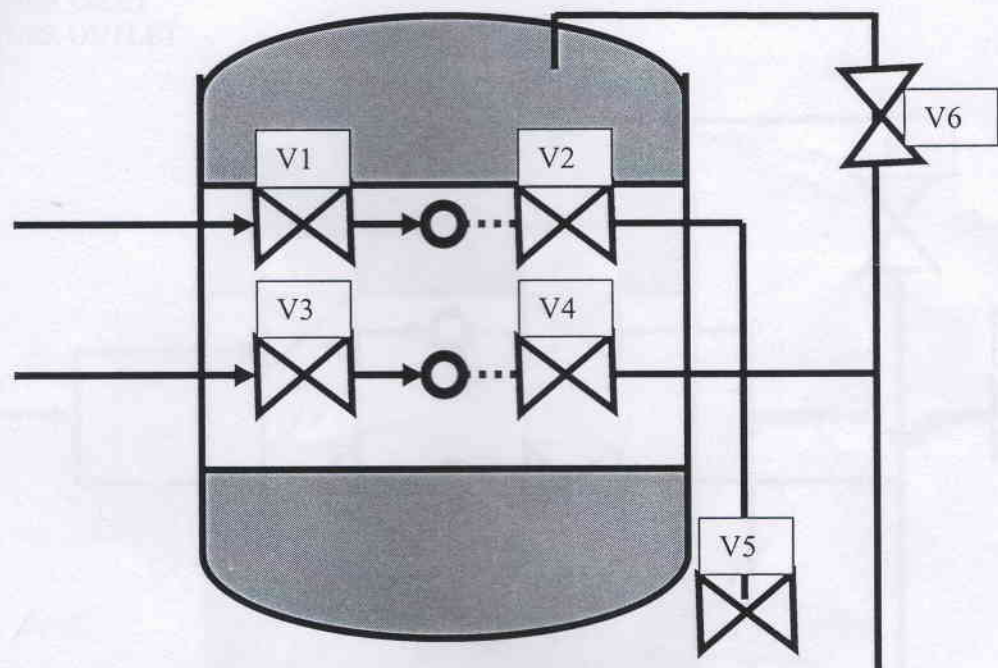
Note:

In larger plants where there is provision for air scouring, air scouring operation is done before backwashing.

2.2 Stopping

- 1) Stop the Raw water pump
- 2) Close all valves
- 3) Open air release valve V6. After the pressure is released, close V6.

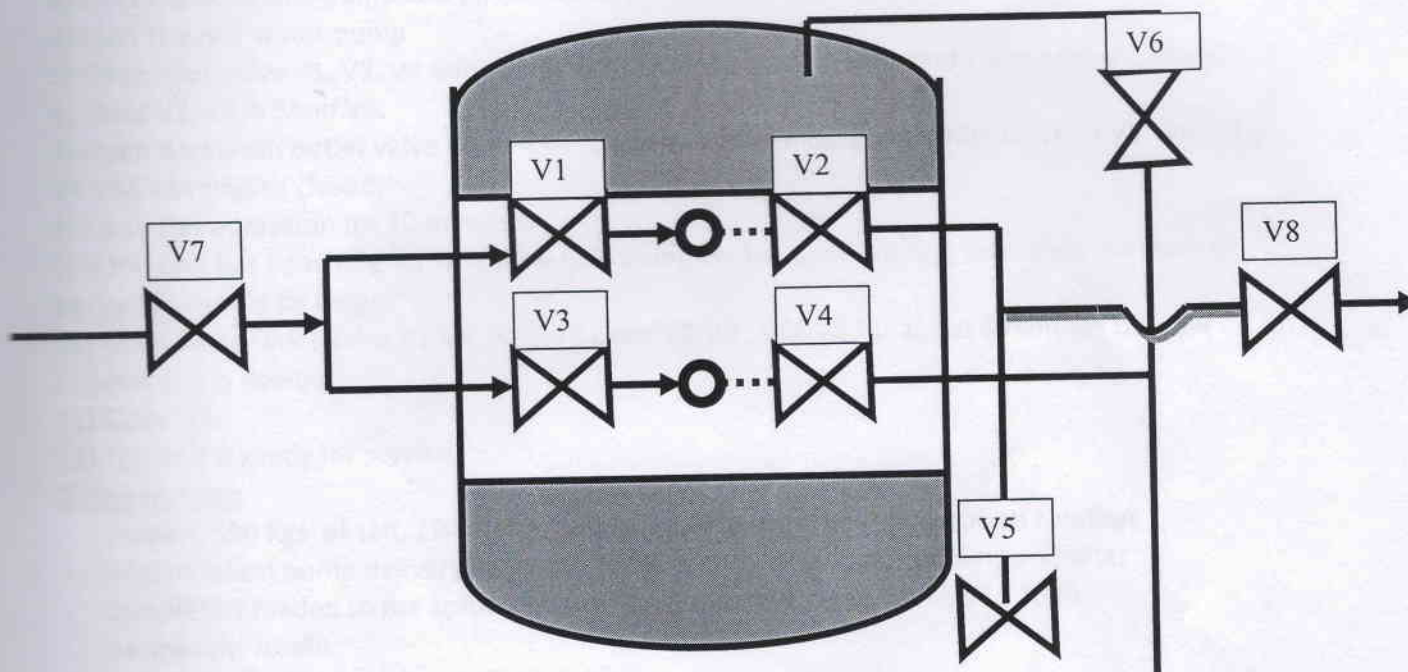
V1 - INLET
V4 - OUTLET
V3 - BACKWASH INLET
V2 - BACKWASH OUTLET
V5- OUTLET (drain)
V6 - AIR RELEASE



Operation of Sand Filter:

S.No	Step	Valves Open	Valves closed
1	Vessel Filling	V1 & V4 V6 open till air released	V2, V3, & V5
2	Backwash	V2, V3 & V5	V1, V4 & V6
3	Rinse	V1, V4 & V5	V2, V3, & V6
4	Service	V1 & V4	V2, V3 & V5

V1 - INLET
V2 - OUTLET
V3- BACKWASH INLET
V4 - BACKWASH OUTLET
V5 - RINSE OUTLET (Drain)
V6 - AIR RELEASE
V7 - SOFTENER INLET
V8 - SOFTENER OUTLET



Operation of Softener:

S.No	Step	Valves Open	Valves closed
1	Vessel Filling	V1, V4, V7 V6 till air released	V2, V3, V5&V6
2	Backwash	V2, V3, V5&V7	V1,V4,V6&V8
3	Rinse	V1, V4, V5&V7	V2,V3 ,V6&V8
4	Service	V1, V4, V7&V8	V2, V3,V5&V6

Operation of the Softener 1:

Introduction

Filtration is the final operation in clarification process. In small & medium size water treatment plants filtration unit may be given without coagulation also.

Start up of Softener:

- 1) Check all equipment and see that they are ready for operation
- 2) Lubricate all mechanical equipment
- 3) Start the bore well pump and fill the water in raw water storage tank
- 4) Start the raw water pump
- 5) Open inlet valve V1, V7, V4 and Air release valve V6 (see drawing and valve nomenclature)
- 6) Close V2, V3, V5 And V6.
- 7) Open Backwash outlet valve V2 and V7 then slowly open backwash inlet valve V3, V5 and V1, V4, V6 & V8 remains closed.
- 8) Carry this operation for 10 minutes.
- 9) If the unit has been idle for long time or is being backwashed for first time then duration of backwash should be longer.
- 10) Open Rinse- Inlet valve V1, V4, V5 & V7 close V2, V3, V6 & V8 for about 5 minutes till clear Effluent starts flowing.
- 11) Close V5.
- 12) The unit is ready for service.

Regeneration:

Prepare 590 Kgs of salt, 2945 liters water is used to stir the regeneration solution.

Regeneration pump delivery valve throttle half to flow the liquid slowly and after completely loaded to the softener, soak for 15min. Open V7, V1, V4 & V5. Then

Backwash: 10min.

Rinse: 10min. Then it is ready for service.

Note:

In larger plants where there is provision for air scouring, air scouring operation is done before backwashing.

2.2 Stopping

- 1) Stop the Raw water pump
- 2) Close all valves
- 3) Open air release valve V6. After the pressure is released, close V6.

Operation of the Softener 2:

Introduction

Filtration is the final operation in clarification process. In small & medium size water treatment plants filtration unit may be given without coagulation also.

Start up of Softener:

- 1) Check all equipment and see that they are ready for operation
- 2) Lubricate all mechanical equipment
- 3) Start the bore well pump and fill the water in raw water storage tank
- 4) Start the raw water pump
- 5) Open inlet valve V1, V7, V4 and Air release valve V6 (see drawing and valve nomenclature)
- 6) Close V2, V3, V5 and V6.
- 7) Open Backwash outlet valve V2 and V7 then slowly open backwash inlet valve V3, V5, and V1, V4, V6 & V8 remains closed.
- 8) Carry this operation for 10 minutes.
- 9) If the unit has been idle for long time or is being backwashed for first time then duration of backwash should be longer.
- 10) Open Rinse- Inlet valve V1, V4, V5 & V7 close V2, V3, V6 & V8 for about 5 minutes till clear Effluent starts flowing.
- 11) Close V5.
- 12) The unit is ready for service

Regeneration:

Prepare 630Kgs of salt, 3140 liters water is used to stir the regeneration solution. Regeneration pump delivery valve throttle half to flow the liquid slowly and after completely loaded to the softener, soak for 15min. Open V1, V4, V7, & V5. Then

Backwash: 10min.

Rinse: 10min. Then it is ready for service.

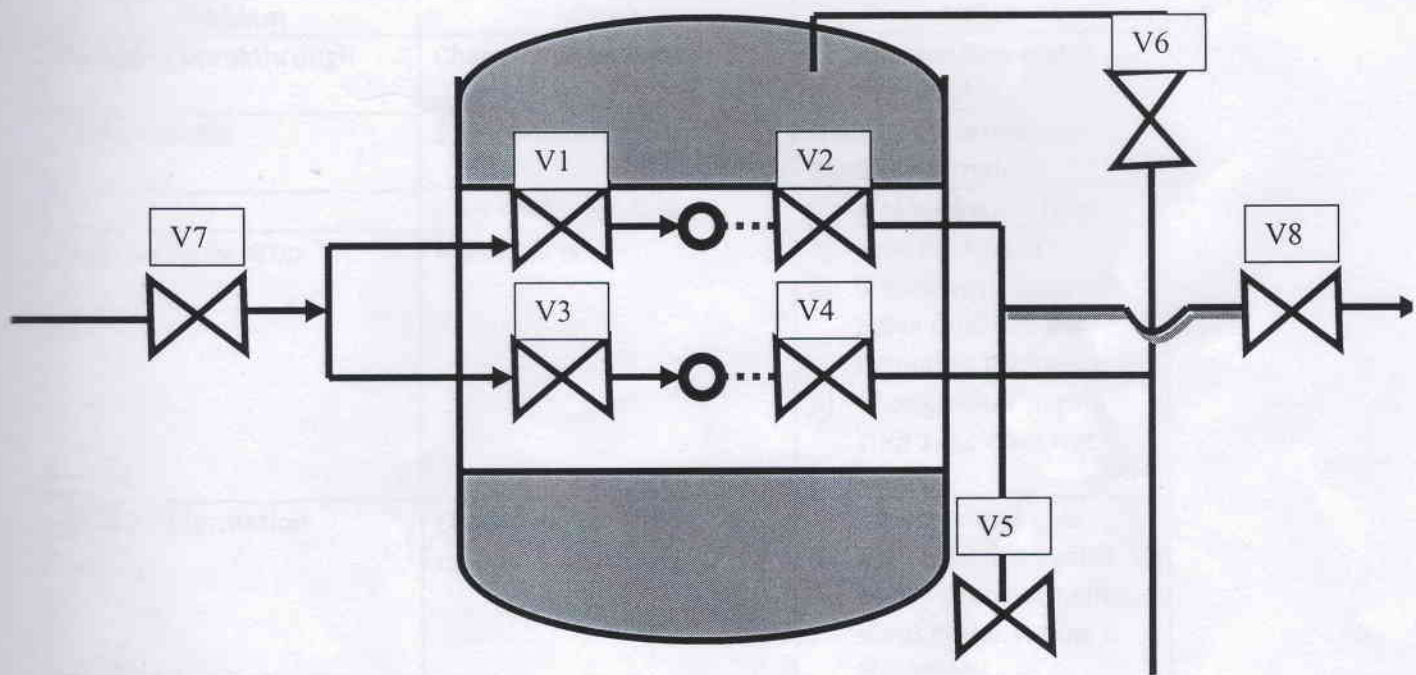
Note:

In larger plants where there is provision for air scouring, air scouring operation is done before backwashing.

2.2 Stopping

- 1) Stop the Raw water pump
- 2) Close all valves
- 3) Open air release valve V6. After the pressure is released, close V6.

- V1 - INLET
- V2 - OUTLET
- V3- BACKWASH INLET
- V4 - BACKWASH OUTLET
- V5 - RINSE OUTLET (Drain)
- V6 - AIR RELEASE
- V7 – SOFTENER INLET
- V8 – SOFTENER OUTLET



Operation of Softener:

S.No	Step	Valves Open	Valves closed
1	Vessel Filling	V1, V4, V7 V6 till air released	V2, V3, V5&V6
2	Backwash	V2, V3, V5&V7	V1,V4,V6&V8
3	Rinse	V1, V4, V5&V7	V2,V3 ,V6&V8
4	Service	V1, V4, V7&V8	V2, V3,V5&V6

3.5 Trouble shooting of filters

Pressure filters are basically very simple in operation and normally does not give much problem. The final effluent from filter if is not of required quality then the reason could be more because of preceding steps and if there is only filter & no coagulation then it is because of Pressure filter not being backwashed regularly. A chart for trouble shooting is shown below.

Problem	Cause	Action
Turbidity Breakthrough	Change in Raw water	1) Analyze Raw water 2) Backwash
Loss of media	Broken internals	Change the laterals or Rectify internals
	High backwash flow	Control backwash flow
High pressure drop	Media dirty	1) Give backwash 2) If backwash does not Solve problem give Extended backwash 3) Change filter media if step 1 & 2 does not work
Mud ball formation	change in raw water quality	1) Air scour and give extended backwash 2) Check pretreatment steps if any. Adjust if Necessary. 3) Decrease Velocity 4) Change media if required

Chapter – c

Maintenance

The routine maintenance of filter includes the following:

3.1 Valves

At periodic intervals (say one month) open the valves and check for Seating, change gland packing or diaphragm depending on the type of valve. Carry out lubrication of spindle.

3.2 Extended backwash

Once in a week the backwash should be given for more time say at least for 45 Minutes. This will help to keep the bed clean.

3.3 Air Scouring & Cleaning of Media

The manhole should be opened once in 6 months and the condition of media should be checked. Any lumps formed on the top of bed should be thrown away.

On units where no regular air scouring is provided; air scouring is done as follows:-

1. If compressed air supply is available, take a temporary tapping (say 1" hose). Attach the hose to a M.S. pipe about 1 meter long. The water level inside the vessel should be about 3" above the bed. The pipe is inserted into the bed till it is half way through the bed. The media will get violently agitated. Move the pipe all over the bed Carry out the air scour for a period of 10 minutes.
2. After the air scour carry out an extended backwash. This extended backwash also called open manhole backwash is given very carefully.
3. Drain the bed till the surface of the bed and scrape of all the dust.
4. Close the manhole.

3.4 Vessel condition

Once a year vessel internal condition should be checked for paints and internals re-paint the vessel after removing the media. Filter media replacement can also be done if required. Filter media is replaced normally once a year.

The routine maintenance guidelines are given both for mild steel filters as well as FRP filters. FRP filters normally require less attention once installed. Operational care is a must for FRP Filter. The pressure should not be more than the recommended pressure or it is likely to damage the filter. FRP filters are of molded design and hence repair is not possible and has to be replaced.

Chapter – D

Water Analysis

Hardness

Hardness is defined as a soap consuming capacity of water. Hardness is mainly due to presence of calcium and magnesium salts. There are two kinds of hardness – Temporary and Permanent. Temporary hardness also called carbonate hardness is due to presence of carbonates and bicarbonates. Permanent hardness is mostly due to chloride, sulphate and nitrates.

Method

EDTA forms a chelated soluble complex when added to a solution of certain metal ions if EBT (Erichrome Black TRIGGER) is added to water containing hardness the colour of the solution turns wine red. This solution when titrated with EDTA will complex all the calcium and magnesium and when this happens the colour turns blue from Red wine. The point at which colour change takes place is known as END POINT.

Reagents

1. Ammonia Buffer Solution
2. 0.01M Solution of EDTA
3. Erichrome Black T indicator.

Apparatus required

1. Burette
2. Graduated cylinder
3. Conical flask (Erlenmeyer Flask)
4. Wash bottle
5. Distilled water

Procedure

Step -1: Take 50ml of sample in an Erlenmeyer

Step -2: Add 2ml of Ammonia buffer solution.

Step -3: Add 3 to 5 drops or ½ tablet of Erichrome black T indicator.

Step -4: The color becomes wine red

Step -5: Immediately titrate against EDTA solution.

Step -6: Carry on titration till the end point is reached i.e. when the color changes to blue.

Calculation

$$\text{Total Hardness as CaCO}_3 = \frac{\text{Volume of 0.01 EDTA Solution}}{\text{Ml of sample}} \times 1000$$

(Mg/liter)

The permanent hardness is found by boiling the water. It is cooled and then above procedure repeated. Temporary hardness is given by the difference of two readings.

Interference

If bicarbonate exceeds 250 PPM it is advisable to add 1ml of 2N HCL before adding the buffer solution. Any other metal ions chelating with EDTA can interfere with the result provided they are in excess then mentioned below

$\text{Al}^{++} > 20\text{ppm}$, $\text{Cu}^{++} > 20\text{ppm}$, iron (Fe^{++} or Fe^{+++}) $> 10 \text{ PPM}$ $\text{PO}_3 > 25\text{ppm}$.

Calcium Hardness

The water sample is titrated against EDTA solution using MUREXIDE INDICATOR (Ammonium murexide) in highly alkaline medium.

Reagents

1. 1N Sodium Hydroxide Solution
2. 0.01M Standard EDTA Solution
3. Murexide Indicator.

Apparatus required

1. Porcelain dishes 100ml capacity.
2. Burette 25 to 50ml
3. Pipettes
4. Stirring rods (Glass)
5. Graduated cylinder.

Procedure:

1. Prepare standard solution as described in chapter.
2. Prepare a color comparison blank in a porcelain dish. The dish should be of white color. 2.0ml of 1N NaOH and 0.2g (4 to 6 drops of indicator) solid indicator is added to 50ml of distilled water with constant stirring 0.05 to 0.1ml of EDTA titrant is added to produce unchanging purple color.
3. 50ml of sample solution is pipette into similar white dish.
4. Add few drops of 0.02 N HCL to neutralize the alkalinity.
5. Boil for 2 to 3 minutes to expel CO_2 and then cool to room temperature.
6. Add 20ml of 1N NaOH or volume sufficient to produce pH of 12 – 13 and mix.
7. Add 0.2gm of powdered indicator or 4 to 6 drops of solution.
8. Stirring constantly titrate with EDTA solution to the colour of comparison blank.

9. Add 1 to 2 drops of titrant in excess to be sure that no further deepening of colour takes place.

Calculation

$$\text{Calcium as ppm CaCO}_3 = \frac{(A-B) \times C \times 1000}{\text{Ml of sample}}$$

Where A = ml of EDTA required for titration of sample.

B = ml of EDTA required for titration of blank.

C = mg of CaCO₃ equivalent to 1.0 ml of EDTA.

Magnesium Hardness: The difference between Total Hardness and Calcium Hardness is magnesium Hardness.

Caution: Laboratory Testing should be done only by qualified personnel. The person should verify the method before testing

SYSTEM OPERATION:

OPERATING GUIDELINE:

All the system pipe work are to be lined up properly before commissioning of any part of the system such as pre-treatment, All the valves are tagged for easy identification for closing and opening as per the guidelines provided in our comprehensive operation & maintenance manual.

Pressure Sand Filter is powered by the energy of moving water. The tanks offer 24 hr. service and trouble free operation. When one tank is exhausted, service automatically switches to the other while the first backwashes,

All the equipments are to be started after ensuring the system's pipe work and vessels is full of water and free of air.

Water samples from different stages of the treatment plant are to be taken regularly checking TSS, Hardness, TDS, and Conductivity of water from RO product water, Filter water, and raw water to assess the performance level.

Detail recording of the plant parameters in standard log sheets, to check and review the performance of the plant as well as to observe for any abnormalities.

All the system pipe work are to be lined up properly before commissioning operation of any part of the system such as pre treatment , All the valves are tagged for easy identification for closing and opening as per the guidelines provided in our comprehensive Operation & Maintenance Manual

SYSTEM OPERATION:

1). RAW WATER PUMP:-

Start Raw Water Supply Pump for feeding water to filter unit. Open delivery valve gradually.

2) Regeneration:

Keep The Multiport in Regeneration and slow rinse Mode and switch on the feed water pump. Ensure the suction of Brine water is taking place.(Time 20-30 mints)

3) Slow Rinse:

Allow the to drain for 30 minutes in Regeneration and slow rinse Mode.

4) Final Rinse:

Change Multi Port Lever to Rinse Position, switch on the feed water pump. Drain the Water for 10-15 Mints and check the hardness of water. Hardness of water is less than 5 ppm, softener is ready for use.

SYSTEM MAINTENANCE:

This section consists of summary of system maintenance tasks, which include scheduled maintenance, trouble shooting and repairs. This section is to be read in conjunction with the detailed maintenance/trouble shooting/repair instructions in the respective manuals supplied by various manufacturers. All maintenance should be documented in a maintenance log, so as to maintain a chronological history of all maintenance tasks performed. While attempt has been made to make this section as exhaustive as possible, site-specific problems are not included here. Need to evolve and establish detailed maintenance schedule specific to the site may exist and instruction for handling such situations may be added to this section, in consultation with the manufacturer, where necessary.

CRITICAL POINTS TO BE MONITERED DURING PROCESS	
Above normal or excessive force in operations	Scoring or jamming with foreign matter or debris. If this condition persists after rinsing, disassemble the valve to clear. Continued operation of the valve may result in the non-sealing condition (damage to gasket). This will lead to water loss to the back wash line or to inefficient filtration.
Dirty Water	1. Insufficient filtration time.
	2. Heavy contaminants or dirt load.
	3. Dirty filter, requires backwashing.
	4. Air leaking on suction (influent line).
	5. Pump impeller vanes blocked.
	6. In sufficient water supply (water level low, blockage).
	7. Pump not primed.
	8. In correct water chemistry.
	9. Excessive flow of water for filter size. Foreign matter or debris forced through filter bed and through the under drain.
	10. Other restrictions including (pool suction cleaners) resistance from other inline
	Equipment such as strainers. Operating the filter on re circulate will determine if the restriction is in the filter.
	11. Clogged or channeled filter media. Perform backwash or regeneration.
	Refer to maintenance section.
Filter Media in the back wash	1. Excessive quantity of media in the filter.
	2. Excessive water flow.
	3. Incorrect sized or grade of filter media.
Filter Media returning to lines	1. Filter is on recalculate.
	2. Verify it is the filter media and not from another source.
	3. Damage to the under-drain laterals.
	4. Damage or incorrect fit of Multiport Valve are correct.
	5. Incorrect or mixed grades of media in the filter.
Short filtration Cycles	1. Presence of algae or a scale build up.
	2. Check water chemistry.
	3. Excessive water flow, check pump size, mains water flow.
	4. Filter blocked through calcium etc. clean filter media.

General Maintenance

The water treatment plant should be inspected externally every six months and any damaged on vessels, pipe work and valves renewed.

An internal inspection of vessels is also recommended every six months, although this period could be extended if service experience indicates that a longer period would not jeopardize this preventative maintenance.

Consequently when removing scale on such items (eg. Bulk storage tanks, measuring and dilution tanks) exercise caution. If there is any possibility of a break-through consult the Water Treatment Plant Chemist or Engineer. If the internal and external inspections are carried out systematically at regular intervals, and a record kept of any work carried out systematically at regular intervals, and a record kept of any work carried out, there will be little likelihood of the unexpected happening.

If it is necessary for maintenance personnel to enter any of the treatment units, rubber or soft soled shoes must be worn and great care taken to avoid damage to any rubber lining and internal lateral systems. The feet should be placed on the lateral clamping bars, not on the laterals themselves and every effort taken to avoid standing on the small plastic strainers. Entry into the vessels should be discouraged, but if unavoidable, must be carried out under the supervision of the WATER TREATMENT PLANT Chemist or Engineer.

PRECAUTIONS TO BE TAKEN:

- 1) Ensure that all fittings as shown on the enclosed "Flow Diagram, and General Layout Drawing" are intact and that there is no damage done in transit
- 2) Ensure that the screwed joints for pressure gauge connections are made leaktight by using Teflon tape or fit-tight compound or o-ring.
- 3) Before taking the water inside the vessel, rotate valve handle to the position 'Bypass to Drain' & let raw water flush the pipeline till the water is clear. This will ensure that any debris is removed from the system.
- 4) Ensure that the inlet and outlet piping is properly supported.

WTP PLANT

DOS	DO NOT DO'S
EVERY DAY DO THE BACK WASH AND RINSING	DON'T DRY RUN THE PUMP.
ADD THE CHLORINE IN DOSING TANK REGULARLY.	DON'T OPERATE THE VALVES WHILE PUMP RUNNING.
CHECK THE HARDNESS VALUE EVERY DAY.	DON'T RUN THE PUMPS CONTINUIOUSLY EVERY FOUR HOURS CHANGE THE PUMP.
AIR SHOULD REMOVE FROM THE PRESSURE SAND FILTER THROUGH AIRVENT	DON'T REACH THE PRESSURE ABOVE 2 KG .
WHEN THE PRESSURE INCREASES DO THE BACK WASH REGULARLY	DON'T FALLING THE WATER ON FILTER FEED PUMPS
CHANGE THE SAND MEDIA IN SAND FILTER EVERY 12 MONTHES	DON'T CHANGE THE PH VALUE RANGE 6.5 -9.5.

Annexure 1 - List of Makes & Manufacturers

PRESSURE SAND FILTER	REPL	M/s. REVOLVE ENGINEERS PVT. LTD., Plot No. 52, D.No. 7-1-282/C/1/52/C, Lingaiah Nagar, Balkampet, Hydreabad – 16
ACTIVATED CARBON FILTER	REPL	M/s. REVOLVE ENGINEERS PVT. LTD., Plot No. 52, D.No. 7-1-282/C/1/52/C, Lingaiah Nagar, Balkampet, Hydreabad – 16
BRINE TANK	REPL	M/s. REVOLVE ENGINEERS PVT. LTD., Plot No. 52, D.No. 7-1-282/C/1/52/C, Lingaiah Nagar, Balkampet, Hydreabad – 16
SAND AND PEBBLES	SRI VENKAT SAI MINERALS	M/s. SRI VENKAT SAI MINERALS HYDERABAD
BUTTERFLY VALVES	INTER VALVE	M/s. INTERVALVE (INDIA) LTD.,
Flow Meters	ASTER TECHNOLOGIES	M/s. Aster Technologies, Regd Office: 2631, clover Highlands off NIBMK , PUNE: 411048
Dosing Pumps	INITIATIVE ENGINEERING	Sr.no: 273, near vittalmandir, Bhatewara Nagar, Pune: 411 057.