

# Water Treatment Through Wetland Filter

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**Abstract-** The increase in population in India creating problems amongst us in the waste production. Sewage waste may be in solid suspension phase. It contains pollutants, like organic, inorganic bacteria etc. Present filtration is based on pollutant level in treated water which may later on can be applied for gardening purpose. Waste water sample collected from station A and station B, after treatment is collected and analyzed with various parameters viz pH, Conductivity, DO, COD, BOD. As the level of COD and BOD were found to be higher than Bureau of Indian Standard recommendation. Various toxic metallic elements absorbed by plants, reducing the pollution level.

**Key words:-** COD, BOD, wetland

## I. INTRODUCTION

Sewage water from kitchen, washrooms, and toilets transferred through different filters like sand filter, after sedimentation, filtration, decantation collected, which may contain minute dirt particles, light colored pigments which are then transferred into storage tank where effluent is collected. The COD, BOD, pH level found to be somewhat high. The pH level found in the range of 7-8 [1]. The composition of waste water from canteen area, toilet, and washroom is found to be different. Simple stable tank is kept initially for treating waste water. The collected waste water is then transferred into various filtering tanks and the treated waste water is collected and collected for analysis. This study is continued for four months from Jan to May '15.

## II. METHODOLOGY OF COMBINED FILTER:

The domestic waste water sample/rivulet waste water sample from respective stations were treated with combination type filter, which gave better results and can be considered as a better filter for today's generation. The quality of water obtained from this combination filter was superior as compared to rest filters we used separately. The rivulet waste water samples collected from different stations were given basic filtration

layers should not be so far. The wastage of water also avoided. The pure water sample obtained from the third layer was very clean, odour free. The central membrane, i.e. AC filter membrane pot was filled with two types of coconut shell charcoal; one was fine powdered form and second was granular form. All the pots were arranged in such a manner that water should easily flow towards the downside, where four beakers were kept for collection of water samples from different stations. The stems (twigs, sticks) of selected trees were changed randomly when there was no proper water flow. Continuous care was taken for all

pots so that there should not be any obstacle in the flow of water from top to bottom (in filtering process). Spongy rocks were kept near the top so that the path should not be blocked by any sand or soil particles. The plants which were kept in the topmost layer were changed, sometimes cut when collapsed (not growing properly). After this process, samples were filtered through the combined filter. The quality of effluent water (filtered water) was fine as compared to the effluent of charcoal, xylem and wetland filter. This was owing to triple filtration. This model was very easy to set up and affordable for common public. The principle behind triple filter was absorption of toxins, trapping of dangerous bacteria and also absorption of organic matter by the aquatic plants which grow into the wetland.

In the combination filter, the pots which were used, arranged systematically and labeled station wise. The systematically arranged four pots were connected (attached) to the second filter of charcoal membrane pots which was continued with final xylem or sapwood filter membrane pot. The water sample which was kept for 2-3 days in the wetland filter pot were slow (dropped wise) transfer to the second part (coconut charcoal membrane) and finally passed through xylem membrane. The water obtained from the last pot was with improved quality, i.e. odour free, bacteria free.

There are three layers, topmost layer is wetland membrane (fig.2,3) was continued with coconut shell membrane (fig.1) and at the bottom the xylem membrane is placed.

The basic science behind soil, cultivated plants and why above material was selected here in the research work is summarized here. During photosynthesis the carbon dioxide from the waste water sample is taken by aquatic plants to convert it into food material



Fig.1 Actual Photograph of Coconut Charcoal



Fig. 2. Actual photograph of combination filter for station A,B,

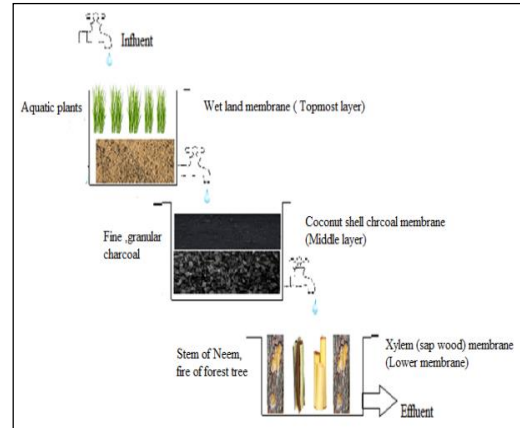


Fig. 3 Diagrammatic representation of combination filter

This absorption of CO<sub>2</sub> (acid) may lead to the high proportion of bicarbonate ion (basic) or hydroxyl ion, which can rise the pH value of effluent sample and may decrease the alkalinity of filtered water sample (in wetland filter) During night time respiration reaction balance the pH and pOH value hence there is no sharp incline in the values of pH.

Red mangroves (*Rhizophora mangle*), Water hyacinth (*Eichhornia crassipes*) were some aquatic plants which were used in the wetland pots.

Red mangroves trees are salt tolerating plants but fresh water is also tolerated by these plants and grows in wetland pot. Mangrove grows like a desert plant i. e leaves are thick, waxy and hairy, which results into less absorption of water and less transpiration rate. It absorbs maximum concentration of ions. Mangroves roots are helpful to concrete the soils and fix the tree. These trees do not show heartwood but there are vessels which are narrower and found throughout wood. Vivipary seedling takes place here,

**\*Water hyacinth (*Eichhornia crassipes*):**

This is a tropical area plant. The by-products obtained from these plants are also used in fertilizers. The plants are not only used in water treatment practice but also their dry parts used in making baskets and similar other products. This is a perennial plant and float freely on the water surface. This plant can shade the entire water level and can stop direct sunlight to some aquatic life which is dangerous for aquatic organisms and provide less oxygen also. It also provides habitat to many livings present in wetland ponds. It grows very fast like a runner. Leaves are flat (ovate). The temperature tolerance range is in between 12 Oc to 30 Oc.

Systematic well cultivated water hyacinth and mangrove plants are shown here in the below fig.4,5.

where seeds mature on plant and mother Plant nourished there and a new plant can developed. The Mangroves can grow in less oxygenated soil area, it also absorb NH<sub>3</sub>, Nitrogen.



Fig. 4 Actual photograph of mangroves plant

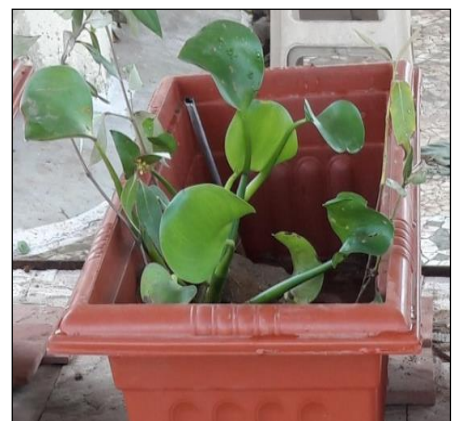


Fig. 5 Actual photograph of water hyacinth plant

### III. SOIL SELECTION

The special attention was given on type of soil which was selected for submerged plant growth. There are various types of soils found in India, which is economic and natural source. The following are some types of soils focused for knowledge purpose,

1. Alluvial soil
2. Red Soil
3. Laterite soil
4. Mountain Soil
5. Black soil
6. Desert soil

#### 1. Alluvial soil

The River forms, some sediment which is deposited and converted into this type of soil. This type of soil is rich in minerals, humus, and hence soil Volcanic rocks and lava flow are the responsible factors for the formation of this type of soil. Some parts of Maharashtra, Andrapradesh, Tamilnadu, Chhattisgarh, Madhya Pradesh, Generally Lime, Iron, Magnesium, and Potassium are the main constituents present in the black soil. Some quantity of potash is also present into this type of soil. Organic matter, phosphorus, Nitrogen is absent in the present black soil.



Fig. 6 Actual photograph of black soil, red soil

Image courtesy: zonters.Com/image/2013/08/desktopwallpapers. Orgua-3133.jpg Image Courtesy: api. Ning. Com/files/-\*DC GhMoY\*S x GS7GZpNVUAlrIdgWu1AVn/redsandpaly. JPG

2. Red Soil: This type of soil is found in a few parts of Maharashtra, Andrapradesh, Tamilnadu, Chhattisgarh, and Madhya Pradesh also in the some areas of Orissa. The red colour of the soil becomes yellowish or brownish owing to loss of iron content after some time interval.

3. Laterite Soil: This type of soil formed owing to leaching process and found, in the region of hills and uplands. Generally in the Kerala, Maharashtra, Chhattisgarh, and Tamilnadu, also found in the hilly region of Orissa.

Image courtesy: i162. photobucket. com/album/t260/tirtha1979/Trip/Laterite1. ipg

Image courtesy: static. panoramio. com/photos/large/2513714. ipg

Image courtesy: postconflict.unep. ch. Organic matter accumulates in one place which actually comes from forest development and gives this type of soil. Generally in the Himalayan area this type of soil found. In this type of soil Tea crop is cultivated where sufficient rainfall is received.

becomes more fertile. Northern part, Narmada and Tapi River, especially lower region are basic sources of this type of soil.



Fig. 7 Actual photograph of alluvial soil

Image courtesy; 2 bp blog spot.com/-EEtrWieBlyUk/Uimckp/AAAAAABP4/gXOvvc0cjs/s1600/DSC06569. JPG

5. Black soil:

6. Desert Soil:

This soil is from the some desert area of Rajasthan is not well developed; the soil is full of salty substances, later on which form a salt crust. This type of soil is having fewer amounts of minerals and organic matter too. In the present research work the type of soil selected was of desert type, because if we select another type of soil which is rich in organic matter than the plants will not absorb toxic substances and other organic matter from the wastewater sample, and will not get proper result.

TABLE 1. Parameters of Stations A and B.

Parameters	Station A Vishal C.H.S.		Station B Atharva management	
	I	E	I	E
pH	6.72	6.67	7.49	6.90
Turbidity	6.54	3.12	5.01	1.87
Iron	1.03	0.28	0.80	0.23
Magnesium	63	21	49	19
Calcium	71	24	61	23
Sulphate	55	29	48	25
Chloride	72	39	51	31
TDS	465	402	246	202
Alkalinity	533	201	422	128
Total Hardness	110	68	76	28
COD	29	07	25	10
BOD	19	05	13	05

### IV. CONCLUSION

The research work is based on the recycle of all kinds of waste water which comes from near by households, kitchen waste, clothing, bathing, some small scale Industries etc. which can be converted into useful water except for drinking purpose. This also includes conservation of water indirectly. The basic idea is to use the above recycled water for gardening, street cleaning, construction purpose, and pavement garden. It is not recommended for public usage in toilets provided by the cost as it can be misused. Special



emphasis should be given that it is only for flushing purpose.

The above research utilises the easily available material in India. The charcoal prepared by this method utilises the coconut shell which is available easily throughout the major parts of India. This system does not require costly and complicated equipments for making charcoal and other materials. The above material after utilisation can be easily destroyed, as it is biodegradable and ecofriendly.

Aquatic plants which will not affect the deforestation and environment are used for the recovery of water as they are capable of absorbing metallic ions and toxins from the domestic waste water sample. These plants convert all the above unwanted material into useful nutrients for the plants so that the animals can also eat the same.

The above plants reduce the higher level concentration which is available in the domestic waste water sample to the minimum acceptable level. This requires further research and observation. The above water become useful and suitable for other purposes.

The residue left after utilization of xylem membrane is again used for agricultural purpose as it can be used as fertilizers for gardening purpose, it should not be thrown as it is rich in nutrients, ultimately this is an ecofriendly research work. The coconut charcoal which is used in the current research work is also not thrown away, it is burnt completely to ash, which can be used in gardening for better plant growth.

In cities like Mumbai, Delhi there is space problem, people do not have proper shelter for survival, there also this simple plant can be fitted because the space required to assemble this triple filter or combo membrane is very less, on a large scale also this assembly can be set but as per requirement we can modify and assemble it.

In the present research work Neem's young twigs are utilized, which not only trap dangerous bacteria but it also destroys more than 500 types of insects, mites, ticks, and nematodes, it does not kill these bacterias but stop its growth. As the first membrane is wetland membrane where researcher grow some wetland plants and water is at is kept for 2 to 3 days, so there are chances of growth of various mosquitoes which can be controlled by the neem sticks or twig used in xylem membrane.

#### A. SCOPE

In case the third world war happens, (it should not happen) will only be due to water. Water is going to be the future resource of our energy and all related activities for human beings. The shortage of water will be felt by all the continents and people. The depletion of water source will create economy burden on all the nations, so it has become essential and necessary to save water and recycled water. The progress of every country depends upon the smart cities and existing major cities. The population of these cities is growing high and hence the consumption of water also becomes higher. The only solution is to recover and

recycle the water spent on domestic consumption and industrial consumption by very good affordable water treatment plants.

India is fortunate to have coconut plantation throughout the coastal area and trees are considered as God's given gift. The coconut shell can be used to convert it into activated charcoal by simple process of burning, there by heat is generated which can be applicable for power generation also. The charcoal obtained in this process can be collected, washed properly, and put into granulated form.

#### B. LIMITATION

1. The above research requires a lot of time, investigation, trial methods to get required membrane and special methods to get desired results. The infrastructure and space required for making the membrane like wetland, activated charcoal, Xylem stems requires additional time and financial efforts. (Initial investment is high later on it becomes affordable for common public)
2. The membrane use requires young stem (twigs) of certain trees, which requires an experience, knowledgeable and educated person; otherwise it can destroy the whole plant which would be dangerous for environment and it will not be ecofriendly.
3. The xylem membrane and charcoal membrane should be changed randomly as it is blocked by micro dirty particles from the waste water sample

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