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Effectiveness of Domestic wastewater treatment by using Water Hyacinth and Porous Concrete in Constructed Wetland System

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Abstract - *Overall 97% of water is accessible on earth. Out of which 2% is in polar regions,95% is in oceans and only 1-2% is water. Therefore, it's more important to conduct effective management of water resources. From past few decades its observed that wetlands are used for waste-water treatment also. For wetland vegetation various varieties of aquatic plants are often used like cattails, reeds, bulrushes, hydrophyte, duck weeds etc. because they're to blame for removal of nutrients like heavy metals, phosphorous, nitrate, suspended solids etc. the underside layer of wetland normally of coarse gravel and upper is of fine gravel in size range of 12-15mm. Void spaces in media function flow channels of waste-water. The despite of all this information, the foremost aim of this research is to look out the varied supporting media which is in a position to extend the overall efficiency of domestic waste-water system. Therefore, after the detailed study it absolutely was decided to use of porous concrete as a supporting media and vascular plant and treat building waste-water. For this work small pilot constructed wetland system is intended. After experimentation and analysis, it absolutely was observed that various waste-water parameters like (BOD, COD, TDS, TSS) etc. are decreasing and water quality are increasing. supported results its concluded that removal efficiency of waste-water system is increased and meet regulatory discharge limits. Therefore, pilot study is usually for large scale also. This study mainly helps in ruler areas where waste-water treatment is important*

Key Words: *Domestic Wastewater, Eichhornia spesiosa, Porous Concrete, Constructed Wetland System, engineered wetlands*

1.INTRODUCTION

During most of this century the trend has been for more mechanized wastewater treatment systems with almost every aspect of the varied processes under the direct control of the operator. within the last twenty years. However, approaches that don't involve the identical "concrete and steel" mentality have drawn more attention. Shortly after the enactment of the Clean Water Act (PL92-500) of 1972, alternate methods of wastewater treatment another time became recognized as valid means of achieving the specified level of effluent quality. Initially, attention was centred on existing natural systems like wetlands and coastal marshes, but more recently, constructed systems using aquatic plants are investigated. within the youth of sanitary engineering, natural treatment was the sole method known. Initially, treatments weren't even an objective, nor were the processes understood. Wastewater were simply disposed of within the nearest river, lake, or swamp if one was available.

1.1 Aim

To understand the effectiveness of domestic wastewater treatment by using hydrophytic plant and Porous concrete in constructed wetland system.

1.2 Objectives

To decide the sort of waste water to be filtered. 2. to check the assorted parameters of domestic wastewater. 3. to work out the unreal filter material and hydrophytic plant which is suitable in constructed wetland systems for wastewater treatment. 4. to gauge the performance of hydrophyte as a tracheophyte. 5. to hold out the study and evaluate the performance of porous concrete as a filter material. 6. To develop a small-scale experimental setup/model for treatment process. 7. to seek out the ultimate results obtained by that experimental model. 8. to work out the general treatment efficiency of constructed wetland when porous concrete and Eichhornia spesiosa is employed. 9. to determine whether that porous concrete which is employed as a filter material is beneficial or not for constructed wetland system.

2. Problem Statement

Problem statement of work a) Constructed wetlands are used as a convenient wastewater discharge. b) For constructed wetlands differing kinds of supporting media or substrate were used and from that we got different treatment efficiencies. c) But the most aim of this research is to search out the various supporting media and vascular plant which can increase overall efficiency of wastewater system. So, after the detail study, it's decided that 1. Top layer is planted with Eichhornia spesiosa plant and a couple of. The wetland is built with porous concrete instead of use of sand, gravel etc.

Table -1: Media Types and its effective sizes

Media Types Porosity and its effective sizes			
Coarse sand	2mm	0.32	
Gravelly sand	8mm	0.35	
Fine gravel	16mm	0.38	
Medium gravel	32mm	0.40	
Coarse rock	128mm	0.45	

3. Scope of study

1. This project focuses only on treating domestic wastewater with subsurface vertical flow with water hyacinth as an aquatic plant and porous concrete as a filtering material. 2. This project provides an overview and basic idea about how efficiently domestic wastewater can be treated by using water hyacinth plant and porous concrete. 3. This study/treatment process only used for constructed wetlands and when ample of land is available.

4. Materials Used for preparation of small-scale model

3 differing kinds of plastic boxes, plastic tap, plastic pipe, aquatic plant, wastewater of building, white cement, porous concrete

4.1 Use of porous concrete as a filter media

Pervious concrete may be a new concrete with high porosity which usually used for flat work applications so as to permit water to undergo it, and by that it reduces the amount of direct water runoff from a site and increases the standard of storm water and reduce pollution. because of the high rate of water through Pervious concrete pavement, rainfall will be captured and percolate into the bottom, recharging groundwater, supporting sustainable construction, reducing storm-water runoff, and providing an answer for construction that's sensitive to environmental concerns. hydraulic cement pervious concrete (PCPC) is extremely popular and continuously gaining lots of attention in industry. Pervious concrete is usually design with high void content (15-25%). There aren't any fine aggregates in pervious concrete. Pervious concrete may be a very special form of concrete with high porosity used for flat work application basically that's allow water from precipitation and other sources to pass directly through thereby reducing the runoff from the positioning and allowing spring water recharge. And during this concrete porosity is attain by a highly interconnected void content. Also, in permeable or pervious concrete has no fine aggregate and has only enough cementing paste to coarse aggregate particles while preserving the interconnectivity of the voids. Using such materials which permit water to leak into the bottom helps contribute to the bottom geological formation and reduces the impact on the storm water drains. One such material which will be accustomed construct porous pavements and porous urban surfaces is "Pervious concrete."

4.2 Characteristics of water hyacinth

- ✓ It could be a free-floating perennial vascular plant.
- ✓ One of the fastest growing plants known.
- ✓ The plant height is 100 to 200 mm and might mature to height of 1 m forming a dense mat shape.
- ✓ Plant having long fluffy roots and leaves are shiny green in color.
- ✓ Flowers having size of about 50 mm in diameter and violet or blue in color.
- ✓ water orchid is found in both alkaline and acidic water but the neutral water bodies possess maximum growth of the plant.
- ✓ It was observed that there have been no any detrimental effects on the plant morphology in domestic wastewater.

5. CONCLUSIONS

From this project work we can come to the following conclusions which are as follows it's observed that hydrophytic plant is incredibly effective vascular plant for the purification of waste-water because it's ability to soak up nutrients from waste-water and reduce the pollutants from waste and also reduce the number of BOD, COD etc. and also reduce harm to ecosystem.

2. During this project, mainly we use porous concrete as a filter media for construction of constructed wetland which is different and artificial material than soil, gravel, sand etc.

3. Then also it acts as a effective filter media because it allows the waste-water to be flow through it freely and collects various pollutants, therefore the general efficiency of waste-water system is additionally increased and water is additionally seen clean and treated than previous untreated water.

4. The initial results of varied parameters of waste-water is over permissible values but after use of aquatic plant plant and again passing through porous concrete, the ultimate results of waste-water system is reduced and it will be freely disposed of to the river or pond.

5. The wastewater treatment which is employed during this project, because of that the efficiency of treatment are often increased by 60% to 90%.

6. Many researches are done and in literature survey, we come to grasp that porous concrete is employed for various purposes like for construction of road pavement, parking

blocks, storm water management etc. except for waste-water system also it acts as a effective filter material.

7. Therefore, it's concluded that use of Eichhornia spesiosa plant and porous concrete as a filter material is very effective methodology for waste-water systems.

Therefore, it is concluded that use of water hyacinth plant and porous concrete as a filter material is highly effective methodology for waste-water systems.

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