APPLICATION OF REED BED TECHNOLOGY IN SEWAGE TREATMENT PLANT FOR THE TREATMENT OF DOMESTIC WASTE WATER

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Abstract: ***This study has been taken to investigate the kitchen wastewater treatment using Reed bed system which is used to treat waste water by biological treatment process by combined action of bacteria and plants. It plays an important role in utilization of natural process in which there can be interaction between plants and environment. In this project application of reed bed system on sewage treatment plant has been carried out using the concept of hydraulic retention time on reed bed system for 10days by maintaining constant discharge rate 0.173m^3/sec, the efficient results obtained by using reed bed technology are pH=6.4,BOD removal efficiency =63%,TS removal efficiency=65%,SS removal efficiency=68%) and for sewage treatment plant the optimum results obtained are pH=7.1, BOD removal efficiency=83%, TS removal efficiency=85%, SS removal efficiency=84%. The reed bed system can also be implemented in sewage treatment plant as a tertiary treatment which provides better results in economical and financial aspects.***

Key Words: Reed Bed, Sewage Treatment Plant , Domestic Wastewater, Tertiary Treatment

I. INTRODUCTION

Reed bed system was developed by Dr.kathe seidel in the 1960 in Germany.Reed bed waste water treatment system is a biological treatment process that works by combined action of bacteria and plants (Rhizosphere).In this process wastewater passes through basin where it undergoes biological treatment which includes the interaction between the waste water,plants and microorganisms.Reed bed system is environment friendly which results in lower operating costs.Types of reed like phragmitesaustralis,Juncusinges (Gaint reed),marram grass, gaint rush, cattail etc used for the treatment of waste water.It plays an important role in utilization of natural processes in which there can be interacted between plants and environment.[3] The interaction may include photosynthesis ,excessive plantation etc. This system can be implemented with a concept known as hydraulic retention time in which efficient results (pH,BOD,TS,SS) can be measured by maintaining different flow rates. The implementation of this system can also be adopted for sewage treatment plant by replacing it with teritiary treatment unit of sewage treatment plant. The cost of construction will be very high for establishing a sewage treatment plant therefore using reed bed system in the treatment unit may be helps to reduce cost and makes it economical both in environment and financial considerations.[4]

II.LITERATURE REVIEW

1.Karikey Tiwari et.al (**march 2017**) says that Reed bed technology is considered has very efficient for treating decentralised waste water treatment for domestic waste water. It has been observed that BOD removal efficiency varies from 80- 96%, TSS removals are better than 75% in most cases, in pathogen 100% removal can be expect. Reed bed treat the water in natural manner and not requirement of much money, not requirement of much energy, not requirement of complicated set up. Presented at International Journal of Engineering Science Invention Research & Development march 2017.[1]

2.Omar Hamed Jehawi et.al (april 2014) says that The use of Reed bed technology to remove micro pollutants and nutrients from domestic sewage is new application in Malaysia. It can be successfully used for both secondary and tertiary treatments. This one is more cost-effective than conventional sewage treatment system. Therefore removal efficiency affected by a number of factors, including availability of plants, oxygen level. Presented at Australian Journal of Basic and Applied Sciences.[2]

III.MATERIALS AND METHODOLOGY

3.1 MATERIALS:

1. Reactor (Rectangular shape of capacity 21tr):-It is used for different units (receiving chamber,skimming tank,screening and grid chamber,secondary treatment, primary treatment, Aeration tank,reed bed unit,collecting tank)

2. Pebbles (10mm to 20mm size):- It is used as a filter material in reed bed system a layer of pebbles will be the first layer in reed bed system.

3.Coarse aggregate (10mm to 20mm):- It will also be used as a filter material in the reed bed system a layer of coarse aggregates will be the second layer in reed bed system .

4.Fine aggregate (river sand):-It will be used as a filter material in the reed bed system a layer of sand aggregate will be used as the third layer in reed bed system.

5.Black cotton soil :-It will be used as a filter material as it contains more pores space as compared to other soil.It is the first layer of reed bed system.

6.Storage tank (25 lt):-A storage tank connected with a tap which will be used to discharge waste water to different units in sewage treatment palnt.

7.Reed plants (marram grass):- A reed plants (marram grass) which is used to treat the domestic waste water by biological treatment between plants and soil.

8.Mesh:-Mesh are used to differentiate the layers of reed bed system and in units of sewage treatment palnt (screening and grid chamber).

9.M-seal:-It is used to bind the pipes which is connected to sewage treatment plant.

10. Plastic pipes:- It is used to connect the units of sewage treatment palnt and produce waste water from one unit to another unit.

11.Electric blower:- It is used to provide air in skimming tank to absorb all grease and oil materials present in the domestic waste water.

12.Electric DC motor (12V,500RPM):-It is used in aeration tank to degrade the waste present in the water.

3.2 METHODOLOGY

All materials are collected to fabricate the set up required for the reed bed system. As the set up of reed bed system is done in five different layers they are:Brown pebbles,White pebbles,Coarse aggregate,Fine aggregate,Black cotton soil The domestic waste water was collected from boys hostel of Roa Bahadur Y Mahabaleshwarrpa Engineering College,Ballari.The test is conducted to determine all basic parameters like pH, BOD (Biological oxygen demand),TS (Total solids),SS (Suspended solids).As the setup is completed the wastewater stored in a storage tank of capacity of 21Ltr is allowed of flow with a constant discharge of 0.173m^3/sec.The treated water is collected and all parameters like (pH,BOD,TS,SS) are analysed.To determine the maximum efficiency the process is repeated for 10 days for both Reed Bed Technology and Sewage Treatment PlantAll materials are collected to fabricate the set up required for the sewage treatment plant along with reed bed system.As the setup of sewage treatment plant along with reed bed system is done by considering all units that generally a STP exists with like receiving chamber,screening and grit chamber,skimming tank, primary sedimentation tank, Aeration tank,secondary sedimentation tank, reed bed system and collecting tank.As the setup is completed the wastewater is allowed of flow with a constant discharge of 0.173m^3/sec. The treated water is collected and all parameters like (pH,BOD,TS,SS) are analysed.To determine the maximum efficiency the process is repeated for 10 days

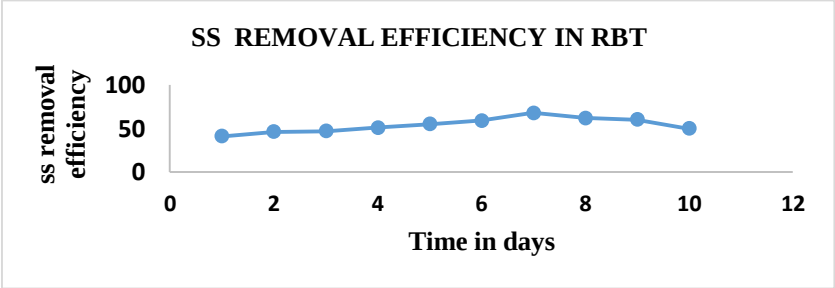
Fig 1: Application of Reed Bed Technology in STP

IV.RESULTS AND DISCUSSION

Table.1:- Initial parameters of domestic waste water (kitchen waste)

SL.NO	DOMESTIC WASTEWATER CHARECTERISTICS	Obtained Results
1	PH	5.8
2	BOD (BIOLOGICAL OXYGEN DEMAND)	120mg/l
3	TS (TOTAL SOLIDS)	1600mg/l
4	SS (SUSPENDED SOLIDS)	1000mg/l
5	DS (DISSOLVED SOLIDS)	600mg/l

4.1 SUSPENDED SOLID REMOVAL EFFICIENCY IN RBT



Maximum Total Suspended Solids removal efficiency using Reed Bed Technology is about 68%. at pH 6.4 for period of 10days this was due to the action of microbes and filtration in the system. at day 7, maximum TSS removal efficiency is observed. at day 8 onwards it will show the reduction in efficiency this may be due to the reduction in the microbial activity and also may be due reduction in microbial action between plants (Rizho sphere) roots and soil.

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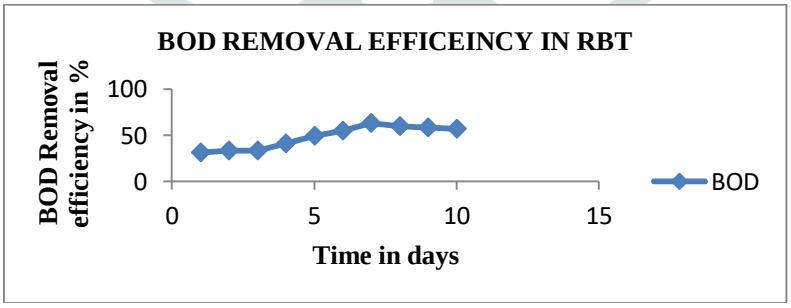
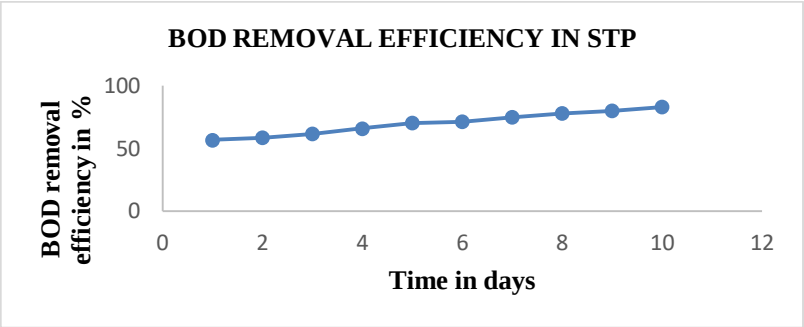
4.2 BOD REMOVAL EFFICEINCY IN RBT



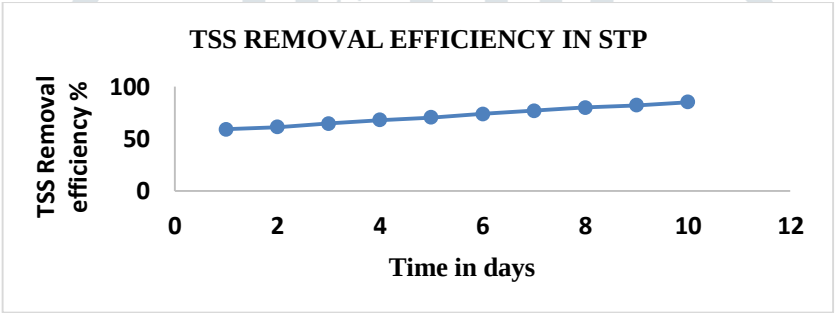
Maximum Biological Oxygen demand removal efficiency using Reed Bed Technology is about 63%. at pH 6.4 for period of 10days, at day 7, maximum BOD efficiency is observed. at day 8 onwards it will show the reduction in efficiency this may be due to the reduction in the microbial activity and also may be due to break down of organic materials present in domestic wastewater at certain temperature over a specific time period.

4.3 BOD REMOVAL EFFICIENCY IN STP



Maximum Biological Oxygen Demand removal efficiency using STP is about 78% at pH 7.1 for period of 10days, this was due to the action of microbes and filtration in the system along with the function of different units in the sewage treatment plant. at day 10, maximum BOD efficiency is observed. at day 10 onwards it will show the reduction in efficiency this may be due to the reduction in the microbial activity and also may be due to break down of organic materials present in domestic wastewater.

4.4 TSS REMOVAL EFFICIENCY IN STP



Maximum Total Suspended Solids removal efficiency using Reed Bed Technology with sewage treatment plant is about 84%. at pH 7.1 for period of 10days. at day 10, maximum TSS removal efficiency is observed. at day 10 onwards it will show the reduction in efficiency this may be due to the reduction in the microbial activity and also may be due reduction in microbial action between plants (Rizho sphere) roots and soil.

CONCLUSION

1. In this study, we conclude that using the concept of hydraulic retention time on reed bed system for 10days by maintaining constant discharge rate 0.173m^3/sec, optimum results obtained by using reed bed technology were pH is 6.4,BOD removal efficiency is 63%,TS removal efficiency is 65%,SS removal efficiency is 68%.

2. In this Research we also conclude that application of Reed Bed Technology in Sewage treatment plant shows optimum BOD removal efficiency is 83%, TS removal efficiency is 85%, SS removal efficiency is 84% for 10days of operation period.

3. By observing above results, we conclude that application of reed bed technology in STP is the best alterative solution for treatment of domestic wastewater thus the reed bed system can also be implemented in sewage treatment plant as a tertiary treatment which provides better results in economic and financial aspects.

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