Vertical Sewage Treatment Unit With Polyethylene Based Filter

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ABSTRACT

This paper represents the design and development of vertical small scale sewage treatment unit. The effects of sewage on the environment are largely negative. Alternatively, leaking or flooding can cause completely untreated sewage to enter rivers and other water sources, causing them to become polluted.

As considering global environment and their effect on human as well as nature is too hazardous. So considering all those parameter we are design a small, efficient and affordable treatment unit for rural area. After considering problems of conventional unit it required more space and manpower subsequently electricity, we are suggesting a compatible and convenient unit which will ensure hygienic environment

To increase the efficiency of treatment unit and also increase the rate of water flow. With the help of polyethylene based filter media we can increase the filter capacity as well as efficiency of unit. Using 5 mm polyethylene we can provide sufficient area to achieve greater efficiency and also reduce the settling depth for colloidal and dissolved particles. According to principle of filtration it needs to provide lesser depth to settle least particle earlier at the bottom of polyethylene subsequently it will reduce process time. After water passing through a set of polyethylene, provided a chamber to neutralize Ca^- and Mg^- into Ca^+ and Mg^+.

To achieve greater efficiency and more rate of flow we have designed a whole unit in a vertical manner so it will work effectively at low cost, and will be run by only few people.

I INTRODUCTION

Day by day pollution is increasing due to each and every human activity, In that many parameters are covered like management of waste water, proper disposal of solids and all. And also main problem is starting from our home itself. There is many diseases are arises from waste water like cholera, malaria, Diarrhea and many more. The origin of the diseases is our daily waste water.. And also one of the most critical problem is that to convey waste water from apartment to treatment unit, many disturbances, blockage of sewer, over sewage etc. is there.

We are going to introduce such a vertical small scale sewage treatment unit, we may say as compatible treatment plant. We can install at your own home, apartment, society, region and village also. i.e. **"Vertical Small scale sewage Treatment unit"**

As per other country, especially Israel is concern they reuse each drop of waste water from domestic as well as commercial waster. From the inspiration of Israel we are going to develop a model.

As per our sanction authority concern we have to provide Rain water harvesting details along with Plan similarly in future it may happened that we need to provide Waste water disposal unit along with plan.

Because day after day sanctioning authority changes their policies and all.

So after considering this scenario,

We design such a compact unit which will treat waste from whole apartment itself. In that we trying to run every unit on gravitational force.

Wastewater from households is conveyed by the sewerage system to sewage treatment plants for safe and economic treatment of sewage, and treatment and disposal of the resulting sludge.

Domestic wastewater will contain both solid and dissolved pollutants including faucal matter, paper, urine, sanitary items, food residues and a variety of other contaminants. The sewer network will usually also receive wastewaters from office and commercial properties. The main aim of project is to reduce the scale of sewage treatment unit here we are installing vertical sewage treatment plant, reuse the water which is flowing due to gravity.

II PROBLEM STATEMENT

Untreated wastewater can spread disease and contaminate drinking water sources. But most Americans give little thought to what happens to their wastewater, and the availability of safe, clean drinking water is often taken for granted. Cholera and other wastewater-related diseases are generally viewed as threats only

1. Domestic or sanitary wastewater. This comes from residential sources including toilets, sinks, bathing, and laundry. It can contain body wastes containing intestinal disease organisms.
2. Industrial wastewater. This is discharged by manufacturing processes and commercial enterprises. Process wastewater can contain rinse waters including such things as residual acids, plating metals, and toxic chemicals.

Wastewater is treated to remove pollutants (contaminants). Wastewater treatment is a process to improve and purify the water, removing some or all of the contaminants, making it fit for reuse or discharge back to the environment. Discharge may be to surface water, such as rivers or the ocean, or to groundwater that lies beneath the land surface of the earth. Properly treating wastewater assures that acceptable overall water quality is maintained.In many parts of the world, including in the United States, health problems and diseases have often been caused by discharging untreated or inadequately treated wastewater. Such discharges are called water pollution, and result in the spreading of disease, fish kills, and destruction of other forms of aquatic life. The pollution of water has a serious impact on all living creatures, and can negatively affect the use of water for drinking, household needs, recreation, fishing, transportation, and commerce.

III IMPORTANCE OF SEWAGE TREATMENT

The sewage treatment plant is physically, biologically and chemically clean &safe to discharge back to environment.

Methodology

1.Primary sedimentation tank

The sewage passes into large sedimentation tanks to provide a quiescent settlement period of about 8 hours. Most of the solids settle to the bottom of the tanks and form a watery sludge, known as 'primary sludge', which is removed for separate treatment. The sewage remaining after settlement has taken place is known as 'settled sewage.

2.Areation

Aeration is the most important operation in activated sludge process .For aeration air diffusers are used .oxygenates the mixed liquored provide adequate mixing in agitation so that mix liquor suspended solids and available for the biological activity

3. ASP

Anaerobic processes are biological treatment processes that occurs in the absence of dissolved oxygen. the bacteria that can survive only in the absence of any dissolved oxygen are known as anaerobic bacteria. And methane gas are produced in this syatem

4.Filtration

Generally For filtration slow sand and rapid sand filtration are used, we change the filter media by using polyethylene based filter media to increase the filter capacity as well as efficiency of unit. Using 5 mm polyethylene we provide sufficient area to achieve greater efficiency and also reduce the settling depth for colloidal and dissolved particles.

5.collection of clear water

In this tank clear water are collected.

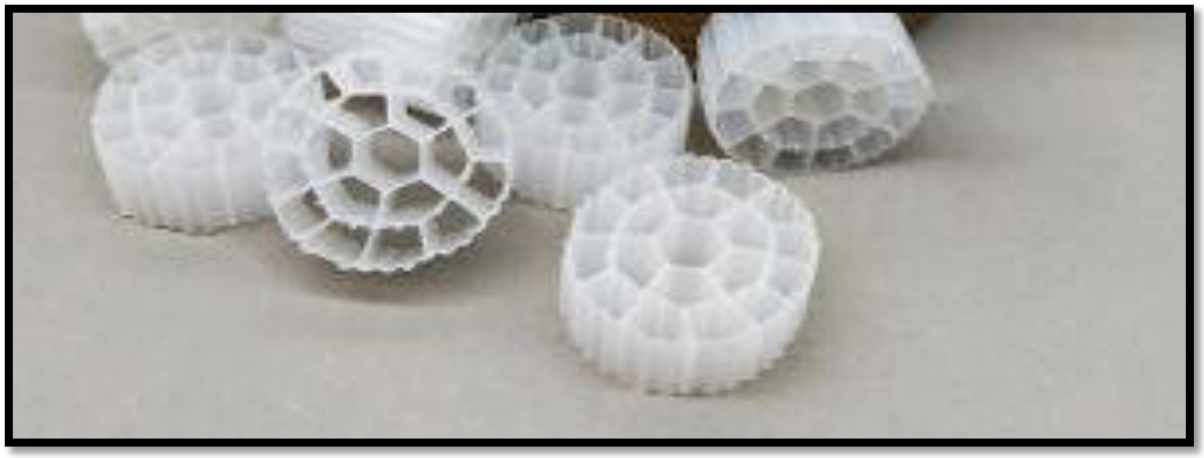
IV METHODOLOGY

Filteration

The resultant water after sedimentation will not be pure, and may contain very fine suspended particles and bacteria in it. To remove or to reduce the remaining impurities still further, the water is filtered through the beds of fine granular material, such as sand, etc. The process of passing the water through the beds of such granular materials is known as Filtration.

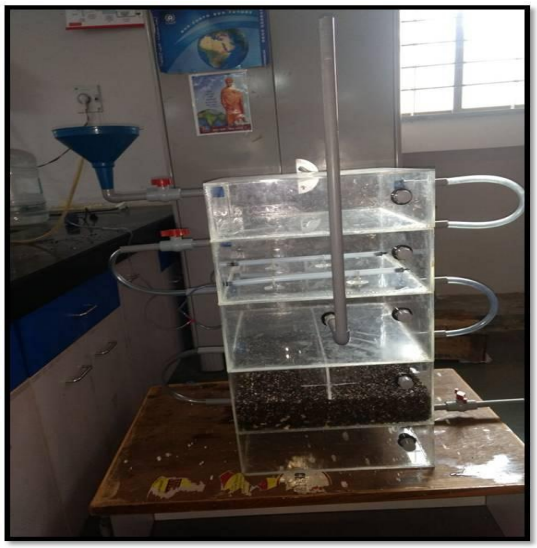
Principle of Polyethylene based filtration

- In a slow sand filter impurities in the water are removed by a combination of processes: sedimentation, straining, adsorption, and chemical and bacteriological action.
- During the first few days, water is purified mainly by mechanical and physical-chemical processes. The resulting accumulation of sediment and organic matter forms a thin layer on the sand surface, which remains permeable and retains particles even smaller than the spaces between the sand grains.
- As this layer (referred to as "Schmutzdecke") develops, it becomes living quarters of vast numbers of micro-organisms which break down organic material retained from the water, converting it into water, carbon dioxide and other oxides.
- Most impurities, including bacteria and viruses, are removed from the raw water as it passes through the filter skin and the layer of filter bed sand just below. The purification mechanisms extend from the filter skin to approx. 0.3-0.4 m below the surface of the filter bed, gradually decreasing in activity at lower levels as the water becomes purified and contains less organic material.
- When the micro-organisms become well established, the filter will work efficiently and produce high quality effluent which is virtually free of disease carrying organisms and biodegradable organic matter.
  They are suitable for treating waters with low colors, low turgidities and low bacterial contents.



Polyethylene Filter

Working of Model-



Model for Polyethylene filter

V RESULT AND DISCUSSION

Sewage treatment is the process of removing contaminants from wastewater, primarily from household sewage. Physical, chemical, and biological processes are used to remove contaminants and produce treated wastewater (or treated effluent) that is safer for the environment.

Sewage treatment may also be referred to as wastewater treatment. However, the latter is a broader term which can also refer to industrial wastewater. For most cities, the sewer system will also carry a proportion of industrial effluent to the sewage treatment plant which has usually received pre-treatment at the factories themselves to reduce the pollutant load. If the sewer system is a combined sewer then it will also carry urban runoff (stormwater) to the sewage treatment plant. Sewage water can travel towards treatment plants via piping and in a flow aided by gravity and pumps. The first part of filtration of sewage typically includes a bar screen to filter solids and large objects which are then collected in dumpsters and disposed of in landfills. Fat and grease is also removed before the primary treatment of sewage

Table- BIS Recommendation along with effluent and influent characteristics

Sr. No	Parameter	BIS Recommendation	Effluent Characteristics	Influent Characteristic
1	**P^H**	6.5to 7.5	5	6.5
2	**Total solid**	300 to 500	1500	350
3	**Phosphate**	50	75	55
4	**DO**	10	2	8
5	**BOD**	30	55	35
6	**COD**	300	400	350
7	**Electrical Conductivity**	10000	35000	15000
8	**SVI**	50 to 150	200	180

9	**Nitrarites**	10	35	20
10	**Chromium**	2	8	3.5

VI COST ESTIMATION

As considering the sewage treatment unit in Tapowan ,Nashik , We compare the total expenditure according to effluent quality and quality parameters.

So we are ensure about environment and healthy life of commuters The equations provide a convenient way to develop the preliminary cost estimates of water treatment processes for economic comparisons of project alternatives during the planning phase of the project. Such estimates do not represent the actual construction and operation and maintenance costs of the project. Actual project costs are site-specific, cannot be generalized, and must be developed for individual circumstances

Table- Cost comparison with Tapowan STP, Nashik

Sr. No	Conventional Treatment Unit (STP, Tapowan, Nashik)	Vertical Polyethylene Based Treatment Unit
1	Quantity= 1 mld	Quantity= 1 mld
2	Area required 5.5 acre	Area required = 10x10m for each tank
3	Manpower= 6 person	Manpower= 2 person
4	Electricity = 200 kWh/d/*MLD*	Electricity = 50 kWh/d/*MLD*
5	Cost= 10 Cr	Cost= 50 lakh
6	Efficiency= 75 %	Efficiency= 85 %
7	Working capital= 35000 per day	Working capital= 5000 per day

VII CONCLUSION

As sewage water is concern, the quality of sewage effluent at discharge should be clear and characteristics of water within limit. While treatment of sewage under vertical polyethylene based treatment unit will never produce toxic by product and which achieves higher efficiency at minimum cost.

As considering the population of every taluka places and having population is up to 15000, we can easily install such kind of unit in that area subsequently will reduce the water born diseases, ultimately will ensure hygienic environment.

According to conventional treatment unit which consumes more space and required more electricity to run same unit, We are introducing a such compatible polyethylene based treatment unit to achieve greater efficiency at minimum cost

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