International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 5, Issue 05, May-2019

Performance Assessment of Sewage Treatment Plant – A Case Study of Tapovan STP Nashik

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ABSTRACT: - The UASB Sewage Treatment Plant at Tapovan, Nashik, is used for domestic sewage treatment. It consists of two phases, phase1 has capacity of 78 MLD and phase 2 has capacity of 52 MLD, total having capacity of 130 MLD. Both the phase 1 and phase 2 has different post treatment process. UASB process was one of the most popular technologies used for sewage treatment in developing countries particularly in India. Despite UASBs popularity, past one decade has witnessed decline in the UASB implementation. The focus of present study is to do performance assessment of sewage treatment plant based on UASB technology and comparative study of different post treatment followed by UASB technology. In this we are going to analysis wastewater parameter like pH, BOD, COD, TSS at inlet or raw sewage, at outlet of UASB reactor, outlet of post treatment and at final discharge.

Keywords-Wastewater, Performance Assessment, STP, UASB, facultative pond, pH, BOD, COD, TSS

I INTRODUCTION

Tapovan STP having total capacity of 130MLD (i.e. phase 1 with 78 MLD and phase 2 with 52 MLD) based on UASB technology. 78MLD Plant is operating since 2003 based on UASB technology followed by polishing pond as a post treatment, Bio Gas generated by this plant is used to generate electricity and is been used for the operation of the plant. 52 MLD Plant is been operated since 2010 based on UASB technology followed by aeration and clarifier i.e. activated sludge process is been provided. Domestic sewage is treated, and effluent is discharge into Godavari River. Topavan zone has three sub sewerage zones followed by pumping station, sewage from old kapila, New kapila, Old ganesh wadi, New Ganesh wadi is being pumped to Tapovan STP for treatment.

a) Objective of work

- To study performance assessment on the sewage after treating with UASB at Tapovan STP Nashik
- To check the parameter of wastewater at various stages of operation.
- To Check Physical, Chemical, characteristics.
- To Study the challenges faced by the STP plant.
- To compare the performance of UASB technology followed by two different post treatments.
- To Evaluate Efficiency of STP Plant.

II LITERATURE REVIEW

H.Draaijer et.al. (1992) The present paper describes the performance of a 1200m3 UASB reactor treating 5000m3 municipal waste water per day at Kanpur, India. The reactor was constructed in three parallel compartments of 600, 300 and 300m3 respectively to study the influence of various design and operation parameter on process performance. The 600m3 compartment is the reference unit. Data collected over a period of 12 months showed that there was an average reduction in COD, BOD, and TSS concentration of respectively 74, 75, and 75% at a hydraulic retention time of 6 hours.

E. Awuah et. al. (2008) The UASB Sewage Treatment Plant at James Town, Accra, is used for domestic sewage treatment to remove organic material from the wastewater. To achieve higher removal efficiencies, Trickling Filters, Settling Tanks and other treatment units were used as post treatment. This study analysed the physical, chemical and biological parameters of the influent (raw sewage) as well as the effluent from the plant. The result indicated that the total removal efficiencies were 94.4%, 98.1%, 68.8%, 17.4%, 78.3% and 99.97% for COD, BOD, TS, TKN, PO4-P and Faecal coliform respectively. The overall performance of the plant was generally satisfactory. The study further revealed that Turbidity, Ammonia-nitrogen and Nitrate-nitrogen of the effluents exceeded the EPA guidelines however; the total nitrogen and phosphate-phosphorus of the final effluent could be discharged into the Korle-Lagoon without causing eutrophication or health risk. On the other hand, the current management practices may cause the plant to work inefficiently.

Namasivayam Vasudevan et. al. (2014) Activated Sludge Process treatment technology, is one such option for treating domestic wastewater. Biological treatment using aerobic activated sludge process has been in practice over a century. Increasing pressure to meet more stringent discharge standards or not being allowed to discharge treated effluent has led to implementation of a variety of biological treatment processes in recent years. In the present study, the performance of

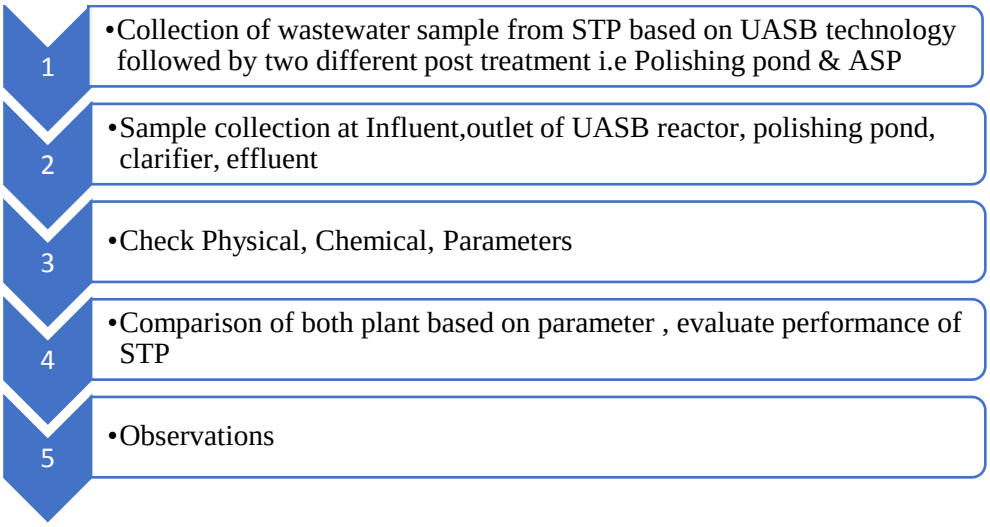
Sewage Treatment Plant for domestic sewage was evaluated in terms of Biological oxygen demand (BOD), Chemical oxygen demand (COD), Total suspended solids (TSS), Total dissolved solids (TDS), and by water tracer studies using Rhodamine. STP showed a removal efficiency of BOD-95%, COD-90%, TSS-87%, TDS-35%. The study revealed that STP is well maintained and achieves the standards prescribed for effluent discharge by the Tamil Nadu Pollution Control Board (TNPCB).

Ashutosh Pipraiya (2017) Up flow anaerobic sludge blanket (UASB) process was one of the most widely used technology for sewage treatment in developing countries particularly in India. The reason for its wide publicity and implementation is its zero energy requirements and production of biogas as a valuable energy 'resource'. Despite their popularity, past one decade has witnessed decline in the UASB implementation. There has been criticism from various sections on the performance of UASB Reactors. The main focus of present study was to assess performance of these sewage treatment plants based on UASB + facultative pond technology. The performance of 40 MLD STPs at Karnal city was evaluated. Wastewater samples were analysed for pH, BOD, COD, TSS at inlet or raw sewage, at outlet of UASB reactor and outlet of facultative ponds unit and from which it is ready for final discharge. The results indicated consistently good performance. The treated effluents from all the three plants meet the discharge standards with reference to compulsory parameters pH, BOD, COD and TSS. Treated effluent is finally agriculture purposes and it meets guideline for reuse. Sludge generated is sold to farmers, which are used as fertilizers.

III Material and Methodology

A) Effluent discharge Standard as per Environmental Protection Rule 1986

S. No.	Parameter	Standards			
		Inland surface water	Public Sewers	Land for irrigation	Marine coastal areas
1	2			3	
		(a)	(b)	(c)	(d)
1.	Colour and odour	See 6 of Annexure-I	--	See 6 of Annexure -I	See 6 of Annexure-I
2.	Suspended solids mg/l, Max.	100	600	200	(a) For process waste water-100 (b) For cooling water effluent 10 percent above total suspended matter of influent.
3.	Biochemical Oxygen demand [1][3 days at 27°C] mg/l max.	30	350	10	100
4.	Chemical Oxygen Demand, mg/l, max.	250	--	--	250
5.	pH Value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0



B) Methodology

Grab sample where collected at Tapovan STP , in a 2 liter air tight plastic bottle at influent, effluent, UASB outlet, outlet of clarifier and polishing pond.

IV Result and Discussion

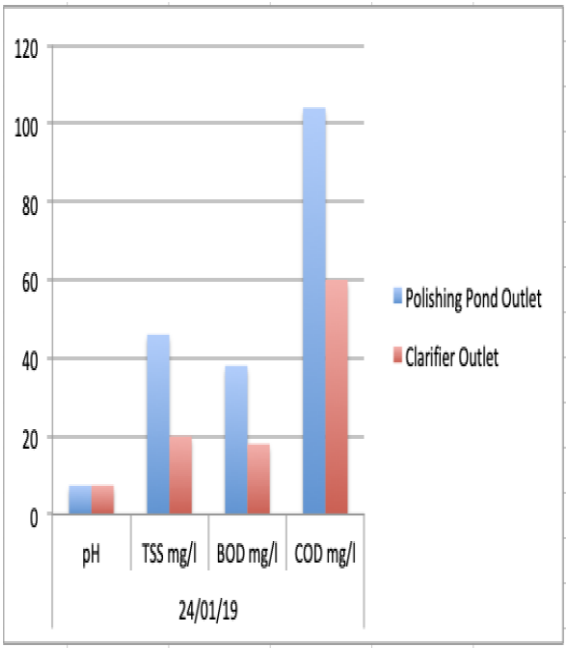
a) Results of samples collected at various stages.

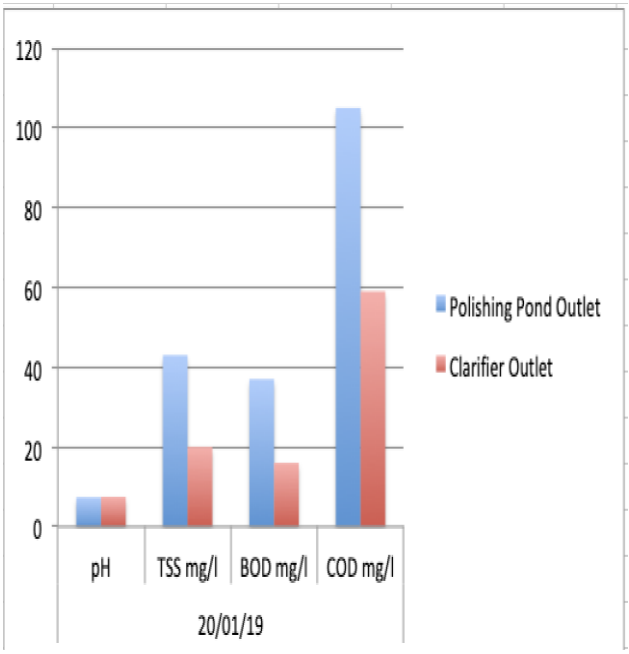
Date	Parameter	Inlet	78 MLD UASB Outlet	52 MLD UASB Outlet	78 MLD Polishing pond outlet	52 MLD Clarifier Outlet	Outlet
01/01/2019	pH	7.05	7.15	7.22	7.52	7.58	7.59
	TSS	139	63	70	30	23	16
	BOD	95	50	47	38	14	14
	COD	274	149	155	109	50	54
04/01/2019	pH	7.15	7.18	7.23	7.32	7.45	7.53
	TSS	158	72	76	40	20	22
	BOD	94	52	49	32	15	16
	COD	286	154	158	107	60	64
08/01/2019	pH	7.1	7.13	7.21	7.35	7.48	7.56
	TSS	150	69	72	41	25	23
	BOD	93	49	45	35	16	18
	COD	273	151	161	105	59	58
12/01/2019	pH	7.02	7.12	7.23	7.33	7.42	7.6
	TSS	143	65	68	40	21	23
	BOD	98	55	56	37	14	15
	COD	280	148	149	98	65	54
16/01/2019	pH	7.22	7.25	7.22	7.48	7.62	7.61
	TSS	158	70	80	45	22	24
	BOD	94	50.55	48	36	15	18
	COD	286	150	160	110	54	56
20/01/2019	pH	7.15	7.20	7.31	7.39	7.48	5.59
	TSS	141	68	72	43	20	23
	BOD	96	50	47	37	16	17
	COD	286	147	150	105	59	57

24/01/2019	pH	7.20	7.25	7.28	7.39	7.43	7.6
	TSS	155	70	75	46	20	22
	BOD	97	51	49	38	18	17
	COD	290	149	151	104	60	55

b) Comparison of parameter of different post treatment i.e. Polishing and Clarifier outlet

Date	Parameter	78MLD Polishing Pond Outlet	52MLD Clarifier Outlet	Effluent Discharge Standard
24/1/19	pH	7.39	7.43	5.5 to 9
	TSS	46	20	Max 100 mg/l
	BOD	38	18	Max 30 mg/l
	COD	104	60	Max 250 mg/l
20/1/19	pH	7.39	7.48	5.5 to 9
	TSS	43	20	Max 100 mg/l
	BOD	37	16	Max 30 mg/l
	COD	105	59	Max 250 mg/l





From the above tale we can see that the values of clarifier outlet are much less that compared to polishing pond outlet, UASB followed by aeration and clarifier gives much good quality effluent, as the sludge settle down in the clarifier is been recirculate to aeration tank and remaining is send to the sludge drying bed to maintain the organism population in the tank, sludge which settles down in the clarifier is called as active sludge, when send to aeration tank the microorganism starts to decomposes the waste in aeration tank. In polishing pond the water is been exposed to air and sun in a natural condition where the suspended particle is been settled down and sludge is been send to the sludge drying bed, suspended particle and BOD is been lowered in polishing pond to meet the effluent standards. As from the above result we can say that UASB followed by Activated Sludge Process is more effective as compared with the polishing pond and also the detention time of the polishing is more as compared with the activated sludge process. Effluent of polishing pond meets the effluent discharge standards and also effluent of clarifier also meet the standards.

V CONCLUSION

1. UASB technology is been widely implemented as its zero energy requirements and production of biogas as a valuable energy 'resource'
2. Results of effluent are within limits as The Environment Protection Rule 1986.
3. Removal efficiency TSS of tapovan plant based on UASB technology is ranging from 83 – 85 %.
4. Removal efficiency BOD of tapovan plant based on UASB technology is ranging from 80 – 83 %.
5. Removal efficiency COD of tapovan plant based on UASB technology is ranging from 78 – 82 %.
6. Overall performance of STP in terms of TSS, BOD, and COD removal were ranged between 75 – 85 %.

7. As compared with different post treatment, Activated Sludge Process is more effective in removal of COD, BOD, and TSS as compared with Polishing Pond used in UASB STPs.

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