



MODERN ESR INTEGRATED WITH WATER TREATMENT PLANT

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Abstract

In our city water is come from the river, dam, lake, etc. But water is not directly taken from the river, dam to the house. Because it contains lot impurities like bacteria, turbidity, dissolve gasses etc .due to spread most of the diseases. Hence water purification is important. Hence for its purification water is first water send to the water treatment plant and then provided to us.

But we can see the same river water is provided to the villages. But where water is not purify and also not provide any water treatment plant. Only add bleaching powder in water due to kill some dissolve organic bacteria and other impurities like turbidity, dissolve gasses like carbon dioxide, odours remains in water. Due to this spread most of the diseases. Hence water treatment plant is necessary in villages. But it is not economical to construct separate water treatment plant to every village. Hence we design such type modern ESR (Elevated Storage Reservoir) with water treatment plant. So as to we provide purify water for the villages. Also We implements some atomization system in it. These system should be more economical for construction and maintenance as compare to the ground level water treatment plant . For providing purify water to the small villages , where water is coming from river or dam. And also these system is easy for operating due to atomization. And we design this type of tank for the 900 people.

Index term: Keywords— ESR

1. INTRODUCTION

Water contains lot impurities like bacteria, turbidity, dissolve gasses etc. Due to spread most of the diseases . Hence water purification is important. Hence for its purification water is first water send to the water treatment plant and then provided to us.

But we can see the same river water is provided to the villages. But where water is not purify and also not provide any water treatment plant. Only add bleaching powder in water due to kill some dissolve organic bacteria and other impurities like turbidity , dissolve gasses like carbon dioxide, odors remains in water . Due to spread most of the diseases.

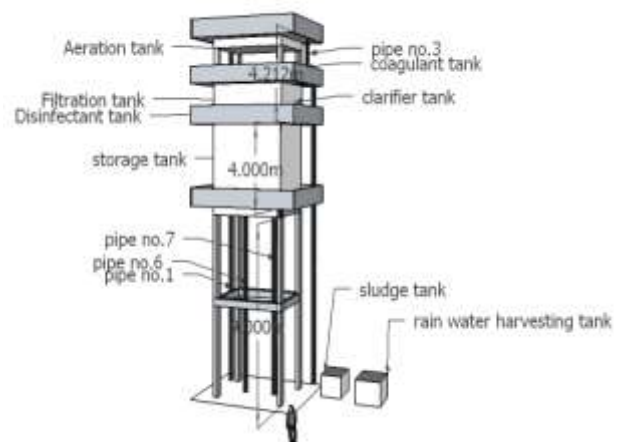
Hence water treatment plant is necessary in villages. But it is not economical to construct separate water treatment plant to every villages .Hence I design such type ESR (Elevated Storage Reservoir) with water treatment plant. So as to we provide purify water for the villages. Also I implicates some atomization system in it.

1. WORKING PRINCIPAL AND UNITS OF THESE PROJECT**1.1. Solar Pump:-**

For lifting water from intake structure to ESR we used solar pumps due to save the electricity. as well as for its supplementary we used electric pump.

1.2. Pipe No.(1)

Pipe(1) which carrying water from intake structure to attach the spray aerators nozzle.



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1.3. Aeration Tank

Aeration is the process of bringing water in intimate contact with air.

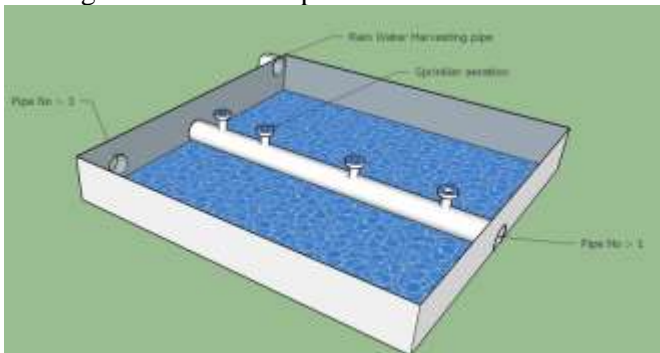
1.3.1. Objectives Of Aeration

- It removes taste and odor cause by gases due to organic decomposition.
- It increases the dissolved oxygen content of the water due to increase the freshness of water.
- It also remove hydrogen sulphate and hence odor due to this is also removed.
- It decreases the carbon dioxide content of water and there by reduces its corrosiveness and raise its P_H value.
- Due to aeration of water , bacteria may be killed to some extent.
- It also used for mixing chemical.

1.3.2. Spray Aerators

For mixing the more oxygen and also removing the all gases , We used spray nozzle aeration. In this method , the water is thrown up in the air with the help of fine sprays to a height of 1-1.5m under water pressure of 0.7 to 1.15 kg/cm^3 .

When small particles of water come in contact of greater surface area of the air, they absorb it and the water is aerated .This dissolved gases like H_2S , CO_2 , etc. escape into atmosphere and the oxidation of various substances and organic matter takes place.



Aeration Tank

1.4. Rain Water Harvesting Pipe No.(2)

Rain water harvesting pipe is used to carrying the extra rain water in the aeration tank and it is use for rain water harvesting.

1.5. Pipe No.(3)

Pipe no.(3) which carry the aerated water from aeration tank to the clarifier tank and it also attack the coagulant pipe.

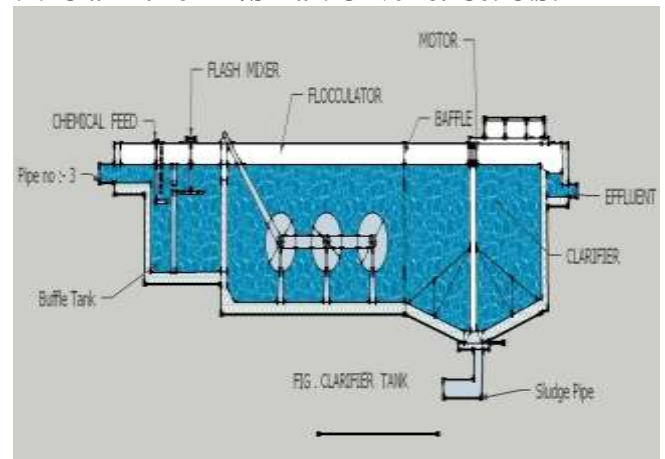
1.6. Coagulant Tank

- Coagulant has been found that when certain chemicals are added to water an insoluble, gelatinous, flocculent precipitation are formed.
- After aeration second main filtration unit is clarify in clarifier for formation of flock coagulant like alum ,

lime is required. Hence for storing coagulant there are coagulant tank is provided.

- And also for carrying the coagulant separate pipe is provided. Pipe is attached to the deflector plate at flash mixer to coagulant tank.
- When during the filtration process.

1.7. Clarifier of M/S Dar. Oliver & Co. U.S.A



Clarifier

In this operation, the flock which has been formed above is allowed to settle down the suspended particle and separated from the water.

1.7.1. Baffle Tank

After aeration water flows under gravity with high velocity due to stable water in clarifier tank get disturb or unstable. Hence we provide baffle tank. In which water from aeration tank first entered in these tank , then tank fill up slowly. Hence due to velocity of water is decreases.

1.7.2. Flash Mixer

In this unit device , the solution of a coagulants is mixed thoroughly in the water by means of a fan operated by electric motor suitable drive.

1.7.3. Flocculation

After thoroughly mixing of coagulants in the water next unit is flocculation. Flocculators are slow stirring mechanism which form flock. Flocculators mostly consist of paddles which are revolving at very slow speed about 2-3 r.p.m.

Paddles may revolve on a vertical or horizontal shaft. The detention time for best result should be between 30 - 60 minutes.

1.7.4. Clarifier

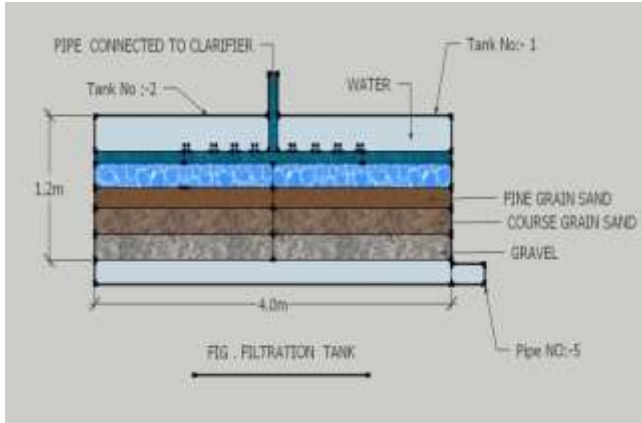
The design of clarifier is similar to that of plain sedimentation tank. Some clarifiers are fitted with a moving arm known ranking arm. These device are also fitted with continuous sludge removing arrangements. Then after 30 - 40 minutes suspended particles is settle down and clear water is form at upward side. Then these clear water is passes through pipes are provided on the top of the

clarifier tank. Pipe carrying a water on the top of the filter media.

1.8. Sludge Pipe

Sludge pipe is used to carrying the sludge or suspended particles from the clarifier tank to the sludge tank.

1.9. Filtration



Filtration is one of the most important operation in the water purification process. Though screening and sedimentation effectively remove fine flock particles, dissolved minerals, micro-organisms. In filtration, water is passed through a filter previously removed by sedimentation.

During filtration the turbidity and colloidal matter of non-settable type are removed. It precipitates the colour, due to which the chemical characteristics of water are changed. The bacterial content of water is considerably reduced due to the presence of an active zoological layer on the top of filtering material.

In these process, We use rapid sand filter because we know that rapid sand filter is very fast purification process than slow sand filtration. Also we provide two rapid sand filtration, because when during the cleaning of the filter media or sometime block the filter media at that time never stop the purification process. Hence for its continuations, we are provide two rapid sand filters.

1.10. Pipe No.5

Pipe no.(5) which is used to carrying the filtered water from both the tank to the storage tank. It also attach the disinfection pipe.

1.11. Disinfection Tank

The filters are unable to remove all the disease spread bacteria. They can remove only few types of bacteria. Therefore, the bacteria which comes out from the filter may contain some disease spread bacteria in addition to the useful bacteria. Before the water supplied to the public it is most necessary to kill all these disease causing bacteria. The chemicals or substances which are used to killing the bacteria known as "Disinfectants".

Hence, For storing the disinfectants the disinfection tank is provided. When water is flowing through the pipe no.5 at that time required amount of disinfectants are added in these pipe.

1.12. Pipe No.(6)

Pipe no.(6) which is used to supply the water from storage tank to the main pipe in water distribution system at the village.

1.13. Pipe No.(7)

Pipe no.(7) which is use to carry cleaning water from tank, during cleaning.

1.14. Pipe No.(8)

When some atomization system is damage or if any problem occurs, at that time these pipe is used to carry the overflow water. These pipe is attach to the storage tank and the pipe from storage tank is attach to the main pipe of water distribution system.

1.15. Pipe No.(9)

Pipe no.(9) is attach to the pipe no.(1) which carry the water from river. Pipe no.(9) is used to cleaning of filtration tank. They block due to suspended and zoological algae.

1.16. Pulley

For lifting the sand, coagulant, disinfectants from the ground level to the tank we provide the pulley near the filtration tank.

1.17. Circular Staircase

In these system we provide the circular staircase for the safety of operator.

2.0. ATOMIZATION

In these system we are used some atomization units are as follows

- With the help of relay and GPS system, when the tank is fill up to the level tube, then GPS system send the message to the operator and then operator switch off the pump and stop the purify system.(auto stop, auto start relay)
- Sometime the filter media is block due to unwanted material such as suspended particles, zoological algae and also reduces the discharge from the filtration tank. The unit near the filtration tank indicates the necessity for cleaning the filtration tank.
- In these system we provide the automatic valve. When the discharge from the one tank is reduce then second filtration tank is automatic start.

3.0. ADVANTAGES OF THESE SYSTEM AS COMPARE

TO WATER TREATMENT PLAN

- E.S.R with water treatment plant constructed on the storage tank. Hence, It does not required more cost and land for construction as compare to ground level water treatment plant.

- And also it does not required any type of building and wall compound.
- Due to atomization we reduce the losses. And also it indicates the filter media is block.
- It does not required storage tank to store the treated water. Because , water is directly store in E.S.R Tank.
- In G.L water treatment plant water is firstly store in storage tank then , send the water in E.S.R . Hence it required more time. But in these system the purify water is directly store in storage tank and then supply. Hence itdoes not take more time to supply water.
- Maintainance of filtration tank is easy , Because due to filtration tray.
- It does not required Back Washing Cleaning Tank. Because , back washing is directly done by pipe no.(1).

4.0. DESIGN OF WATER TANK

Design of water tank for population of the village is 900 people.

4.1. Storage Tank

Water Demand for per capita = 135 lit.
 For 900 people water required = 900×135
 = 1,21,500lit.

For economical , we provide pure water to 900 people in two shift

We design water tank for 450 peoples
 = 450×135
 = 60,750 lit.

2] Design Of Storage Tank :- Design of storage tank for 60,750 lit . Water
 = $4 \times 4 \times 4$
 = 64 m^3
 = 64,000 lit > 60,750 lit

4.2. Filtration Tank

Assume rate of rapid sand filter is 4500 lit/hr.
 Area = Quantity of water filter/ Rate filter per lit.

Quantity of water = 2.6×4500
 = 11,970 lit/hr

Rate of filtration 30 min. = 5985 lit/30 min.

Clarifier to store the water = 3400 lit/30 min.
 = $2 \times 1.2 \times 1.5$
 = 3.6
 = 3600 lit > 3400 lit.

4.3. Discharge of pump = 3600 lit/30 min.

4.4. Time required to 6400 lit. water = $3400/30$
 = $6400/X$
 = 564 min.
 = 9 hr 41min

5.0. MAINTAINANCE

5.1. Cleaning The Filtration Media (Back Washing)

After 2-3 days we can see, the suspended particles , zoological algae are form on the filter bed due to filter media is block and also reduce the discharge from the filtration tank. Therefore, cleaning of filtration media is essential and for cleaning the filtration media provide separate pipe from the pipe no.(1)

5.2. Add Coagulant In The Tank

Add coagulant like alum or lime in the tank every 1-2 days.

5.3. Fill Up The Disinfection Tank

Add disinfectants like chlorine gas or bleaching powder every 1-2

5.4. Changing Filter Media

After some time we need to change the filter media. Hence , It is difficult to remove the filter media from the tank. So , we provide the separate tray for separate layer , such as fine grain sand separate tray , coarse grain sand separate tray. So that due to providing separate tray it is easy to to change filter media.

6.0. CONCLUSION

These system should be more economical for construction and maintenance as compare to the ground level water treatment plant .For providing purify water to the small villages , where water is coming from river or dam and also these system is easy for operating due to atomization.

7.0. REFERENCE

[1] K.N. Duggal