Wastewater Reuse

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Abstract

Wastewater Reuse is that idea which basically deals with the treatment and reusing of wastewater from domestic areas for irrigation purposes. In this process, the wastewater which is being obtained from the domestic societies is being treated by the phragmite plants. These phragmite plants have an unique property of killing the harmful toxic micro-bacterial organisms from the wastewater and make it suitable for reuse. Actually the phragmite have the property of disintegrating the wastewater by their roots and make them suitable for the reuse. The quantity of wastewater obtained from societies is treated with the help of these plants which can be reused for different purposes like planting, gardening, irrigation, washing floors etc. The solid wastes are separated at the starting of the pipes through which wastewater goes to the tank. The solid wastes are collected at a place and mixed with fallen leaves and organic matters which after some days can be used as organic manures are fertilization which can be used in biogas-plants for producing biogas. In this way, wastewater is converted into suitable water and the other solid materials converted into biogas. So, this technique must be adopted at different societies.

So that the re habilitation of the waste water can take place. Hence, this paper looks in the forward of establishment of these techniques for reuse of wastewater.

1.INTRODUCTION

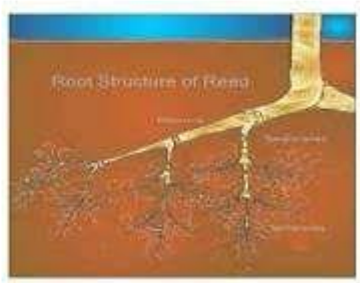
Domestic wastewater treatment and reuse is becoming an important field of research in a global context of increasing water scarcity and inadequate sanitation. In the developing world, insufficient water supply and poor sanitation facilities cause thousands of deaths each day, while in developed countries water wastage is often the norm and ineffective septic and wastewater treatment systems cause pollution of lakes, rivers and groundwater. In parallel, water demand continues to increase and its availability for agricultural irrigation is a limiting factor for food production in many countries. New water-use models and wastewater reuse patterns are being discovered. The domestic wastewater consists of human waste, ablution water, kitchen wastewater and other wastes of household activities in urban areas. The domestic wastewater is generally conveyed away through a buried pipeline into the tank. Also the wastewater from the societies is passed through a buried pipeline into sewage tank[1]. Hence, this leads to an image of introducing the Phragmite plants into the nature for reuse of this water.

1.1. INTRODUCTION TO PHRAGMITES

Phragmites australis (also known as the European common reed) is an invasive perennial. Phragmites australis, common reed, commonly forms extensive stands (known as reed beds), which may be as much as 1 square kilometer (0.39 sq mi) or more in extent. Where conditions are suitable it can spread at 5 meters (16 ft) or more per year by horizontal runners, which put down roots at regular intervals. It can grow in damp ground, in standing water up to 1 meter (3 ft 3 in) or so deep, or even as a floating mat. The erect stems grow to 2–6 meters (6 ft 7 in– 19 ft 8 in) tall, with the tallest plants growing in areas with hot summers and fertile growing conditions. The leaves are long for a grass, 20–50 centimeters [2] (7.9–20 in) and 2–3 centimeters (0.79–1.2 in) broad. The flowers are produced in late summer in a dense, dark purple panicle, about 20–50 cm long.

1.2. Role of phragmites in decomposition

The phragmites play an important role in the decomposition and disintegration of various organic and inorganic matters as they remove various toxic and kill micro-bacteria present in the wastewater



1.3. Types of phragmites

1.3.1 Invasive

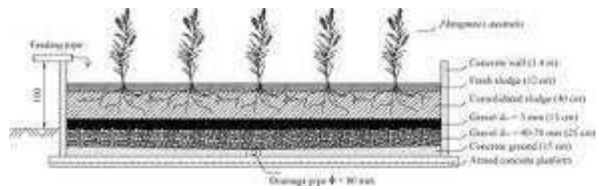
Invasive Phragmites is a very aggressive plant that spreads rapidly and outcompetes native species for water and nutrients. This invasive species thrives in disturbed habitats and is often among the first species to colonize these areas. Invasive Phragmites has an intricate system of specialized roots that secrete toxins into the soil to impede the growth of and kill neighboring plants. While invasive Phragmites prefers areas of standing water, its roots can grow to extreme lengths. These roots can also extend deep into the soil to find and access moisture, allowing the plant to survive in relatively dry areas.[3]

1.3.2Native

Invasive Phragmites is closely related to the native subspecies Phragmites australis subspecies americanus. Generally, native Phragmites does not grow as tall or as densely as the invasive subspecies and does not outcompete other native species. Invasive Phragmites stands are extremely dense, with up to 200 stems per square metre, and individual plants can grow up to five metres tall. Stands of invasive Phragmites can grow so densely that they crowd out other species whereas native Phragmites grows mixed with other plants.[4]

2. ANALYTICAL PROCEDURES

Firstly the two tanks one of 4m*4m*8m and second of 12m*4m*1.5m are installed in the ground and they are properly isolated with the P.O.P. coating of about 3cm thickness is provided. The tanks are ¾ times filled by the soils and phragmites are being grown in that tank. The setup of the whole system is as follows:



3. WASTEWATER TREATMENT

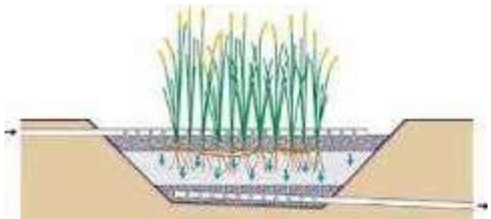
The wastewater treatment generally consists of a number of unit operations and processes to achieve the desired level of treatment. According to the degree of treatment, the unit operations and processes are classified into three treatment types. These are known as primary, secondary and tertiary treatment.

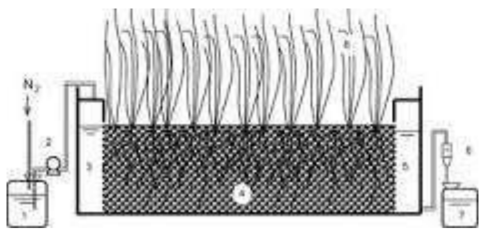
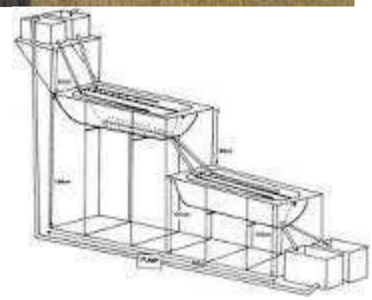
3.1. Primary treatment

At this state the waste water from the pipes consists of the solid as well as the liquid water consisting of the organic as well as inorganic matter that is toxic in nature is forward to the solid waste removal machine in which the matter which is solid in nature is separated and further waste is carried forward for secondary treatment.

3.2. Secondary treatment

At this stage the water in its liquid form is carried to the first tank which is small in size and is allowed to pass through the Phragmites plants where the extra solid waste which is in the form of small size is stopped there only and the water when passes through the roots of the phragmites decomposes its toxic matter and this water further moves to the tertiary tank treatment



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3.3. Tertiary treatment

At this final stage the water after passing from the secondary tank containing no solid toxic waste is accepted by the third tank or to the process of the tertiary treatment. In this large tank, the phragmites are grown and the liquid water is allowed to pass through it. In this tank all the toxic micro-organisms is being killed by the roots of phragmites. This finally treated water is passed further for the agricultural or irrigation purposes.

4. **TREATMENT TO THE SOLID WASTE**

The solid waste left in the separator unit at primary level is very toxic in nature. So this thing can be formulated with the decayed leaves, organic matter, etc can be used for making of the biogas at the bio-gas plants.

5. CLEARENCE OF THE TANK

The tank in which phragmites are grown shed their leaves in winters but still they are effective in nature. As they continue disintegrating the harmful toxic waste that is obtained from the wastewater. Proper clearing of the solid waste separator is done once in a month. But for the tank in which phragmites are grown, these tanks are cleared once in a year and all the waste is being removed and the tank structure is being reconstructed. The growths of phragmites in these tanks are very simple as phragmites grows up by placing their roots in the soil. They do not require much of the work to grow and whole of the experimental setup is restored.

6. WASTEWATER QUALITY AND EFFECTS

Most of the wastewater contains organic compounds, ammonia, iron or other oxidizable compounds and is a significant source of biological oxygen demand. The discharge of domestic wastewater with oxygen demand interferes with desirable water uses. The impact of low dissolved oxygen concentrations or anaerobic conditions is reflected in an unbalanced ecosystem, fish mortality, odour and other nuisances.[6] Some types of industrial wastewater may be toxic and pose substantial health hazard to biological lives in the environment. Some organic chemicals discharged into the aquatic environment result in aquatic effects of mortality and / or chronic effects on ecosystem. In extreme cases, heavy metals such as mercury, cadmium, lead etc. and organic chemicals which are bioaccumulated in the aqueous food chain, may cause odour and nuisance problems. A large amount of nutrients such as nitrogen and phosphorous compounds present in domestic wastewater and certain industrial wastewater may cause eutrophication of receiving water bodies.

7. WASTEWATER REUSE

Increased water reuse is inevitable in the world today. Existing water supplies are simply incapable of meeting the future demands. Conservation via recycling will be one means to augment conventional sources. Municipal wastewater reclamation and reuse for beneficial community should be a viable planning alternative. The potentially applicable effluent reuse methods can be grouped into the following general categories.[7]

7.1.Agricultural Irrigation: This category includes irrigation for edible and non-edible crops, pasture irrigation and livestock watering.

7.2.Cooling Water: Many industries, including power generating plants use large quantities of water for cooling purposes.

7.3. Landscape, Irrigation and Recreational Uses: includes irrigation of turf and ornamental planting in golf courses, parks, storm water retention basins or other areas; also use of the reclaimed wastewater to fill artificial lakes for recreational or aesthetic purposes may also be included in this category.

7.4. Industrial Process Water: Many industries use significant amount of water in their manufacturing process and thus can utilize recycled wastewater.

7.5. Non-Potable Water Reuse: Includes uses of the reclaimed water for toilet flushing, fire protection and air conditioning.

7.6. Groundwater Recharge: Wastewater is used to replenish groundwater supplies, either by infiltration through the ground surface or direct injection into aquifers. The potential reuse alternatives described above have varying requirements regarding the quality of the wastewater effluent. Domestic usage and reflects on the quantity and quality of waste generated. Depending upon the use, the wastewater has to be treated at different levels. The environmental and health aspects are extremely important in the soil and crop system of any land application of treated wastewater.

8. IRRIGATION WATER UTILITY IN INDIA

The use of treated municipal wastewater for irrigated agriculture offers an opportunity to conserve water resources. Wastewater reclamation can also provide an alternative to disposal in areas where surface waters has limited capacity to assimilate the contaminants, such as the nitrogen and phosphorous that remain in most treated wastewater effluent discharges. Land application of municipal wastewater and sludge has been practiced for its beneficial effects.

9. SUMMARY

The responsible management of water resources will become one of the main challenges of the 21st century. It will necessitate a concerted effort to both limit our draws on natural water bodies and control the quality of effluents sent back into the environment. Water reuse of all forms should be encouraged as it allows the maximization of water's utility on-site and encourages the treatment of used water prior to discharge. Greywater reuse at the domestic level may well be the simplest form of water reuse and should be investigated as a means to reduce the impact of residential developments on water resources worldwide.

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