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"Feasibility of Phytorid Technology For Waste Water Treatment "

Prof. Nagvekar Y.
Dept. Of Civil Engineering Department
Dr. D. Y. Patil College of Engineering and Innovation, Varale, Talegaon, Pune.

Mr. Roshan Gajanan Dhumale
B.E. Civil Engineering Department
Dr. D. Y. Patil College of Engineering and Innovation, Varale, Talegaon, Pune.

Mr. Kunal Vilas Deshmukh
B.E. Civil Engineering Department
Dr. D. Y. Patil College of Engineering and Innovation, Varale, Talegaon, Pune.

Mr. Ashish Sanjay Gatagat
B.E. Civil Engineering Department
Dr. D. Y. Patil College of Engineering and Innovation, Varale, Talegaon, Pune.

Mr. Vaibhav Babasaheb Dhakane
B.E. Civil Engineering Department
Dr. D. Y. Patil College of Engineering and Innovation, Varale, Talegaon, Pune.

ABSTRACT
There are various types of wastewater treatment process are available. Every process has its unique quality, advantage, importance, procedure, disadvantages, and type of treatment.
Phytorid system also has its unique qualities of treating wastewater at its own level. Phytorid is developed on the basis of waste water treatment by wetland which is artificially by engineers. In the big world there are various types of plants available which have a capability of cleaning the streams, rivers, wastewater, by them In India Phytorid system or it is also known as Reed Beds introduced by NEERI. (NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE).

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I. INTRODUCTION

1.1 Introduction of project work

There are various types of wastewater treatment processes available. Every process has its unique quality, advantages, importance, procedure, disadvantages, and type of treatment. Phytorid system also has its unique qualities of treating wastewater at its own level. Phytorid system is developed on the basis of waste water treatment by wetland which is artificially made by engineers. In the big world there are various types of plants available which have a capability of cleaning the streams, rivers, and wastewater, by themselves. In India Phytorid system or it is also known as Reed Beeds introduced by NEERI (NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE).

A constructed wetland (CW)/ Phytorid system is an artificial wetland created for the purpose of treating municipal or industrial wastewater, grey water or stormwater runoff. It may also be created for land reclamation after mining, refineries, or other ecological disturbances such as required mitigation for natural areas lost to land development. Constructed wetlands are engineered systems that use natural functions of vegetation, soil, and organisms to treat different water streams. Depending on the type of wastewater that has to be treated the system has to be adjusted accordingly which means that pre- or post-treatments might be necessary? Constructed wetlands can be designed to emulate the features of natural wetlands, such as acting as a bio-filter or removing sediments and pollutants such as heavy metals from the water. Some constructed wetlands may also serve as a habitat for native and migratory wildlife, although that is usually not their main purpose. The two main types of constructed wetlands are subsurface flow and surface flow wetlands. The planted vegetation plays a role in contaminant removal but the filter bed, consisting usually of a combination of sand and gravel, has an equally important role to play.

The main three constructed wetlands types are: 1. Subsurface flow constructed wetland - this wetland can be either with vertical flow (the effluent moves vertically, from the planted layer down through the substrate and out) or with horizontal flow (the effluent moves horizontally, parallel to the surface).
2. Surface flow constructed wetland
3. Treatment wetland

1.2. Problem Statement

The growing population, urbanisation, economic and industrial development are putting pressure on the water resources.

The Major finding or issues surveillance of STP's in Major Indian cities are around 95% of the systems are not fully functional, Interrupted operation due to frequent power failure, Hydraulic or organic overloading.

Insufficient or non-existing management of municipal and waste water results in immense environmental problems and increasing hygienic risks.

1.3. Objectives

The objective of this system is as follows:

a) To provide a feasible solution for ever increasing sewage treatment problems and eventually conserving natural water bodies removing the possibility of dumping.

b) Another objective of this system is to decrease the load of STP plants, which increases day by day due to population increases, increased wastewater, etc.

c) To make a system that is cost efficient and energy efficient for treating wastewater.

d) The general objective is the removal of suspended and floatable material, treatment of biodegradable organics and the purging of the pathogenic microbial flora.

II. LITERATURE REVIEW

2.1. Literature Review

Sanjay Murlidhar Karodpati, Alka Sunil Kote / ENERGY-EFFICIENT AND COST-EFFECTIVE SEWAGE TREATMENT USING PHYTORID TECHNOLOGY / International Journal of Advanced Technology in Civil Engineering, ISSN: 2231 –5721/ 2013 / Volume-2, Issue-1/ page no. 69-72.

The conventional type of STPs employing the aerobic, anaerobic or combination both can be made efficient by advanced technologies and intelligent supervision but this in turn increases the total cost. The entire problem of energy requirement, maintenance and supervision in conventional STPs is saved by adopting Phytorid technology.

Swapnil S. Navaghare, Vipul A. Kadam, Suraj T. Sawant, Saurabh Swamy and Prof. Archana N. Mahajan/ NEW INVENTION ON REUSE OF SEWAGE AND WASTEWATER BY PHYTORID TECHNOLOGY /International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169 / Volume: 4 Issue: 4 / April 2016/ page no. 273 - 276

Phytorid technology systems offer a range of low cost to high tech sanitation options which are hygienically safe, comfortable to use, environmentally friendly and often more economical than conventional systems. In addition, they ideally enable a complete recovery of nutrients in household wastewater and their reuse in agriculture.

Anuradha Manikrao Patil, Sagar Gawande/ IMPLEMENTATION OF SEWAGE TREATMENT PLANT BY USING PHYTORID TECHNOLOGY/ International Journal Of Innovative Research In Technology ISSN: 2349-6002/ June 2016 / Volume 3 Issue 1/ page no. 121-123

The design of the Phytorid tank as well as the details of the plant is taken from this journal. The technology is a natural treatment system, as the result operation is mostly passive and requires little operator intervention. Maintaining uniform flow across the treatment cells through inlet and outlet adjustment is extremely important to achieve optimum treatment performance. Sampling of inlet and outlet will be carried out for a period of 6 months for every month

Balpande, S.S. and Ashok Mhaske/ QUALITY OF SEWAGE WATER AND PHYTORID TECHNOLOGY FOR ITS REUSE IN AGRICULTURE / Journal of Global Biosciences ISSN 2320-1355 / 2017 / Volume 6, Number 6/ page no. 5114-5119

Pollution load of raw sewage water varies with the location and season. Use of raw sewage water for irrigation may cause soil and groundwater pollution problems. Treated sewage water through Phytorid Sewage treatment plant can safely be utilised for irrigation.

2.2. Summary

The review summarises the types of constructed wetlands considering media, vegetation, removal efficiency, construction cost, maintenance cost and land area requirement using life cycle cost analysis. The review compares how and why constructed wetland is a better option as per treatment efficiency, their payback period and cost-effectiveness with the other wastewater treatment technologies.

III. TEST AND RESULT

3.1. Test Performed

3.1.1. pH (IS: 3025- Part 11- Reaffirmed 2002)

The term pH refers to the measure of hydrogen ion concentration in a solution and defined as the negative log of H+ ions concentration in water and wastewater. The values of pH 0 to a little less than 7 are termed as acidic and the values of pH a little above 7 to 14 are termed as basic. When the concentration of H+ and OHions are equal then it is termed as neutral pH.

3.1.2. Total Dissolved and Suspended

The term total dissolved solids refer to materials that are completely dissolved in water. These solids are filterable in nature. It is defined as residue upon evaporation of a filterable sample. The term total suspended solids can be referred to materials which are not dissolved in water and are non-filterable in nature. It is defined as residue upon evaporation of non- non-filterable samples on a filter paper.

3.1.3. Chemical Oxygen Demand

The chemical oxygen demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water (e.g. lakes and rivers), making COD a useful measure of water quality. It is expressed in milligrams per litre (mg/L), which indicates the mass of oxygen consumed per litre of solution. COD is the measurement of the amount of oxygen in water consumed for chemical oxidation of pollutants. COD determines the quantity of oxygen required to oxidise the organic matter in water or wastewater samples, under specific conditions of oxidising agent, temperature, and time. This method covers the determination of COD in ground and surface waters, domestic and industrial wastewaters. The applicable range is 3-900 mg/L.

3.1.4. Biochemical Oxygen Demand

The biochemical oxygen demand determination is a chemical procedure for determining the amount of dissolved oxygen needed by aerobic organisms in a water body to break the organic materials present in the given water sample at a certain temperature over a specific period of time. BOD of water or polluted water is the amount of oxygen required for the biological decomposition of dissolved organic matter to occur under standard conditions at a standardised time and temperature. Usually, the time is taken as 5 days and the temperature is 20°C. The test measures the molecular oxygen utilised during a specified incubation period for the biochemical degradation of organic material (carbonaceous demand) and the oxygen used to oxidise inorganic material such as sulphide and ferrous ions. It also may measure the amount of oxygen used to oxidise reduced forms of nitrogen (nitrogenous demand).

3.1.5.Chlorides (IS:3025-Part32-Reaffirmed 2003)

Chlorides are widely distributed as salts of calcium, sodium and potassium in water and wastewater. In potable water, the salty taste produced by chloride concentrations is variable and dependent on the chemical composition of water. The major taste producing salts in water are sodium chloride and calcium chloride. The salty taste is due to chloride anions and associated cations in water. In some water which has only 250 mg /L of chloride may have a detectable salty taste if the cat-ion present in the water is sodium. On the other hand, a typical salty taste may be absent even if the water is having very high chloride concentration, for example 1000 mg /L. This is because the predominant cation present in the water is not sodium but either calcium or magnesium may be present.

3.1.6. Sulphates (IS:3025-Part 24 - Reaffirmed 2003)

Sulphates is widely distributed in nature and may be present in natural waters in concentration ranging from few hundred to several thousand mg/L. Sulphates occur naturally in numerous minerals, including barite, epsomite and gypsum. These dissolved minerals contribute to the mineral content of drinking-waters. Acid Mine Drainage (AMD) may contribute large amounts of sulphates through pyrite oxidation. Sulphate is the second most abundant anion in seawater. Its high concentration owes to the high to moderate solubility of the salts that it forms with the major cations in seawater, namely, Na, Mg^{2+}, andCa^{2+} .

3.2. Result Obtained

Different analysis of wastewater samples was done at inlet and outlet to understand the chemical and biological characteristics. Following tests were conducted i.e. pH, TSS, TDS, COD, BOD, Chlorides and Sulphates.

Table 3.2.1. Result of Phytorid Outlet

Sr. No	Characteristics	Unit	Phytorid Value (Outlet)	STP Value (Outlet)
1	pH	-	7.15	7.21
2	Total Suspended Solids	mg/lit	06	10
3	Chemical Oxygen Demand (COD)	mg/lit	13	20
4	Biochemical Oxygen Demand (BOD)	mg/lit	30	40
5	Total Dissolved Solids	Ppm	1900	2000
6	Chlorides (Cl)	Ppm	600	850
7	Sulphates (SO4)	Ppm	950	900

Table 3.2.2.
Comparison BetweenPhytorid and STP

Sr. No	Characteristics	Unit	Phytorid Value (Outlet)	STP Value (Outlet)
1	pH	-	7.15	7.21
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6	Chlorides (Cl)	Ppm	600	850
7	Sulphates (SO4)	Ppm	950	900

After testing the sample it is noted that the pH value Obtained from the Phytorid outlet is 7.15 which is within MPCB limits. And we also noted that the pH treatment efficiency of Phytorid Is more effective than STP. Estimation of total dissolved solids is useful to determine whether the water is suitable for drinking purposes, agriculture and industrial purposes. So, according to our result as shown in table 1 and table 2 the total dissolved solids are treated very well in Phytorid and within MPCB limits. So, we can use the treated water for agricultural purposes. COD values are particularly important in the surveys designed to determine and control the losses to sewer systems. The ratio of BOD to COD is useful to assess the amenability of waste for biological treatment. So, after getting COD values in limit we concluded that the treated water from Phytorid is allowable to discharge in river water or used for many purposes. After the BOD test is conducted we get BOD values in MPCB limits so we can discharge treated water into the river. Also we can use treated water for irrigation purposes. Chloride determinations in natural waters are useful in the selection of water supplies for human use. Chlorides interfere in the determination of chemical oxygen demand (COD). So, our result as shown in table 1 and 2 concluded that our chloride values are within limits and cannot interfere in COD determination. Also Chlorides are treated very well in Phytorid so we can use this water for various human purposes. After collecting all necessary results and values from the Phytorid system, we found that the Phytorid system can treat wastewater effectively, with ease than STP.

IV. CONCLUSION

1. The cost of construction of STPs of various technologies is almost the same.
2. However, the maintenance cost varies significantly among aerobic, anaerobic and Phytorid technology. Sewage treatment by Phytorid technology uses only 20% of the energy as compared to conventional sewage treatment plants.
3. The details gathered and enumerated in a table of comparisons points to a clear choice of Phytorid technology as the STP of the future.
4. Phytorid technology systems offer a range of low cost to high tech sanitation options which are hygienically safe, comfortable to use, environmentally friendly and often more economical than conventional systems. In addition, they ideally enable a complete recovery of nutrients in household wastewater and their reuse in agriculture.
5. This system not only conserves vital resources which are otherwise simply wasted but also creates employment opportunities. In spite of the fact that it requires minimum maintenance as compared to other prevalent systems. The new paradigm in sanitation must be based on ecosystem approaches and the closure of material flow cycles rather than on linear, expensive and energy intensive end-of-pipe technologies. Sanitation systems are part of several cycles, of which the most important cycles are the pathogen cycle, water cycle, nutrient and energy cycle.
6. In order to ensure public health, sanitation approaches primarily aim at interrupting the life cycle of pathogens. In addition, the new approach is recognizing human excreta and water from households not as a waste but as a resource that could be made available for reuse, especially considering that human excreta and

manure from husbandry play an essential role in building healthy soils and are providing valuable nutrients for plants.

7. While conventional sanitation restricts health security to the in-house environment and sometimes leads to a disastrous situation in the neighbourhood or the receiving water body, the new approach is aiming at sanitising the products instead of exporting problems and applying a health oriented multi-barrier concept of treatment, crop restriction and exposure control.

8. Phytorid technology system offers a range of low cost to high tech sanitation options which are hygienically safe, comfortable to use, environmentally friendly and of ten more economic than conventional systems. In addition, they ideally enable a complete recovery of nutrients in household wastewater and their reuse in agriculture.

9. This system not only conserves vital resources which are otherwise simply wasted but also creates employment opportunities. In spite of the fact that it requires minimum maintenance as compared to other prevalent systems. In this way, they help preserve soil fertility and safeguard long-term food security, whilst minimising the consumption and pollution of water resources.

10. With the various advantages, the Phytorid system comes with some disadvantages. The Logging problem due to excess collection sludge on top of soil which cannot pass water through it. To overcome these problems we can increase settling time in the sedimentation tank.

11. Also the problems of mosquitoes because of storage of water can invite various types of diseases. To avoid these problems we can provide more flower plants, because due to its smell mosquitoes can't come near to the bed.

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