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Wastewater Treatment Using Constructed Wetland System

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Abstract: ***Natural wetland such as marshes ,swamps and bogs protect water quality . constructed or artificial wetland system mimic the treatment that occurs in natural wetlands by rellyilng on plants and a combination of naturally occurring biological , chemical and physical processes to remove pollutants from water . As of 1999,there were more than 500 constructed wetland in Europe and 600 in north America . constructed wetland are a less energy intensive and more environmentally sound way of treating waste water and conserving potable water . The first single family home constructed wetland in southern Nevada was completed Eighth years ago. A constructed wetland (CW) is an artificial wetland to treat sewage, greywater, stormwater runoff or industrial wastewater. It may also be designed for land reclamation after mining, or as a mitigation step for natural areas lost to land development constructed wetlands also act as a biofilter and/or can remove a range of pollutants (such as organic matter, nutrients, pathogens, heavy metals) from the water. Constructed wetlands are designed to remove water pollutants such as suspended solids, organic matter and nutrients (nitrogen and phosphorus).***

I. INTRODUCATION

A constructed wetland (CW) is an artificial wetland to treat sewage, greywater, stormwater runoff or industrial wastewater. It may also be designed for land reclamation after mining, or as a mitigation step for natural areas lost to land development. Constructed wetlands are engineered systems that use the natural functions of vegetation, soil, and organisms to provide secondary treatment to wastewater. The design of the constructed wetland has to be adjusted according to the type of wastewater to be treated. Constructed wetlands have been used in both centralized and decentralized wastewater systems. Primary treatment is recommended when there is a large amount of suspended solids or soluble organic matter.

A VSB contains coarse substrate media such as gravel which the water travels through. The top of the water level is below the surface of the media and plant roots are allowed to grow in the coarse media. These wetlands remove contaminants by different means but the basic processes and mechanisms are the same for both.

Wastewater wetlands encompass many processes and mechanisms in the removal of contaminants. The basic three are physical, biological, and chemical removal processes. Physical processes are often used in primary treatment of traditional wastewater treatment systems. The processes are no different than in wetlands. Water that flows through wetlands moves rather slowly due to resistance from plant matter and a uniform sheet flow of water.

A. Uses

Constructed wetlands can be used to treat raw sewage, storm water, agricultural and industrial effluent. Constructed wetlands mimic the functions of natural wetlands to capture stormwater, reduce nutrient loads, and create diverse wildlife habitat. Constructed wetlands are used for wastewater treatment or for greywater treatment.

B. Advantage

1) Wetlands can be less expensive to build then other treatment options
2) Utilization of natural process
3) Simple construction (can be constructed with local material)
4) Simple operation and maintenance
5) Cost effectiveness (low construction and operations costs)
6) Process stability

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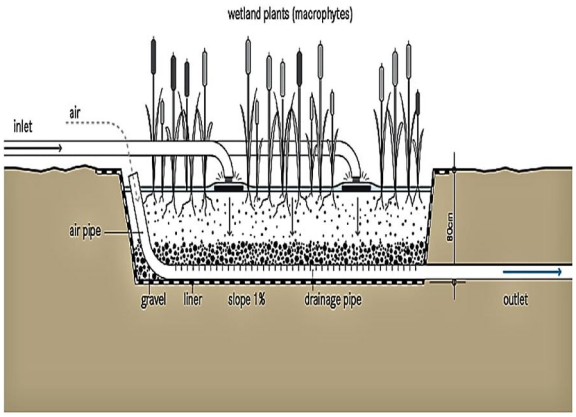
C. Limitations

1) Large area requirements
2) Wetland treatment may be economical reletive to other options only where land is available and affordable
3) Design criteria have yet to be developed for diffrent type of wastewater and climates.

II. MATERAILS AND METHODOLOGY

1) In these exprimental setup a basin with different size an dimension will be used Rectangular basin of size 40 cm length , Breath 15 cm and height 30cm having suitable outlet .
2) The vertical pipe will be placed above the basin for distribution of water. Plastic can will be use for the collection of treated of water
3) Treated water sample will be collected and analysis in laboratory
4) The angular horizontal sub surface flow constructed wetland will be prepare as follow: three layers of support bed is constructed wetland will be prepare with course aggregates sand and garden soil.
5) Coarse aggregate 20 kg total weight will be use for making bottom layer of 10 cm height
6) Selective healthy, small , young , locally available pant will be transplanted into the bed
7) Thee rectangular basin with plant bed will be provided with 10 degree slope and kept and in the slanting position
8) Inlet flow and outlet flow a wastewater will be adjusted to maintain hydraulic retention time (HRT) of 7 days

Layer 1. Coarse aggregate
1st layer: gravel stones size between >20mm & <40mm
Layer 2.Fine aggregate
2nd layer : sand
Layer 3. Soil
3rd layer : soil
Red soil of which is locally available and suitable for plant growth is filled at the top layers.



A. How Wetland Improve Water Quality

The mechanisms that are available to improve water quality are therefore numerous and often interrelated. These mechanisms include:

1) Settling of suspended particulate matter
2) Filtration and chemical precipitation through contact of the water with the substrate and litter
3) Chemical transformation
4) Adsorption and ion exchange on the surfaces of plants, substrate, sediment, and litter
5) Breakdown and transformation of pollutants by microorganisms and plants
6) Uptake and transformation of nutrients by microorganisms and plants
7) Predation and natural die-off of pathogens.

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III. WETLAND OPERATION AND MAINTENANCE REQUIREMENTS

Regular inspections of constructed wetlands must be undertaken to ensure their proper and continued function.

In practice, the maintenance frequency will be determined normally by site-specific needs. But maintenance operations should include:

1) Checking inlet and outlet structures
2) Checking weir settings
3) Cleaning-off surfaces where solids and floatable substances have accumulated to an extent that they may block flows
4) Removal of gross litter/solids
5) Checking sediment accumulation levels (wetlands, sediment traps, infiltration trenches etc..)
6) Bank erosion
7) General maintenance of the appearance and status of the vegetation and any surrounding landscaped zones.

The operation and maintenance procedures connected with a constructed wetland are anticipated to include:

a) Jetting/cleaning sediment traps, removal of sediment;
b) Maintenance of the substrate and plants;
c) Harvesting;
d) Maintenance of water levels;
e) Maintenance of nutrient levels;
f) General structure maintenance; and
g) Control of weed growth.

A. *Wetland Pollutant Removal Mechanisms and their Major Controlling Factors*

Pollutant Removal Mechanism	Pollutant
Adsorption	Heavy metals, Dissolved nutrients, Synthetic organics
Biofiltration and microbial decomposition	BOD/COD, P, Hydrocarbons, Synthetic organics
Plant uptake and metabolism	P, N, Heavy metals, Hydrocarbons
Chemical precipitation	Dissolved nutrients, heavy metals
Ion exchange	Dissolved nutrients
Oxidation	COD, Hydrocarbons, Synthetic organics
Photolysis	As oxidation
Volatilisation and aerosol formation	Volatile hydrocarbons, Synthetic organics
Natural die-off	Bacteria/pathogens
Nitrification	NH3-N
Denitrification	NO3-N, NO2-N
Reduction	Sulphate (resultant sulphide can precipitate metal sulphides)
Infiltration	Dissolved species (nutrients, heavy metals, synthetic organics)

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B. Types of Plants used in Constructed Wetland

Most of the things in the constructed wetland are the plant which we have done in this project which plays an important role in filtering the wastewater due to presence of wastewater in constructed wetland, there are more mosquitos and a plant also used drive away the mosquitos.

Such type of plant use in constructed wetland are: Arrow arum, Blue flag iris, Devil's ivy, marigolds, basil.

IV. CONCLUSION

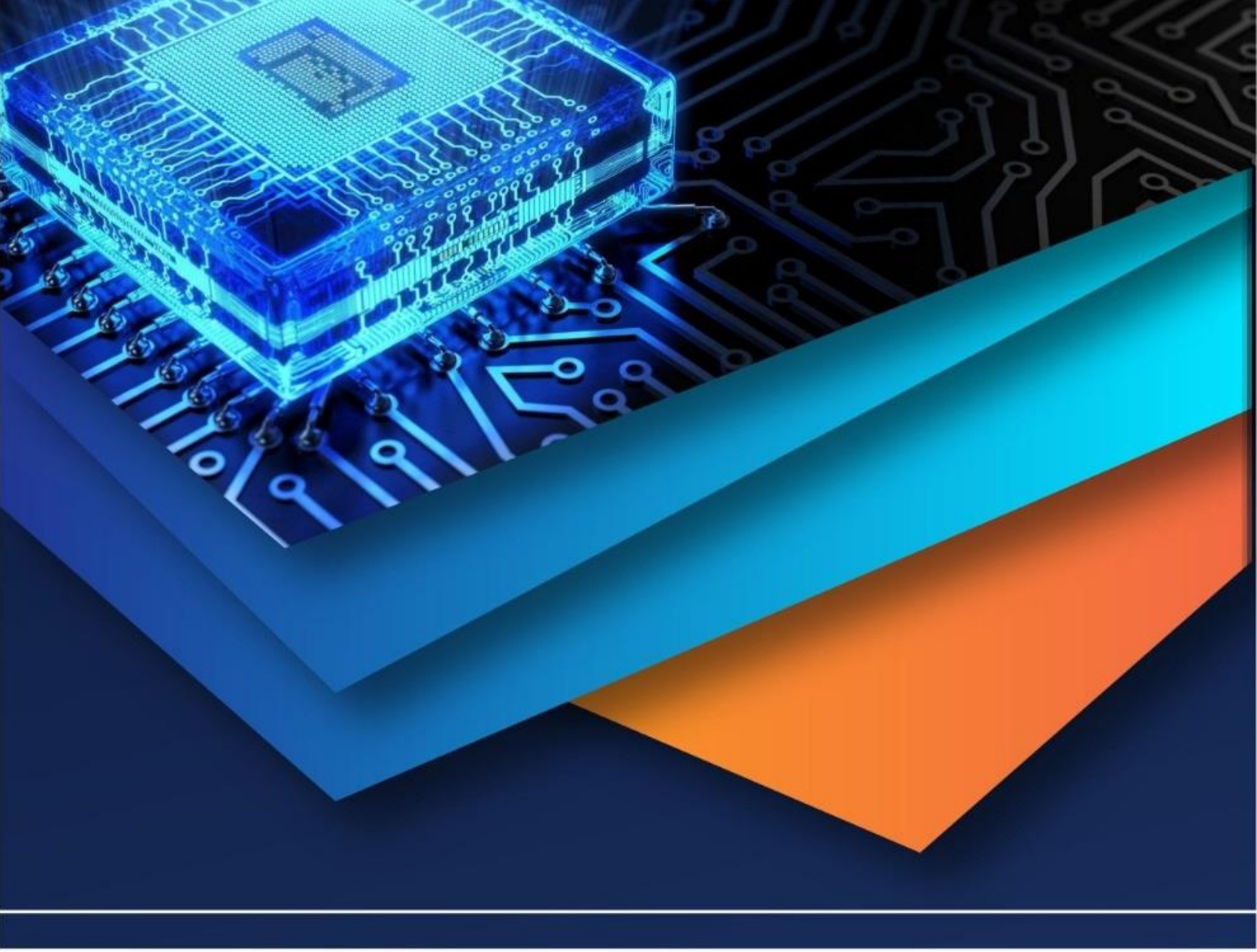
1) The result in the set colocasia esculenta reveal that the maximum pollution reduction efficiency was observe in 70% sewage concentration

2) Angular horizontal sub surface flow constructed wetland through phytoremedition is an efficitive green technology for the treatment of sewage

3) The proper selection of locally adaptive aquatic plants is more trust worthy and insured technology for better treatment of sewage in local environment

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