

“ANALYSIS & DESIGN OF RIVER WATER SAND FILTERS BY USING COCONUT SHELL & COAL”

Khamkar Rushikesh Ashok¹, Bankar Ashwini Eknath², Shinde Poonam Shahaji³, Pandhare Ramkrushn Dasharath⁴, Prof. Mokashi Snehal C.⁵

1-UG Student, Department of Civil Engineering, Hon. Shri Babanrao Pachpute Vichardhara Trust's Parikrama College of Engineering Kashti, Ahamadnagar, India.

2- UG Student, Department of Civil Engineering. Hon. Shri Babanrao Pachpute Vichardhara Trust's Parikrama College of Engineering Kashti, Ahamadnagar, India.

3- UG Student, Department of Civil Engineering. Hon. Shri Babanrao Pachpute Vichardhara Trust's Parikrama College of Engineering Kashti, Ahamadnagar, India.

4- UG Student, Department of Civil Engineering. Hon. Shri Babanrao Pachpute Vichardhara Trust's Parikrama College of Engineering Kashti, Ahamadnagar, India.

5-Assi. Professor, Department of Civil Engineering. Hon. Shri Babanrao Pachpute Vichardhara Trust's Parikrama Collage of Engineering Kashti, Ahamadnagar, India.

ABSTRACT

A study was carried out to determine about slow sand filter which are very commonly used in conventional water treatment plants. The slow sand filter beds are suffering by the problems like mud ball formation and unsatisfactory effluent. Dual media and multimedia filters can overcome the limitations of slow sand filter. Capping of crushed coconut shell and coal is used as a dual media. Designing dual media filter capped with crushed coconut shell proves to be more efficient, economical and durable. Two models having same dimensions of 70 cm height & Third model with 77 cm height was designed. All 3 models had 27cm diameter and capacity of 40 litre are practiced. The water sample was collected from nearby river. The tests which are conducted on sample are pH, Temperature, Total Dissolved Solids, Alkalinity, Hardness and Turbidity. The efficiency is determined on the basis of test results followed by conducting various experiments on sample

KEYWORDS: coconut shell , wooden coal, various size of sand , filtration

1. INTRODUCTION

Slow beach filtration is a technology that has been used for drinkable water filtration for hundreds of times. It's a process well- suited for small, pastoral communities since it doesn't bear a high degree of driver skill or attention. As its name implies, slow beach filtration is used to filter water at veritably slow rates. The typical filtration rate is at least fifty times slower than for rapid-fire rate filtration. Due to this slow rate of filtration, a large land area is needed for the filtration basins. No chemical addition is needed for proper filtration operation. Flayspeck junking is fulfilled primarily through natural processes that give treatment. The natural exertion is located primarily in the top face of the sludge known as the schmutzdecke, although recent exploration has indicated that natural processes throughout the depth of the sludge bed may also impact flayspeck junking. A growing period from several weeks to several months is necessary for the natural organisms to mature in a new slow beach sludge. Slow beach pollutants aren't backwashed like rapid-fire rate pollutants, but are rather scraped or cursed periodically when head loss reaches 3-4 bases across the sludge bed.

1.2 Proposition of filtration

Indeed after the process of sedimentation and the process of coagulation which removes the contaminations present in the water, the water still isn't completely pure for consumption as it may still have some veritably micro patches or some fine micro organic matter.

To remove these fine patches from the water, the water is allowed to pass through the beds of grainy material. This process is known as filtration.

After this process of filtration, the water becomes free from all the undesirable contaminations similar as odour, colour, turbidity and also the pathogenic bacteria.

• Types of pollutants

On the base of the time needed for the process of filtration; the pollutants are divided into two orders similar as slow beach sludge and rapid-fire beach sludge.

Slow beach sludge To ameliorate the natural, chemical and physical characteristics of the water to be purified, it's the allowed to pass sluggishly through the subcaste of beach, which placed above the introductory accoutrements.

The slow beach sludge is most suitable system to purify the water force to the pastoral areas because it's easy and needs lower conservation cost. Veritably effective junking of bacteria, contagions, protozoa, turbidity and heavy essence in polluted fresh water. Easy to install in pastoral, semi-urban and remote areas, Simplicity of design and operation.

Slow beach filtration is a type of centralized or semi-centralized water sanctification system. A well- designed and duly maintained slow beach sludge (SSF) effectively removes turbidity and pathogenic organisms through colorful natural, physical and chemical processes in a single treatment step. Only under the frequency of a significantly high degree of turbidity or algae- impurity, pre-treatment measures (e.g. sedimentation) come necessary. Slow beach filtration systems are characterized by a high trustability and rather low lifecycle costs. Also, neither construction nor operation and conservation bear further than introductory chops. Hence, slow beach filtration is a promising filtration system for small to medium-sized, pastoral communities with a fairly good quality of the original face water source. As stated by the WHO, slow beach filtration provides a simple but largely effective and vastly cheap tool that can contribute to a sustainable water operation system

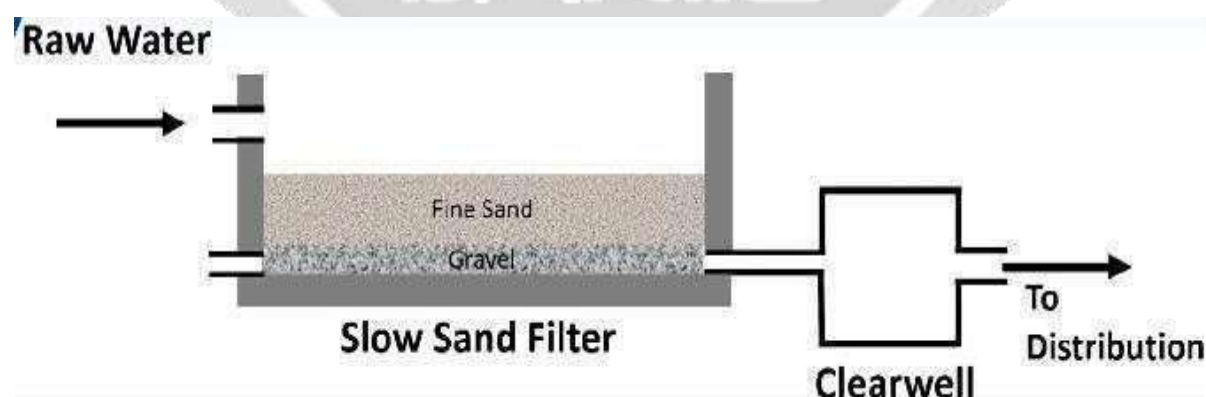


Fig.1 Typical slow beach sludge

Main advantages of the slow beach sludge are its simplicity and provident construction, operation and conservation using original accoutrements and chops as well as no conditions for chemicals or energy. The effectiveness of slow beach sludge depends on the flyspeck size distribution of the beach, rate of face area of the sludge to depth and the inflow rate of water through the sludge. The slow beach sludge has the following

necessary corridor to carry the process, Enclosed tank, Under drainage system. Base material, Filter media of beach and Appurtenances.

2. LITERATURE REVIEW

1. B. Mah, PFRACanada-Saskatchewan Agri-Food Innovation Fund (AFIF). June 2001.

Slow sand filtration has been used successfully in Europe since the early 1900s, and is still a popular method of treating municipal water supplies. Research, and other observations, shows that slow sand filtration can effectively remove cysts and coli form bacteria from raw water, and is an innovative, cost effective, low maintenance treatment process. This system works best as part of a multi-barrier treatment approach. The filtration process – a form of natural, biological water treatment – is used to remove solids, precipitates, turbidity (muddiness) and in some cases bacterial particles that produce bad taste and odour.

2. SudhirKapgate,Amol G Gore, Gaurao S Kale, Sagar I Wanjar , Kunal P Wanode , Rushikesh B Balpande, Rain water is an important source to feed the ground water aquifer, which is done directly or by harvesting and recharging. Purification is always a need from the ancient age of civilization. So the central and state governments are taking effort to provide adequate and safe drinking water to society by constructing water treatment plants in India. In India rapid sand filter are mostly used to remove the suspended and colloidal particles from water in filtration process for the faster rate by setting out the different sand beds in constructing it. Designing ‘Dual media filter capped with crushed coconut shells’ proves to be more efficient, economical and durable.

3. Snehal N. Chaudhari¹, Kalyani A. Bogawar **MODIFICATION IN RAPID SAND FILTER WITH COCONUT**, International Journal For Technological Research In Engineering Volume 4, Issue 12, August-2017 SHELLS AS CAPPING MEDIA Filtration is the important process in water treatment. It removes the particulate and other suspended impurities from water passing through filter media. Hence we studied the performance of Dual Filter over the conventional Rapid Sand Filter where Capping of Crushed Coconut Shells is used as dual media. Designing a ‘Dual Media Filter Capped with Crushed Coconut Shells’ proves to be more efficient, economical.

4. RushikeshJagtap, RakeshGawali , VinayakKanade, SanketThite, Prof P R Gayake Water supply system is a system of engineered hydrologic and hydraulic components which provide water supply. Water distribution network play vital role in preserving and providing desirable life quality to the public, of which reliability of supply is the major component. Such type of problem can be solved manually as well as by using different computation technologies like LOOP 4.0, MIKENET, STANET and EPANET 2.0 software. This study is based on assessment of existing water distribution network using EPANET 2.0 software.

5. Teena Ann Thomas and K. MophinKani **International Journal of Scientific & Engineering Research, Volume 7, Issue 4, April-2016 315 ISSN 2229-5518**, Slow sand filtration is a technology that has been used for potable water filtration for hundreds of years. As its name implies, slow sand filtration is used to filter water at very slow rates. The typical filtration rate is at least fifty times slower than for rapid rate filtration. Due to this slow rate of filtration, a large land area is required for the filtration basins. No chemical addition is

required for proper filtration operation. Slow sand filters are not backwashed like rapid rate filters, but are instead scraped or harrowed periodically when head loss reaches 3 - 4 feet across the filter bed.

• Base material

The base material of clay is placed on the top of the under drainage system. The depth of the clay material varies between 300 mm and 750 mm. The size of the gravels changes from the top to the nethermost subcastee.g. the top subcaste has the gravels having the size between 3 mm and 6 mm. In the intermediate subcaste, the size varies between 6 mm and 20 mm. While in the nethermost subcaste it varies between 40 mm and 65 mm. Out of the total depth of the base material of clay the top subcaste is about 150 mm, in depth, the intermediate layers. Cover 150 150 mm deep. So the total depth of these layers is 600 mm.

• Sludge media of beach

Above the layers of clay subcaste of beach is placed. The depth of this beach layers varies between 600 mm and 900 mm and size of the beach patches also varies from 0.20 mm to 0.30 mm. Fine beach can be more effective to remove the contaminations but the time needed for the process is long and the process is slow.

Rapid beach sludge

Though the slow sand sludge has lot of advantages and good for the pastoral water treatment plant, the topmost disadvantage of slow sand sludge is that it needs to have a large space of its installation (in the pastoral areas, space is not a major problem). So in the communal areas where the land cost is sky hill, that system becomes useless.

To increase the rate of filtration below two styles are used

- It can be achieved as adding the size of the sand patches. This reduces the disunion of the sand patches with moving water. This helps to gain high speed for the filtration.
- If the water allowed to pass through the sand, with pressure, its haste increases and so the time demanded for filtration is reduced.

Essential Corridor of rapid-fire- fire sand sludge

1. Base material.
2. Sludge media of sand. Objectives:

Grounded on the literature check the following points and objects were decided

- To design, construct and test the model of slow beach sludge limited with coconut shell and slow beach sludge limited with coal.
- To compare the performance of slow beach sludge limited with coconut shell and slow beach sludge limited with coal on the base of quality of effluent produced which is measured in terms of parameters similar as pH, total dissolved solids, alkalinity, hardness, and turbidity.
- To study & design a beach sludge for the junking of pathogen & suspended solids from water using coconut shells, anthracite coal, swash beach & clay for pastoral area

Sr. no	Material	Particle Size
1.	River Sand (Fine Sand)	0.35 – 0.60 mm
2.	Coal	2 - 3 cm
3.	Gravels	4 - 5 cm

- **CONCLUSION**

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- The following conclusions can be drawn from the design study on different aspects of slow sand filtration.
 - Slow sand adulterants limited with coal having better junking effectiveness of Hardness, Total dissolved solids comparing with slow sand sludge limited with coconut shell.
 - Turbidity and colour junking effectiveness decline extensively with advanced filtration rates, although the filtrate quality remains nicely good.
 - With lower flux rate and the periodic relief of sludge media are the major limitations of the slow sand adulterants.
 - Slow sand adulterants limited with coconut shell and coal together have shown effective dumping of turbidity, Total dissolved solids comparing with slow sand sludge
 - Limited with coconut shell and slow sand sludge limited with coal.Result

Table 1 : Tests result of outlet of SSF capped with coal & coconut shell

Parameters Week	Hardness	Ph	TDS	Turbidity
1	44.8	7	104.5	3.30
2	43.7	7.1	103.9	2.91
3	44.2	7.3	104	3.26
4	45.1	7.35	105.8	3.45
5	44.9	7.46	104.7	2.99
6	46.2	7.5	106	3.01
7	45	7.56	105.2	3.42

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