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WATER QUALITY MAINTENANCE BY DEVELOPING A BIOFILTER MODEL USING COCONUT SHELL ACTIVATED CARBON AND RICE HUSK AS ABSORBENTS

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Abstract - *Safe and Clean Drinking water proves to be the Major problems all over the World and Particularly in Rural Areas. To overcome this problem, an attempt is made to Design, Construct and Evaluate a cost Effective Biofilter Model. The main purpose of Adopting Filter is for the purification of water in Mandakki Bhatti layout where the surrounding water quality is poor due to the puffed rice factories. The Designed Filter is Fabricated from locally Available Materials and filled With Coconut shell activated Carbon, Rice Husk Activated Carbon, Sand and Pebble layers. Water samples are collected From Azad Nagar and Basha Nagar around Mandakki Bhatti layout and water samples are tested in laboratory to determine the contamination of water. To reduce the contaminants in water it is subjected to Designed BioFilter from the top where the Diffuser plate is placed. Water is allowed for sedimentation in filter and again the water collected and tested to know the reduction of contaminants in water. Therefore the Present work is aimed at Determining the Efficiency of Filter in Removing the contaminants.*

Key Words: Coconut shell Activated carbon, Rice Husk Activated Carbon, BioFilter Model, Sand and Pebbles

1. INTRODUCTION: Water quality and quantity issues are key challenge in the world wide. These Issues are going to be further aggravated in the future by climate modification and lack of enhanced sanitation and related to it causes the deficient in safe drinking water, which currently affects the people in the world all over. In addition to this inappropriate management, exposure to chemical toxicants through food chain. This deals with the pollution of freshwater resources, including lakes, Rivers and Subsurface water. Water contamination occurs when useless materials enter into water which in turn changes the quality of water and cause harmful to environment and human health. Water is a vital natural resources useful for drinking and other developmental purposes in our lives. Main reasons for water pollution are due to the discharge of domestic and industrial effluent wastes, leakage from water Tanks, marine dumping, domestic sewage, population growth and weak management system. It is reported that major reason for water pollution is caused by domestic sewage. Domestic Sewage and Toxic metals enter into water and lessens the water quality. Any physio-chemical or biological changes in water quality that has a adverse effect on living organisms or makes water not suitable for domestic uses. Sewage is the primary pollution of fresh water when discharged into them. Discharge of untreated sewage into freshwater is unhealthy. This consequence can decrease amount of Dissolved oxygen in the water it is because organic matter stimulates decomposers especially Bacteria which breakdown suspended solids in untreated water. Pollution poses a severe risk to life especially when the water is a source of drinking and for domestic uses for Humans which may cause water borne diseases. Disease causing Bacteria and viruses are carried into surface and Subsurface water. Drinking water is affected and cause health hazard, damage to plants and animals nutrition which also affect human health. The water quality is depraving in Mandakibhatti Layout near Azad Nagar and Basha Nagar in Davangere due to improper management of water and increasing human habitation. Therefore, the present study is carried to investigate the problem, suggesting recommendation and Modelling of filter for the Maintainence of water quality and safety in Mandakibhatti Davangere.

2. MATERIALS AND METHODOLOGY

The proposed project comprise of cost effective Ecofriendly Filter which consists of sand and pebbles as filter media, Activated Carbon coconut shell and Activated Carbon Rice husks which acts as a Natural Absorbents. The filter consists of a filter body which is made up of Glass.

2.1 Materials

2.1.1 Coconut shell Activated Carbon:

Activated Carbon from coconut shells have a high volume of Micropores for filtration. Coconut shell Activated Carbon acts as Excellent absorbent in removing many pollutants in water as it has larger inner surface area hence it can Absorb the

contaminants. Coconut shells are also an environmental friendly and a renewable resource for purification of water. In this filter coconut shell is heated at temperature of 400^0C to form Carbon and is used in Filter for purification.

Fig. 2.1: Coconut shell Activated Carbon

2.1.2 Rice husk Activated Carbon:

Rice husk Activated Carbon can be used in two ways in purification process, Firstly the Rice husk ash can be used as a filter medium and secondly as a coagulant. The rice husks are collected, washed with water then it is sun dried and Heated at Temperature of 400^0C to form Carbon and is used as Absorbent in Filter.

Fig. 2.2: Rice Husk Activated Carbon

2.1.2 Filtration Sand layer:

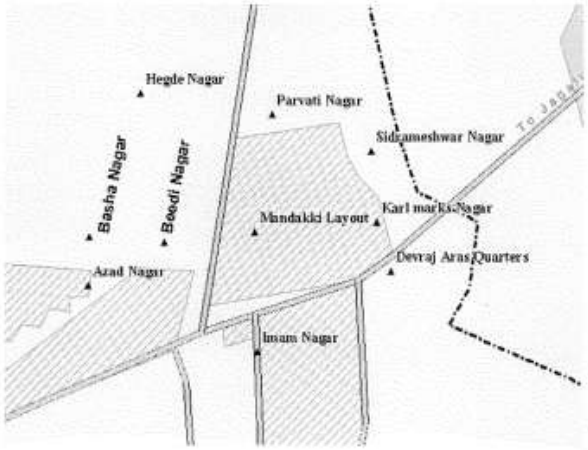
Filtration sand is sieved, washed, oven dried for 24 hours and is placed in two layers. The sand which passes through 1.18mm IS sieve and retained on 600micron IS sieve and 0.9m thick fine sand is placed in First layer and in the Second layer the sand which passes through 4.75mm IS sieve and retained on 2.36mm IS sieve and 0.12 m thick coarse sand layer is placed

2.1.2 Pebbles layer:

Pebbles are placed at Bottom in one layer. The pebbles which passes through 40mm IS sieve and retained on 20mm IS sieve is placed below the Filtration Sand Layer and 0.15 m thick drainage pebble layer is placed. Pebbles used in filters are sieved washed thoroughly and are oven dried for about 24 hours and then these materials are placed into the filter.

2.2 Study Area:

Water samples were collected from three different sample sites near Mandakki Bhatti layout of Azad Nagar and Basha Nagar in Davangere District where maximum number of puffed rice factories are located.



2.3 MODELLING OF FILTER

Filter is made up of glass material of size 0.45X0.3X0.6 m having an area of 0.135 m^2 and volume of 0.081 m^3. The component parts of Filter are Filtration sand layers, Pebble Layer, Activated Carbon Rice Husk, Activated Carbon Coconut Shell layer and outlet tube.

Fig. 2.3: Filter Model Using Natural Materials

2.4 METHODOLOGY:

Water samples were collected in and around the Mandakibhatti layout which is near Azad Nagar and Basha Nagar Davangere. These samples are tested in laboratory for finding the impurities present in it. Depending upon the impurities present in the water samples filter media is selected and the filter is modeled. Water is subjected to filtration by passing through the filter and is allowed for settling. The filtered water is collected and again the laboratory tests are conducted to know the reduction of impurities in the water.

3. RESULTS AND DISCUSSIONS:

The Collected water Samples were tested for various parameters before Filtration and After Filtration like Turbidity, Dissolved oxygen, Total dissolved solids, Acidity, Alkalinity, Total Hardness, Sulphates, pH. The following results are obtained.

Table-1: DO Values Before and After Filtration

Sample No.	Parameter	Before Filtration	After Filtration
Sample 1	Dissolved Oxygen mg/L	3.28	4.07
Sample 2		3.94	5.7
Sample 3		3.44	4.83

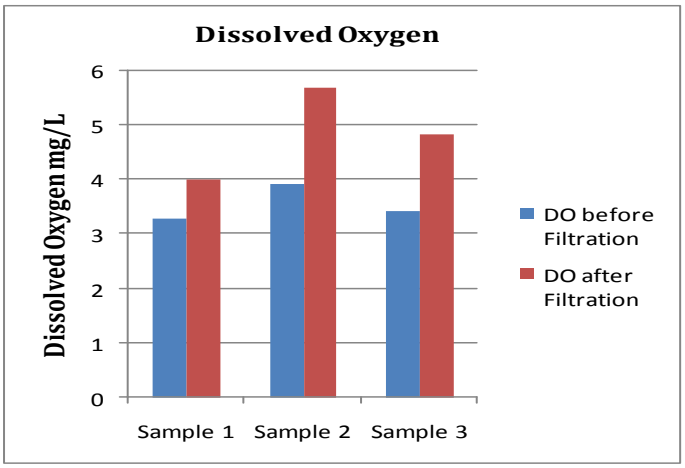


Chart-1: Variation in DO Before and After Filtration

Table-2: pH Values Before and After Filtration

Sample No.	Parameter	Before Filtration	After Filtration
Sample 1	pH	7.21	6.7
Sample 2		7.48	6.9
Sample 3		7.42	7.1

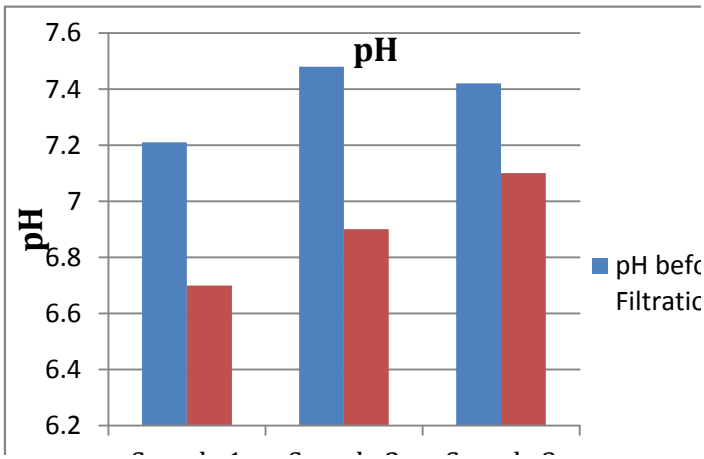


Chart-2: Variation in pH Before and After Filtration

Table-3: Chlorides Values Before and After Filtration

Sample No.	Parameter	Before Filtration	After Filtration
Sample 1	Chlorides mg/L	673.22	358.62
Sample 2		481.44	193.38
Sample 3		555.35	232.45

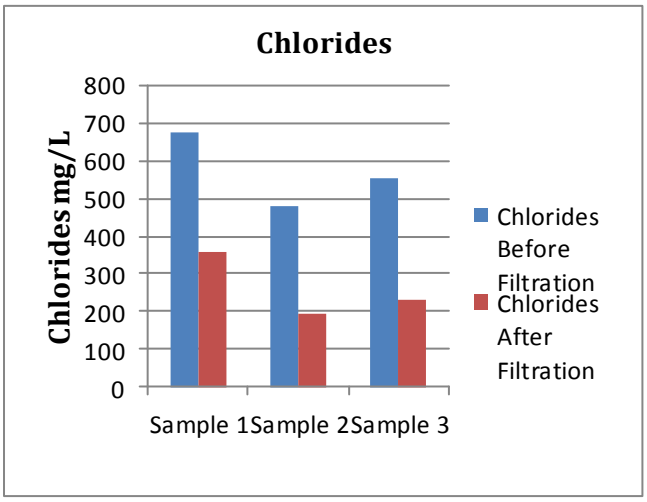


Chart-3: Variation in Chlorides Before and After Filtration

Table-4: Sulphates values Before and After Filtration

Sample No.	Parameter	Before Filtration	After Filtration
Sample 1	Sulphates mg/L	395	342
Sample 2		323	273
Sample 3		352	289

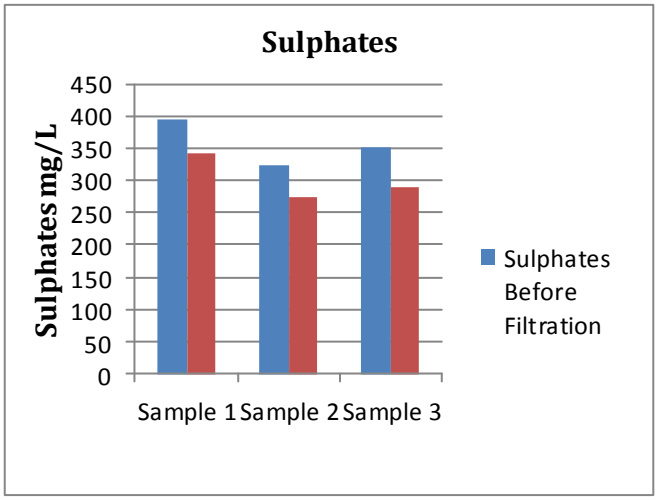


Chart-4: Variation in Sulphates Before and After Filtration

Table-5: Acidity Values Before and After Filtration

Sample No.	Parameter	Before Filtration	After Filtration
Sample 1	Acidity mg/L	58	79
Sample 2		32	55
Sample 3		42	67

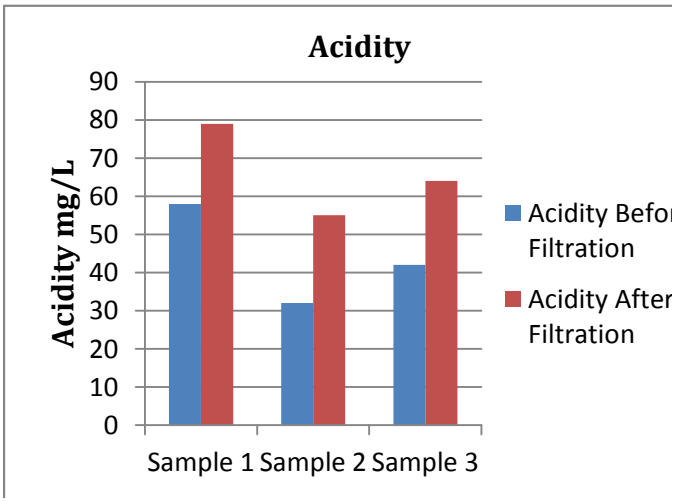


Chart-5: Variations in Acidity Before and After Filtration

Table-6: Alkalinity Values Before and After Filtration

Sample No.	Parameter	Before Filtration	After Filtration
Sample 1	Alkalinity mg/L	572	287
Sample 2		526	242
Sample 3		648	308

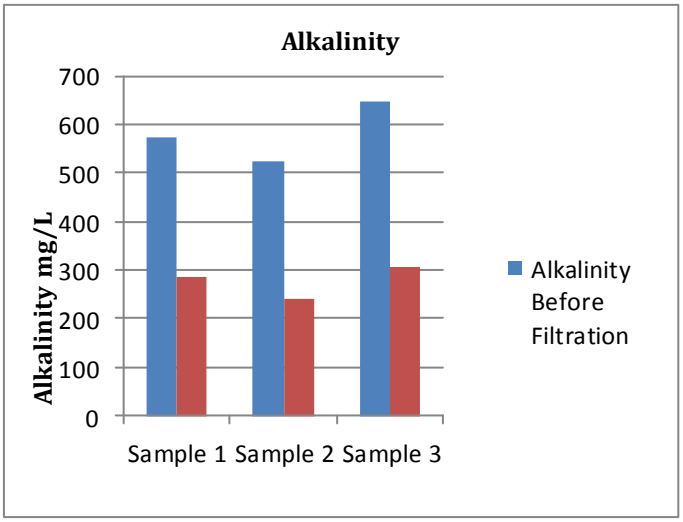


Chart-6: Variations in Alkalinity Before and After Filtration

Table-7: Total Hardness Before and After Filtration

Sample No.	Parameter	Before Filtration	After Filtration
Sample 1	Total Hardness mg/L	1168	768
Sample 2		772	392
Sample 3		936	543

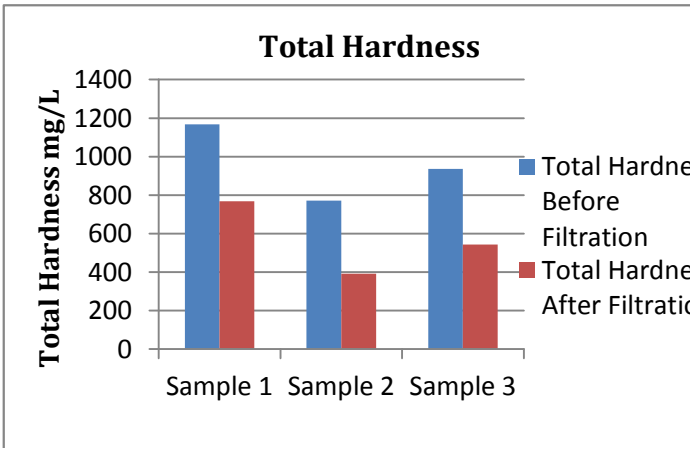


Chart-7: Variation in Total Hardness Before and After Filtration

Table-8: Total Dissolved Solids Before and After Filtration

Sample No.	Parameter	Before Filtration	After Filtration
Sample 1	Total Dissolved Solids mg/L	450	382
Sample 2		1200	748
Sample 3		1600	860

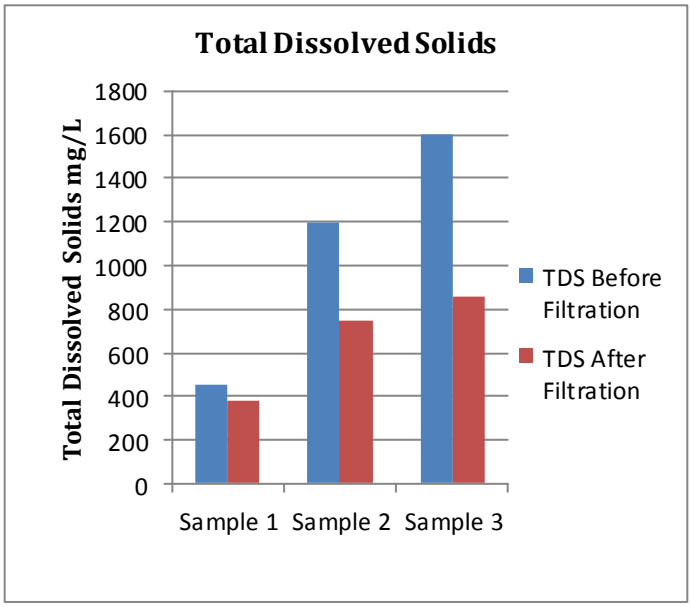


Chart-8: Variation in Total Dissolved Solids Before and After Filtration

4. CONCLUSIONS: In the present Study the effect of Absorbents used in Contaminants reduction in Water such as Activated Carbon Coconut Shell and Activated Carbon Rice Husk is observed by Developing a BioFilter Model and passing the water through the Model. From the results it is observed that there is substantial Reduction in Total Hardness, Chlorides, Sulphates, Total Dissolved solids after subjecting to filter.

The Important Conclusions Obtained from the present study by considering the Results obtained are:

1. Reduction of Pollutants in Water to the Desirable Limits of BIS water Standards for drinking purpose.

2. Sand Filter having Activated Carbon Coconut Shell and Activated Carbon Rice Husk is Efficient in pollutant Reduction.

3. Decrease in Total Hardness, Chlorides, Sulphates, Total Dissolved solids after subjecting to filter which makes water Safe for Drinking and Increase in Dissolved Oxygen is observed after Subjecting to Filter.

4. The Filter developed in this project is made of locally available Materials; hence it is Cost Effective and Ecofriendly.

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