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Design of Surge Tank for Village, Dongaon MH. India

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ABSTRACT: A study on waste water characterization of surge tank will be performed followed by the design of surge tank. The whole project study involves the analysis of pH value. The solids, total suspended solids, alkalinity, BOD, COD oil and grease. A surge tank is quite necessary to receive the houses and other waste and removes the materials which pose harm for general public. Its objective is to produce an environmentally safe fluid waste stream (or treated effluent) and a solid waste (or treated sludge) suitable for disposal or reuse (usually as from fertilizers).

The present work effort has been made to design surge tank to cater to need of up to the year of village for which population forecasting, sampling and analysis, selection of site, degree of treatment required, design of surge tank and estimation of the cost will be under taken. The samples were collected from the various parameters. The work also involve selection of method of treatment on efficiency and cost.

The main purpose of surge tank processes is to remove the various constituents of the polluting load. Solids, organic; nutrients, inorganic salts, metals, pathagens, etc. effective waste water collection and treatment are of great importance from the stand point of both environmental and public health.

Waste water treatment operation are done by surge tank method in order to reduce its water and organic content. And the ultimate goal of waste water management to protection of the environment in the manner commensurate with public health and socioeconomic concerns. In this report waste water treatment techniques, *factors affecting, selection and design waste water system are discussed briefly.*

KEYWORDS Surge tank, BOD, COD, Management of waste water

I. INTRODUCTION

The objective in domestic wastewater treatment is to provide a low cost process that is reliable meeting effluent quality standards. Surge tank is the process of removing contaminants from wastewater; primarily from house hold sewage physical, chemical and biological process are used to remove contaminants and produce treated waste water that is safer for the environment.

This paper presents the technical aspects of the design for surge tank with a capacity of 144 cubic meters (cm³) per day in Dangoan of MH India. The population increasing day by day and people are facing many diseases. So, it is needed to construct surge tank at place where sewage water meets to the tank.

II. METHODS OF FORECASTING POPULATION

- A. Arithmetical increase method.
- B. Geometric increase method.
- C. Incremental increase method.
- D. Decrease rate method.
- E. Simple graphical method.
- F. Comparative graphical method.
- G. Logistic curve method.

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A. Arithmetical increase method:

In this method it is assumed that for all the decades the birth rates, death rates are constant. The following equation is used for the Arithmetic method:

$$P_n = P_o + (n * i)$$

Where, P_n = Population after n^{th} decade

P_o = Present population

n = Number of decades

i = Growth rate of population per decade

Year	Population	Population increase
1991	1990	-
2001	2340	350
2011	2935	595
Total growth of population		=350+595 =945
Average increase population	=473	
$P_n = P_o + (n * i)$		

Census Year	Forecast of Population $P_n = P_o + (n * i)$	
2021	$2935 + 1 * 473$	3408
2031	$3408 + 1 * 473$	3881
2041	$3881 + 1 * 473$	4354

The probable population in the year 2021, 2031 and 2041 of the given region would be:

2021	3408
2031	3881
2041	4354

B. Geometrical Increase Method:

In this method, it is assumed that the rate of growth is proportional to the increase in population. Following equation is used to calculate the growth of population:

$$P_n = P_o * (1 + i/100)^n$$

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Census Year	Population	Population increase	Percentage increase in next decade
1991	1990	-	-
2001	2340	350	350/1990 *100=17.58%
2011	2935	595	595/2340 *100=25.42%
Total increase		945	43% increase

Census Year	Probable (expected) population
2021	2935+ 17.58/100 *2935= 3450
2031	3450+ 17.58/100 *3450= 4056
2041	4056+ 17.58/100 *4056= 4769

So the population in the years 2021, 2031 and 2041 are as follows:

2021	3450
2031	4056
2041	4769

C. Incremental increase method:

In this method, both Arithmetical and Geometrical increase of population is taken into account. This method gives almost accurate results because for the future decades the addition is made at an average rate for two consecutive decades. The equation used for the calculation is as follows:

$$P_n = P + n (I_a + I_c)$$

Where,

I_a = Avg. Arithmetic increase

I_c = Avg. Incremental increase

Year	Population	Increase by Arithmetical increases	Increase by population incremental increase
1991	1990	-	-
2001	2340	350	-
2011	2935	595	245
Total increase		945	245
Average increase		475.5	245

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Population at the end of next decade	Formula	Probable population
2021	$2935+1(473+245)$	3659
2031	$3653+1(473+245)$	4371
2041	$4371+1(473+245)$	5081

So, the population in the year 2021, 2031 and 2041 would be as follows:

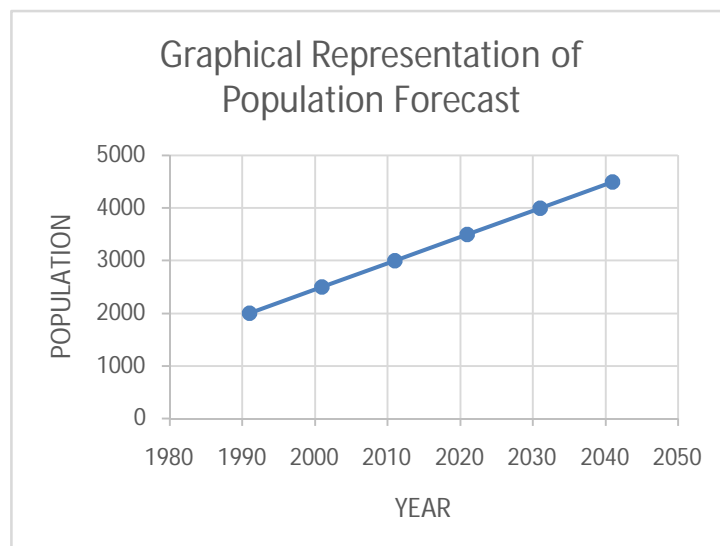
2021	3408
2031	3881
2041	4354

3.Population Forecasting-

Forecasting method	Population in year		
	2021	2031	2041
Arithmetical increase method	3408	3881	4354
Geometrical increase method	3450	4056	4769
Incremental increase method	3653	4371	5081

The large value of population is obtained from incremental increase method. Hence, this method to be taken to calculate quantity of sewage generated.

Graphical Representation of Population Forecast:



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4. Quantity of Sewage:

Population as calculated by incremental increase method- 5081.

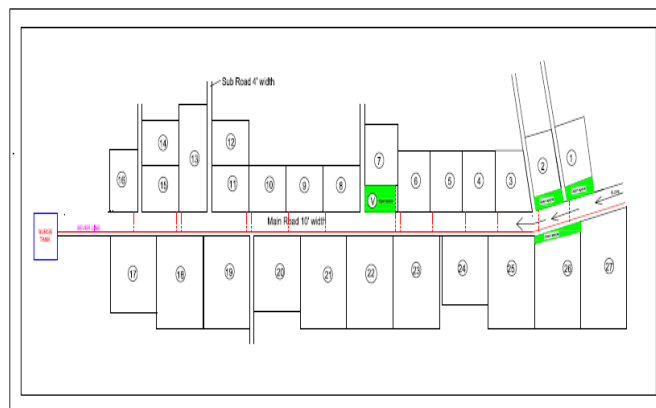
Sewage- 85Lit/day/capita

$$\begin{aligned} \text{Quantity of effluent in Lit/day} &= 85 \times 5081 / 3 \\ &= 143961.67 \end{aligned}$$

$$\begin{aligned} \text{Volume of Sewage} &= 143962 / 1000 \\ &= 144 \text{m}^3 / \text{day} \end{aligned}$$

Volume of Sewage= 80% wastes.

5. Design of Surge tank drawing using Auto-cad:



6. Design of screen chamber or bar screen:

$$\text{Total flow of Sewage} = 144 \text{m}^3 / \text{day}$$

Standing period of screen chamber is 10 minutes

$$\text{Volume of Screen chamber} = 6 \text{m}^3$$

If we consider screen chamber of 1.5m height. The size will be 2*2*1.5m

7. Design of filter media or Treatment tank:

$$\text{Total flow of Sewage} = 144 \text{m}^3 / \text{day}$$

Standing period of filter media is 2hours

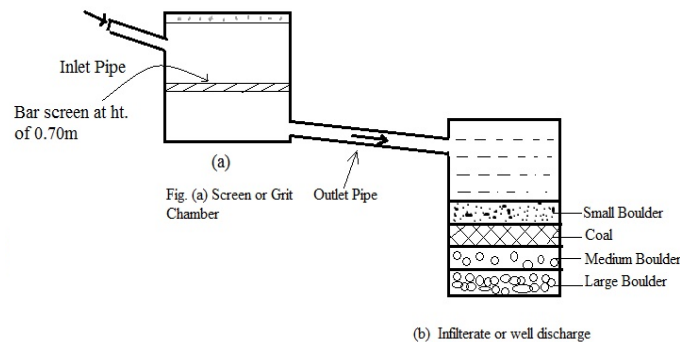
If we consider height of filter media or treatment tank 1.5m then the diameter will be 1.5m

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VIII. CONCLUSION

The technical project involves integration of various fields. This report has combined all the aspects of environmental, chemical, biological and civil engineering. The tank is designed to meet future expansion for next 30(2041) years population of 5081. This project consists the design of complete components of a wastewater treatment tank from receiving chamber, screening chamber. The construction of waste water treatment tank will prevent the direct disposal of waste water from Dongoan village. The components of surge tank are modified to make it cost effective. Readily available material are used to purify the water before discharging it into well or allowing it to infiltrate it into the ground The usage of treated water will be reduce the surface and ground water contamination.

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