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Black Water Filtration by using Sodium Compound

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ABSTRACT: Black water is the mixture of urine, feces and flushwater along with anal cleaning water or dry cleaning materials. black water requires biological or chemical treatment and disinfection before reuse by which can save the maximum water .if the black water or grey water is reused then the ground water minimizes and increases the level of water. Black water is any wastewater that is contaminated with water discharged from a toilet ,bathtubs, washing machine and kitchen sinks.after the black water filtration .we can reuse for various purposes like car washing, gardening,floor washing plantation and for irrigation purposes.

In black water filtration the materials which is used locally available the materials used in it , limestone, charcoal,fine sand and coarse sand ,sodium dichloroisocyanurate as well as there is no need of electricity for filtration so it is very economical .in black water filter the five steel tanks are used of size 18cm × 30 cm..

In first storage tank black water can be stored as a source , sedimentation tank is a tank in which water can be distributed condition for 30 min by adding sodium dichloroisocyanurate in it which helps to settle down the impurities.this impurities is used to making the fertilizer and this fertilizer used for agricultural land and garden plantation land..after the sodium compound added in water .next process the valve of sedimentation tank open and water can be entered into the filtration tank and in this tank limestone and sand is used as filter media.size of limestone is 2.5cm and sand size is 2.36mm retained in IS sieve second filtration tank use charcoal and size 2.5cm and fine sand is used.

The charcoal and fine sand can help to remove the impurities . charcoal can remove colour ,odour, iron, manganese and oil then the water can pass into a disinfection tank in which potassium permanganate is used for disinfection the tank is connected to a pipe of this type the filtration process can be done..

I. INTRODUCTION

1.1 General Introduction:-

BLACK WATER :-

Blackwater is the mixture of urine, feces and flushwater along with anal cleansing water (if water is used for cleansing) and/or dry cleansing materials. Blackwater contains the pathogens of faeces and the nutrients of urine that are diluted in the flush water.

Blackwater in a sanitation context denotes wastewater from toilets, which likely contains pathogens. Blackwater can contain feces, urine, water and toilet paper from flush toilets. Blackwater is distinguished from greywater, which comes from sinks, baths, washing machines, and other kitchen appliances apart from toilets. Greywater results from washing food, clothing, dishes, as well as from showering or bathing.

1.2 Objectives :-

The objective of Waste Water Treatment:-

- To remove harmful bacteria, to make water safe and attractive for drinking and domestic purposes.
- Design of the treatment plant for a specific water treatment requirement.
- Installation and set-up of the whole plant on a small scale.

II. LITERATURE REVIEW

1. George W. Fuller

George Warren Fuller (December 21, 1868 – June 15, 1934) was a sanitary engineer who was also trained in bacteriology and chemistry. His career extended from 1890 to 1934 and he was responsible for important innovations in water and wastewater treatment. He designed and built the first modern water filtration plant, and he designed and built the first chlorination system that disinfected a U.S. drinking water supply. In addition, he performed groundbreaking engineering work on sewage treatment facilities in the U.S. He was President of both the American Water Works Association and the American Public Health Association, and he was recognized internationally as an expert civil and sanitary engineer.

2. Manoj N Hedaoo, Anand G Bhole, Nitin W Ingole,

Yung-Tse Hung Handbook Of Environment And Waste Management: Air and Water Pollution Control, 431-473, 2012 The basic function of wastewater treatment is to speed up the natural processes by which water is purified. There are two basic stages in the treatment of wastes, primary and secondary, which are outlined here. In the primary stage, solids are allowed to settle and removed from wastewater. The secondary stage uses biological processes to further purify wastewater. Sometimes, these stages are combined into one operation.

3. Karin Larsdotter

Vatten 62 (1), 31, 2006 Microalgae can be used for tertiary treatment of wastewater due to their capacity to assimilate nutrients. The pH increase which is mediated by the growing algae also induces phosphorus precipitation and ammonia stripping to the air, and may in addition act disinfecting on the wastewater. Domestic wastewater is ideal for algal growth since it contains high concentrations of all necessary nutrients. The growth limiting factor is rather light, especially at higher latitudes. The most important operational factors for successful wastewater treatment with microalgae are depth, turbulence and hydraulic retention time

III. METHODOLOGY

3.1. SITE WORK :-

The various locations of Nag River, from which water samples can be collected, were visited. Various locations of Nag River are:

1. Yashwant Stadium, Sitabuldi
2. Reshimbagh
3. ST. Xavier High School, Hiveri Nagar

COLLECTION OF WATER SAMPLES:-

The water samples for analysis were collected from above Three locations starting from Yashwant Stadium to Hiveri Nagar and the sampling location at this site is as below:

1. Yashwant Stadium, Sitabuldi: - Near the Shiv temple, near the residential area
2. Reshimbagh: - Near the vehicular road bridge behind the 'Lokanchi Shala' High School.
3. ST. Xavier High School, Hiveri Nagar: - Near the vehicular road bridge along the agricultural land.
- 4.

TESTS CONDUCTED:-

The following tests were conducted on the water samples collected from various locations of Nag River like pH Value, Dissolved Oxygen, Biochemical Oxygen Demand, Chemical Oxygen Demand, Nitrate, Faecal Coliforms.

The temperature at various sampling location is found almost the same because the samples were collected in the afternoon with a time interval of 15 minutes at every sampling location

3.2 Methods :-

- 1) Black water filter consists of a tank of size 18 cm X 30 cm which is made up of Steel and connected to each other by pipe.
- 2) This whole assembly is placed on a stand made up of bamboo.

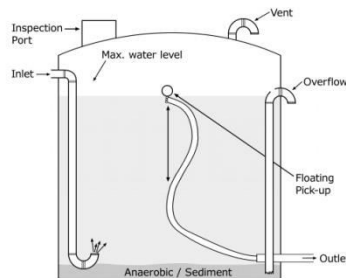
- 3) Storage tank is a tank in which day Black water can be stored as a source.
- 4) The sedimentation tank is a tank in which water can be stored in a distributed condition for 30 minutes by adding Sodium dichloroisocyanurate in it which helps to settle down the impurities.
- 5) In the sedimentation tank, we will keep the impurities which are settled at the bottom side, as we will make fertilizer.
- 6) This waste solid impurities is used to make the fertilizer and this fertilizer is well good for the field or agricultural land and also garden plantation land. This fertilizer is economical and free from other harmful chemicals.
- 7) After this process the value of the sedimentation tank is open and water can be entered into the filtration tank.
 - a) Filtration tank 1) :- in his tank the Limestone and sand is used as a filter media .The size of Limestone is 2.5 cm and sand size is 2.36 mm retained on IS sieve.
 - b) Filtration tank 2) :- in this tank the charcoal of size is 2.5 cm and fine sand is used. The charcoal and fine sand can help to remove the impurities.

3.3. WORKING OF BLACK WATER FILTRATION :-

In this process of Black water filter the five tanks are used which are placed at the stand which is made up from the bamboo then this tank is as follows.

3.3.1. Storage Tank :-

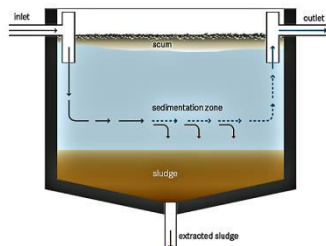
Storage tank is the in which the black water can be stored and it is used as a source. The tank is made of steel, size 18X30 cm.



3.3.1. STORAGE TANK

3.3.2. Sedimentation tank :-

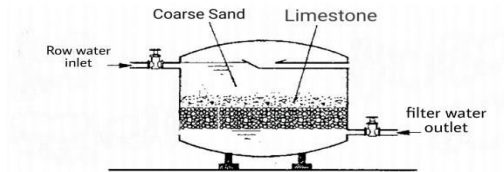
The sedimentation process the water can store in undisturbed condition for 30 min by adding 14.28 gm per liter Sodium dichloroisocyanurate in it as a coagulant which can help to settle down colloidal impurities. Flocculation refers to water treatment processes that combine or coagulate small particles into larger particles, which settle out of the water as sediment Filtration process of removing particles bacterial impurities which could not be removed in earlier processes from water by passing it through porous media.



3.3.2. SEDIMENTATION TANK

3.3.3. Filtration tank 1 :-

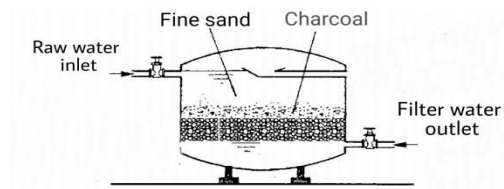
In this tank the limestone and sand is used as filter media The size of tank is 18 X 30 cm and size of limestone is 2.5 cm and size of sand is 2.6 mm retained



3.3.3. FILTRATION TANK 1

3.3.4. FILTRATION TANK 2 :-

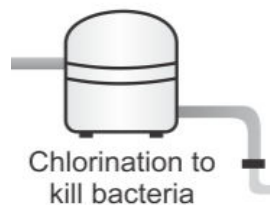
In this tank charcoal and fine sand are used as a filter media the charcoal of size 2.5 cm and finds and up size 1.18mm passing from IS sieve



3.3.4. FILTRATION TANK 2

3.3.5. DISINFECTION TANK :-

The tank is made of steel of size 18X30 cm in this tank the process of disinfection can be done many new or modified treatment process are being investigated as an attempt to solve the serious water supply and wastewater disposal problems of the growing population and industries



3.3.5. DISINFECTION TANK

3.4 MATERIALS USED IN BLACK WATER FILTER :-



3.4.1. LIMESTONE 2.5 CM



3.4.2. SODIUM DICHLOROISOCYANURATE



3.4.3. COARSE SAND 2.36 MM



3.4.4. FINE SAND 1.8 PASSING



3.4.5. CHARCOAL 2.5 CM

3.5 Analysis :-

In this filtration process the water can be stored into a storage tank from the sewer as a source in this tank the screening process can be done and the floating matter can be removed. then tank valve can be opened the water can enter into the sedimentation tank in this tank the Sodium dichloroisocyanurate ($C_3Cl_2N_3NaO_3$) is used as a coagulant the solution of Sodium dichloroisocyanurate can be made and added in it for sedimentation process under the action of gravity for 30 min the colloidal and suspended particle can be settle down at the bottom.

After this process the second valve can be opened and allow the water to enter into filtration tank 1 in this tank the sand can kill some bacteria and make the water clean in some amount and impurities retain on the sand bed. Then the next valve can be opened and water entered into filtration tank 2 in this tank the fine sand and charcoal can be used the charcoal can be helped to remove iron, magnesium, oil, and colour odour. Then in the next step the water can enter into the disinfection tank for the disinfection process. So this type of clean water can be obtained

IV. RESULT & DISCUSSION

4.1 PH VALUE :-

The pH of most drinking-water lies within the range 6.5–8.5. Natural waters can be of lower pH, as a result of, for example, acid rain or higher pH in limestone areas. The pH of an aqueous sample is usually measured electro metrically with a glass electrode.

SR. NO.	TYPE OF WATER	PH
1	drinking water	4.87
2	mineral water	7.52
3	distilled water	5.73
4	Black water filter	7.69



4.1.1. PH VALUE

4.2. TURBIDITY VALUE :-

Turbidity is the measure of relative clarity of a liquid. It is an optical characteristic of water and is a measurement of the amount of light that is scattered by material in the water when a light is shined through the water sample. The higher the intensity of scattered light, the higher the turbidity.

SR. NO.	WATER SAMPLE	TURBIDITY
1	Black water	10 NTU
2	Tap water	4.5 NTU

4.2.1. TURBIDITY VALUE

4.3 TOTAL DISSOLVED SOLID (TDS) :-

Total dissolved solids (TDS) is a measure of the combined inorganic and organic substances dissolved in water. It is directly related to the electrical conductivity of water and as such can be used as an indication of change.

SR. NO.	BEFORE FILTRATION (BLACK WATER) PPM	AFTER FILTRATION (FILTERED WATER) PPM	DURATION OF FILTRATION MIN
1	507	410	34:72 MIN
2	513	472	35:02 MIN
3	473	390	34:00 MIN
4	766	447	35:06 MIN

4.3.1 TOTAL DISSOLVED SOLID (TDS)

V.CONCLUSION & FUTURE SCOPE

- The overall performance of the laboratory scale integrated treatment plant was excellent, producing very high quantity effluents.
- The overall performance of the plant for treatment of kitchen and bathroom blackwater demonstrate deduction competency of water pollution such as COD (84%),BOD (92%), coliform (98%) , TSS (87%), TDS (76%), turbidity (64%) and total hardness (70%)
- The COD (84%) removal was lower than (92%) removal implying that the Black water make contains more biodegradable pollution then non biodegradable
- The pH level of bathroom Black water (8.1 to 7.7) was higher than kitchen grey water (7.5 to 7.0)



- The parameters BOD, TSS, Coliform and total hardness were found at higher level in kitchen Black water than the bathroom black water
- The filtration state found major role in the winter season and lakes in the spring season because in the spring season the pollution are more dissolved in the surface and groundwater
- The present study demonstrate that Black water is suitable for the purpose of landscaping gardening and toilet flushing
- The treatment technology can be considered as a variable alternative conventional treatment plant in rural region
- The benefit of treatment system are low in energy demand less
- Operating and maintenance cost and lower the load of freshwater
- The treatment system is environmental friendly, without any chemical operation, cost effective and resourceful of rural development
- Recycling of blackwater provides new water supplies to made for the need and help to protect public health and safety

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