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# Case Study of 161 MLD Sewage Treatment Plant Kanchanwadhi, Aurangabad, Maharashtra

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***Abstract: Sewage treatment plant is a mainly designed and build to receive the waste water from various Domestic Source and remove material and damage water quality which affect public health and safety when discharge into water natural stream. Sewage is generated by various sources i.e. residential and institutional. It includes household waste liquid from toilets, flush water, baths, showers, kitchens, and sinks draining into sewers system. The separation and draining of household waste into the greywater and blackwater are becoming more common now days, after treatment of greywater being permitted for reuse for watering plants or recycled for flushing toilets. Municipal waste-water is the combination of liquid or water- carried wastes originating in the sanitary conveniences. Municipal waste-water is a combination of water and water- carried wastes originating from residential facilities and Institutions which contains various soluble and insoluble Organic and Inorganic pollutants. The present study comprises a comprehensive survey of the various methods and technologies currently used in waste-water treatment, with emphasis on municipal waste-water. The work area is 161 MLD STP Kanchanwadi, Aurangabad, The Project was awarded in 2014 to M/s. Khilari Infrastructure Pvt Ltd, and The STP was successfully completed and commissioned in 2017. The Operation & Maintenance of STP for next 10 Years is under the charge of M/s. Khilari infrastructure Pvt Ltd.***
***The sewage of entire Aurangabad city area is collected through underground drainage network by gravity and collected to the Sewage Pumping Station at Golwadi which is approx. 2 kilometre from 161 MLD STP and Raw Sewage Collected at Golwadi SPS is pumped to inlet of 161 MLD STP by Pumping Machineries.***
***Keywords: sewage, Waste-water, gravity flow, treatment, sludge, parameter, pumping station.***

## I. INTRODUCTION

Sewage treatment is the process of removing hazardous contaminants from municipal waste-water, containing mainly in household sewage which is harmful for environmental and human health. Waste-water is divided in physical, chemical and biological characteristics. Physical parameters include colour, odour, temperature, and turbidity. A by-product of treated sewage is surplus activated sludge. The sludge has to undergo further sludge treatment before being suitable for disposal or application to land as a manure. Various types of STPs are introducing each day, according to the requirement and economic view. STP in Kanchanwadi is working on Sequential batch reactor (SBR), capacity of plant is 161MLD.

The Design of Wastewater Treatment Works is one of the most requested Document produced by the New England Interstate Water Pollution Control Commission. Sequential batch reactor (SBR) are becoming popular waste water treatment option in New England and across the country due to their ability to treat the varying flow rates and allow control flexibility. In addition, they have a small footprint and are comparatively less expensive to construct and maintain.

Untreated waste water generally contains high level of organics material, numerous pathogenic micro-organisms, as well as nutrients and toxic compounds. It is necessary to environmental and health hazards and must immediately be conveyed away from its manmade sources and treated appropriately before final disposals of treated sewage.

Fig.1.View of STP Kanchanwadi

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It is a best example of STP known for not using any chemicals in whole treatment process. The farthest point of sewerage collection Pumping Station is approx. 2Km from the STP. This type of STPs can also be termed as energy saver of a country. As it recharges the groundwater, flow freely and be reused for irrigating and construction purposes. The STP of Kanchanwadi consist inlet section, which is common for both phase of STP. The raw sewage first collects here.

Fig.2.Inlet chamber of STP

After entering the sewage in inlet chamber, the sewage flows to screen chamber for fine screening. Screens are inclined at an angle of 45 degree. Screening is completely operated automatically by SCADA programming. For safer side a manual screen is also available on plant.

Fig.3.Showing automated screening

After removing the screened solid waste from sewage, it transfers to grit chamber for removing the grit. The whole process is fully automatic. There are 4 Mechanical grit removal mechanisms. For safer side a manual grit removal mechanism is also available on plant.

Fig.4. Showing the inner view of grit removal

Fig.5. View of mechanism of grit separator (Rack classifier)

After grit separator, the water is sent to splitter box for secondary treatment i.e. Biological treatment. Various sewage treatment technologies are available but in STP Kanchanwadi sequential batch reactor SBR/cyclic activated sludge process is used, it gives 98% of BOD removal efficiency.

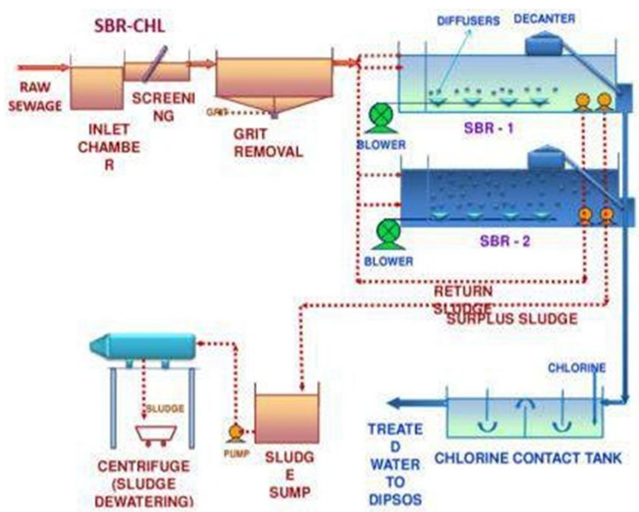


Fig.6.Sequential batch reactor (SBR) flow diagram

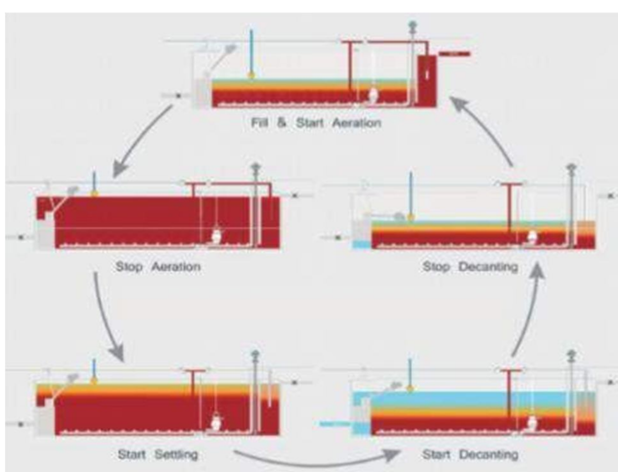


Fig.7.SBR Cyclic Process

In secondary treatment, water firstly enter into an aeration tank, aeration is carried out in cyclic technology in C-Tech basin. Each cycle is 180 minutes in which 90 min filling aeration, 45 min settling, 45 min decanding. Complete cycle is operated automatically by SCADA operating system.

At the time of aeration activated sludge process (ASP) is running simultaneously with the help of RAS (Return Activated Sludge) pump in anoxic zone. To meet the objective of organic matter removal, bio mass formed (which itself is organic in nature) should also be separated. Usually, a settling tank is provided to separate bio-mass formed during organic matter degradation.

Fig.8. View of Aeration and Decanting

After complete process of aeration and settling clean water is extracted with the help of decanter for chlorination and settled sludge is sent to centrifuge section with the help of SAS pump for further processing.

Main objective of centrifuge section is dewatering of surplus activated sludge. The sludge collected at different steps of process sent to the gravity sludge thickener (GST) where thicken sludge from 0.8 to 3-4%, reduce volume of sludge, reduce size of mechanical dewatering unit and then sludge get sent to the Thickened Sludge Sump after that it transfer to the centrifuge unit in centrifuge unit dosing pump and feed pump is installed where polyelectrolyte increase the efficiency. The sludge is dewatered by using centrifugal pumps and the thickened sludge is sent for anaerobic digestion. This process gives digested sludge, which use as manure by local farmers.

Fig.9. View of Centrifuge unit


Fig.10. Centrifuge section flow diagram

Fig.11. Dewatered sludge

The clean water which is extracted from the decanter is then sent for chlorination process. Main objective of chlorination is disinfection of water to kill pathogens.

Fig.12. View of Chlorination unit

In chlorination unit sodium hypochlorite is use as a dosing chemical and chlorine gas is use for vacuum chlorination. Contact time in of water in chlorination unit is 30 minutes. After chlorination of water is ready to reuse for domestic purpose like farming, gardening, irrigation, construction etc.

Fig.13. View of chlorine contact tank

 

Treated water of STP Kanchanwadi is also consumed by various industries which is situated at surrounding area for inhouse production.

Fig.14. Treated water

For smooth running of plant and follow the BIS standards for treated water, lab is setup on the STP site. The laboratory is fully furnished and all necessary equipment's for testing water is available here. In this laboratory, the water is testing at every stage for ensuring the health of the STP.

Fig.15. Laboratory equipment's

## II. CLASSIFICATION OF INLAND SURFACE WATERS (CPCB STANDARDS)

A' Outdoor bathing (organised)

B' Irrigation, industrial, cooling, controlled.

| S. No. | Characteristics | A' | B' |
|---|---|---|---|
| 1. | Dissolved Oxygen, mg/L, Min | 5 | - |
| 2. | Biochemical Oxygen Demand, mg/L, Max | 3 | - |
| 3. | Total Coliform Organisms*, MPN/100 mL, Max | 500 | - |
| 4. | Total Dissolved Solids, mg/L, Max | - | 2100 |
| 5. | Chlorides (as Cl), mg/L, Max | - | 600 |
| 6. | Colour, Hazen Units, Max | 300 | - |
| 7. | Sodium Absorption Ratio, Max | - | 26 |
| 8. | Boron (as B), mg/L, Max | - | 2 |
| 9. | Sulphates (as SO4), mg/L, Max | - | 1000 |
| 10. | Nitrates (as NO3), mg/L, Max | - | - |
| 11. | Free Ammonia (as N), mg/L, Max | - | - |
| 12. | Conductivity at 25$^{o}$C, micromhos/cm, Max | - | 2250 |
| 13. | pH value | 6.5-8.5 | 6.5-8.5 |
| 14. | Arsenic (as as), mg/L, Max | 0.2 | - |
| 15. | Iron (as Fe), mg/L, Max | - | - |
| 16. | Fluorides (as F), mg/L, Max | 1.5 | - |
| 17. | Lead (as Pb), mg/L, Max | - | - |
| 18. | Copper (as Cu), mg/L, Max | - | - |
| 19. | Zinc (as Zn), mg/L, Max | - | - |

Importatnt Waste Water Contaminants

| SR NO | Contaminant | Source | Environmental significance |
|---|---|---|---|
| 1 | Suspended solid | Domestic Waste | Cause sludge deposits and anaerobic condition in aquatic environment |
| 2 | Biodegradable organic | Domestic Waste | Cause biological degradation |
| 3 | Pathogens | Domestic water | Transmit communicable disease |
| 4 | Refractory organics | Industrial waste | Cause taste and odor problems |

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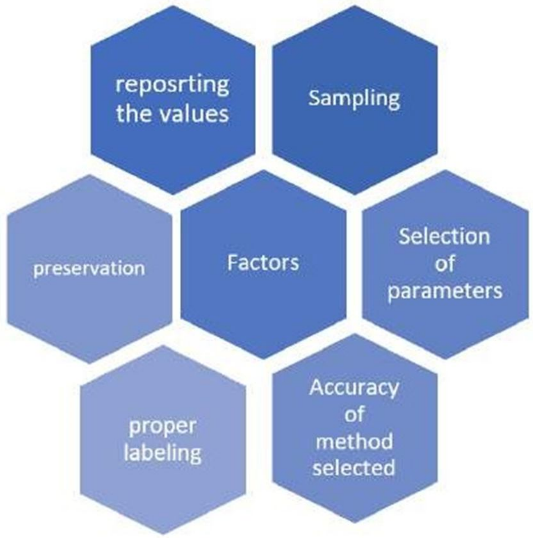
*A. Water Analysis -Key Factor*




*B. Study Area*

The study area is confined to STP Kanchanwadi, Aurangabad and nearby area for mass survey through google form. The data collected from STP office is useful to analyse rather the treated water fit for any other use or not.


Fig.16. Satellite image of the plant (captured from google earth)

*C. Objectives Of Study*

The objective of study was to assess and monitor the physicochemical parameters in wastewater at inlet and outlet of sewage treatment plant (STP) Kanchanwadi and also to study the effectiveness of the STP, so that we can dispose treated water safely in natural stream or reuse it.

We try to understand its waste to energy generation, waste reduction & treated water consumption in an economical way.

The ultimate goal of waste water management is the protection of the environment in a manner commensurate public health and socio-economic concern.

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## III. CONCLUSION

The STP is currently working well and farmers can use this water, as it cannot harm the crops, even increase the yield of crop. However, the irrigated crops should be of commercial purpose as people strongly opposed to use this water for farming food. The concept of waste to energy of the designer is a subject of appreciation. The treated water can also be used for recharging groundwater or for horticulture and planting trees on both sides of road of the area. This practice will definitely again help in reducing power consumption as no need for pumping water from ground for planting trees and for commercial crops irrigation, industries in surrounding area also demand for treated water for their inhouse production because they have to pay less.

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