USE OF PHYTORID TECHNOLOGY FOR BHAKTA NIWAS BUILDING, AKKALKOT

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ABSTRACT

The water scarcity for Akkalkot Taluka, Maharashtra (India) occurs frequently after every year. Akkalkot village, which is situated in Solapur district, received average annual rainfall of 538.5 mm according to past available data but still village face the drought condition for occasionally. Now a days, disposal of sewage is a major problem around the globe. One of the principal causes is the increase in the level of pollutants and the heterogeneity of sewage water. Instead of source segregation, we are still following the traditional way of mixing everything and sending it to the respective sewage treatment plants, which results in lower efficiency of the treatment process, leading to the contamination of the water bodies and high waste generation. Disposal itself is a big problem due to land unavailability. Water requirement of Bhakta Niwas is 2.11 lakh litre per day. Waste water quantity is 1,19,000 litre per day. To avoid this wastage, waste water treatment must be encouraged. Phytorid technology is a type of system, which reduces the impact of sewage and converts into useful water for gardening and irrigation purposes. The best alternative and cost effective process in society is to reuse the west water by Phytorid Technology. Phytorid Technology is perfectly suitable for rural areas. The technology is designed to overcome the problems of rural areas like lack of electricity supply and unskilled manpower. To study the characteristics of phytorid bed, a prototype was constructed and the process of quality check was carried out.

Keywords: waste water, reuse of water, phytorid technology, water pollution.

INTRODUCTION

The residential area in cities has seen increase in water demand now a day. Water requirement is expected to grow from 30 billion m3 to 111 billion m3 and with the demand in high-rises, water demand is increasing rapidly. India needs to think again on recent water treatment systems and investigate which technique is appropriate today. While traditional aerobic and anaerobic technologies exist in large set-ups, they have been found to be operational-energy intensive, require high maintenance and need high cost. Considering all this situation, the present research is focused on developing a decentralized biological wastewater treatment system for Shri Vatavruksha Swami Maharaj Devasthan's Bhakta Niwas Building, using a 'Phytorid' process developed and designed by National Environmental Engineering Research Institute (NEERI), Mumbai. This technology doesn't need electricity, requires minimum man force and uses natural plants in a manner that they achieve the desired treatment levels; and reuse the treated water while becoming part of the landscape and aesthetics.

Aim of the study

To ensure a simple, feasible, practically improved, eco-friendly, maintenance free and cost-effective technology, which can handle the waste water treatment leading to reuse of treated water for purposes like gardening, irrigation, flushing etc.

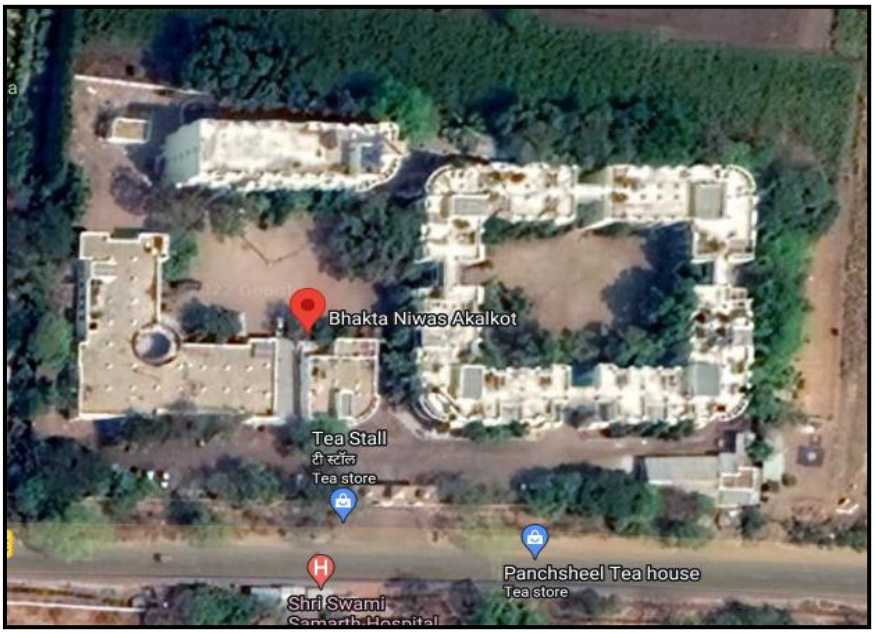
Objectives of the study

1 To reduce the gap between water demand & water requirement during summer season/ scarcity.

2 To use the treated waste water efficiently for cleaning floors, cleaning of toilet & bathrooms, gardening, flushing of toilets etc.

3 To provide a feasible solution for ever increasing sewage & waste water treatment problem.

STUDY AREA



Satellite image of Bhakta Niwas Building, Akkalkot.

Shri Swami Samarth temple is the place, where, devotees from all over India visit daily. Devasthan has provided accommodation facility for the devotees in Bhakta niwas building. Bhakta niwas building can accommodate 1000 devotees per day. Bhakta Niwas Building is located in Akkalkot Tehsil of Solapur District, Maharashtra, India. It is 1.7 km from Akkalkot bus stand. It is located at 760.21° East and 1705.1° North.

About Phytorid Technology

Phytorid technology is developed by NEERI for treatment of sewage. NEERI is a Government research institute under Council of Scientific and Industrial Research. NEERI is one of the reputed laboratories for environmental research and consultancy. The national environmental policy recommends use of constructed wetland systems for efficient sewage treatment. The main aim of providing phytorid technology is to provide a simple, feasible, practically improved, eco-friendly, maintenance free and cost-effective technology, which can handle the waste water treatment leading to reuse of treated water for purposes like gardening, irrigation, flushing etc.

LITERATURE REVIEW

1.Anuradha Manikrao Patil and Sagar Gawande (2016), Implementation of Sewage Treatment Plant by Using Phytorid Technology, International Journal of Innovative Research in Technology, Vol.3, issue 1, pp 121-123.

Anuradha Manikrao Patil and Sagar Gawande studied that in the developing technologies and growing environment, the usage of the water source plays a vital role and it's been needed and used in large amount. Insufficient management of municipal and wastewater in immense environmental problems and increasing hygienic risks for the growing urban population thereby hampering poverty alleviation and a sustainable development of Indian society. But now days, the waste water is converted into a source for various purposes in different aspects by the use of phytorid technology. Phytorid technology is a patented technology and being very effective in water pollution treatment it leads one step forward to sustainable treatment of wastewater in safe manner using Iris Pseudacorus (Yellow Iris) plants and natural source for the treatment without affecting the ecosystem.

2. A. A. Raval1 and P. B. Desai (2015), Root Zone Technology: Reviewing its Past and Present, International Journal of Currrent Microbiology and Applied Science, Vol.4, issue 7, pp 238-247.

This paper focuses on increasing urbanization and human activities exploits and affect the quality and quantity of the water resources. This has resulted in pollution of fresh water bodies due to increased generation of domestic waste, sewage, industrial waste etc. This paper reviews the Root Zone Treatment System (RZTS) which are planted filterbeds consisting of soil. This Technology uses a natural way to effectively treat domestic and industrial effluents. RZTS are well known in temperate climates and are easy to operate having less installation, low maintenance and operational costs and incorporates the self-regulating dynamics of an artificial soil eco-system. This technology has been successfully running in several countries like Europe and America. Use of constructed wetlands can now be recognized as an accepted low cost eco-technology, especially beneficial as compared to costly conventional treatment systems. There is a need to exploit this technology in a developing country like India to its maximum to gain its benefits and for sustainable development.

3. Dipu Sukumaran, Anju Anilkumar, Ritha Saha,and Salom Gnana Thanga V (2013), Phytoremediation of Radionuclide Polluted Industrial Effluent by Constructed Wetland Technology, Advances in Agriculture, Science and Engineering Research, Vol. 3, issue 4, pp 768-774.

In this research author has found this sustainable and inexpensive process is fast emerging as a viable alternative to conventional remediation methods, and will be most suitable for a developing country like India. In India, commercial application of phytoremediation of heavy metal or organic compounds is in its earliest phase. Fast growing plants with high biomass and good metal uptake ability are needed. In most of the contaminated sites hardy, tolerant, weed species exist and phytoremediation through these and other non-edible species can restrict the contaminant from being introduced into the food web. From this study, the emergent plant Typha sp. based constructed wetland has proved as a promising technology.

MATERIALS AND METHODOLOGY

Data Required

For design of Phytorid system of Bhakta Niwas Building, Akkalkot, following data were obtained:

1. Collection of data of number of devotees visiting Bhakta niwas
2. Collection of data of Bhakta niwas building
3. Collection of data of daily water requirement
4. Collection of waste water samples
5. Time slot
6. Waste water calculation
7. Existing location of Bhakta Niwas

Materials used:

1.10 mm coarse aggregate

2.3 mm coarse aggregate

3. Crush sand

4. Plants used-Colocasia esculenta (Alu), Canna (Kardali)

Actual Procedure followed

Actual data collection of Bhakta Niwas Building, Akkalkot.

The data of devotees visited to Bhakta niwas building is collected by conducting daily visit and observing daily, monthly register. Daily 1000 devotees visit to bhakta niwas building. . Bhakta niwas building is having total area

of 3 acres. It has total Built up area of 6202.62 sq.m (66,744 sq. ft). Its total floor area is 9918.24 sq.m (1, 06,720.26 sq.ft). It has 228 rooms, 7 halls, 270 toilets & 240 bathrooms.

Estimation of Total water demand and waste water calculation of Bhakta Niwas Building

Purpose	**Daily Water Demand**		
	Qty. in Ltr	No. of devotees/day	Total qty. in ltr.
Drinking	3	1000	3000
Flushing	10	1000	10000
Bathing	20	1000	20000
Cloth washing	10	1000	10000
Cooking	20	400	8000
Cleaning	Considering 30 lit/10sq.m		1,50,000
Gardening			10000
	Total req./day		2,11,000
	Waste water/day		**1,90,000**

Total waste water quantity = 1,90,000 litre /Day

MODEL MAKING AND ITS PERFORMANCE

1.I decided to use 18 litre circular water jar in which i arranged Phytorid beds. It was a circular jar having diameter 260mm and height of jar is 350mm.

2.A jar is filled with 10mm washed coarse aggregate first up to 150mm thick at bottom. And then filled with washed 3mm aggregate up to 100mm at middle layer of. At top, filled crush sand up to 50mm. Used Colocasia esculenta (Alu) and Canna (Kardali) plants at the top to treat the samples.

Layered view of Model

Waste water sample

Layered view with plants

3. As per the guidance of guide, time slot were selected for the physical, chemical and biological analysis of waste water quality. Total 03 slots decided in 24 hours to get maximum accurate result for the analysis of waste water. During sampling, total 03 samples of each time slot collected for testing and analysis purpose.

Slot Number	Slot	Time	
		From	To
01	Morning	5:00AM	12:00PM
02	Afternoon-Evening	12:00PM	8:00PM
03	Night	8:00PM	5:00PM

4. Plastic bottles were used for the collection of treated water after flowing out through the Phytorid beds through the outlets. Treated water samples were collected and analyzed in laboratory.


Collection of treated water after every 48 hours


Collected samples after passing through phytorid bed

Selection Parameters

Test samples before and after treatment were analyzed for selective parameters like pH, TSS, TDS, COD, BOD, DO, MPN, Turbidity etc. using standard method.

Result and Discussion

The following table shows the results of the experiment compared to the statistical data.

Sr. No	Test	Avg. value before Phytorid treatment	Avg. value after Phytorid treatment	Percentage of removal
1	**pH Test**	9.16	7.38	19.43
2	**Total Hardness as CaCo3**	463.44 mg/lit	164.32 mg/lit	64.54
3	**Total Suspended Solids**	739.22 mg/lit	346.44 mg/lit	53.13
4	**Turbidity**	21.07 NTU	2.58 NTU	87.76
5	**Chloride Content**	579.44 mg/lit	236.33 mg/lit	59.21
6	**Total phosphorus**	9.76 mg/lit	1.79 mg/lit	81.66
7	**MPN (per 100 ml)**	14.1	0	100
8	**Sulphate**	437.77 mg/lit	82 mg/lit	81.27
9	**Ammonia**	18.96 mg/lit	0.81 mg/lit	95.73
10	**Sodium**	365.0 mg/lit	181 mg/lit	50.41
11	**Electrical Conductivity**	208.81 mS	15.95 mS	92.36
12	**Dissolved Oxygen**	2.61 mg/lit	6.08 mg/lit	(+132.95)
13	**Biochemical Oxygen Demand**	122.33 mg/lit	23 mg/lit	81.19
14	**Chemical Oxygen Demand**	386.66 mg/lit	110.11 mg/lit	71.53

CONCLUSION

It is concluded that the method of phytorid technology is capable to reduce pollutant level. From above analysis, phytorid technology is a type of constructive wetland and a successful solution to decentralisation and wastewater reuse that produces acceptable outcomes. Furthermore, the treated water can be used for

i. Treated sewage water through Phytorid Sewage treatment plant can safely utilized for the irrigation

ii. Phytorid technology system offers a range of low cost to high tech sanitation options which are hygienic.

Iii.The use of water treated through phytorid technology can help to reduce pollutant load, improve water quality and the treated water can be useful for, washing, gardening, planting or any other purposes.

REFERENCES

[1] Anuradha Manikrao Patil and Sagar Gawande (2016), Implementation of Sewage Treatment Plant by Using Phytorid Technology, International Journal of Innovative Research in Technology, Vol.3, issue 1, pp 121-123.

[2] A. A. Raval1 and P. B. Desai (2015), Root Zone Technology: Reviewing its Past and Present, International Journal of Currrent Microbiology and Applied Science, Vol.4, issue 7, pp 238-247.

[3] Dipu Sukumaran, Anju Anilkumar, Ritha Saha,and Salom Gnana Thanga V (2013), Phytoremediation of Radionuclide Polluted Industrial Effluent by Constructed Wetland Technology, Advances in Agriculture, Science and Engineering Research, Vol. 3, issue 4, pp 768-774.

[4] Rajesh B. Biniwale, 'Decentralised Wastewater Treatment including reuse and recycle-role of constructed wetlands' NEERI-Mumbai.

[5] Sanjay Muralidhar Karodpati, Alka Sunil Kote, 'Energy efficient and cost effective sewage treatment using Phytorid technology' ISSN: 2231-5721, VOLUME-2, ISSUE-1, 2013

[6] Kokyo Oh, Tiehua Cao, Tao Li, and Hongyan Cheng, "Study of Application of Phytoremediation Technology in Management and Remediation of Contaminated Soil", Journal of Clean Energy Technologies, Vol. 2, No. 3, July 2012.

[7] V.T. Deeptha, J.S. sudarsan and G.Baskar, " Performance and cost evaluation of constructed wetland domestic waste water treatment", journal of Environmental Biology 2014.

[8] Sanjay MurlidharKarodpati, Alka Sunil Kote, " Energy-Efficient and Cost-Effective Sewage Treatment using Phytorid Technology, International Journal of Advanced Technology in Civil Engineering, ISSN: 2231 –5721, Volume-2, Issue-1, 2013.

[9] V.S.Ghorpade, Dr. P.G. Sonawane, Study of Performance Evaluation of Decentralized Wastewater Treatment Systems to treat domestic wastewater, International Journal of Engineering and Technical Research(IJETR),November 2015.

[10] Maria, A. (2003), 'The Costs of Water Pollution in India', paper presented at the conference on Market Development of Water & Waste Technologies through Environmental Economics, 30–1 October 2003, Delhi

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