

## PERFORMANCE EVALUATION OF SEWAGE TREATMENT PLANT

### LOCATED AT TIRUVANNAMALAI TOWN, TAMILNADU

#### **Introduction:**

As per Annual Action Plan 2015-16, under the Project Head –VI (Waste management and urban pollution control) Sub Head -12, the STPs located in South Zone are monitored by this office. Under this project, one number of STP located at Tiruvannamalai town in Tamilnadu State was monitored.

#### **Background:**

Tiruvannamalai is a holy town in Tamilnadu State with population of about 1,45,278 (as per 2011 census). It is District headquarters with four municipalities and 10 town panchayats. The Tamilnadu water Supply and Drainage Board (TWAD) has constructed a STP of 8.7 MLD capacity to treat the domestic sewage generated in the Tiruvannamalai municipal town and the same is in operation since June 2014.

For administrative purpose, the town has been divided in to three zones. Under Phase I, Zone II with expected population of 93338 in 2023, was taken and sewerage lines were laid covering 22 wards completely and 2 wards partially and transmitted to STP located at Manalurpet road. Presently, 2.3 MLD of sewage is received and treated and discharged in to Olaiyaru river, situated about 1.5 km away from the STP. Under Phase II zones I and II will be taken up. As per 2011 census, total population of Tiruvannamalai municipality is 1,45,278 and the expected sewage generation is 13.1 MLD. However, only 2.3 MLD is received and treated. Hence, the existing collection and treatment system covers about 20.6 % of the sewage generated in the town.

The STP was inspected on 11.2.16 and samples were collected on 13.2.16 at inlet, aeration tank and outlet of STP.

#### **Details of STP:**

TWAD has constructed a STP of 8.7 MLD and presently the STP is receiving 2.3 MLD for treatment. The treatment system is based on activated sludge process (ASP) and the components of the system are as follows.

Receiving tank → Bar screen → Degritting tank → Parshall flume → Primary clarifier (2 nos) → Aeration tank (2 nos) → Sec. clarifier (2 nos) → Chlorine contact tank → Final outlet.

Primary clarifier sludge → Sludge digester → Centrifuge.

Sludge from the primary clarifier is taken to sludge digester and the digested sludge is taken to centrifuge for concentration and removal of solids.

The dimensions are given below:

	Name of unit	Quantity	Size, meter liquid depth	Capacity, m <sup>3</sup>
1	Receiving tank	01	4 x 1.4 x 2.5	14
2	Degritting tank	02	4.6 x 4.6 x 0.7	15
3	Primary clarifier	02	14.5 Dia x 3.0	495
4	Aeration tank	02	16.6 x 8.4x 5.5	767 ( 8 hrs – ret)
5	Secondary clarifier	02	15.8 Dia x 3.0	588
6	Chlorine contact tank	01	12 x 6 x 3	216
7	Sludge digester	02	6.5 Dia x 8.07	268

### Results:

Location	Parameter							
	pH	TSS	BOD	COD	NH <sub>3</sub> -N	TC	FC	MLSS
STP Inlet	7.1	49.2	61	178	<b>23</b>	--	--	--
STP Outlet	7.3	17.6	<b>22</b>	139	<b>26</b>	27.2x10 <sup>5</sup>	24.5x10 <sup>5</sup>	--
Aeration tank	--	--	--	--	--	--	--	882
Standard	5.5-9.0	< 30	< 20	--	--	--	--	--

### Observations:

1. STP was operational during inspection and monitoring
2. STP is running with valid consent issued by TNPCB.
3. The treated sewage is disposed in to inland surface water namely Olayar river.
4. As per consent condition, STP is equipped with flow meters at inlet and outlet.
5. All the records are maintained properly.
6. The TWAD has developed greeneries in and around the campus and maintained properly.
7. In order to maintain the STP, TWAD has developed a laboratory with all facilities.  
However, chemists lack basic knowledge and hence they have to be trained properly.
8. Display boards have been kept in all places.
9. As alternative power, TWAD has installed DG set of capacity 250KVA.
10. As part of tertiary treatment, disinfection by using liquid chlorine is carried out. However, dosage was found to be very less, not sufficient to complete disinfection.
11. Foaming was found at the outlet of secondary clarifier.
12. Biogas generated is presently vented out without proper use.
13. Outlet BOD is higher than the standard limit prescribed by TNPCB

14. TNPCB has not stipulated any standard for nitrogen parameters and FC. However, when compared to new standards, values of ammonical nitrogen and FC values are very high.

**Recommendations:**

TWAD shall initiate steps to reduce nitrogen content in outlet.

TWAD shall ensure that the plant is operated scientifically and only treated sewage is disposed in to the receiving body.

TWAD shall take steps to improve the operation of sludge digester and to use the biogas generated effectively.

Dosage of liquid chlorine shall be increased such that redox potential of 650mV is achieved for effective disinfection.

TWAD shall also ensure that the Olayar River is not polluted because of discharge. Periodically samples can be collected and analysed to ensure the quality of river water.

TWAD shall arrange intensive training to laboratory staff for effective maintenance of STP.

Digested sludge from sludge digester shall be converted to manure by composting.

Steps may be initiated to reduce nitrogen level at the outlet.

TWAD shall take steps to install online monitoring devices at inlet and outlet.

Inspection team:

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Zonal Officer:

## PERFORMANCE EVALUATION OF SEWAGE TREATMENT PLANTS

### LOCATED AT PUDUCHERRY (UT)

#### Introduction:

As per Annual Action Plan 2015-16, under the Project Head –VI (Waste management and urban pollution control) Sub Head -12, the STPs located in South Zone are monitored by this office. Under this project, three numbers of STP located at Puducherry were monitored.

#### Background:

Puducherry city is the administrative headquarters of Union Territory of Puducherry as well as Puducherry District. As per 2011 census, total urban population of the city is 6.57 lakhs with an area of about 77 km<sup>2</sup>. For administrative purpose, the city has been divided into two municipalities (Puducherry and Ozhukarai) and 5 commune panchayats.

The public health division of PWD, Puducherry, is responsible for water supply to the city and draining. The department has divided the urban area in to 9 zones for effective management of sewerage system.

The Department has constructed 3 STPs of total 17.5 MLD capacity, covering zone I and zone II completely and III to V partially.

Also, PWD had constructed 2 more STPs one at Lawspet and another at Dubrayapet each of 17 MLD capacities and the plants are under commissioning stage. Also, collection and conveyance pipelines are being laid to connect to STP.

The details of STP are given below:

S.No	Location	Treatment system	Capacity, MLD	Remarks
1	Lawspet	Oxidation pond	12.5	Running
2	Lawspet	UASB	2.5	Running
3	Dubraypet	UASB	2.5	Running
4	Lawspet	SBR	17	Under commissioning
5	Dubraypet	SBR	17	Under commissioning

#### STP at Lawspet:

Lawspet area has two STPs, one based on natural treatment system (oxidation pond) and another one based on UASB.

##### 1. Oxidation pond:

The plant was inspected on 12.2.16 and 2 numbers of samples were collected.

The details of oxidation ponds are given below:

Total no. of ponds: 04

Total capacity: 62.87 ML

Actual treatment/day: 12.5MLD

Pond 1 and 2: 150m x 75m

Pond 3: 107.5m x 67.8m + ½ x 75m x 75m

Pond 4: ½ (166+138) m x 108m + ½ x 125m x 54m

Recharge pond: 2 nos. 18.37 acres

Results:

Location	pH	TSS	TDS	BOD	COD	NH <sub>3</sub> -N
Pond inlet	7.0	44.0	1229	55	239	25
Pond outlet	7.2	19.6	1464	36	174	31

**Observations:**

1. During visit the plant was in operation.
2. The treated sewage are stored in recharge pond and used for irrigation within the premises.
3. Foaming was found at the outlet of pond 4.
4. The ponds are positioned as Pond 2 → Pond 1 → Pond 3 → Pond 4. Raw sewage is pumped to pond-1 and overflows to pond 3 and pond 4. Presently Pond 2 is not used.
5. Parameters pH, TSS and BOD are within the limit.

**2. UASB:**

The plant was inspected and samples were collected on 12.2.16. The designed capacity of UASB is 2.5 MLD. The design of STP is as follows:

Grir chamber → UASB (2 nos – 12.5 x 5.5 x 5m each) → Duck weed pond 1 no. 100 x 172m)

Sludge drying bed ( 6 nos – 5x8m each)

The final treated sewage is sent to duck weed pond for maturation. The analytical results are given below:

Location	pH	TSS	TDS	BOD	COD	NH <sub>3</sub> -N	Alkalinity
UASB inlet	7.0	44.0	1229	55	239	25	--
UASB outlet	7.3	34.0	1415	29	127	25	408
Standard	5.5-9.0	200	--	100	--	--	--

**Observations:**

During visit, the plant was in operation

Parameters pH, TSS and BOD are within the limit prescribed by PPCC.

There is only 47% reduction in BOD and COD load.

Alkalinity value is very low, indicating partial degradation of sewage.

There is no laboratory to measure important operating parameters.

TC and FC values are found to be very high

**Recommendations:**

PWD may develop laboratory to carryout analysis of operational parameters.

PWD may initiate action to improve the performance of UASB so as to achieve 10 mg/L BOD.

Steps may be initiated to lower the nitrogen content in the outlet.

Disinfection may be carried out to reduce the values of TC and FC and to polish the final quality of effluent.

**STP at Dubraypet:**

The STP is based on UASB technology with capacity of 2.5 MLD. The various units of STP are given below.

Treatment unit	Number	Size	HRT
Balancing tank	1 no.	--	--
Screen cum grit chamber	1 no.	--	--
UASB reactor	2 nos	12.5m x 5.5m x 5m each	8 hrs
Sludge drying bed	4 nos	5 x 8m each	--

**Analytical results:**

Parameters	Inlet	Outlet	UASB outlet
pH	6.9	6.9	
TSS mg/L	61.2	30.8	
TDS mg/L	1475	1388	
BOD mg/L	82	38	
COD mg/L	309	259	
Ammonia mg/L as N	18	26	
Alkalinity mg/L as CaCO <sub>3</sub>	--	--	408

**Observations:**

The STP was found operational during inspection

Final treated sewage is disposed to Uppar drain that leads to sea

New STP based on SBR technology has been commissioned and ready for operation. However, pipelines have to be laid to connect the sewer line to STP.

The STP doesn't have any facility to measure the inlet and outlet flow.

Gas generated in UASB is vented out with- out proper use.

No records are maintained

There is no laboratory to monitor the operation of STP

Alkalinity value of 408 mg/L shows that the UASB is not maintained properly.

COD value is higher than the consent limit of 250 mg/L.

**Recommendations:**

PWD should ensure proper maintenance of STP

Records should be maintained for all operations

PWD should install flow meters at inlet and outlet

PWD should develop laboratory to monitor operational parameters

**Inspection team:**

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