

Waste Water Treatment by Reed Bed System

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Abstract- India is facing the worst water shortage in its history, according to a report by (National Institution for Transforming India is the premier policy 'Think Tank' of the Government of India, providing both directional and policy Niti ayog). People are suffering with high to extreme water shortage and around 2000000 lives of Indians are losing every year owing to the contamination of water. Now a days, rapid urbanization and industrialization has led to high intake of water and enormous generation of waste water. Rivers are getting polluted at an alarming rate of 80% due to untreated wastewater flowing into water bodies and this rate has doubled in recent years. To reduce the contamination level of water resources waste water treatment will play a predominant role. The aim of this study is to find a practical method for waste water treatment and compare its cost with conventional method. The conventional method is not suitable in rural areas due to high expenses incurred. The reed bed system is one of the alternative techniques for wastewater treatment.

In the present study it is proposed to implement the reed bed treatment method in the city of Chiplun for studying it's effectiveness. Social, environmental, economic factors had to be considered in the implementation of our reed bed system. The effluent characteristics like ph., color, odor, conductivity, DO, COD, BOD, oxygen are found out with the help of the site work. From an environmental standpoint the reed bed system is quite ideal. The choice of materials used for construction is quite flexible, and there is the advantage that the materials can be fashioned out of the local sources. Thus, it affects the surrounding minimally. This system is having soil for the detention period of five days, ten days, fifteen days, twenty days. Reed beds are an aquatic plant-based system in which aquatic plants like reed allows

bacteria in the root to feed on the organic matter contained in waste water. This research is therefore an investigation of performances of waste water treatment by reed bed method.

I. INTRODUCTION

A project especially from engineering field shall always be focused on solving a real-life problem and helping people in living their routine life smoothly. With this spirit Civil Engineering dept. of Dr D.Y Patil School of Engineering and Technology has always encouraged their students to solve civic problems of Ratnagiri as 80% of Civic amenities are related to Civil engineering. Pollution of natural water bodies due to waste water drainage in them is a serious issue of our times. The pollution of water bodies not only harms humans but it also destroys entire eco system flourished within and outside this flow. Moreover, the seepage of polluted water in adjacent lands makes them hard to utilize for agricultural or residential purposes. Just an example how serious this issue is. Indian government has approved a budget of Rs. 20,000 Crore to clean the holy Ganga River. Such an enormous loss of money due to ill managed waste water! Ganga has always been a popular river since ancient times. However, there are many such Gangas in every corner of our nation which are facing the same problem as Indian society in modern days has become very negligent towards health of aquatic bodies like wells, pools, rivers and sea. A prime reason behind this negligence is highly expensive modern waste water treatment in terms of construction and maintenance. A sewage treatment plant requires very complex sets of machinery, huge space and large number of staff and resources to operate on full scale.

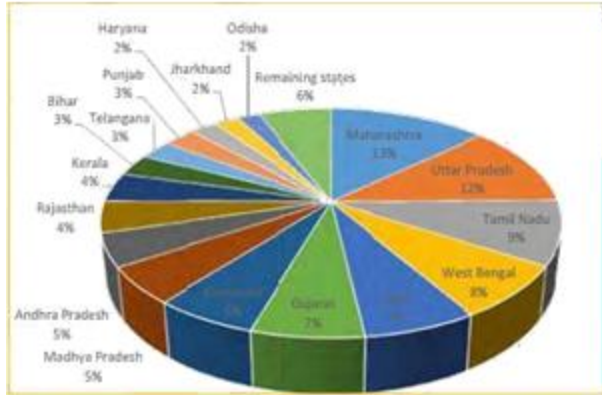


Fig No. 1. Percentage of sewage waste generating state.

According to a recent report published by Ministry of Environment, Domestic human waste includes human excreta, urine and the associated sludge (collectively known as black water), and wastewater generated through bathing and kitchen (collectively known as grey water). In 1950 average daily output of human waste (i.e., excrement and urine) was estimated to be 3.2 million tonnes; in the year 2000, the estimated daily output was 8.5 million tonnes. It is estimated that 22,900 million litres per day (MLD) of domestic wastewater is generated from urban centres against 13,500 MLD industrial wastewater. The treatment capacity available for domestic wastewater is only for 5,900 MLD, against 8,000 MLD of industrial wastewater. Thus, there is a big gap in treatment of domestic wastewater. Govt. of India is assisting the local bodies to establish sewage treatment plants under the Ganga Action Plan and subsequently under the National River Action Plan. Since the task is massive, it may take long time to tackle the treatment of entire wastewater. It is estimated that the total cost for establishing treatment system for the entire domestic wastewater would be around Rs. 7,560 crores. Operation & maintenance cost would be in addition to this cost.

Our own Maharashtra state being the most urbanized and industrialized state tops the list of highest sewage generating states. With this speed of pollution spread through disposing waste water in natural water bodies, one day all of the sea and ocean will become dead pools of waste water, with no more sea food to eat, clouds raining waste water, no more water to drink. Though, this statement is overly inflated, it is not

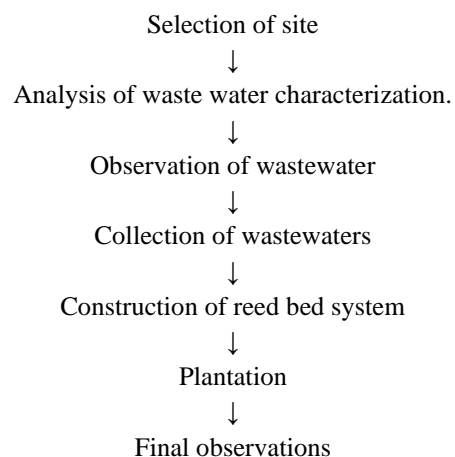
impossible at all. Is it really hard and high-cost consuming activity to treat water? In fact, most of the domestic wastewater is a source of plant nutrients and organic matter.

During this project we worked on Reed bed systems or constructed a wet land which is a natural option for waste water treatment. There are some types of plants which purify waste water in their root zone with help of some certain type of microbes. Salient feature of a reed bed is it can be constructed on running flow and without engaging additional land, machinery and men for treatment. In terms of effectiveness, they are slower and less efficient than standard sewage treatment plant. But they are useful where budget and human resources are major issues. We have found out local plants which are capable of waste water purification under guidance of renowned botanist Dr. Umesh Mundalye. As well as we have studied every aspect of its construction like flow diagram, chemical properties of waste water, construction techniques and estimation plus budgeting. We visited places where reed bed is already in use. Also, we consulted many teachers of our college and experts from the field. Cherry on the cake is that, we have built a real model of reed bed on a live sewage water flow by their own efforts. We tested class room teaching on field and learnt many things by our own observation.

1.1 Aim & objective of study

The aim of the study is to find a practical method for waste water treatment & compare its cause with conventional method.

II. METHODOLOGY



III. CONSTRUCTION OF REED BED

- Construction of Bund.

We take stones from and put into the empty cement bags. Then the bags full of stones are laid in two layers across the stream. The length of bund is 5m, width is 0.5m and the depth is 0.5m. After the construction of bunds, the water becomes stable and the sedimentation and aeration process starts in water. The plants near the bunds starts purifying of water in small scale.

i. Bund 1



Fig No 2. Construction of bund1

- Location- About 180m from mixing of grey water and natural source
- Length of bund- 5m
- Area covered-35sq.m
- Material used- stones and empty cement bags

ii. Bund 2



Fig No. 3. Construction of bund 2

- Location- At 10m from bund 1
- Length of bund- 2m
- Area covered- 10 sq.m
- Material used- stones and empty cement bags

iii. Reed bed



Fig No. 4. Construction of Reed Bed

- Location- At 2.5m from bund 2
- Size of reed bed- Length- 2.5m, Width- 2.3m, Depth- 0.5m
- Area Covered- 12 sq.m
- Material used- GI mesh, Gravel size 150-230mm and gravel size 50-100mm, soil, Plants like – Colocasia (Alu), Canna Indica (Kardal), Phragmitesauatralis
- We clean the site by removing plastic bags, garbage, trenches etc. After that we level the ground for placement of GI mesh.



Fig No. 5. Construction site

- We make the box of GI mesh by using spiral binding. and then it is placed at selected site. After that we pack the remaining portion of right and left sides of the box by stones, soil.



Fig No 6. Placing of gravels

- After that we made the layer of 150mm height using the gravel size 50mm-100mm. We fill the gravel in a box of 1800X1800X150mm



Fig. No. 7. Construction of Bed For plantati

- After forming the required bed to the plantation. We order the required plants like Alu, Kardal and Phragmitesauatrealis. After that we planted the plant



Fig No 8. Construction of Reed Bed

- To minimize the bacteria from that waste water we mixed culture in it. culture is divided into four parts. First part is added in plants roots. Second part of culture is mixed in water of first bund. Then third part is added in bund two and fourth part is add in where the greywater mixed with natural source. After the seven days culture is divided into four parts. First part is added in plants roots. Second part of culture is mixed in water of first bund. Then third part is added in bund two and fourth part is add in where the grey water mixed with natural source.

IV. OBSERVATION

While gathering the information for project we were visited many places including the project site. As well as the offices related to our project were visited by us.

We saw waste water generating from houses, buildings, hospitals etc. directly mixing in vashishti river. It pollutes wells and other natural sources. This water is harmful for people's health and aquatic life. The water is black in colour and giving bad odour. So, the large amount of water is being wasted which could be reused if treated for other purposes. We saw the plants which purify the water. So, to clean the waste water Reed bed system is the simplest process that we observed in our project.



Fig. No. 9. Comparing the water from upstream to downstream side of reed bed

V. RESULTS

Test	Unit	Require-ment	Up-stream	Down-stream
PH	-	5.5-9.0	6.89	7.31
TS	mg/lit		1625	1300
TDS	mg/lit	<600	875	600
TSS	mg/lit	<200		700
Chloride	mg/lit	<250	53.96	63.9
Iron	mg/lit	<3	0.9	-
COD	mg/lit	<250	56.84	12
BOD	mg/lit	<3	0.9822	NIL
DO	mg/lit	>6	0.8574	6.0814

CONCLUSION

- Reed bed is faster in terms of construction. It consumes very less material, labour and there is no need of heavy machinery to install a reed bed.
- Reed bed is suitable in the locations where road connectivity is less.
- Due to simple nature of construction, it is much cost effective than conventional sewage treatment plants.
- Maintenance of reed bed is easy. It only requires dosage of bio culture once or twice in a year.

ACKNOWLEDGEMENT

We are thankful to our guide Assistant professor G. Arya in Civil Engineering Department for his constant encouragement, able guidance and continuous support in making this work complete

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