



DESIGN APPROACH OF SEWAGE TREATMENT PLANT IN KATIHAR, BIHAR

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ABSTRACT

Due to the steady increase in the population of katihar city, this city is on the list of developing cities in Bihar. With the increase in population the result in the generating of the domestic sewage is increasing and still no proper facilities of sewage treatment plant are provided. The sewage treatment plant with all the requirements is very necessary to construct in that type of developing city. The sewage treatment plant is imparting its importance in the two different ways one is removing and other is receiving, firstly we all know that sewage treatment plant is intended to remove those materials which are ready to harm the human mainly general public and in receiving process it receives the waste which is categorized in domestic and commercial waste. This paper is well focused on the design purposes of sewage treatment plant for next 30 years in katihar city of Bihar. Producing environment friendly waste and disposal is the main aim of sewage treatment plant. Growing in environment pollution first thing is necessary to remove the waste water presence which is recognized in the waste water study mainly domestic sewage. New treatments were processing for controlling the priority pollutant when the pollution is increase in waste water. Taking to the past the limit of domestic waste treatment is only to

remove carbon. This type of treatment plant is mainly design for helping the human in removing, receiving and safety also. Including some processes like (physical, chemical, biological) to remove the contaminant depending on its constituent. With the help of advanced technology in this era reusing sewage discharge for our daily purposes is possible. The process which implies for the treatment of wastewater also protect both the environment and human throughout the removal of water pollutant. By processing different methods of treatment for water purification, it helps in getting the advanced technological world.

Keywords: Sewage, Treatment, Reusing, Technologies

INTRODUCTION

In the total world's population, about one quarter of the population is affected due to the proper facilities of water. The consumption of water resources is more when the population increase and due to more consumption availability of water is less concerning the population. The waste generated from urban areas in India is about 5 (bld) (billion litre per day) in 1947 and the generating of waste is increasing in 1997 by 30 bld. [1] By the calculation of (CPCB) 16 bld amount of wastewater is generated from the class I cities, the cities in

which the population is more than 1,00,000 and 1.6 bld amount of wastewater is generated from the class2 cities , the cities in which the population is between (50,000 to 1,00,000).[2] In developing countries the percentage calculation of generating wastewater is 80% and in India and China it is used for irrigation purpose . The wastewater is use in only 10% of the total world's largest irrigated area and because of this the wastewater can be use efficiently. The sewage treatment plant plays the role of a factory, which always prevents the environment from waste which is produced by human beings . STP (SEWAGE TREATMENT PLANT) sometimes is the only solution when the waste produced is beyond the limit of the environment to decompose. Cleaning of rivers, ponds the sewage treatment plant reduces the waste produces energy ordure and energy also. Not only in the current but also in future our water demand could be met by the use efficiency and demand management of it and for this either you say the waste quality of water or low quality of water the sewage treatment plant is only an emerging potential source for demand management after going through the treatment. The sewage treatment plant is also viewed as a source of water that helps in recharging ground water through the surface storage of treated water. Not only by human excrement and water a variety of chemicals can also be detected in sewage. One of the biggest challenges for sewage treatment plant is that the volume, physical, chemical and the limited quantity of pollutants and biological characteristics of sewage continuously change. On the other view there is also a change that the sewage treatment plant meet , as long term change in which all the information regarding the settle of sewage treatment plant is mentioned with the calculation of future expected of population that will live in that area. With all the various changes and proper lay down of sewage treatment plant still in urban area there is lack of proper civic amenities. Now, consider the urban population the percentage of getting better privileged sewage system is 35-40%. Without sewage treatment plant it is just like the changes that we create in the environment because not only for environment but also for us sewage treatment plant plays a important role in current and future also.

LITERATURE REVIEW

It is reported that the flow of sewage in Calcutta city was surveyed their manorial qualities. In terms of response sewage was normal marginally alkaline but in winter sewage contain the abnormal state of fundamental tones. Bicarbonate and chloride ions which were the present position of them is at toxic levels. The fact about rich in nutrient to toxicity level it is only possible by sewage effluents and sludge because the sewage discharge and sludge were rich in nutrient. About 97% of nation sewage in Venezuela is released in the form of crude into nature [4]. While, talking about sub - Saharan Africa a greater part of it is without the facilities of wastewater treatment. Taking the example of a developed middle eastern nation , Iran the sewage which has been infused in the Tehran's city ground water is not perfectly treated.[5] These are all viewed as the state of metropolitan drainage system as a basic base for removing both wastewater and water from the city. Because of this the condition of rainwater anticipate is unhygienic and also maintain a suitable strategic distance from damage and flood [6]. Sewage treatment is the only option where variety of procedures are planned and work with the goal i.e. the treatment process mainly for diminish the contamination burden level to the nature. Mainly in such manner exceptional is considered important for survey the effect of existing wastewater treatment offices in natural way. [7]. Indication of incorporate primary settling is found during secondary treatment due to chemical expansion. This is considered as a significant parts of tertiary Treatment measure.[11] The technique which is expected by the resarch centre to focus on the subject of pure chemical test and the plan of sorption to carbonate and hydroxide , is considered as a vital factors and are really preplexing 0.05mg/L limit anticipated is perform by full- scale framework.[12] . Assessing the impact of wastewater treatment facilities on the environment is also necessary.[7]

Design parameter:-

There are three units in the design of wastewater treatment plant.

Parameters	pH	BOD	COD	Oil grease	Solid	Total Coliform
Raw Sewage	6.5	296	550	40	560	100000
Effluent	5.5 - 9.0	<= 20	<= 250	<= 5	<= 5	<=1000

In the sewage scheme the laying of underground sewer pipe and the construction of treatment units is neither replaces nor increases its capacity easily because these are costly treatment units. To avoiding such type of complications the sewage quantity should be forecasted and ready to serve the community for a reasonable year. Mostly design of sewage treatment plant is of 25-30 years. Screening, grit removal and sedimentation are in primary treatment .A bioreactor is in secondary treatment. Sludge thickening, gravity thickening and drying beds these are in sludge treatment.

The stream rate and concentration of water are changed in a day at different events and these are exposed to occasional varieties.

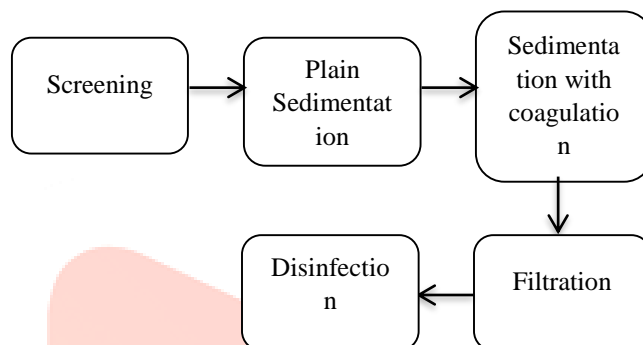
Example:-

Both the flow rate and the value of BOD are high in the first part of the day and in rainy season because of the surface overflow strong substance are more.

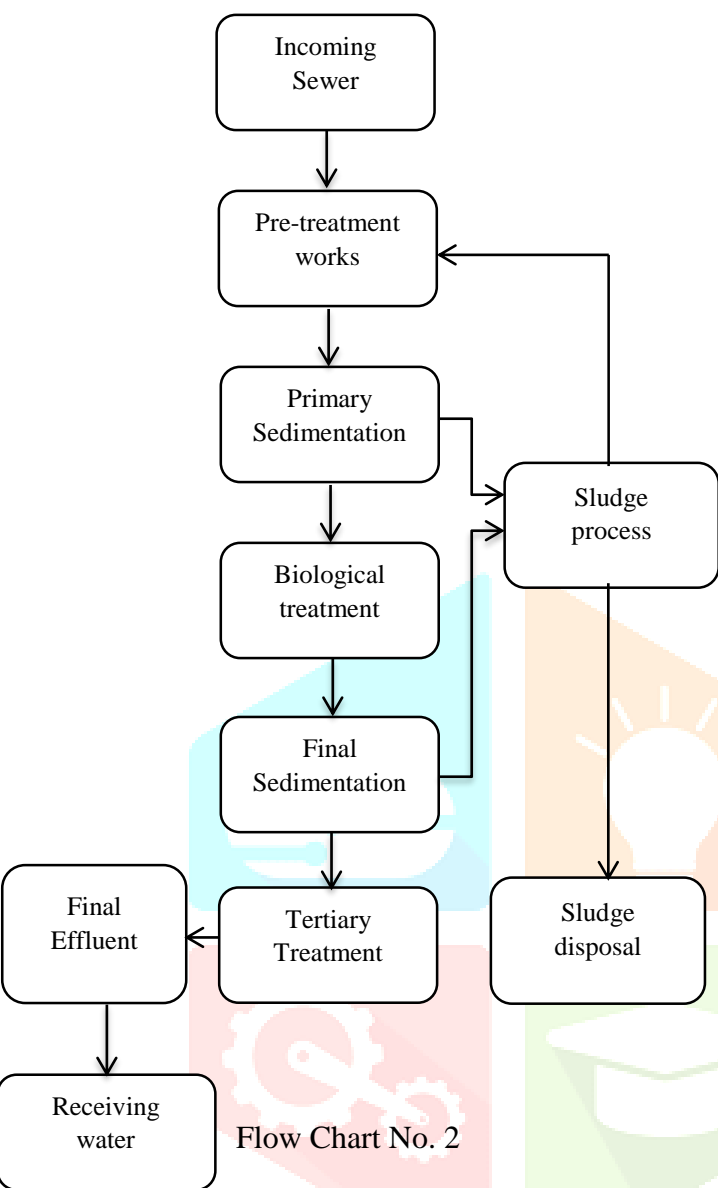
LOCATION OF TREATMENT PLANT AND DESIGN CONSIDERATION:-

The distance between the treatment plant and the point of disposal should be near. Not only for the design concept, if the disposal is disposed into river, the treatment plant is located at the near of the bank as possible. All the requirements for the design process of the treatment plant are well checked in all point of view either it is the matter of the location of site or design of site because it is

necessary that the site is on the downstream side of the city and away from water intake works. The position of treatment plant should be placed in such a way by which the treated sewage is easily follow under gravitational force towards the disposal point. Far away from the crowded area and town for the position of treatment plant , the purpose is only for the better design and better process of treatment plant. Also it is very necessary to assess that so much distance from the town is not appropriate for the design of treatment plant because it helps in reducing the length of sewer line.



Flow Chart No.1



Flow Chart No. 2

Maximum discharge in cumec	0.924 cumec
Dimension of coarse screen	1.2m x 0.7m(SWD)+0.5(FB)
Dimension of fine screen	3.2m x 0.8m(SWD)+0.5m(FB)
Dimension of grit chamber	5.7m x 6m x 3m
Dimension of Receiving chamber	6m x 3m x 4m(SWD)+0.5(FB)
Dimension of Skimming tank	1.5m x 1m x 3m+0.5(FB)
Dimension of primary sedimentation tank	56.9m dia x 3.5m depth + 0.5m (FB)
Dimension of aeration tank	97m x 20m x 15.5m + 0.5m(FB)
Dimension of secondary sedimentation tank	43m dia x 22.5m depth + 0.5m(FB)
Capacity in dry well in stabilization tank for 2 no. of pump house	150.10 MLD
Dimension of sludge drying beds for 5 no's	12.5 m x 8m

Table No

Design Parameters	Value
Design Period	30 years
Estimated Population by year 2050	33492017
Water Supply per capita	135 L/h/d
Average sewage generation per day	3617.12MLD
Average discharge in cumec	0.308 cumec

Design considerations:-

- 1):- The design period of the treatment plant is mainly between 25-30 years.
- 2):- It is not easy to do the configuration on hourly sewage stream basis.
- 3):- Providing a single major unit to the treatment is not so good in comparison to providing two little units which never stop the maintenance as well as repair of plant.
- 4):- The self-cleaning process by velocity should develop at every place of plant.
- 5):- Time completion should not exceed more than 2-3 years.
- 6):- All the sufficient accommodation should be provided for all the important units.

STUDY AREA



Fig No.1: Satellite image of the working area in Katihar Bihar

In our project we all work on a particular area of our district. Latitude is 25°32'18" and longitude is 87°34'13" of katihar district. The altitude of katihar from sea level is 111 feet . Widespread rainfall always in katihar during monsoon and climate of katihar is nearly moderate. The daily maximum and minimum temperature of katihar is 24.6°C minimum and 40°C maximum sometimes the temperature also varies and it reaches nearly about 48 to 50°C mainly in summer humidity its also varies . An assuming value is 25% minimum humidity and 42% maximum humidity. Average annual rainfall in katihar is 1281 mm

Materials and Methods:-

The population is calculated for upcoming 30 years from the last year in which census is done.

By incremental increase method

$$P_n = P_o + n \times x + n \times n + 12 \times y$$

METHODOLOGY

1):-Calculation of sewage:-

After collecting data by calculating population from the incremental increase method calculation of sewage generation is also required.

2):- Design of Receiving Chamber

The main work of receiving chamber is to receive sewage from different building. The detention time of receiving chamber is 60 second by using design flow. To check the design of receiving chamber volume design should be greater than volume required and a free board should be provided.

3):- Design of screening:-

The velocity is not allowed to exceed 0.8 m/s in average flow in a coarse screen. The coarse screen consists of raw sewage which generally passes through the bar screen only for the purpose of trapping and removing floating matter. Also the velocity at peak screen should not exceed twice the velocity at average flow.

4):- Design Calculation of fine screen:-

The velocity at average flow is 0.8 m/s but in fine screen the velocity at the peak is two times the average velocity. The Screen is placed at an appropriate angle.

5):- Design Calculation of Grit Chamber:-

Detention time is three minute, length is also assumed to increase for the purpose of inlet and outlet. Routine cleaning and maintenance are also provided.

6):- Design Calculation of skimming tank:-

Removing oils and grease from sewage is the main aim of skimming tank.

7):- Design Calculation of Primary Sedimentation Tank:-

The maximum quantity of sewage, surface loading, and detention period is in the primary sedimentation tank.

8):- Design of Aeration Tank:-

The main aim is to calculate design flow, BOD at the inlet and outlet. The shape of aeration tank is rectangular.

9):- Design Calculation of secondary sedimentation tank:-

Design as the primary sedimentation tank, inflow of secondary sedimentation tank is calculated by taking in the consideration of which it is returned to.

10):- Design Calculation of stabilization tank:-

The aim is to reduce pathogens and eliminate the offensive odors, control of purification of organic matter.

11):- Design Calculation of sludge drying beds:-

Some points are considered the rate of sludge applied in drying beds, the specific gravity of sludge, solid contents and consideration of the region in which the treatment plant is constructed.

Treatment of sewage:-

There are many processes in sewage treatment plant for the removal of different parameters which are present in wastewater. The level of treatment is mainly depending upon the attributes of raw sewage, influent and effluent. The classifications of sewage treatment process are follows:-

1):- Preliminary Treatment

2):- Primary Treatment

3):- Secondary Treatment

4):- Tertiary Treatment

Preliminary Treatment:-

The main objective of preliminary treatment is to remove the large materials which are frequently seen in waste water like coarse solid. The procedure of preliminary treatment is usually contained grit removal, coarse screen, fine screen and a combination of large objects. Due to this process there is a decrease in wastewater BOD, by approximately 15-30%. Grit chamber and communicator are the devices that are used during this treatment.

Primary Treatment:-

Removing of large suspended organic solid in settling basin primary treatment is usually accomplished by sedimentation. A large amount of suspended organic material and high BOD is often contained in the liquid effluent from the primary treatment. (About 60% of original)

Secondary Treatment:-

After the primary treatment this treatment is used for completing the cleansing process. Removal of biodegradable, colloidal or organic matter is in this treatment. The process which decomposes organic matter by bacteria is an aerobic biological secondary treatment process. A little BOD of (5% to 10% of original) is containing in the effluent coming from secondary treatment and also contains several mg/l of DO.

Tertiary Treatment:-

The main objective of this treatment is to remove the constituent particles that cannot remove by secondary treatment. The purpose of tertiary treatment is to give the last treatment stage just for raising the emanating quality before discharging to accepting climate, Example of Receiving environment (sea, river, lake, ground etc). At any treatment plant, more than two tertiary treatments may be used. In this treatment the procedure of wastewater treatment stages schematically.

RESULT AND DISCUSSION

The population of India is increasing day by day but the proper facilities of sewage treatment plants are not everywhere. An estimated of 80% wastewater is generated by the developing countries. Still with this high percentage of generating wastewater the facilities of the treatment plant is not provided in some part. Let think about the impact of sewage treatment plant if it is designed in every part. Firstly, the consumption of ground water is reduced because of treated water which is treated by the sewage treatment plant. The treated water is not only for the purpose of reducing ground water consumption; it also helps in the purpose of irrigation when the water is perfectly treated by the treatment plant. The sewage treatment plant provides a better impact on the environment also. The design area of the sewage treatment plant is fully viewed with respect to design criteria. In this paper the well-designed sewage treatment plant is done by our group. The treatment plant which is perfectly design by our group meets the future expansion for the next 30 years. The impact of sewage treatment plant is not bad on the environment. Helping us in fulfilling the requirements of valuable assests of life i.e.

water and provide a friendly impact on the environment the sewage treatment plant is designed in every place where the facilities of it are not provided till now.

CONCLUSION

A plan for the wastewater treatment plant and the executives of sewage produced from katihar city were analyzed by our group. The area where in the treatment plant is planned gives a superior effect, similarly as we say environment friendly. The treatment plant design is helpful in the very important purpose of our life. The first point is the design of the treatment plant saves the consumption of valuable assets of life i.e. the consumption of ground water will reduce when the treated water is treated perfectly and utilized. Not only for reducing the consumption, but sewage treatment plant also helps in irrigation purposes when the water is perfectly treated. The treated sludge which is utilized as compost assists with expanding the fruitfulness of soil. All the important component of the sewage treatment plant, designing of screening, receiving chamber, skimming tank, primary sedimentation tank, aeration tank, secondary sedimentation tank, stabilization tank and sludge drying beds all the components are well designed with respect to the population. The design of site is also checked perfectly to meet the design criteria of sewage treatment plant.

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