Waste Water Management for Smart Cities

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Abstract — The growing population, urbanization, economic and industrial development are not only putting pressure on the water resources in terms of quantity, pressure is increasingly in terms of quality. Mainly Domestic sewage, industrial effluents and agriculture and mining runoff cause severe water pollution. The Major issues 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, Inadequate oxygenation due to power failure and mechanical breakdown of aerators, uneven sewage distribution, difficulties in sludge handling and financial difficulties. The decision regarding the process to be adopted should be derived from a balance between technical and economical criteria, taking into account quantitative and qualitative aspects of each alternative. There are no such generalized formulas for this but in city like Pune; some criteria should be taken into account like treatment efficiency and reuse, capital cost, power consumption, land requirement, operation and maintenance cost, sludge disposal, manpower requirement and most important environmental impact.

I. INTRODUCTION

The ‘Phytorid Technology’ is a combination of the physical, chemical and biological processes which resulted into ultimate treatment for the waste water. This particular technology works without electricity, minimum maintenance, less manpower and importantly self sustainable. ‘Phytorid Technology’ is a patented technology and being very, effective in water pollution control as it functions as “pollutant” sinks for sediment, nutrients, and metals. There are different mechanisms plays an important role in treating waste water in the wetland, principal measures are sedimentation, bacterial action, filtration, decomposition, nutrient uptake and vegetative system.

The system comprises of a sequence of two independent cells Advanced Filter Cell (AFC), that supports a permutation of different sizes of stones and gravel wherein anaerobic digestion occurs Phytorid Treatment Cell (PTC) made up of different layers of life supporting media (Gravel) as in AFC, planted with wetland plants. ‘Phytorid Technology’ can treat the wastewaters by naturally without the addition of chemicals. It has been accomplished with the use of aquatic or semi aquatic plants along with their associated biota. ‘Phytorid Technology’ is an improved wetland ecosystem for treatment of wastewater. It involves proper utilization of biological treatment capacity with optimized engineering parameters.

II. TYPICAL DESIGN FEATURES

The Treatment methods are usually classified as physical, chemical and biological (Figure 1). The ‘Phytorid Technology’ is the combination of all these three processes needs in the treatment of sewage. The general concept design for the ‘Phytorid Technology’ is ‘Advanced Filter Cell (AFC), that supports a permutation of different sizes of stones and gravel wherein anaerobic digestion occurs and Phytorid Treatment Cell (PTC) made up of different layers of life supporting media (Gravel) as in AFC, planted with wetland plants (Figure 2) and Final Collection Cell (FCC). Nevertheless the design may be further modified as per specification and land availability.
utilized to attain maximum efficiency in the treatment of domestic waste water. The plants include Phragmites australis, Phalaris arundinacea, Glyceria maxima, Typha spp., Scirpus spp., Canna spp., Typha spp. etc. The waste water treatment is dependent on both plant species and microbial consortia that specific to the used plant system. So the ultimate removal of the organic and inorganic load from the waste water is the consolidate effect of the biota.

III. METHODOLOGY

The treatment system shall comprise Advance Filter Cell (AFC) along Phytorid Treatment Cell (PTC) for flow of 180m$^3$/d + 75 m$^3$=255 m$^3$/day.

IV. ADVANTAGES OF TECHNOLOGY

The waste water treatment with PHYTORID TECHNOLOGY is easy, efficient; require less manpower, and totally sustainable method to the all conventional methods. Technology is cost effective and efficient in the removal of faecal coliforms, BOD, COD, nutrient are up to 95 percent, which is higher than traditional methods.

The system used natural vegetation and the plant specific associated micro biota, as leads to eco-friendly sewage treatment technology. The area occupied by the treatment system also improves the aesthetic of the surrounding area. The subsurface flow treatment is totally free of mosquitoes and odour nuisance. The treated water can be used for enhancement of environmental architecture such as road side fountains. The effluent can also be used for irrigation, gardening, toilet flushing etc. The treated water achieves the permissible limit for sewage discharge in the fresh and marine water body.

V. TREATMENT EFFICIENCY

The ‘Phytorid Technology’ being natural method, the treatment efficiencies for removal of different pollutants are given in Table 1. The tabulated efficiency will be achieved after the system is stabilized which may required a period of one month after commissioning.
VI. OPERATION AND MAINTENANCE

The technology is 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.

REFERENCES
