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Characterization of Sewage & Design of Sewage Treatment Plant of Kinvhali, Shahapur

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A B S T R A C T

The main objective of this project is to build a 1.20 MLD capacity sewage treatment plant based on the activated sludge process with continuous aeration in Kinhavali village.

A study was conducted to assess the characteristics of the wastewater of Kinhavali village, such as physical and chemical analysis, and then the identification and construction of the wastewater treatment plant was carried out. Products related to pH, total waste, waste removal, explosives, waste, alkalinity, chloride, hardness, iron, toxic oxygen demand, toxic oxygen demand, sulphate, phosphate, ammonia nitrogen, nitrite, nitrate analysis.

The STP is designed to determine the maximum and average flow and maximum output. The main components are screens, sand chambers, primary leachate tanks, aeration tanks, secondary pumps, sludge digestion tanks and sludge drying beds. With the implementation of this project, all sewage in Kinhavali village can be treated effectively and efficiently.

Keywords: Design of sewage treatment plant, Sewage of Kinhavali village, Wastewater of Kinhavali village, Analysis of ph, Biological oxygen demand.

1. INTRODUCTION

1.1 General

Strengthening and improving the performance of poor quality materials or composite materials is called reinforcement. Home remodelling is not the same as repair or remodelling. Rehabilitation refers to the partial improvement of the strength of the buildings destroyed after the earthquake. In fact, this is just a cosmetic treatment. Renovation is an improvement work whose purpose is to restore the structure after the earthquake.

Retrofit refers to the improvement of buildings to meet needs after or before an earthquake. The target seismic performance of the reconstructed building is higher than the old building.

The increasing need for environmental pollution to clean wastewater has led to research on the properties of wastewater, especially domestic wastewater. The behaviour of wastewater is important for efficient and economical waste management. In order to determine the quality of wastewater discharged to the surrounding water or treated and reused, the characteristics of the affected wastewater should be clearly defined. 99.9% of domestic wastewater is water and 0.1% is evaporated material. About 2/3 of the waste is organic and mostly nitrogenous compounds, carbohydrates and fats. Inorganic compounds include chlorides, iron salts, ash, road sand, etc. is found. The main components of domestic wastewater include solids, chloride, alkalinity, biological oxygen demand, chemical oxygen demand, nitrogen, phosphate, sulphate, etc. is found. Biological oxygen demand (B.O.D) and suspended solids (S.S). BOD refers to the amount of oxygen used by the biochemical oxidation of organic matter. The amount of oxygen used is related to the duration and temperature of the process. Usually this is the five-day requirement at 20°C, expressed in milligrams per litre (mg/L). The main treatment is to remove suspended materials and floating materials from the sewage. It includes scanning to capture particles and gravity to remove waste. This level is sometimes referred to as "mechanical therapy," but medications are often used to speed up the resolution process.

BOD can be reduced by 20-30% with primary treatment and reduce total solids by approximately 50-60%. Primary treatment is the first step in water treatment.

Secondary treatment removes dissolved organic matter from the primary treatment. Secondary treatment is usually carried out by aquatic organisms in controlled areas. Separation is necessary to remove contaminants from treated water prior to discharge or tertiary treatment.

Tertiary treatment is sometimes defined as treatment other than primary and secondary treatment for spraying sensitive or sensitive ecosystems. Advanced purification can remove more than 99% of impurities from sewage, and the quality of the water is close to drinking water. Treated water is sometimes chemically or physically disinfected before it is released into streams, rivers or wetlands.

1.2 Need of the project

Currently there is no sewage treatment in Kinhavali village. The group built its own septic tanks as sanitary facilities. In some parts of the city, 2 Page water filtration is done manually or with toilets connected by open channels. Sewage waste causes unhealthy and ugly misery.

Sewer systems emit foul odours that provide a breeding ground for flies and insects. In this case, it is very possible to break the virus. Therefore, considering the above facts and the necessity of this suitable location, we propose a wastewater treatment/process.

1.3 Advantages & Disadvantages of Sewage Treatment Plant

1.3.1 Advantages

Sewage is a mixture of water and waste containing organic and inorganic wastes originating from various establishments for commercial, industrial or residential purposes. Therefore, it is necessary to clean the sewer.

Yes, sewage treatment (STP) is the best way to get rid of pollution and keep the environment healthy. The top 5 advantages/benefits of Sewage Treatment Plant (STP) are:

1. STP is a proven technology to work well.

2. Sewage treatment plants protect the natural environment from pollution.

3. STP meets the emission standards set by the government and is safe for health.

4. Installation is simple and easy, and plant operation and maintenance costs are low.

5.Upgrading the sewage treatment plant reduces risks to public health and the environment.

1.3.2 Disadvantages

Waste water treatment plants may not be suitable for every house, and there are some disadvantages that those who want to improve the system should consider. Some disadvantages of are:

1. Difficult to clean.

2. Most plants need at least three tanks.

3. Temperature changes affect the water tank positively.

1.4 Objectives and Aims of study

The main purpose of wastewater treatment is to treat wastewater, mainly from households and factories without harming human health or harming the natural environment. Ensure the safety of liquid waste in the environment. It is not expected to pose a risk to human health or harm the natural environment. Sewer, toilet, bathroom, shower, kitchen, sink, etc. into the well. includes household waste. Sewage also includes wastewater from industries and businesses.

The aims of this study are:

1. Physical, chemical and properties of Kinhavali

domestic wastewater.

2. Comparison with reference model

3. Construction of wastewater treatment plant:

• Inlet chamber

• Grate

• Sand chamber

• Aeration system including aeration tank, 4 flow 4 settling tanks

3. LITERATURE REVIEW

3.1 General

Puspalatha et.al (2016) reviewed on design approach for sewage treatment plant. A case study of Srikakulam greater municipality. The present study involves the analysis of parameters like BOD, raw sewage, effluent. The construction of sewage treatment plant will prevent the direct disposal of sewage in Nagavali river and the use of treated water will reduce the surface water and contaminated ground water.

Pramod Sambhaji Patil et.al.(2016) studied on design of sewage treatment plant for Dhule city. Some treatment units are designed like screens, grit chamber, storage tank, settling tank, aeration tank and skimming tank. The effluent can also be used for artificial recharge of ground water, flushing, foam control, fire protection, lawn sprinkling.

Murthy Polasa et.al (2014) reviewed about design of sewage treatment plant for gated community. In this project three types of treatment unit operations are conducted. Like physical, chemical and biological processes. By increasing the detention time of sewage in each treatment unit increases the efficiency of removal unwanted impurities.

Chakar Bhushan et al. (2017) reviewed about design of sewage treatment plant for Lohegaon village, Pune. This project studied that social and environmental pollution issue due to sewage is disposed in some part of village and directly sewage drain in open land. It is used for recharging sub surface water level at Lohegaon and used for irrigation purpose.

M. Aswathy et al. (2017) studied on analysis and design of sewage treatment plant of apartment in Chennai. This project is studied that domestic and commercial waste and removes the material with possess harm from generated public. To produce an environmental sewage fluid waste stream and solid waste suitable from disposal of use.

4. AREA OF STUDY

4.1 General

Providing a safe and healthy environment is the responsibility of the government organization, the residents and the environmental protection staff. Waste elimination and pollution reduction and prevention should be the best way. Strict penalties should be adopted for illegal waste disposal. Gurukul nagar kinvhali is one of the famous area in shahapur taluka thane district which has a large number of people living in its village. It consists of many buildings, blocks and a number of houses and buildings.

Sources of free water pollution from polluting sectors in the study area:

Location: Gurukul Nagar, Kinvhali

Water Source: All Barriers, bathroom waste, kitchen waste, water, Room/Toilet, Road Sewer, Gutter, Manholes and more

sewage treatment plant, etc.

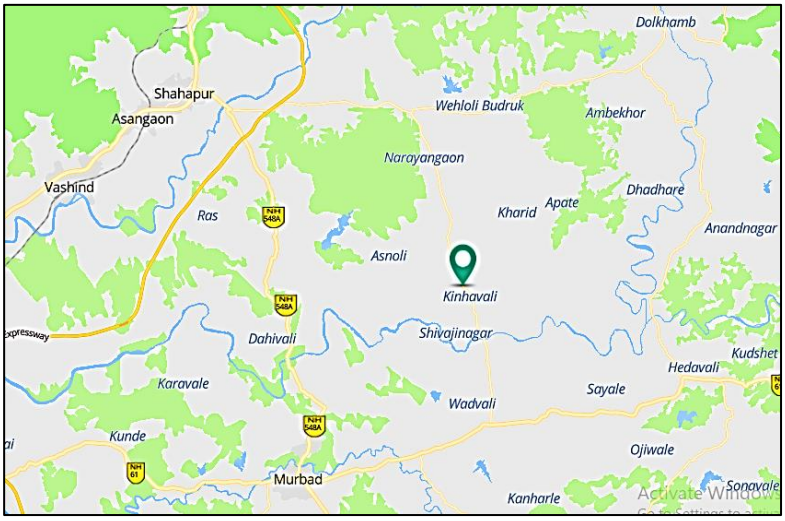

Fig. 3.1 Gurukul Nagar, Kinvhali.

4. BASIS OF DESIGN

4.1 Raw water treatment

Parameter	Unit	Value
pH	-	7.5
Biological oxygen demand	mg/l	210
COD	mg/l	400
Suspended solids (SS)	mg/l	340
Volatile Suspended Solids (VSS) (60%)	mg/l	204
Total Kjeldahl Nitrogen (TKN)	mg/l	40
Ammoniac Nitrogen (NH3-N)	mg/l	10
Total Phosphorus	mg/l	8

4.2 Treated Effluent Quality

Parameter	Unit	Value
pH	-	5.5-9.0
Biological oxygen demand	mg/l	30
COD	mg/l	250
Suspended solids	mg/l	100
Dissolved phosphates as (P)	mg/l	5.0
Total Kjeldahl Nitrogen (TKN)	mg/l	100
Total Coli Form	MPN/100 ml	50
Total Phosphorus	mg/l	1000
Temperature	°C	Shall not be exceed 5°C above

5. PROCESS DESCRIPTIONS

5.1 Raw Wastewater Main Pumping Station (MPS)

The main pumping station is to collect the sewage from all sewage and put it in the sewage treatment plant (STP) to enter the same park as the STP.

- Reception room
- Coarse screen
- Raw sewage pumping station

5.2 Waste water treatment plant

The wastewater treatment plant is based on the activated sludge process. However, the main process chamber (i.e. the part from the inlet to the sand chamber) is designed for medium flow.

- Inlet Chamber
- Fine Screening Station
- Sand Chamber
- Primary Clarifier Distribution Chamber
- Primary Clarifier
- Aeration Tank Distribution Chamber
- Aeration Tank
- Secondary Systems Clarifier

5.3 Sludge Treatment System

- Primary sludge pumping station
- ROV QAB activated sludge tank and pumping station
- Gravity sludge conditioner
- Anaerobic sludge separator
- Digester Feeding
- Digester Mixing
- Bioscience System
- Foam concentrator and pumping station
- Supernatant tank and pump station

6. RESULTS & DISCUSSION

6.1 Tabulation

Name of building	Capacity of tanks (in litres)				Total supplied water (in litres/day)
	1000	1500	2000	3000	
Yukta Apartment		18			27,000.00
Appabhanushali building		12			18,000.00
Vaikunth palace		10			15,000.00
Building no 01		6			9,000.00
Dhanke building		10			15,000.00
Dhanke building 2		12			18,000.00
Vishesh Home			1		2,000.00
More Home			1		2,000.00
Vishe 2 Home			1		2,000.00
Sase Home & store			1		2,000.00
Pratikasha Nivas Home				1	3,000.00
Chinmay Home			1		2,000.00
Sai Nivas Home			1		2,000.00
Aashirvaad Home			1		2,000.00
Ganpati Building		8			12,000.00
Kanakose Building		2	1		5,000.00
Another 22 Homes		22			33,000.00
Another 10 Building		108			1,62,000.00
5 building under construction	40	30	10	8	1,29,000.00
Waste water from Road areas, Manholes etc					10,60 0.00
TOTAL					**4,70,600.00**

6.2 Required Capacity of Plant

Average supply water per day = 470600 lit

Average sewage generated per day = 85% of supplied water

= 85% x 470600

= 400010 lit

i.e. Average Flow = 0.400 MLD

Average Flow (Qa) = 0.400 MLD

Average Flow per hour = (0.400 x 1000)/24

= 16.67 M3/hr

Peak Factor (Pf) = 3

Peak Flow = Qa x Pf

= 0.400 x 3

= 1.200 MLD

Peak Flow per hour = (1.200 x 1000)/24

= 50 M3/hr

Lean Factor (Lf) = 0.30

Lean Flow = Qa x Lf

= 0.400 x 0.30

= 0.12 MLD

Lean Flow per hour = (0.12 x 1000)/24

= 5 M3/hr

7. CONCLUSION

As per basis of design chart. After treating sevage waste water.

- PH range 5.5-9.0
- BOD 30mg/l & COD 250mg/l
- Suspended solid 100mg/l & dissolved phosphate as (P) 5mg/l
- Total kjeldahl nitrogen 100mg/l & ammonium nitrogen 50mg/l
- Total coli form 1000 MPN/100ml & temperature shall not be exceeding 5°c above the receiving water temperature treating waste
- Considering all these values we have prepared savage treatment plant designed
- Total amount of waste water treated = 0.423 MLD
- Provide Receiving Chamber (1 No) of Size 1.5 M L x 0.3 M W x 1 M SWD
- Provide Mechanical Coarse Screen Channel (1 NOS) of Size 2 M L X 0.3 M W X 0.40 M SWD
- Provide Manual Coarse Screen Channel (1 NO) OF SIZE 2 M L X 0.3 MW X 0.40 M SWD
- Provide Raw Sewage Pump House (1 NO) OF SIZE 2 M DIA X 1.50 M SWD
- Provide Inlet Chamber (1 NO) of size 1 M L x 0.3 M W x 1.50 M SWD
- Provide Mechanical Fine Screen (1 NO) of size 2.5 M L X 0.3 M W X 0.40 M SWD
- Provide Manual Fine Screen Chamber (1 NO SB) of size 2.5 M L X 0.3 M W X 0.4 M SWD
- Provide Manual Fine Screen Chamber (1 NO SB) of size 1.10 M L X 1.10 M W X 1 M SWD
- Provide Primary Clarifier Distribution Chamber (1 NO SB) of size 1.50 M L X 0.93 M W X 0.60 M SWD
- Provide Primary Clarifier (2 NO) of diameter 3.816 M X 3 M SWD
- Provide Aeration Tank Distribution Chamber (1 NO SB) of size 1.50 M L X 0.93 M W X 0.60 M SWD
- Provide Anoxic Tank (2 NO) of size 4 M L X 2 M W X 2 M SWD
- Provide Aeration Tank (2 NO) of size 8 M L X 2 M W X 2.5 M SWD

- Provide Secondary Clarifier (2 NO) of dia. 3.569 M X 3 M SWD
- Provide Gravity Sludge Thickener (1 NO) of dia. 2.5 M X 3 M SWD
- Provide Centrifuge of Capacity 0.383 M3/hr & Feed pump of Capacity 0.383 M3/hr.

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