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ijirset@gmail.com



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Constructed Wetland for Domestic Waste Water Treatment

Prof. Amit Kharwade¹, Vaibhav .K. Rathod², Ajay .P. Makde³, Kajal .A. Badodekar⁴, Chetan .M. Raut⁵, Sumeet .D. Meshram⁶, Namrata .B. Sakhare⁷

Professor, Department of Civil Engineering, Nagpur Institute of Technology, Maharashtra, India¹

Student, Department of Civil Engineering, Nagpur Institute of Technology, Maharashtra, India^{2,3,4,5,6,7}

ABSTRACT: Constructed wetlands have acquired a lot of significance for treating homegrown, modern and farming squanders and are considered as a viable optional or tertiary treatment strategy. The fundamental qualities influence the expulsion effectiveness of Constructed wetland are the vegetation type, pressure driven home time and substrate. The job of materials, plants and creation microorganisms have appeared as a sign of a superior pace of corruption. Constructed Wetlands (CW) are designed wastewater treatment frameworks loaded up with permeable media and planted with developing wetland plants. Water defilement is a significant issue world is confronting today and the kitchen squander is one of the significant variables. It is discovered that phytoremediation is one of the powerful strategies for the expulsion of poisons from water and soil. Phytoremediation comprise of media beds, plants, miniature organic entities which is primarily relies upon physical, compound and natural action to eliminate the toxins. Wastewater treatment by Constructed wetland allowed in a non-industrial nation. It is performed for the evacuation of biochemical oxygen interest, substance oxygen interest, suspended strong, smelling salts and nitrogen from pre-treated homegrown wastewater, the treatment of wetland convey under two pressure driven stacking for example 3 cm d⁻¹ and 6 cm d⁻¹, the treatment of wastewater by developed wetland diminish COD by 41 73% for bay natural stacking and 1602kg ha⁻¹ d⁻¹ furthermore, the BOD lessen by 41 - 58% in natural stacking. Phragmites Australis, Canna, Typha, Reed, lotifolia are the plants used effectively in Constructed Wetland.

KEYWORDS: Constructed Wet land, Phyto-remediation, cana-indica, occasional variety, Artificial wetland

1. INTRODUCTION

Current cultures have built enormous concentrated waste water treatment offices that treat huge volumes of water utilizing both substance and natural cycles. this interaction comprises of minimal effort medicines and built by locally accessible material. as contrast with traditional waste water medicines the expense of such medicines are less. Developed wetland was one of the waste water treatment frameworks that had been underlying numerous spots on the planet to deal with squander water from settlement, mechanical, rural and numerous other water contamination source s. execution of a developed wetland was impacted by the plan, substrate, plant and maintenance time. The Constructed wetland strategy utilized for the essential, optional and tertiary treatment of homegrown wastewater and mechanical wastewater, by utilizing CW technique we can treat modern waste containhigh

II. LITERATURE SURVEY

In the field of wastewater treatment, energy-intensive and highly mechanized technologies are giving way to nature-based technologies that utilize solar energy and living organisms. Constructed treatment wetland (CTW) technology has played an important role in bringing about the change. Wetland technology can provide cheap and effective wastewater treatment in both temperate and tropical climates, and are suitable for adoption in both industrialized as well as developing nations. Currently, CTWs are being utilized for removal of a range of pollutants and a broad variety of wastewaters worldwide. The objective of this article is to provide a comprehensive review of the CTW technology and to present the pollutant removal performance experiences gathered through the application of this technology around the world.

III. WHAT IS CONSTRUCTED WET LAND (CTW)

A constructed wetland is an organic wastewater treatment system that mimics and improves the effectiveness of the processes that help to purify water similar to naturally occurring wetlands. The system uses water, aquatic plants (i.e.: reeds, duckweed), naturally occurring microorganisms and a filter bed (usually of sand, soils and/or gravel). Constructed wetlands can be used for either secondary or tertiary wastewater treatment. Many different designs exist including vertical wetlands, which require less land, but more energy for operations like pumping or siphoning than horizontal wetlands, which can instead rely on gravity and topography. The extensive options in design, materials and technology allow the constructed wetland to be adapted to local conditions and land availability. Costs are dependent on the price of land and materials, but where land is cheaper and widely available, constructed wetlands are a very cost-effective method of wastewater treatment.

The general concept is that the plants, microorganisms and substrates together act as a filter and purification system. First, water is slowed as it enters the wetland, allowing for the sedimentation of solids. Through the process of water flow through the constructed wetland, plant roots and the substrate remove the larger particles present in the wastewater. Pollutants and nutrients present in the wastewater are then naturally broken down and taken up by the bacteria and plants, thereby removing them from the water. The retention time in the wetland, which varies depending on the design and desired quality level, along with UV radiation and plant secretion of antibiotics will also kill the pathogens present in wastewater. After treatment in a constructed wetland, water can be safely released into surface waters or used for various purposes.

IV. WORKING AND PRINCIPALS

As energy and construction costs have increased, new methods of wastewater treatment with potentially lower energy and capital costs have become increasingly attractive. Relatively simple wastewater technologies can be designed to provide low cost sanitation and environmental protection while providing additional benefits from the reuse of water. Effluents from conventional treatment facilities not only contain some unstable organic matter but also nutrients, which represent potential energy. It is therefore illogical to utilize external energy sources to dissipate energy stored within the wastewater. A natural treatment system makes use of aquatic animals and plants to improve the water quality and reclaim nutrients. In addition, persistent toxic environmental contaminants such as pesticides, aromatic hydrocarbons and metals can be removed from

wastewater through biological treatment process. Natural wastewater treatment systems include algal mass culture, macro-phyte treatment systems (including constructed wetlands) and aquaculture. Natural systems maybe utilized to treat agricultural, domestic and industrial wastewater. Climate, soil conditions, space, waste characteristics and other factors relate to its applicable.

V. SAMPLING METHOD

Samples intended for chemical analysis must be collected during normal operating hours, Sample must be collected from the collecting tank which is separated from the (black water i.e toilets and urinals). It is also essential that the hand of the person who is collecting the samples be extremely clean to prevent subsequent contamination when handling sample.

VI. DESIGN OF REACTOR

We consider, the discharge of water and velocity of flow. Discharge taken as 10 litres and velocity of flow as 0.05 m/sec. from the formula of discharge we get the area of reactor, mathematical formula as given below .

$$Q = A \times V$$

$$10 \times 10^{-3} = A \times 0.05$$

$$A = 0.080 \text{ m}^2$$

Dimension of Reactor,

$$Q = 4.021 \times 10^{-3} \text{ m}^3$$

$$V = 0.05 \text{ m/sec}$$

$$A = 0.080 \text{ m}^2$$

$$R = 16 \text{ cm}$$

$$D = 32 \text{ cm}$$

$$H = 30 \text{ cm}$$



Fig 01 : Sample Collection



Fig 02 : Reactor CW

VII. SEMATIC LINE DIAGRAM OF EXPERIMENTAL SETUP

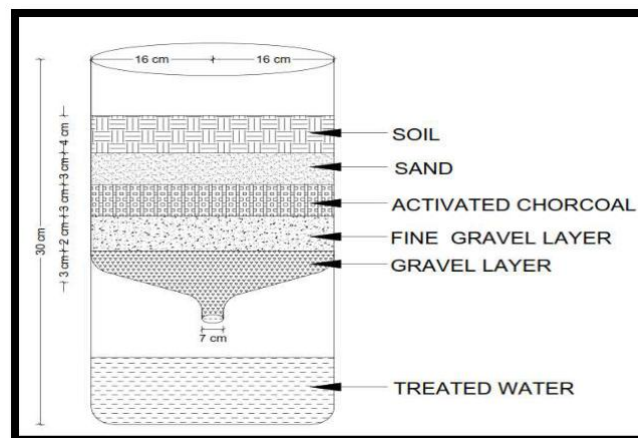


Fig: 03. Sematic Line Diagram of Experimental Setup :

VII. SELECTION OF MATERIAL FOR REACTOR

Material for to construct reactor and its specification
Garden soil

Fine and Course grained Activated Charcoal

Boulders Plants

7.1 GARDEN SOIL

The soil is an important parameter for bed layer. It helps to grow the plants. The soil is use as filter media the y reduce the turbidity of water. Particulate matter retained on the soil layer and ultimately gets removed from the Grey water.

7.2 FINE AND COURSE GRAINED SAND

These grained sand is used as a filter media. They are very important parameter for filtration of water. these s and is reducing the turbidity from water this sand grained maintain the temperature of water. It retained the p articulate matter on the layer of sand grained.

7.3 BOULDERS

The boulders is play an important role in filtration of water. The boulder is used as filter media the boulder is help to reduce the turbidity. Boulder has to major role to form the colonies of bacteria and reduce the BOD of Waste water.

VIII. RESULT AND DISCUSSION

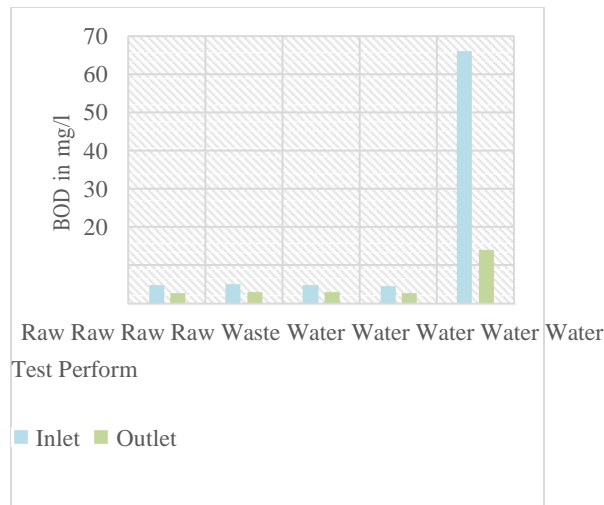
This graphical indicate the removal of excess parameter in percent. This conclude that all the parameter which where excess before treatment by CW method are satisfy after treatment and removal of excess parameter are under permissible limit.

Grey Water after treating with Constructed Wetland CW:

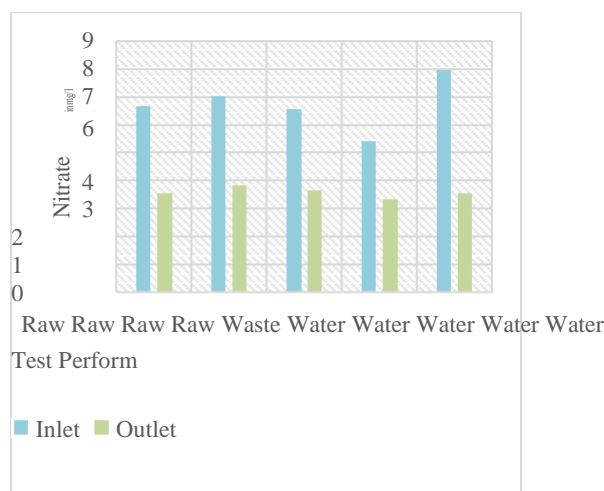


Fig : 5.1 Grey Water after treating with Constructed Wetland CW (Inlet & Outlet)

Test No.4 Turbidity at Inlet 8.4 NTU and Outlet 0.8 NTU, Test No.5 Turbidity at Inlet 58.6 NTU and Outlet 3.4 NTU.



The above graphical analyse the variation in the BOD test perform for Raw water and Waste water. The result showing are Test No.1 BOD at Inlet 4.8 mg/l and Outlet 2.8 mg/l, Test No.2 BOD at Inlet 5.0 mg/l and Outlet 3.0 mg/l, Test No.3 BOD at Inlet 4.8 mg/l and Outlet 2.9 mg/l, Test No.4 BOD at Inlet 4.6 mg/l and Outlet 2.8 mg/l, Test No.5 BOD at Inlet 66 mg/l and Outlet 14 mg/l.



The above graphical analyse the variation in the Nitrate test perform for Raw water and Waste water. The result showing are Test No.1 Nitrate at Inlet 6.65 mg/l and Outlet 3.54 mg/l, Test No.2 Nitrate at Inlet 7.01 mg/l and Outlet 33.81 mg/l, Test No.3 Nitrate at Inlet 6.56 mg/l and Outlet 3.63 mg/l, Test No.4 Nitrate at Inlet 5.4 mg/l and Outlet 3.32 mg/l, Test No.5 Nitrate at Inlet 7.97 mg/l and Outlet 3.54 mg/l.

IX. ANALYSED DATA

Analysis Result													
Sr. No.	Characteristic (Parameter)	Unit	Analysis Results Grey water Sample									Drinking Water Specification BIS: 2012 IS 10500:2012	
			TG W	G W	TG W	GW	TG W	GW	TGW	GW	RG W	Requirement	Permissible limit
1	pH	--	8.1	8.0	8.3	8.0	8.3	8.1	8.3	8.0	8.0	6.5 to 8.5	No Relaxation
2	Turbidity	NTU	4.6	6.6	2.4	7.2	1.2	8.4	0.8	3.4	6.6	1 Max	5 Max
3	Temperature	°C	21	22	22	23	23	24	24	28	22	--	--
4	Nitrate (as NO ₃)	mg/L	3.5	7	3.8	6.56	3.63	5.40	3.32	3.54	7.01	45 Max	No Relaxation
5	BOD	mg/L	2.8	5	3.0	4.8	2.9	4.6	2.8	14.0	5.0	--	--

Note : - TGW- Treated Grey water , GW- Grey water , RGW- Raw grey water

X.CONCLUSION

Comparative other method of treatment of domestic grey water . this method proves more effective. And it effectively remains of BOD, COD, pH, SS.

The analysis result shows that most of the parameters of grey water are above permissible limit for discharge. Hence treatment is necessary before disposal of raw water into the natural stream. The maximum BOD removal was found in Phragmites, Typhas plant. The wetland with Phragmites plant is more efficient in treating grey water as well as campus wastewater compared to the wetland with canna Indica plant. The vertical subsurface flow of constructed wetland through phytoremediation is an effective green technology for the treatment of sewage. The subsurface flow system with expanded clay as main media and vegetated with high biomass producers like Phragmite, Typhas, Eichhornia Crassipes plant etc. The low cost of implementation low maintenance and the fact that specialize personal to operate them is not needed are the main assets of the technology.

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