CONSTRUCTION OF IN-PIPE WATER FILTER FOR RURAL AREA

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Abstract: *Conventional rapid sand filter is been used by most of the treatment plant in urban areas. As rapid sand filter used in urban areas generally have faster filtration rate, and the media which is used for rapid sand filter is generally or locally easily available. As the media used is generally sand or gravel etc. but maintenance of such filter which are used is very high. There rare availability of water treatment plant in rural areas and hence there is lack of safe drinking water in rural areas. Thus use of direct in-pipe water filter unit is economical as it is provided as a separate unit. This research paper details out the working of dual media filter. A dual media filter using layer of burnt clay was experimented. This gave good results for treating water and making it useful for domestic and drinking use.*

Key words: direct in-pipe, burnt clay and dual media filter

Introduction

Water purification means purifying water to make it liable as drinking water. Although natural water is drinkable for human as it also looks clean many times but it may have some germs and pathogens many times. So without treatment the water also looks pure sometimes but actually it is not and also may have foil smell or pungent smell without purification. Natural water contains micro organism in it which cannot be seen by naked eyes. Sometimes also may have bacteria in it. We cannot observe it with naked eyes. In addition water pollution is getting serious thus purification is very necessary to ensure safe drinking water which is very important to our health The aim of water treatment is to remove contaminants or reduce them to a concentration so that to provide safe drinking water to the community. Water treatment depends mainly upon the composition of water and quality of water. Water treatment generally contains two procedure steps one is removal of physical removal of solid particle and other is killing or deactivating micro organism by chemical disinfection and also removal of organic particle. In water supply chain water treatment plays important role. And also it plays role in sustainable management. This project aims to determine efficiency of filtration in removal of pollutants.

Tap water supply plays major role in actual supply of drinking water, but in reality its direct use is not appropriate. Also it is unsafe to use it .Water directly from tap may have high level of chlorine, lead etc. It also has high level of impurities sometime, which can lead to formation of precipitate. It also has huge amount of chlorine as it is used for disinfection which is also not good for human body. Due to presence of micro organism it may taste bad sometimes. Sometimes used water is reused for many purposes so for that purpose chorine is used at large level for cleaning it. Also many times tap water has lot of fine microorganism in it. So taking in consideration this point it can be said that purification of water is very important. Thus filtration can be turned as important factor for safe drinking water. Also it can be used for purification.

Particle in the source can be removed from various mechanism used in the filter. The particle size plays very important role in filtration process. If particle size is same as void size they will stick there in that place. Now a days various type of potable filters are available which can be used for filtration. So chemical component and suspended particle are removed by using it. Various filter media are used for this purpose.

Now filter should be preferred more for many reasons, few among them are: it requires less mechanical power, no high maintenance training is required, media used or material used is locally available materials, and less maintenance so this is very economic and it can be used in poor isolated areas. Filter generally has easy design simple to operate and very economic. The material used in filters are sand, coal, gravel etc. And some granular substances so basically it is very easily and cheaply available .Thus using this filter we can use potable drinking water. So this filter can be used in various developing countries as it can be used for water purification. Thus raw water can be converted into drinking water that is potable water. Filters can be used in developing countries because of its low energy requirement and its durability is more. It can definitely reduce some amount of organic and inorganic pollutants from raw water. Also it shows its result on color, turbidity, hardness and many such water parameters

Methodology

Site Selection:-

The village selected for study is Kandalgaon near Kolhapur city in Maharashtra. The drinking water supplied to the village is from its upstream lake. The water is stored in the overhead Sintex tank. The treatment provided is sedimentation and disinfection by

chlorine dose. It is observed that the percentage of waterborne diseases in this community is comparatively more than its surrounding area and rest of the Kolhapur. Hence we have selected Kandalgaon village and nearby Wadi-vasti as our area of study. We checked quality of water sample before and after use from the In-pipe water filter. We observed that water sample from in - pipe water filter had a change in color with almost nil turbidity. Water had a pleasant taste.

Dual media filter.

Filter Layers:-

- 5 numbers of filter beds were used and one with best result is finalized.
- The materials used are cement, granite and water.
- The ratio used for design 1:4:8.
- W/c ratio used 0.37.
- The size was varied accordingly. Sizes were 6cm, 7cm, 8cm, 9cm, 10 cm.

Material used

Granite:-

Referring the research paper here the aggregate use are of Granite. The design is same as that of the concrete bed made of aggregate but here aggregate are replaced by the granite aggregate.

Fig 1: Granite aggregate used for casting concrete blocks

Granite blocks

Fig 2: Concrete blocks casted using granite aggregate

Clay plates used:-

The second layer used in the filter is clay layer. According to the research paper porous clay has good impact on the filtration process .So basically the clay plates of size 20mm, 30mm and 40mm were made. Then the were placed in furnace for 7 day .Thus the were dry and totally porous.

Fig 3: clay layer

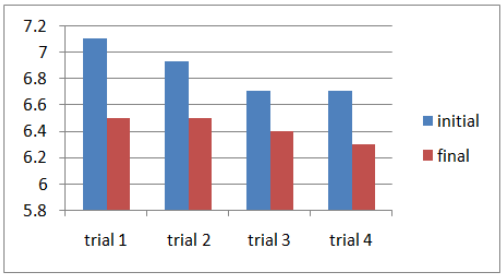
- The other layer used is of layer of burnt clay.
- It showed effective results.
- 3 layer of different size are used out of which one with the maximum result is used.
- Sizes used are 20 mm, 30 mm and 40 mm.

Results of Dual media filter

The inlet pH of water was about 7 .After filtration pH reduced of outlet water all most up to drinking standard.

Table 1: showing analysis of pH for Kandalgaon water sample

pH	Kandalgaon inlet	Kandalgaon outlet
Trial 1	7.1	6.5
Trial 2	6.93	6.5
Trial 3	6.7	6.4
Trial 4	6.7	6.3



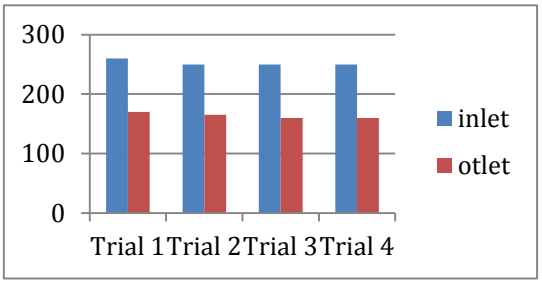
Graph 1: showing pH for Kandalgaon of water sample

Alkalinity:

The alkalinity test of water was carried out .In-pipe filter effectively removed alkalinity. Hence outlet alkalinity was less than the inlet

Table2: showing analysis of alkalinity for Kandalgaon water sample

Alkalinity	Kandalgaon inlet	Kandalgaon outlet
Trial 1	260	170
Trial 2	250	165
Trial 3	250	160
Trial 4	250	160



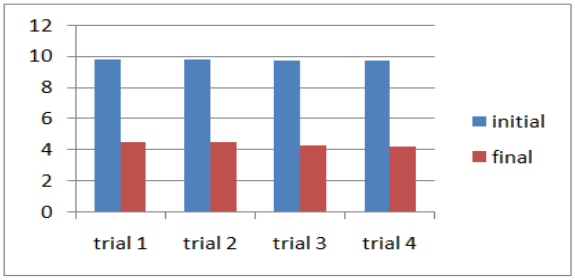
Graph 2: showing alkalinity for Kandalgaon of water sample

Turbidity:-

The turbidity of inlet water sample was much high. But after passing water through In-pipe water filter it reduced to extent.

Table 3: showing analysis of turbidity for Kandalgaon water sample

Turbidity	Kandalgaon inlet	Kandalgaon outlet
Trial 1	9.8	4.5
Trial 2	9.7	4.3
Trial 3	9.7	4.2
Trial 4	9.7	4.2



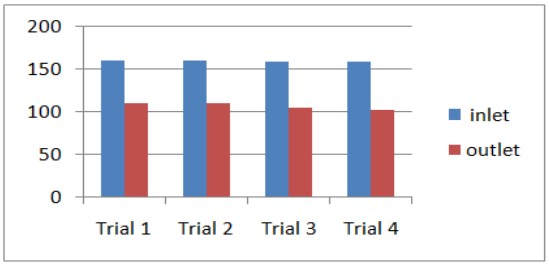
Graph 3: showing turbidity for Kandalgaon of water sample.

Hardness:-

Hardness was reduced after passing the water through the filter.

Table 4: showing analysis of hardness for Kandalgaon water sample

Hardness	Kandalgaon inlet	Kandalgaon outlet
Trial 1	160	110
Trial 2	159.48	110
Trial 3	158.48	104
Trial 4	158.48	102



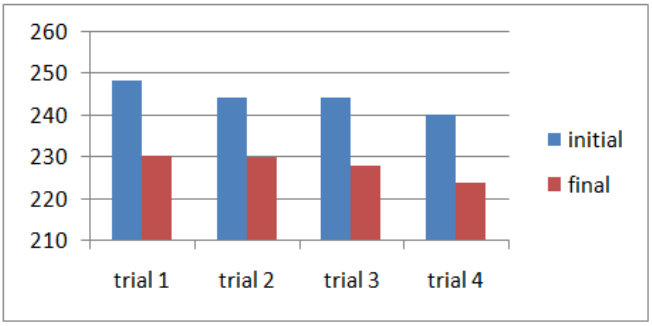
Graph 4: showing hardness for Kandalgaon of water sample

Chloride:-

Chloride from water was also reduced after passing the water through the filter and it was effective in removal of it.

Table 5: analysis of chloride for Kandalgaon water sample

Chloride	Kandalgaon inlet	Kandalgaon outlet
Trial 1	248.2	230.2
Trial 2	244	230
Trial 3	244	228
Trial 4	240	224



Graph 5: showing chloride of Kandalgaon water sample

Porosity calculation:-

So in filtration process porosity plays very important role in filtration process. More porous the filtration proceeds easy and rate of filtration is also more but efficiency of filter may be effected because of it. Porosity for the block was calculated.

Table 6: Porosity percentage for concrete block

Block size	Porosity %
6 cm	64.15
7 cm	51.49
8 cm	46.92
9 cm	44.44

Table 6: Porosity percentage of clay block

Size	Porosity %
2 cm	71.70
3 cm	70
4 cm	58.97

Conclusion:-

In this research study of filtration process is done. Various water parameters like pH, turbidity, electric conductivity, chloride, hardness, and alkalinity were studied. Sample collection and analyzing its initial parameter and also the final parameter were studied. The dual media filter used showed turbidity efficiency removal up to 60 % and alkalinity removal efficiency of 40%.Turbidity efficiency removal also showed that as depth of the layer increases the turbidity removal efficiency also increases. Porosity also plays important factor in the filtration process if porosity increases the rate of filtration increases and also particle removal efficiency decreases. Porosity percentage of 9 cm porous concrete and clay layer of 3 cm clay disc were 44.44 and 70 % respectively

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