

“DESIGN OF RAPID SAND FILTER BY CAPPING OF COCONUT SHELL”

Prapti Upase¹, Saloni Bhagat², Dikshant Moon³, Ujwal Dolaskar⁴, Mayur Lohe⁵

UG Student, Department of Civil Engineering, Bapurao Deshmukh College of Engineering, Sewagram¹⁻⁴

Professor, Department of Civil Engineering, Bapurao Deshmukh College of Engineering, Sewagram⁵

Abstract: A study was carried out to determine about the rapid sand filter which are very commonly used in Conventional water treatment plants. The rapid sand filter beds are suffering by the problems like Mud ball formation, unsatisfactory effluent, etc. Dual media and multimedia filters can overcome the limitations of RSF. Capping of crushed coconut shell is used as a Dual Media. Designing Dual media filter capped with crushed coconut shell proves to be more efficient, economical and durable. The sample was collected from nearby lake which was highly turbid and having high amount of total solids. A fabricated model was prepared having dimensions 0.5 x 0.5 x 0.9m. Gravel, Sand, Coconut Shell was filled in the model in the layer of size 20cm, 15cm, and 20cm respectively. The tests which are conducted on the sample are pH, Turbidity, BOD and Total solids. It improves the performance of filter in the terms of high filtration rate, high turbidity removal and high decrease in percentage of total solids and thus making it more applicable. This filter media reduces about 90% of turbidity. The amount of total solids was decreased about 89%.

Keywords: Rapid Sand Filter, Coconut Shell, Filtration, Turbidity, pH, BOD, Total Solids.

I. INTRODUCTION

This Water is the main source for the survival of the mankind. Water is used for irrigation, drinking, sanitation etc. We cannot imagine the world without water. Water is used for the drinking purposes is to be treated properly. For this treatment of the water every method there are several methods. But each method is implementing the chemicals into the water and processing the treatment this makes the water good in taste shows its side effects in a long run. Filtration is a process that is widely used for removing fine particles from water. Almost all conventional Surface water treatment facilities and some Ground water treatment facilities make use of Rapid Sand Filter. Rapid sand filter is commonly used in the treatment of surface water supplies. Some form of pretreatment of raw water, such as sedimentation, is usually needed. Most of the conventional water treatment plants are overloaded due to increase in demand which highlights the need of higher filtration rate. Dual media and multimedia filters can overcome these limitation of RSF alternatively higher filtration rates even can be achieved. However, the use of such techniques is limited to India due to unavailability of filter materials apart from sand.

Capping is the process of covering the filtration media by appropriate caps such as anthracite coal, bituminous coal, crushed coconut shell, etc. Capping involves the replacement of portion of sand with appropriate caps. The proposed study was made to assess the use of Coconut shell as capping media. Coconut shells are easily available and it helps to tackle some additional flock loads. It improves the quality of filtration with respect to bacterial measure.

II. OBJECTIVE

1. Suggest more efficient filter design.
2. To remove the turbidity effectively.
3. To increase filtration rate and runtime.
4. To provide economical method for purification of water.

III. MATERIALS

GRAVEL: Gravel which retained on 4.75mm has been used as supporting media for sand layer. The depth of gravel layer in the filtration units is 20cm. Gravel was washed and oven dried thoroughly before using as the supporting filter media layer.

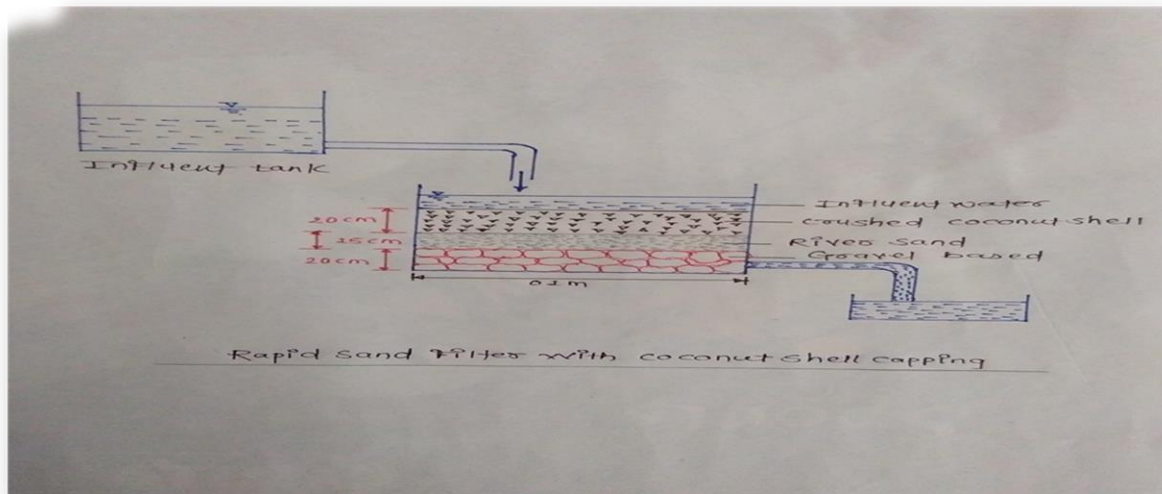
SAND: River sand having uniformity co-efficient 1.7 and effective size 0.60mm is used as filter material. Sand is washed with clean, sun dried and oven dried before using as a filter media. The depth of sand layer maintained in the filtration unit is 15cm.

CRUSHED COCONUT SHELL: Crushed coconut shells having an effective size of 1.91mm were used as capping media above the sand layer. Crushed coconut shells were placed in layers above the sand as capping. The depth of coconut layer in filtration unit was 20cm. Coconut shells were crushed into pieces manually using a rammer and then thoroughly cleaned before using it as capping. Crushed coconut shells were washed and oven dried for 24 hours.

IV. METHODOLOGY

The following procedure was adopted for conducting the experiment:

1. Filter layer consisting of gravel bed of 20cm thickness, sand layer of 15cm thickness and crushed coconut shell layer of 20cm thickness was spread in the filter unit.
2. The water obtained from the lake is stored in a large container for a detention period of about 3-4 hours. The supernatant water after the sedimentation process was passed through the rapid sand filter.
3. Influent water is fed into the filter with the help of a dispenser of 20 liters capacity has been placed well above the filter unit.
4. A head of water above the filter media in the filtration unit of 10cm was maintained throughout the test period. The raw water was fed to filtration unit continuously through the dispenser placed above the filtration unit.
5. Effluent sample were taken at a frequency of every 1 hour. This sample is tested for turbidity, pH, total solids, BOD.
6. The experiment has been carried out up to 8 hours.
7. The following procedures were adopted to test the water sample in the laboratory



V. SCOPE

1. Use of filter with coconut shell as capping media for longer period will give better performance analysis.
2. Capping with coconut shell prove very effective in improving performance of rapid sand filter in pilot scale.
3. To study the backwashing of filters and head loss characteristics.
4. To study the removal of other parameters like fluoride, iron, manganese etc.

VI. CONCLUSION

The coconut shell as a capping material for filter media, it had given very good efficiency during the filtration process. Even there was a considerable reduction in the colour intensity. The pH was also changed during this filtration process. The coconut shell usage also helped in removing the considerable BOD in water sample efficiently. Higher rate of filtration can be obtained after capping without much effect on the filter quality. Capping of conventional Rapid sand filter can be very effective tool in case of overload conventional plants where higher rate of filtration can be possible without much modification. Using a coconut shell is giving a teste to water.



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