Research article Available online www.ijsrr.org ISSN: 2279–0543

International Journal of Scientific Research and Reviews

Assessment of Efficiency of The Sewage Treatment Plant at Sri Balaji Technical Campus

Bhagat Suraj Kumar *, Tiyasha

M.Tech* (Environmental Engg.), Deptt, of Civil Engg., SBCET, Jaipur,
M.Tech* (Environmental Engg.), Deptt, of Civil Engg., Poornima Group of Institution, Jaipur

ABSTRACT

The area irrigated with waste water varies around 10 % of the total world irrigated area so waste water can be used efficiently. Adequate treatment is necessary to prevent the bad effect on the receiving water bodies, whether it is for water supply, recreation, or any other purposes. Sri Balji Technical Campus has 100 KLD Sewage Treatment Plant with two Aeration Tank of 35 KLD each and one Settling Tank lead to Filter Tank which treated the waste water of same place and purified water is used by gardening as well as agriculture in neighbor area (25-30 ha). Vegetable as well crop grown in nearby locality is used by local people so Sewage Treatment Plant must work efficiently to produce good quality of water which will improve health as well as social life of residents. Raw water and purified water were analyzed in terms of Temperature, BOD_5, Taste, Odour, Total Solid, pH, Fluoride, Conductivity, and NO_3.

KEYWORD: KLD, Aeration Tank, Settling Tank, Filter Tank, Sewage Treatment Plant, BOD_5, NO_3, Total Solid, and Conductivity.

Suraj Kumar Bhagat
M.Tech* (Environmental Engineering),
Department of Civil Engineering,
Sri Balaji College of Engineering and Technology, Jaipur,
E-mail: suraj_futuretech@yahoo.com, Mob: 08233404815

INTRODUCTION

The waters from sky, the waters of rivers, and water in the well, whose source is the ocean, may all these sacred waters protect me (Rig Veda). It is estimated that about 20 million hectare in 50 countries are irrigated with raw or partially treated wastewater. Wastewater (WW) is a combination of the liquid, or water carrying wastes, removed from domestic, institutions, commercial and industrial establishments together with surface/ground/storm water. Wastewater treatment consists of applying known technology to improve or upgrade the quality of a wastewater.

History

You may be surprised to learn that the treatment of wastewater is not a modern practice. Removal of foul-smelling from sewer water was common in ancient Rome; it was not until the 19th century that large cities began to understand the necessity of reducing the amount of pollutants in the used water they were discharging to the environment. Despite large supplies of fresh water and the natural ability of surface waters to clean them over time, populations had become so concentrated by 1850 that outbreaks of life-threatening diseases became common. These outbreaks were due to pathogenic bacteria found in the polluted water. What happens in a wastewater treatment plant is essentially the same as what occurs naturally in an ocean, lake, river or stream[1]. The function of a wastewater treatment plant is to speed up self-cleansing process. The practice of wastewater collection and treatment has been developed and upgraded, using advanced biological, physical, chemical and mechanical techniques available presently. As a result, public health and water quality has been secured better today than ever before[2].

Wastewater treatment, however, can also be classified by the nature of the treatment process operation being used; for example, physical, chemical or biological. Examples of these treatment steps are shown below. A common wastewater treatment system may consist of the application of a number of physical, chemical and biological processes[3].

Our study focused more on the wastewater treatment in Sri Balaji Technical Campus (SBT) and research on the processes that contribute in enhancing the Wastewater treatment; toward making SBT Campus a green campus.

Need of Study

This type of studies is beneficial for the waste water management of the campus So that if in future there is any requirement for taking any action to managing or changing the strategy of Wastewater management than this study will be very informative. This type of studies are never carried out in campus that's why this topic is quite a new study for the SBT campus, since it is rare in other campuses. The need of study is also due to the problem associated by the Wastewater, that is treated or disposed off in unsatisfactory way which may cause severe

aesthetic nuisance in terms of smell and appearance, flies breeding in some sites of wastewater, and as we know flies are very effective vectors that spreading diseases**.**

Benefits of Sewage treatment:

1. Safeguard the health of people who eat and produce food grown in recycled water i.e. residents of neighborhoods near irrigated areas
2. Safeguard the health of operators who irrigate the land with untreated or partially treated waste water and come to the direct contact of wastewater.
3. The prevention of contamination and degradation of land, ground water as well as escaping of contaminants to surface water sources.
4. Regulating the level of nutritional material liquefied in water and suitable corrections to meet the requirements of the vegetation
5. Quality crops for wastewater attribute.
6. Expulsion of growth inhibiting liquefied materials and poisons into food chain.

OBJECTIVE OF STUDY

- Evaluation of present status of the waste water management of SBT campus.
- To identify the problems related to STP of SBT campus.
- To characterize physical and chemical properties of the Wastewater being generated in SBT campus.
- Evaluation of the fate of the wastewater being generated in SBT campus.

The overall water management objectives of wastewater treatment are associated with the removal of pollutants and the protection and preservation of our natural water resources. Specific concern is protection of human health by the destruction of pathogenic organisms present in wastewater prior to treated effluent being discharged to receiving bodies.

MATERIALS AND METHOD[4,5,6]

Evaluation of Current Status of SBT Campus

In the subsequent section a brief methodology of evaluating the present status has been discuss**.**

Study Area (SBT Campus)

The college is spread over 30 acres of land. It is nearest to the main Railway Station and Central Bus Stand among all the engineering colleges in Jaipur City. College has all the facilities in the campus itself. SBTC has well furnished separate hostel for boys and girls. In the campus to accommodate 400 boys and 150 girls and have pleasant surrounding

Demographic Study

Population data of academic building, workshop, girl's hostel, boy's hostel, staff quarters, guest house and canteen is given in table 3.1.

Table 3.1 Population with the name of places

Sl. No.	Name of Building	Population
1	Girls hostel	105
2	Boys hostel	350
3	Department	1754
4	Guest House	21
5	Staff quarters	11
6	Canteen	4
7	Workshop	8
8	Hostel mesh	17
TOTAL		2270 persons

An overview on Sewage Treatment Plant of SBT Campus:

Fig: A photo of Sewage Treatment Plant at Sri Balaji Technical Campus

Sewage Treatment Plant has following technical steps:

First Storage Tank:

- This has 1.25 Lacks liter capacity with two air blower inlet
- It supports both aerobic respirations of microbes as well as removal of smell.
- This collects waste water of Sri Balaji Technical campus.
- *Inlet of waste water varies with season and semester working-holiday calendar schedule.*

Aeration Tank:

- There are two aeration tanks with 35 KLD capacities.
- Both are connected to each-other with PVC pipe half meter below from top of the tank
- It contains air blower (Everest company) inlet for aeration
- It supports both aerobic respirations of microbes as well as removal of smell.
- Second aeration tank leads their aerated wastewater to the settling tank

Settling Tank:

- It takes aerated water from second aeration tank by inlet opening 1 m from bottom.
- It make possible to settle to settelable partical and this is enhanced with tube settler tank
- It takes 1-1.5 hr to reach their outlet opening through tube settler

Second Storage Tank:

- It stores water for extra feeding and leads to fine filter tank
- Give another chance to settle the practical which are remains after settling tank.

Fine Filter with Pump:

- It clears the water from fine particle size varies from 1 to 0.5 mm.
- It creates pressure to send the purified water to the agricultural & gardening land.

Sludge Disposal:

- 20-25 kg sludge have to dispose every day which has been stored, dried and used as manure as good practice in agriculture.

PHYSICAL ANALYSIS [2, 5]

I. ***Temperature:*** this is measured by thermometer just after collecting sample.

II. ***Color:*** The method is useful in the field by comparing the color of sample with a comparator. When viewed by transmitted light through a depth of several feet, pure water exhibits a light blue color which may be altered by the presence of organic matter to greenish blue, green, greenish yellow, yellow or brown. Colour is removed to make water

suitable for general and industrial applications. In such a case, an instrumental method is useful. Colour expressed in terms of Pt/Co standard unit.

III. ***Total Solid:*** This is done by the evaporation method, i.e. Residue left after the evaporation and subsequent drying in oven at specific temperature 103-105°C of a known volume of sample are total solids. Total solids include "Total suspended solids" (TSS) and "Total dissolved solids" (TDS) .

CHEMICAL ANALYSIS[2, 3, 5]

I. ***pH:*** In this is study the pH of all sample are measured by electrometric method which is the electromotive force (emf) of a cell comprising of an indicator electrode (an electrode responsive to hydrogen ions such as glass electrode) immersed in the test solution and a reference electrode (usually a calomel electrode).

II. ***BOD:*** The test is mainly a bio-assay procedure, it is necessary to provide standard conditions of temperature, nutrient supply, pH (6.5-7.5), adequate population of microorganisms and absence of microbial-growth-inhibiting substances. Generally, temperature is controlled at 20ºC and the test is conducted for 5 days, as 70 to 80% of the carbonaceous wastes are oxidized during this period. The test can be performed at any other temperature provided the correlation between BOD_5 20 ºC is established.

III. ***Total Hardness:*** This is accomplished by titration method which is EDTA method. Where phenolphthalein is used as indicator.

IV. ***NO_3:*** This is measured by Spectrophotometer, for use at 220nm and 275nm with matched silica cells of 1cm or longer light path. Nitrate is determined by measuring the absorbance at 220nm in sample containing 1mL of hydrochloric acid (1N) in 100mL sample. The concentration is calculated from graph from standard nitrate solution in range 1-11mg/L.

V. ***Fluoride (F^-):*** This is measured by Ion selective electrode method, when the fluoride electrode is dipped in sample whose concentration is to be measured, a potential is established by the presence of fluoride ions by any modern pH meter having an expanded millivolt scale.

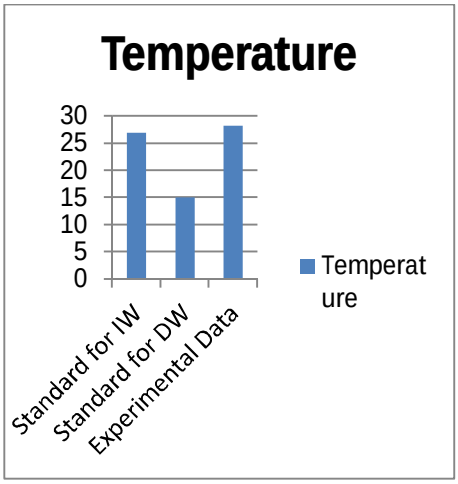
VI. ***Conductivity:*** This method is used to measure the conductance generated by various ions in the solution/water. Rough estimation of dissolved ionic contents of water sample can be made by multiplying specific conductance (in mS/cm) by an empirical factor

which may vary from 0.55 to 0.90 depending on the soluble components of water and on the temperature of measurement.

RESULT AND DISCUSSION

Physical Characterizations:

I. **Temperature:** All 15 days sample reveals the following graphical fluctuation in which mean value have been shown which is the minor change in respect of the Indian standard.

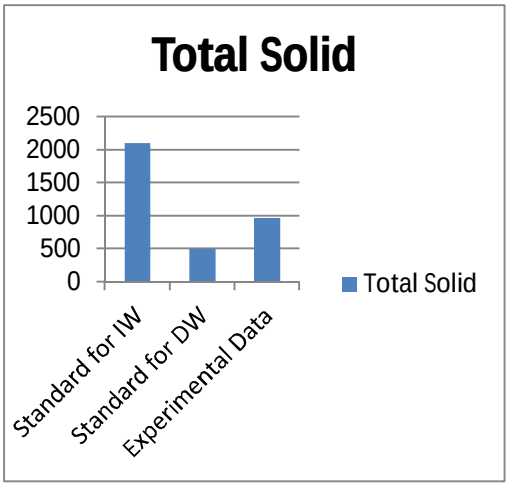


Graph 1: Comparative graphs for Temperature

***IW** is for Irrigated Water
***DW** is for Drinking Water
***Experimental Data** is a value calculated in lab
The above result of Temperature shows the slightly higher temperature of the treated water by the Sewage Treatment Plant which indicates the lack of optimum detention time for aerobic respiration.

II. **Color:** Comparator shows the color of treated water is resemble with brownish color which indicates that the incomplete the work of either settling or aerobic digestion by the aerobic microbes.

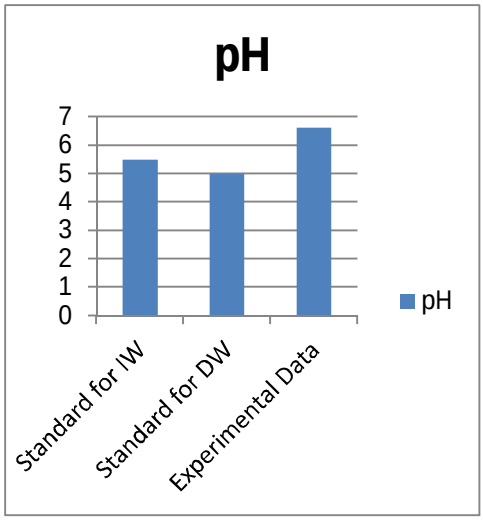
III. **Total Solid:** The experimental data shows the near 50% reduction in the Total Solid of Treated Wastewater. It can be improved by the increasing the settling time.



Graph 2: Comparative graphs for Total Solid

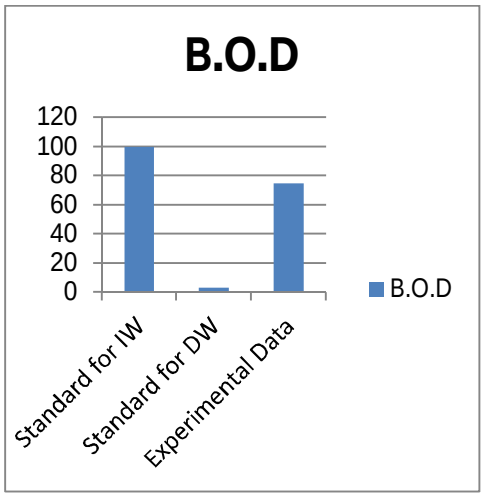
Chemical Characterizations:

I. **pH:** Experimental value reveals the higher value of pH than standards. Which indicates the treated water is slightly saline. It is due to the presence of basic component which may not be degraded by the microbes due to lack of time in aerobic tank. Chemicals can be added to decrease salt load or neutralizing by remixing the sludge with more acidic waste can be a solution.



Graph 3: Comparative graphs for pH

II. **BOD:** Experimental data shows the low degradation in BOD value comparison with drinking water data. Retention time of aerobic tank should be more to reduce the value of BOD. But in case it is used for irrigation purpose it is in permissible limit.

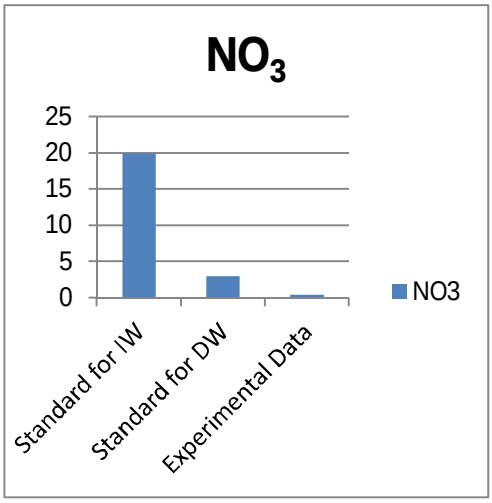


Graph 4: Comparative graphs for BOD

I. **Total Hardness:** Experimental data shows that it can be used for irrigation purpose since it is in permissible limit but for drinking water it should be more lower.

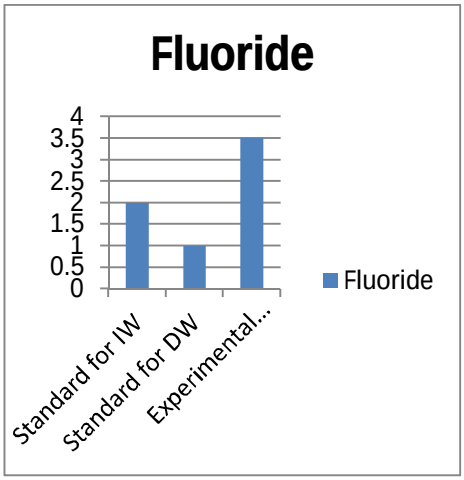
Graph 5: Comparative graphs for Total Hardness

II. **Nitrate (NO_3^-):** The experimental data shows the nearly complete degradation of NO_3. It has shown good result during microbial process in such a given retention time.



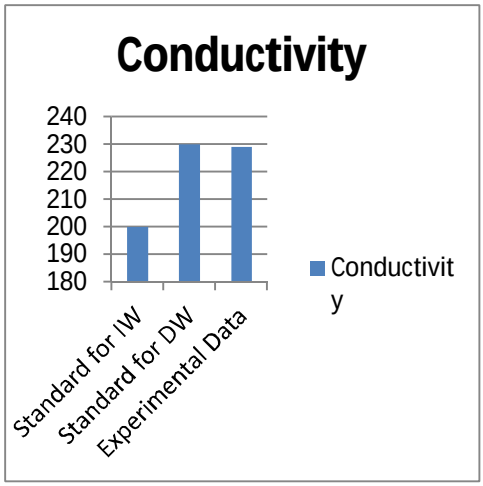
Graph 6: Comparative graphs for NO_3

III. Fluoride (F^-): Experimental value reveals the presence of Fluoride which indicates the no specific treatment has been done for the fluoride removal.



Graph 7: Comparative graphs for Fluoride

IV. Conductivity: The experimental data reveals that the high value of the conductance of the sample which mean to be presence of organic or inorganic ion which needs more time to degrade by the microbes.



Graph 8: Comparative graphs for Conductivity

CONCLUSION

Sewage Treatment Plant of Sri Balaji Technical Campus can improve their efficiency by taking the followings steps:

1. By installing the Primary and Secondary Clarifier
2. By increasing the settling time
3. By using Disinfection method
4. The Disposal of sludge of the STP as Fertilizer in irrigation
5. Neutralization should be done by remixing the sludge with more acidic waste.

This project can improve the water scarcity challenge near by the college area especially during summer season. It might full fill the requirement of Drinking water after reverse osmosis which will be considered under the Indian standards

Approximately 4000 people get benefited now which will increase with time So it is required to pay attention on the quality of treated water of Sewage Treatment Plant water of Sri Balaji Technical Campus.

REFFERENCES

1. Campos, J.R., E. Foresti and R.D.P. Camacho, Anaerobic treatment in the food processing industry: Two case studies, Water Science Technology. 1986; 18:87-97.
2. G.D. 188/2002 - Annexe 3. Normative concerning pollutant loading limits for industrial and municipal wastewater at discharging in natural receivers, NTPA-001/2002;
3. Sayed, S.K.I., J. van der Zanden, R. Wijffels and G. Lettinga, Anaerobic degradation of the various fractions of slaughterhouse wastewater. Biological Wastes. 1988; 23:117-142.
4. Tritt, W.P. and F. Schuchardt, Materials flow and possibilities of treating liquid and solid wastes from slaughterhouses in Germany. Bioresource Technology. 1992; 41:235-245.

5. Dague, R.R., R.F. Urell and E.R. Krieger, Treatment of pork processing wastewater in a covered anaerobic lagoon with gas recovery. In Proceedings of the 44th Industrial Waste Conference, Ann Arbor, MI: Ann Arbor Science; 1990; 815-823.
6. Guide Manual of water and wastewater analysis by Central Pollution Control Board, New Delhi.
7. APHA. Standard Methods for the Examination of Water and Wastewater. Washington. DC: American Public Health Association. 1992;
8. M. Gopalakrishnan, Secretary General, ICID, President IWRS & NDC-WWC
9. AOAC., Official Methods of Analysis of the Association of Official Analytical Chemists., Arlington VA: Association of Official Analytical Chemists1984;
10. Banu C., Food Industry Engineer Book, Tehnical Publishing House, Bucharest. 2002,
11. Bara V. Oneţ C., Hygiene Guide in Food Units, University of Oradea Publishing House 2008;
12. G.D. 188/2002 – Annexe 2. Normative regarding conditions of wastewater discharging in municipal sewer and in plant units, NTPA-002/2002;
13. Municipal Wastewater Treatment Plant Energy Baseline Study by M/J Industrial Solutions San Francisco, CA 94122 in 2012