Planning And Designing of Modified Water Treatment Units

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Abstract- *Drinking water is a vital resource for human beings. Need of treatment process for treating water is so important that we can avoid many possible water borne diseases like cholera, typhoid and so on. Such treatment involved many treatment technologies. There may consume the lot of money for removal of water contaminants from water.*

Variety of methods involved in purification of drinking water which are very costly. In that, the coagulation is the main process in removing the contaminants from water. The purpose of coagulant/flocculation is to remove suspended matter, turbidity, color,micro organism and odour producing substance by physio chemical method using alum and copperous which is most expensive for small scale large scale units.

This study revealed that TamarindusIndica L natural coagulants which is effective in removal of turbidity. And also we had tried to develop a "Low Cost Water Purification Technique" using the basic ideas of Rapid Sand Filter, some locally available filter material charcoal. Main focus was removal of turbidity from surface water by adsorption. A ceramic membrane with locally collected aggregate chips was prepared for effective removal of turbidity.

I. COAGULATION

Coagulation is chemical used that is added to the forces stabilizes the colloidal particle to suspend in the water. Once the coagulant is introduced colloids must aggregate and grow bigger so that the impurities can be settle down at the bottom of the Beaker and separated from the water suspension aluminum is used as a coagulant in waste water treatment, it can caused several bad effect on human health such as intestinal convulsions, abdominal colic's, loss of energy

Coagulant discovered so far that can replace Aluminium sulphate (alum), which is used widely for water treatment around the world. Tamarindus Indica L was used as locally available natural coagulants in this study to reduce turbidity water with conventional jar test apparatus. The purpose of this study is to provide information on low cost household water treatment using seeds of the tamarind tree, present study deals with the suitability of coagulation-flocculation process using tamarind seeds as natural coagulation for purification of water for drinking purpose.

COAGULANTPARAMETERS

- pH
- TURBIDITY

TAMARINDUSUSINDICAL

Tamarind (Tamarindus Indica L) is a leguminous tree in the family Fabacease Indigenous to tropical Africa. The genus Tamarindus is a monotype toxin, having only a single species. Tamarindus seed kernel powder is an effective agent to turbid municipal and lake water clear kernel powder compared to alum, is non-toxic and biodegradable. The study established the powder's potential as an economic flocculants performance. Tamarind seeds (TamarindusIndica L) contain high protein. Natural coagulants have been found to generate not only a much smaller sludge volume of up to five times lower but also with a larger nutritional sludge value. As such, sludge treatment and handling costs are lowered making it a more sustainable option. Tamarindus seeds as a natural coagulant in the treatment of synthetic water.

WOODCHARCOALAS AFILTER MEDIA

Bituminous coal has been used before as an adsorbent and proved to very effective in removal of iron. Due to non-availability of bituminous charcoal, we used wood coal as an adsorbent media for experimentation. Locally collected wood charcoal crushed to size15mm and down was used for removal of iron from water.

UNIT PROCESS OF WATER TREATMENT

POPULATION FORECASTING:

To design the treatment plant, it is necessary to know the quantity of the water to be treated. So the population of

that area must be studied. Then the population has to be forecasted for design period. Thus the quantity of the water can be estimated by knowing the details of per capita demand of the people of that area population.

INTAKETOWER:

- An intake tower or outlet tower is a vertical tubular structure with one or more openings used for capturing water from reservoirs and conveying it further to a hydroelectric or water-treatment plant.
- Unlike spillways, which release water from the reservoir only in emergency conditions, intake towers are intended for the reservior's regular operation, conveying clean, debris-free water for further use.

SCREENING:

- It is the preliminary treatment of raw water.
- It can be implemented in source itself or at the treatment plant.
- It removes large sized particles like tree branches, wooden wastes and large suspended particles, etc.

INLETCHAMBER:

- It is also called as division chamber where water from source is first enter into the inlet chamber via main pipe from source.
- It divides the water to two clariflocculator equally through the open channel.
- It is the place where pre chlorination occurs too.
- It is to be designed for a capacity of 0.107 MLDof water with dimension 4.8*3.2*7 m

CLARIFLOCCULATOR:

- It is the structure where water enters from inlet chamber viz open channel
- The functions like coagulation, flocculation and sedimentation occurs in a clariflocculator in a sequential manner

FILTRATION:

- It is the structure which receives water from clariflocculator from both side of filter bed.
- The clariflocculator does not remove turbidity completely so for further removal of total solids a filter bed is adopted.
- The filter bed is of four units each unit is of 5m.

DISINFECTIONS:

- It is the process of adding chemicals or fungus to obtain the water with optimum colour, odour and pH
- This process is takes place during the flowing of water into clear storage tank or at the storage tank itself.

PLANOFTHEWATERTREATMENT PLANT

It consists of

1. Laboratory,
2. Admin block,
3. Chlorine room,
4. Sulphuric acid storage room,
5. Over head tank,
6. Office room,
7. DG generator,
8. Storage room,
9. Chemical house,
10. MCC room,
11. TNEB supply,
12. Surge valve,
13. Solar panel processing,
14. Flowmeter,
15. Security office.

SURVEYING DETAILS OF THREE LAKES

RETTERI LAKE

It is located on the Grand Northern Trunk (GNT) road of Chennai, also known as Kolkata highway. The lake is spread over 5.42 million square meters and fed by adjacent water bodies such as Redhills reservoir and Korattur lake.

AMBATTUR LAKE

The ambattur lake is located in ambattur municipality of Thiruvallur district, Tamilnadu. It is governed by Chennai Metropolitan Development authority (CMDA) and covers an area of 40.36 sq.m. The ambattur lake mainly depends on monsoon rainfall.

KORATTURLAKE

The korattur lake, spread over 990 acres in korattur (13°07'19.2"N and 80°11'04.4E"). It is located to the north of the Chennai-Arakkonam railway line and is one of the largest lakes in the western part.

ANALYSIS OF WATER SAMPLE

Colour

Colour in water is primarily a concern of water quality for aesthetic reason. Coloured water give the appearance of being unfit to drink, even through the water may be perfectly safe for public use. On the other hand, colour can indicate the presence of organic substances, such as algae or humic compounds.

Turbidity

Turbidity is a measure of the light-transmitting properties of water and is comprised of suspended and colloidal material. It is important for health and aesthetic reasons.

Solids

The total solids content of water is defined as the residue remaining after evaporation of the water and drying the residue to a constant weight at 103℃ to 105℃.

PHYSICO CHEMICAL CHARACTERISTICS OF OBTAINED SAMPLE WATER

S.NO	CHARACTERISTICS	UNITS	PERMISSIBLE VALUE	OBTAINED VALUE
1	pH	-	6.5 -8.5	7.83
2	Iron	-	1.5	0
3	Turbidity	NTU	5	9.1(initial)
4	Hardness	Ppm	600	260
5	Chloride	mg/l	1000	460
6	Total suspended solids	mg/l	1500	800
7	Dissolved oxygen	mg/l	8	7

RESULT OBTAINED FROM COAGULATION:

Tamarind seed as a natural coagulant and alum as chemical coagulant were used in the experimental work. For two hours settling time the optimum dose of tamarind seed was 2 gram per 600 ml water sample, then the residual turbidity was 13.7NTU. The optimum dose of alum was 1.5 gram and the residual turbidity observed was 8.2 NTU.

The pH of the raw water sample was 7.83. The optimum doses of coagulant were found in 4th and 3rd jar for tamarind seed and alum respectively. After performing the jar test, the pH values of alum were increased than tamarind seeds because it has alkaline in nature. The pH at optimum dose of tamarind seeds and alum were 7.01 and 8.02. According to BIS the acceptable range of raw water is 6.5-8.5 and final results lies in the range.

pH and turbidity variation for use of natural coagulants

SAMPLE NO	DOSAGE	pH	TURBIDITY
1	0.5	6.61	23.5
2	1.0	6.82	16.3
3	1.5	6.99	20.2
4	2.0	7.01	13.7
5	2.5	6.91	21.9

For two hours settling time of water sample for different dosages of alum, we have obtained the following results.

pH and turbidity variation for the use alum solution as coagulant

SAMPLE NO	DOSAGE	pH	TURBIDITY
1	0.5	7.94	15.1
2	1.0	7.98	11.0
3	1.5	8.02	8.2
4	2.0	8.16	12.4
5	2.5	8.76	17.2

II. CONCLUSION

- Water treatment involves a variety of processes performed at different levels of treatment. The basic form of treatment is to treat the polluted water and supply to the local public.
- The water present in the Retteri gets polluted due to surrounding environment like dumping the waste, throwing of food wastes, metals and also contamination of sewage which is expected to be prevented after implementing the treatment plant.
- Thus the final product obtained will be clear and pure water without any infection which can be consumed by domestic users as well.

- From the study, it can be concluded that, the use of natural coagulant like TamarindusIndica L is receiving attention for the effectiveness in water treatment.

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