

A Comparative Study of Artificially Aerated and Non Aerated Wetland To Treat Hostel Sewage AT PVPIT BAVDHAN Pune

DR. D.B Jasutkar¹, Sakshi Harpal², Manasi Pawar³, Jwali Kamble⁴, Abhishek Kadam⁵

¹Head of civil Engineering Department, Padmabhushan Vasantdada Patil Institute of Technology Pune, Maharashtra

^{2,3,4,5}Civil Engineering Department, Padmabhushan Vasantdada Patil Institute of Technology Pune, Maharashtra

Abstract— Constructed wetland is an environmentally friendly method for removing contaminants from waste water and has been applied to municipal waste water, petroleum refinery waste water, husbandry drainage, acid mine drainage etc. The once decade has seen a remarkable number of inventions in the exponentially growing field of microbiology. This handwriting covers a critical review of crucial aspect of CW, similarly various type of constructed wetland the contaminants and their removal mechanism, degradation pathway, challenges and opportunity, material, application and the proposition with the focus on recent advance in the last three decades. In additional, an attempt has been taken to project future advance in the field of CW and facilitate these advances by framing crucial unsold problem in cw. Guidelines are prepared for the fast-growing CW field through the standardization of crucial design aspect. This review covers the evaluation of the current state-of-art of CW community and provides definition and performance metric nomenclature in an effort to unify the fast-growing CW community. It also contains an outlook on the arising trend in CW and propose unborn exploration and development direction.

Keywords— environmentally friendly technique, Fast Growing, removing contaminants

I. INTRODUCTION

A wetland is a place in which land covered by water, salt, fresh, or nearly or between either seasonally or permanently. CW offers natural, simple, affordable and green fashion for waste water treatment. CW has long been known as “black box” in which waste water enters and is treated over a certain period of time. A CW is a finagled wetland that employs chemical, physical and biological processes to a natural wetland for waste treatment.

This study compares the performance of instinctively aerated and non-aerated wetland in hostel sewage. This aim is to evaluate the effectiveness of these system in removing contaminants and perfecting water quality. The finding of these study will contribute to the development of sustainable waste water treatment result of hostel facilities. since also the subsurface system has been generally used in Europe while free water system has been more popular in north America and Australia. During the 1970s and 1980s the information on constructed wetland technologies spread sluggishly. But since 1990s the technology become international, facilities by exchange among scientist and experimenter around the world.

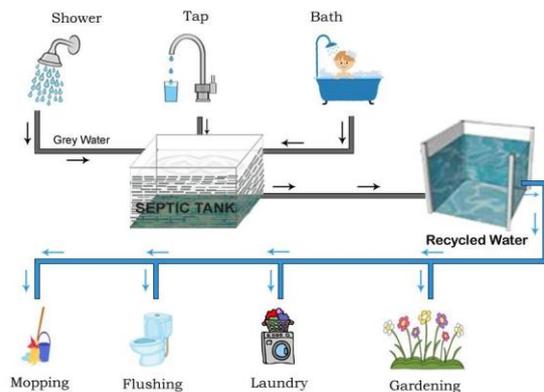


Fig.1 Uses of Waste Water of Hostel

As egrigious from fig. 1. Hostel that are known for high water use, which means they can realize many benefits from water reuse. Rather of wasting precious drinking water on nonportable operation. Hostel can treat and repurpose gray water from laundry purpose, kitchen and indeed bathrooms. New modular waste water technologies are making its easier to treat waste water on point for easy reuse.

Grey water requires the least amount of treatment because it is the last contaminated portion of waste water. Grey water contains 30 to 40% inorganic solid and 60 to 70% easily degradable organic material. The majority of inorganic portion is sand and grit, which collect to coat an inorganic sludge. Both settleable and colloidal solid are included in the total suspended solid. One of the simple treatment technique the eliminate suspended particle is by using settling or filtering.

II. RELATED WORK

These setup consist of two 10 litter tank, two taps, an aerated pump, charcoal, brick, and mm aggregate, all of which are easily available in the market, we can tret our water using both aerated and non-aerated methods.

III. PROPOSED METHOD

In the proposed method, we employing two different approaches: aerated and non-aerated. In the aerated tank, we utilize an aerated pump to introduce oxygen into the water, which helps promote the breakdown of organic matter. On the other hand, in the non-aerated tank we rely on a natural, passive self-treatment process, allowing the water to be treated without the addition of external oxygen. By using both methods in tandem, we are effectively treating the waste water generated from the PVPIT Hostel, ensuring cleaner and safer water.

The proposed method follows the operational process.

- a. Collect waste water from hostel
- b. Put it in 10 liter tank
- c. Allow it to flow from the material
- d. Passes from Typha latifolia plant
- e. Then 10 MM Aggregate
- f. Then Coal
- g. After that from Crushed brick.

We are using this material in our project because it is easily available in the market. Now, we are looking for the exact function of each material used in proposed method.

A. TYPHA LATIFOLIYA PLANT

Typha latifolia or Broadleaf cattail, is a wetland plant used in constructed plant for waste water treatment, effectively removing contaminants like

heavy metals, organic matters, and nutrients through phytoremediation shown in fig.2



Fig.2 TYPHA LATIFOLIYA PLANT

It is a plant that Grow in wetland and aquatic area. It has various uses in water treatment, especially in the context of natural water purification. Here's how Typha latifolia can be used in water treatment.

Typha Latifoliya offers several significant advantages in water treatment, primarily through phytoremediation, constructed wetland, erosion control, ad the removal of contaminants from water. Its ability to absorb nutrients, filter contaminants and improve water quality make it an excellent natural water treatment option in various environment and water management project

B. 10 MM AGGREGATE

10 mm aggregate is not big in size so material commonly used in construction and water treatment process. In the context of water treatment, 10 mm aggregate can serve various functions depending on how its incorporate into the treatment system. 10 mm aggregate can be used as a part of filtration system. It act as a filtering bed to remove suspended particles, turbidity, and larger pollutant from water. It is often used as layer in the filter bed, where it traps particles as the water flow through.



Fig.3 10 MM AGGREGATE

The 10 mm aggregate provide space between them for water to flow through, while trapping particulate matter. This helps in reducing the overall impurity level in the treated water.

C. COAL

Coal is an versatile material than can play an important role in the tretment of waste water . although cola itself is not commonly used in its raw form, activated carbon, which is derived from coal, is widlwy utilize for waste water tretment due to its excellent adsorption properties.

The primary function of activated carbon is to absorb organic compound, chemical, and contaminants in waste water, including dissolved gases, heavy metals, and toxins.

Activated Carbon has a high surface area with numerous tiny pores, allowing it to adsorb a wide range of contaminants from water.



Fig.4 COAL

When Waste water passes from activated carbon, contaminant likes chlorine, pesticide, solvent and volatile orgaice compound (VOCs) adhere to surface of the carbon particles.

D. BRICK

Brick can play a role in water tretment primarily as part of certain filtration or construction process. While brick themselves and not use in chemical treatment like activated carbon or orther specializedfiltration Media they can be involved in construction wetland , biological filtration system, and astheticce or structural features in water tretment facilities.



Fig. 5 BRICK

Waste Wayer flows through the constructed wetland, where brick help support plant root and offer a habitat for microorganisms. These plants and microbes work together to absorb nutrients and break down contaminants in water, thus improving water quality.

In some cases, brick are used as a part of biological filtration system where water passes through various layers of material, including bricks to remove particulate matter and organice contaminants. In the filtration setup water flow through a brick layer, where bacteria and other microorganism colonize the poros surface of the brick. These microbes consume organice matter and contaminants in the water as it passes through , purifying the water.

III. WORKING OF MODEL

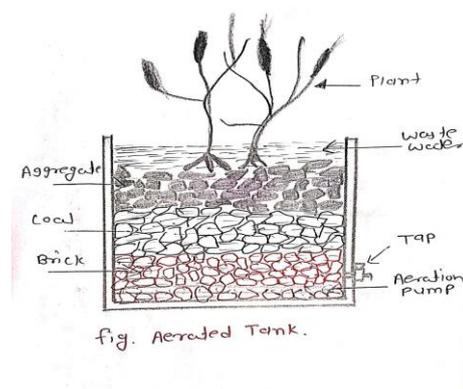


Fig.6 AERATED TANK

First we take two 10 liter tank and place the aeration pump tube ay the bottom of tank. Then we crush a brick into small pieces and creat a layer of the crushed brick at the bottom of the both the tank. After that we add a layer of coal on top of the crushed brick in both tank. Next we spread a thick layer of 10 mm aggregate on top of the coal in each tank. Following this we plant typha latifolia in both

tanks. Finally we will fill both tank with waste water generated from the PVPIT Hostel. The model is ready for the waste water treatment process.

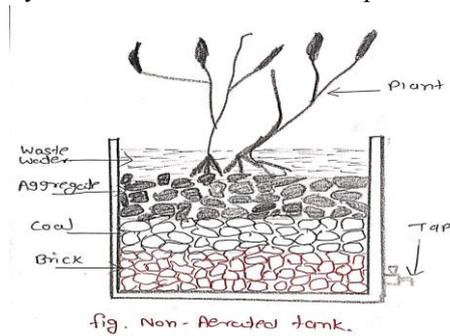


Fig. 7 NON-AERATED TANK



Fig. 8 MODEL OF AERATED AND NON-AERATED PLANT

After Four to five days, we trim a little bit of the plant to encourage further growth. Then after a few days, we collect the water from both the aerated and nonaerated tanks and conduct test on them. After obtaining the result, we compare them with the result from the PVPITs hostel tretment plant. By comparing the results, we achieve the objectives and aim of our projects.

IV. RESULT AND ANALYSIS

➤ pH Test

No. of days	Initial Waste Water		Aerated Waste Water		Non-Aerated Waste Water	
	1 Day HRT	2 Day HRT	1 Day HRT	2 Day HRT	1 Day HRT	2 Day HRT
1	6.77	6.9	7.5	7.6	7.01	7.3
2	6.95	6.8	7.45	7.5	7.03	7.25
3	6.87	6.8	7.5	7.65	7.09	7.3
4	6.97	6.9	7.6	7.6	7.04	7.4
5	6.98	6.75	7.5	7.63	7.1	7.25
6	6.95	6.8	7.5	7.5	7.2	7.25

Greywater was found to have pH levels that ranged from 6.5 to 7.6. Throughout the experiment, it was seen that the pH value of both CWs gradually decreased over time. The pH level was unaffected by the CW's system

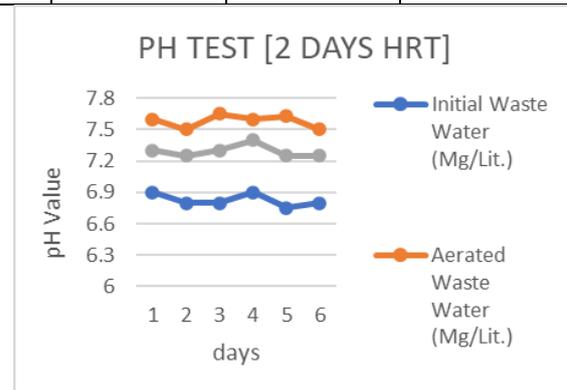
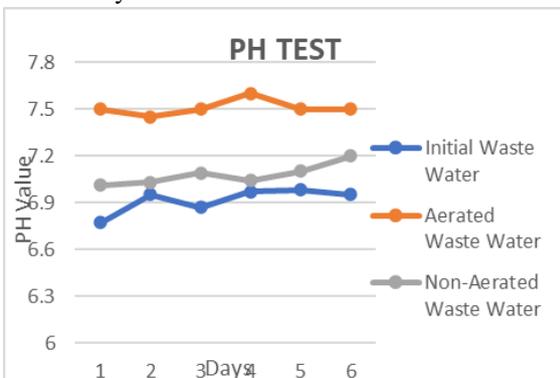


FIG.4.1.1 VARIATION OF PH IN CWS FOR 1 D HRT & 2D HRT

➤ COD TEST RESULT

No. of days	Initial Waste Water (Mg/Lit.)		Aerated Waste Water (Mg/Lit.)		Non-Aerated Waste Water (Mg/Lit.)	
	1 Day HRT	2 Day HRT	1 Day HRT	2 Day HRT	1 Day HRT	2 Day HRT
1	15200	16000	7200	6500	12400	8800

2	14800	15600	8400	8400	11600	9500
3	15200	15800	8800	8000	12000	10500
4	15600	15200	8400	7500	12200	10000
5	16000	16000	7200	7200	12800	10300
6	16400	15000	8000	7400	13600	9200

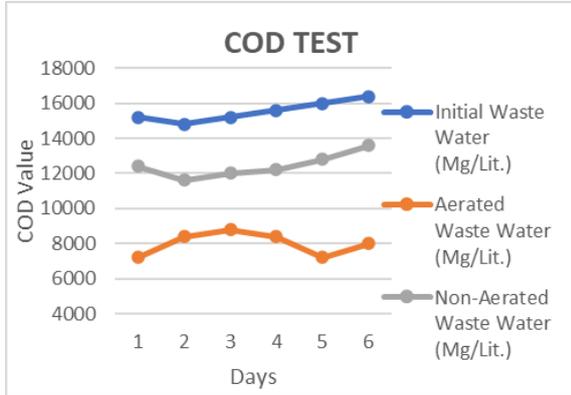
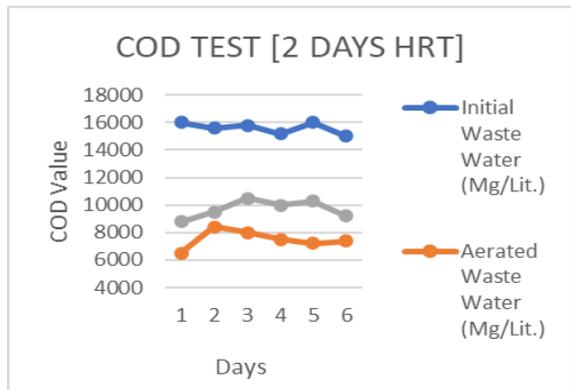


FIG.4.1.2 VARIATION OF COD IN CWs FOR 1 D HRT & 2 D HRT

COD of greywater used in the experimental setup was observed to be in the range of 8000 mg/L to 16000 mg/L. It can be seen from the observation that the COD in raw greywater increases with an increase in organic loading. The biological activity within the filter through attached growth action contributes to the organic matter removal.



➤ ALKALINITY TEST RESULT

No. of days	Initial Waste Water (Mg/Lit.)		Aerated Waste Water (Mg/Lit.)		Non-Aerated Waste Water (Mg/Lit.)	
	1 Day HRT	2 Day HRT	1 Day HRT	2 Day HRT	1 Day HRT	2 Day HRT
1	65	70	95	100	80	80
2	80	75	115	115	100	95
3	90	85	115	115	100	105
4	85	80	105	120	90	105
5	75	85	100	125	85	110
6	80	95	105	130	95	110

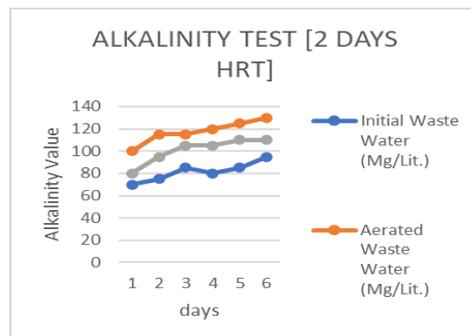
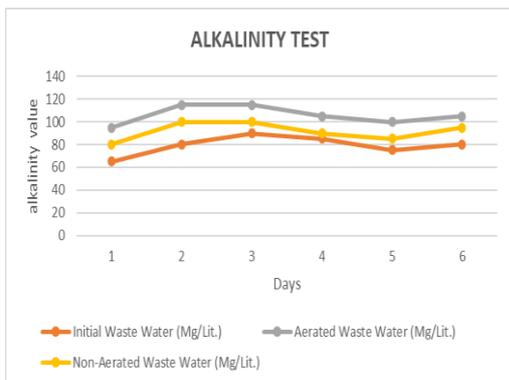


FIG.4.1.3. VARIATION OF ALKALINITY IN CWs FOR 1 D HRT & 2 D HRT

The range of the total alkalinity of waste water of hostel was observed is 150 mg/L to 250 mg/L. We observed that total alkalinity in raw waste water was increases gradually when we increase organic loading.

The increase in total-alkalinity value is in 53 %. The results indicate that there is no significant variation in total alkalinity in the entire system. Suspended organic matter, dissolved inorganic as well as organic compound are the main causes of the changes in total alkalinity.

V. CONCLUSION

- [1] Raw waste water is acidic in nature.
- [2] The efficiency of aerated wetland is more than non-aerated wetland.
- [3] Because of neutralization the wastewater from hostel in PVPIT College Bavdhan Pune The concentrations of parameters Ph is increased by 10 %.
- [4] The concentrations of parameters COD is decreased by 40-50 % in 1 day HRT and COD is decreased by 50-60 % in 2 days HRT.
- [5] Because of neutralization the concentrations of parameters Alkalinity is increase by 10 % to 15 %.
- [6] The effectiveness of the aeration system is 20 to 25 % higher than the non- aeration system.

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