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Design Of Dual Media Water Filter Purifier Using Clay Pot Author

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ABSTRACT: Low cost water treatment devices for rural households like filters, RO and UV based water purifiers are developed by many industries but these devices suffer from problems like filter clogging, periodic replacement of filters, wastage of water (in case of RO) and unavailability of electricity in rural areas making them costlier. Due to above reason RO, UV purifier are not affordable to rural areas. The objective of our project is to deal with improvisation in existing filter design and remove the flaws in existing filtration models at economical level. The study deals with the purification of water using naturally available material using copper mesh as a disinfectant and provide effective and economical water purifier for rural area. Earthen pots are used for the purification of water made from different proportions of Clay and Saw dust (50:50, 60:40, 70:30). Lake and well water was treated as it is normally used in rural areas. Various drinking water test carried on samples before and after the treatment of water showed that the filters were capable to treat water as per the drinking water standards. Maximum turbidity and TDS was removed in 1st model (50:50) up to 89% and 72.35% respectively for lake water and 78% and 67.47% respectively for well water .As copper was used as a disinfectant, no trace of E-coli was found in the treated water for all three models. The results showed that Pot Filter (50:50 model) can be effectively used as a low cost filtration device in rural areas.

KEYWORDS: Potfilter,Economical,Effective,ReverseOsmosis,Ultraviolet,Ruralareas.

I. INTRODUCTION

One of the important problems, currently facing the society, is the provision of clean drinking water. According to the forecasts, the situation will worsen in the future due to the reduction of fresh water supplies and population.

Onwards to primitive age, when the intellectual man had started thinking and studying about agriculture and the environment; he realized and developed new concepts, 'The Science'! By the time, 'The man growing social' became aware of his Safety and Hygiene. He started using hygiene practices primly in the food and water culture. He found that the Physical, chemical and biological properties of water may vary region to region; from time to time and the water in its available form is not always potable. It may contain impurities other than required nutrients to human body. He understood the importance of purification of water.

Formerly, they used some basic ways for purification. Later, rising agricultural and industrial development across the globe lead man to treat water as the Precious Natural Resource in this ecosystem, where water is used for many purposes in various ways. Besides only for drinking, washing etc. water has found numerous applications and uses in industry today. Also increase in water pollution or contamination with waste result in adverse changes in its properties, making it hazardous for drinking directly. It may cause diseases. Now -a- day's water is thus tested for necessary parameters before any application and is then treated to match the requirements.

Today, progress in environmental sciences has developed various techniques for purification of water .Special 'water treatment plant' is designed in water supply scheme for this purpose. It involves different steps of operation making water usable and even potable. Treatment units include coagulation, flocculation, sedimentation andfiltration units basically. Our project entitled "Modification in RSF with coconut shells as capping layer" deals with the recent improvisation in filter design removing the flaws in existing filtration models. The water crisis affects millions worldwide and it is expected to worsen over the coming years and decades.

It is estimated that in 2010 1.8 billion people consumed water deemed "unsafe" and 783 million regularly used water sources unprotected from contamination. Children are the most affected by ingestion of contaminated water: 15% of deaths in children under five years old are associate with

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the nearly 2.5 billion cases of diarrhea each year. These means that every year, 3.4 million children die as a direct result of diarrhea and other diseases caused by water-borne microbes, making it the second leading cause of death of children, especially in low- and middle- income countries.

1.1 Problem Statement

The filtration units in treatment plants are observed to be less efficient and facing major problems in its operation such as high head loss, frequent clogging, reduced filtration rate, more wastage of filtered water in backwashing as higher backwashing requirements, reduced filter run and thus ultimately affecting on quality of filtration.

1.2 Objectives

Our objective is to develop a working model as an alternative for RO and UV purifier in rural areas at low cost, which will provide safe drinking water as per the standards prescribed and it can remove disadvantages of RO and UV in moreefficient and economical way.

II. METHODOLOGY

1.3 Study Area

The district of Dhule, formerly known as West Khandesh and categorized as district head quarters since 1960. Situated between 20°38' and 22°3' North latitude and 73°47' and 75°11' East of longitude, is the westernmost of the districts of Northern border area of Maharashtra State.

2.2 Material Used

Clay, Sawdust, Copper mesh as Disinfectant, Fine Sand & Gravel, Coconut Shell, Activated Carbon, Cotton, Corn Starch and Maize waste.

2.3 casting procedure of model :-

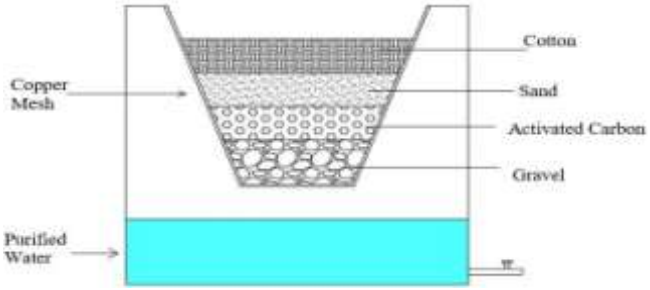
- Clay and sawdust will be taken in required proportions for casting of filter -
  - Model I 50:50
  - Model II 60:40
  - Model III 70:30
- During this the mixture should be carefully searched for hard particles like small Stones etc.
- A fine mixture is prepared so that earthen vessels can be moulded out of it.
- After preparing the mixture, three pots (matkas) shaped like a hollow spindle are moulded of similar dimension- diameter 10 inches, height 1 foot and wall thickness 0.59 inch.
- It will be kept in kiln and burning.

2.4Information about Model

Total number of models used for this project 3 Nos. The models each for same material. Name of models A, B, and C For making of each pair different quantity is used. Material used for each two model is different as following:-

- Model A – 50% Clay & 50% saw dust
- Model B – 40% Clay & 60% saw dust
- Model C – 30% Clay & 70% saw dust.

Figure2.1 SchematicDiagramofaclaypotwaterfilter



FigureSchematicDiagramofaclaypotwaterfilter

III. EXPERIMENTATION

Earthen pots have pores. When water is poured into the pot, a small part of it exitsthrough these pores and evaporates from the surface of the pot, thus making the pot coolerthan before. Another benefit of clay water pots is the alkaline nature of clay. The alkalineclay interacts with the acidity of water and provides the proper pH balance. This water canhelp curb acidity and in turn provides relief from gastronomic pains. Water stored in anearthen pot is gentle on the throat. It is an ideal drink for people suffering from cough orcold. More importantly the earthen pot transfers the coolness to the water according to theclimaticconditions;whichisthespecialqualityofearthen potthatnoothercontainer.

Analysis

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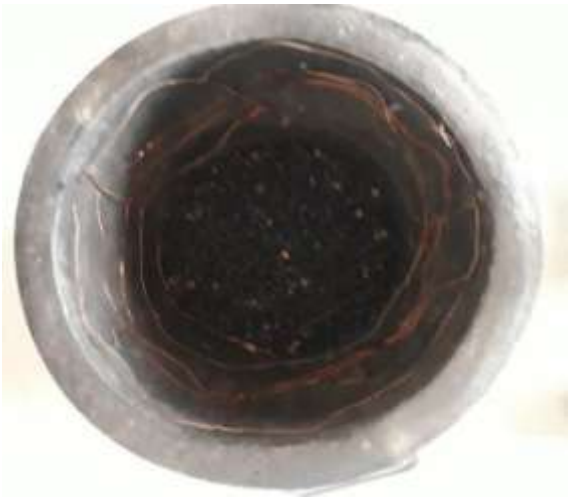
Physical Parameters
Temperature, Turbidity
Chemical parameters
pH,Chlorided,Flourides,TotalHardness,TotalDissolvedSolids,TotalSuspendedSolids,Conductivity,Copper Content



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IV. OBESERVATIONS FROM THE TESTS CONDUCTED ON VARIOUS WATER SAMPLES

The study conducted showed that model A1 was more effective than models in removing impurities and other parameters as per the drinking water standards.

- Various drinking water test carried on samples before and after the treatment of water showed that the filter were capable to treat water as per the drinking water standards.
- Maximum turbidity and TDS was removed.
- In 1st model (50:50) up to 89% and 72.35% respectively for lake water and by 2nd model up to 78% and 67.47% respectively for well water.
- As copper was used as a disinfectant, no trace of E-coli was found in the treated water for all three models. The results showed that pot filter (50:50) can be effectively used as allow cost filtration device in rural areas.
- Other models is less efficient than model A1.
- This filter is economical than other filters.

LakeWaterReadingwithdifferentmodels:-

Sr.No.	Parameter	Reading	LakeWater				Unit
		Initial Reading	A1	B1	C1	RO/UV	
1	Ph	8.6	7.61	7.9	7.94	7	
2	Turbidity	34	4	6	19	1	NTU
3	TDS	434	120	300	219	200	Mg/l
4	Total Hardness	247	129	180	160	0	Mg/l
5	Chloride	165	52	130	70	0	Mg/l
6	Fluoride	1	0.1	0.2	0.2	0	Mg/l
7	MPN	3	0	0	0	0	
8	Copper	1.2	0.4	0.7	0.8	0	Mg/l
9	Temperature	22	20	20	20	20	C

TABLE SHOWS THE VARIOATIONS READING WITH THE MODEL

WellWaterReadingwithdifferent models:-

Sr.No.	Parameter	InitialReading	WellWater				Unit
			A1	B1	C1	RO/UV	
1	Ph	8.2	7.89	7.89	7.94	7	
2	Turbidity	9	13	13	19	1	NTU
3	TDS	206	135	135	219	200	Mg/l

4	Total Hardness	239	144	144	160	0	Mg/l
5	Chloride	130	42	42	70	0	Mg/l
6	Fluoride	0.6	0.1	0.1	0.2	0	Mg/l
7	MPN	4	0	0	0	0	
8	Copper	1.2	0	1.1	0.8	0	Mg/l
9	Temperature	22	20	20	20	20	C

TABLE SHOWS THE VARIOATIONS READING WITH THE MODEL

V. CONCLUSION

The study conducted showed that model A1 was more effective than other models in removing impurities and other parameters as per the drinking water standards. Various drinking water test carried on samples before and after the treatment of water showed that the filter was capable to treat water as per the drinking water standards. Maximum turbidity and TDS was removed in 1st model (50:50) up to 89% and 72.35% respectively for lake water and by 2nd model up to 78% and 67.47% respectively for well water, 80 % and 78 % for river water. As copper was used as a disinfectant, no trace of E-coli was found in the treated water for all three models. The results showed that Pot Filter (50:50 model) can be effectively used as a low cost filtration device in rural areas.

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