Study the Wastewater Characteristics of Greater Noida Wastewater Sewerage System

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ABSTRACT

The rapid growth of the population, the technological advancement and industrial boom has brought major problems and degradation of the environment as well as eco-system. Effective collection of urban wastewater and then its further treatment is a critical problem in India. Here wastewater is mainly generated from industries andbuildings which facesnumber of health hazards related to water. Conventional treatment method and methods using Sewage Treatment Plants (STPs) have been constructed in most places to decrease the degradation of quality of water of the receiving water bodies by reducing the pollution load on these bodies and to ensure and making a healthy environment appealingly along with preserving the ecosystem. In the present scenario, study of Greater Noida in U.P India has been taken where the development has taken place in a planned manner, the industrial area, commercial area, education hub (knowledge park), and housing area all are well planned so the hazard due to waste-water can be minimized. The study was undertaken to analyze the wastewater quality of various lagoons and sewage drains of the city during the year 2018. The area irrigated with wastewater is around 10 % to 15 % of the totalirrigated area of the world so waste water can be used productively and efficiently. Further treatment is required to prevent the adverse effect on the receiving water bodies, whether it is for water supply, recreation, or any other use. NIET Greater Noida Campus has 85 KLD Sewage Treatment Plant with one Aeration Tank of 40 KLD and one Settling Tank which lead to Filter Tank, treated waste-water is used by gardening as well as agriculture in neighbor area (40-50 ha). Vegetable as well crop grown in nearby locality is used by local people so Sewage Treatment Plant must work efficiently and purify water which will improve health as well as social life of local residents. The work carried out in this research presents the results of the experiment conducted with the Primary treated sewage and tertiary treated sewage water taken from the Sewage Treatment Plant (STP) of our campus to carry out the economic performance of STP based on new advanced technology located in Greater Noida for handling and treating the domestic wastewater. Raw water and purified water were analyzed in terms of pH, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Turbidity, Greece and Oils, Odor.

Keywords: *Aeration Tank,Sewage Treatment Plant, BOD, COD.*

I. INTRODUCTION

Water is a resource circulated through ecosystem and is capable of transport, storage, and recycling. Its continuous demand forces man to access and examine water reuse technologies more seriously than ever. Groundwater and surface water are the two major sources available for human consumption. Water is critical for development. Over the decades, the demand for water has multiplied due to population growth, rapid industrialization, climatic changes & overexploitation of existing water resources. Therefore, existing water resources demand sustainable management through scientific approach. Regardless of origin, industrial wastewater, after proper treatment, represents another ample and reusable water source. Water pollution has been a major cause of concern to scientists and engineers [1].

India is a large country having uncertain monsoon patterns which leads to water scarcity & droughts. There is a tremendous amount of pressure in protecting the water resources available in the country. Protecting the surface water resources from wastewater pollution plays a vital role for the development. The disposal of wastewater into the surface water bodies leads to serious problems and affects the people in health aspects. Especially in the urban areas, the pollution of domestic effluent discharges intothe nearby surface water bodies created problems for the public. There are many ways of safedisposal of wastewater. But improper management of wastewater generation in the urban areasfind its own way of getting into the surface water. Hence, the effluent discharge affects thesurfacewater bodies. The water quality changes in the surface water bodies created many healthproblems to the public. The typical domestic wastewater treatment system is a centralized municipal-sized facility that treats wastewater to specified discharge limits, to protect human health and the environment [2]. Treatment of any kind of wastewater to produce treated water of good quality is necessary. Treatment technologies are based on varying levels of mechanization, energy inputs, land requirements, costs, skilled manpower etc. Therefore, choice of an effective treatment system is important. Though well proven and reliable, conventional aerobic treatment processes usually require large surface areas and react slowly to high-load variations. In order to provide compact plants and to assure greater treatment efficiency and reliability, biological aerated filtration technique has been developed [2]. The objective of this work is to analyze the wastewater generated in the university campus and evaluate the suitability and effectiveness of treating effluents by STP and compare the results with INDIAN STANDARDS of treating wastewater. Themajor cities are growing with a daily average addition of 1000 persons.As a result of thistremendous growth, service infrastructure is not able to keep up to provide the city a healthyenvironment. Ample supplies of clean unused water can no longer be taken for granted due topopulation growth, increasing urbanization and industrial water demands. Pollution of freshwater streams and ground water by industrial discharges result indepletion of existing watersources. Hence, it is increasingly becoming obvious that reuse of wastewater is a viable solutionin many instances [2,3].

II. 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 is never carried out in our campus that's why this topic is quite a new study for the NIET 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.

III.MATERIALS AND METHODS

Study Area (NIET Campus)

The college is spread over 17 acres of land. It is nearest to the main Delhi-Pari Chowk Expressway in Knowledge park at Greater Noida City. College has all the facilities in the campus itself. NIET has separate hostel for boys and girls. In the campus to accommodate 200 girls and 450 boys [5]. This research work evaluated the performance of the STP based on advanced aerobic technology in terms of wastewater characterization to derive a comparative account between the pollution load before and after the treatment processes, besides, discerning their efficiency.
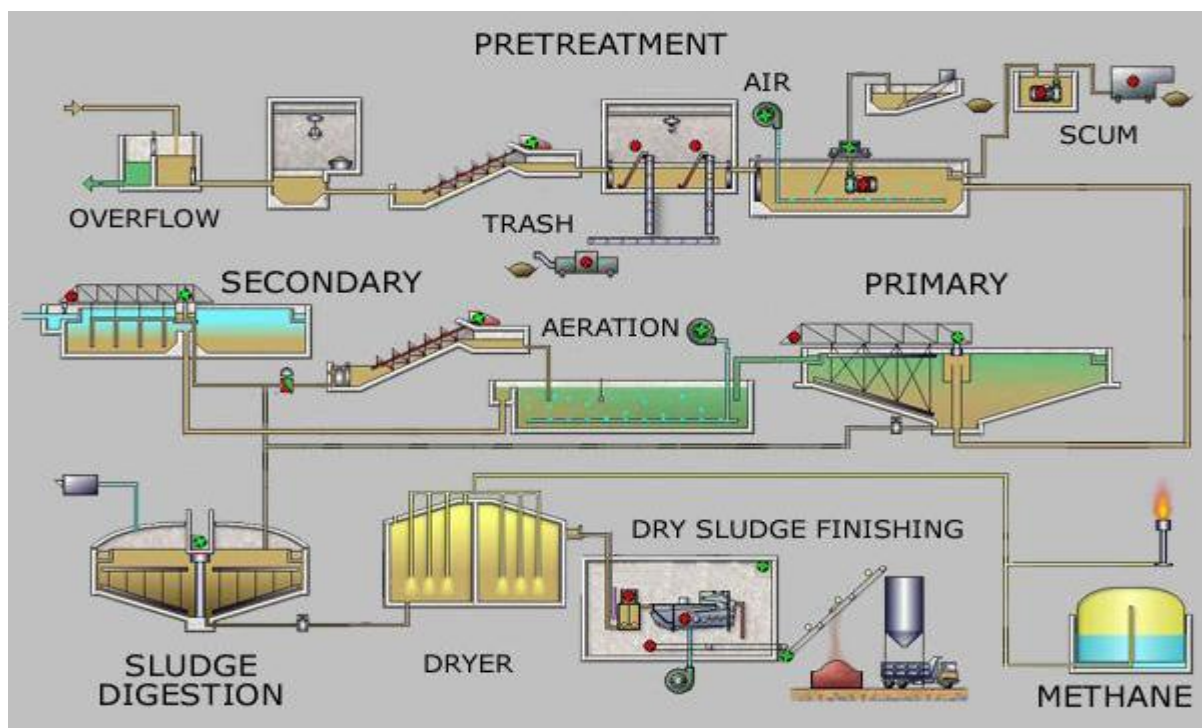

Figure 1: Layout ofwastewater treatmentplant [8].

IV.WASTEWATER PARAMETERS

Wastewater contains a variety of inorganic and organic substances from domestic sources. The wastewater parameters namely BOD, COD, TDS, TSS and pH were analyzed. The procedure followed for calculating the parameters are the STANDARDISED methods (APHA, 1992) [4,6].

Collection of samples and its description:

Physical Analysis

1. Temperature: Sample is collected and its temperature is measured.

2. Total Solid: This is checked by evaporation and measuring its residue after drying it in oven 103-105°C.Totalsolids include "Total dissolved solids" (TDS) and "Total suspended solids" (TSS).

3. Color: The sample color is checked by comparator. Color is varied by light blue color for clean water which may be change due to presence of organic matter or inorganic matter so that it seems yellow greenish blue or brown. Color must be transparent in order to achieve cleanliness. Color is expressed as Pt/Co standard unit.

Chemical analysis

1. pH:sample's pH is measured by electrometric method i.e. electromotive force (emf) of a cell comprising of an indicator electrode immersed in the sample solution and a reference electrode i.e. calomel electrode.

2. Total Hardness: This is checked by EDTA titration method and phenolphthalein is used as indicator.

3. Chlorides: It shows a great difference between the wastewater of city area and civil linearea with respect to chlorides. The range of chloride concentration lies between 300-500mg/l ascompared to city area where the concentration is below 300mg/l.

4.BOD:BOD is a measure of, the amount of oxygen that require for the bacteria to degrade the organic components present in water / waste water.Temperature remain at 20ºC and for 5 days, as 70 to 80% of the carbonaceous wastes are oxidized during this period.

5. COD: COD or Chemical Oxygen Demand is the total measurement of all chemicals (organics & in-organics) in the water / waste water.

6. Oil and grease: Oil and grease includes fats, oils, waxes, and other related constituents found in water, generally wastewater. If these compounds are not removed before discharge of treated wastewater, oil and grease can interfere with biological life in surface waters and create unsightly films.

V.RESULT AND DISCUSSION

Physical Characterizations:

1. Color: Comparator indicates the color of treated water is brownish, which indicates that the incomplete aerobic digestion by the aerobic macrobacteria.

2. Total Solid:the experiment result indicates 40% reduction total solids. It can be improved if settling time is increased.

Table: 1(total solid quantity)

Total Solid in Untreated sample	1.17g/l
Total Solid in Treated sample	0.25g/l

Chemical Characterizations:

1. pH: sample shows pH is higher than standards. Which shows the treated water is saline.Chemicals can be added to decrease salt load.

Table: 2(pH value of sample)

Sample No	Temperature of sample	pH	Sample Status
1	300K	6.46	Untreated
2	300K	8.6	Treated

2. BOD: sample shows BOD value comparison with drinking water. Retention time of aerobic tank should be increase to reduce the magnitude of BOD. So, it can be used for irrigation purpose in permissible limit.

Table 3(Biuret reading of different sample)

Trial No	Day	VolumeOf sample	Biuret Reading (ml) Initial	Biuret Reading(ml) Final	Volume oftitrant (ml)	Dissolved Oxygen (mg/l)
Blank	5	300	0	0.04	0.04	0.4
Untreated	5	300	0	1.1	1.1	11

Treated	5	300	0	0.4	0.4	04
Blank	0	300	0	0.03	0.03	0.3
Untreated	0	300	0	1.5	1.5	15
Treated	0	300	0	0.8	0.8	08

Table: 4 (Biochemical oxygen demand)

BOD (Untreated)	160 mg/l
BOD(Treated)	20mg/l

3. COD: Sample shows reduce in COD value in compare drinking water data. Retention time of aerobic tank should be increased to decrease the value of COD. So that it can be used irrigation purpose.

Table: 5 (COD of different sample)

Sample No	COD(mg/l)	Sample Status
1	740	Untreated
2	75	Treated

4. OIL AND GREECE: Sample shows decrease in OIL AND GREECE value when compare with drinking waterdata. Retention time should be increased.

Table: 6(Oil and Grease value)

Sample No	Oil and Grease (mg/l)	Sample Status
1	75	Untreated
2	13	Treated

Table: 7 (Parameters by INDIAN STANDARDS)

Parameters	Untreated	Treated
pH	5.4-6.7	8-9
COD	(750-800) mg/l	(40-80) mg/l
Oil and Grease	(70-90) mg/l	(015) mg/l
BOD	(180-220) mg/l	(10-20) mg/l
Total Solids	(1-1.5) g/l	(0.2-0.50) g/l

VI.CONCLUSION

Sewage Treatment Plant of NIET Campus can improve their efficiency by taking the followings steps:

1) By installing the Primary and Secondary Clarifier
2) The result shows the pH value of drains and lagoons are within permissible limit
3) By increasing the settling time
4) It was observed that the dissolved solids formed the main part of total solids concentration as compared to suspended solids.

One more parameter that may be affecting the biological parameter is detergents andsurfactants as most of thedrains and lagoons are virtual washing places of laundry resulting inthe manipulation of the wastewatercharacteristic making it more difficult to analyze.The Disposal of sludge of the STP as Fertilizer in irrigationand using Disinfection method. The effluent from college Hostel is alkaline in nature and with high organic matter, low inorganic matter and heavy metals.domestic sewage generated from industry is of less strength. The combined effluent is treated through STP under hydraulic load of 3-5 MLD and design load of 10 MLD.The STP comprises oil and water separator, chemical and bio-oxidation processes.

The treatability studies were carried out to investigate the treatment route for upgrading the existing treatment facility for recycling/reuse of treated water with in the industry for process. In sand filtration, the maximum COD removal efficiency achieved is 55% with 100 % SS removal and in activated carbon column, the maximum COD removal efficiency achieved is 65% and further residual COD is removed through chlorination.

Based on experiment performed in field this treatment is contains oil and water separator chemical treatment, sand filtration followed by activated carbon and later chlorination.

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