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CHARACTERIZATON AND TREATMENT OF INDUSTRIAL WASTEWATER

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Abstract: *Water aeration is often required in water bodies that suffer from anoxic condition usually caused by adjacent over baiting a fishing lake not only fish other aquatic animals also need it , but oxygen breathing aerobic bacteria decompose organic matter when oxygen concentration become low , anoxic condition may develop which can decrease the ability of waster body to support life. In a sewage plant, the activated sludge process used for one or several of following purpose oxidizing carbonaceous biological matter, oxidizing nitrogenous matter. During the study of characteristics of wastewater such as BOD, COD, TS, PH, TURBIDITY were observed after of 2.5 hr. and hydraulic optimise retention time 18 hrs. The PH, TURBIDITY, TS, BOD, COD are 6.90, 77 NTU, 600 mg/L, 350mg/L, 530mg/L respectively. While after passing water through aeration tank the value were 7.69, 20 NTU, 20mg/L, 250mg/L, 210MG/L respectively. Industrial wastewater treatment using sand filter, membrane filter, sedimentation and aeration.*

Keywords: Distilled Water, wastewater, BOD, COD, TS, PH, TURBIDITY

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INTRODUCTION

It is well known that chlorine and its compound, traditionally utilized for water and wastewater disinfection, react with some organic matter to form undesirable by-product. Disinfection process is conventional step used to remove pathogen micro-organism from both drinking water and wastewater , in order to eliminate waterborne microbiological contamination caused by pathogenic bacteria , viruses and protozoan parasites an protect public health as well as the environment .

1.1EFFECT OF CONTAMINATION OF WASTE WATER ON NATURAL BODIES

1. Death of aquatic animals
2. Disruption of food-chains
3. Contamination effect on aquatic plants

1.2 EFFECT OF CONTAMINATION OF WASTE WATER ON LAND

Water pollution dramatically affects life on land because rain picks up pollution and moves it around.. Water spreads these chemicals throughout the land, because of this the death of trees and other plants leads to weakened soil, which further prevents the soil from sustaining plant life. Contamination of water results in a cycle of damage to land , because the nutrients in soil come from decomposition of dead organisms, including plants, bacteria in the soil break them down, releasing organic compound and minerals back into the soil

2.LITERATURE REVIEW

2.1CONTAMINANTS LIKE ORGANIC AND INORGANIC POLLUTANTS

1. Organic pollutants

- Detergent
- Disinfection by-products found in chemically disinfected drinking water, such as chloroform.
- Food processing waste, which are fats and grease.
- Insecticides and herbicides, a huge range of organ halides and other chemical compounds, Petroleum hydrocarbons and lubricants and fuel .
- Volatile organic compounds, such as industrial solvents, from improper storage.
- Chlorinated solvents

2. Inorganic pollutants

- Acidity caused by industrial discharges
- Ammonia from food processing waste
- Chemical waste as industrial by-products.
- Fertilizers containing nutrients, nitrates and phosphate.
- Heavy metals from motor vehicles

These types of organic and inorganic water pollutants are present in industrial waste water.

TREATMENT OF INDUSTRIAL WASTE WATER

1) Activated sludge treatment, 2) Screen, 3) Grit chamber, 4) skimming tank, 5) aeration tank

3. MATERIALS AND METHODS

3.1 STUDY OF PARAMETERS: PH, Total suspended solids, BOD, COD, Turbidity

Apparatus used

Evaporating dish ,Muffle furnace ,Steam bath , Desiccators , Glass fibre filter disk , Filtration apparatus , Membrane filter funnel , Gooch crucible, Filtration apparatus with reservoir and coarse (40-60uM) fruited disk as filter support. , Suction flask of sufficient capacity for selected sample size. , Drying oven. , Analytical balance , Incubation bottles of 250 to 300 ml capacity with ground glass stopper, Air incubator thermostatically controlled at 20 ± 1 ºC , DO Analyser PE135 and Magnetic Stirrer , COD Vario , COD vials: LR-Range - 150 mg/lit MR-Range - 1500 mg/lit , HR-Range -15000 mg/lit , Turbidimeter , Sample tubes

Procedure for total dissolved solids

1) Insert disk with wrinkled side up into filtration apparatus. 2) If volume solids are to be measured, ignite cleared evaporating dish at 550 □ 50 ^{o}C for 1 hour in muffle furnace. If only total dissolved solids are to be measured, heat cleans the dish to 180 ^{o}C for 1 hour in an oven. Store in desiccators until needed, weigh immediately before use (W1) .3) Filter measured volume of well mixed water sample through glass fibre-filter. 4) Transfer the filtrate to a weighed evaporating dish 5) 2 ^{o}C, cool in a desiccators to balance the temperature and take the weight (W2).

Procedure for total solids

1)Take the dry weight of glass disk (W1 gm.) 2) Wet filter with a small volume of distilled water to fill it.3) Filter a measured volume of the thoroughly mixed waste sample through the glass fibre filter.4) Carefully transfer filter from filtration apparatus to an aluminium or stainless steel planchet as a support.5) Dry for at least 1 hour at 103 to105 ^{o}C in an oven, cool in a desiccators to balance the temperature and weight(W_2mg)

Procedure of BOD

1) switch the instrument **ON**.2) Throw the **MODE** toggle switch to TEMP mode.3) The value of ambient room Temperature in ^{0}C will be displayed on the **READOUT**.4) 0.01 $^{0}/_{0}$ of KCL is added in the distilled water and 2-3 drops of prepared sample is put in the probe for calibration purpose.5) Keep the Standard solution 5 %(Na_2SO_3)-filled flask on the platform of the stirrer.6) Adjust **ZERO** control to display 0.00 on the READOUT. 7) Raise the Probe, remove the flask containing Na_2SO_3 solution and clean the sensor part of the Probe thoroughly with distilled water and blot it dry tissue or filter paper 8) Adjust **CAL** control to display **10.0** on the READOUT.9) After that immerse the probe into waste water sample to know the value of

INITIAL D.O.10) Place the sample bottle into incubator for **5 Days at 20^{0}C** to get D.O. After 5 Days.ie FINAL D.O.11) Difference between the of FINAL D.O. value and INITIAL D.O. value will give the B.O.D. of the sample then calculate DILUTION FACTOR (D F)

D F of B.O.D.$_5$of the sample = (Final D.O. Reading - Initial D.O. Reading) /D F

Procedure for COD

1)Take the vial which contains standard potassium dichromate sample.2) Open the reaction vial with a white cap and add a specific volume. LR/MR :2 ml sample. HR : 0.2 ml sample.3) Prepare a blank sample by using distilled water instead of test sample.4) Tightened the cap and invert the vial gently for several time to mix this content.5) Digest the vials for **120 minutes** in a reactor at a temp. of**150^{0}C** in the rector. 6) Remove the vials from the rector and allow them to cool down at 60^{0}C or less by inverting each vial several times while still worm.7) Then COD is measured in a COD VARIO.

Procedure with Vario

1)Fix the vial of 16 mm dia. On the sample chamber.2) Switch the unit by ON/OFF key. 3) Select the required test using the MODE key i.e. LR, MR, and HR.4) Place the blank sample in adopter and make it ZERO i.e. calibration of the COD-Vario.5) After calibration place the vial containing waste water sample in adopter and TEST the sample.6) The COD value will appear on the screen.

Nephelometric turbidity method

Reagents: Turbidity free water , Stock turbidity suspension , Standard turbidity suspension , Alternate standards , Dilute turbidity standard

Procedure

Turbidity calibration: In the absence of a precalibrated scale, prepare calibration curve for each range of the instruments. Check accuracy of any supplied calibration scale on precalibrated instruments. Run at least one standard in each instrument range to be used. Turbidity meter gives stable readings in all sensitivity ranges used. High turbidities determine by dilution technique.

Measurement of turbidity less than 40NTU: Thoroughly shake sample. Wait until air bubbles disappear and pour sample in to turbidity meter tube..Read turbidity directly from instrument scale

Measurement of turbidity above 40NTU: turbidity falls between 30 and 40 NTU. Compute turbidity of original sample from turbidity of diluted sample and the dilution factor. For turbidities above 40 NTU use undiluted stock solution.

3.2 MATERIALS

Size:1)Aeration tank of 0.18MX0.18MX0.13M,

2) Sedimentation tank:Dia-0.22M,Depth- 0.015M

Procedure of sedimentation tank

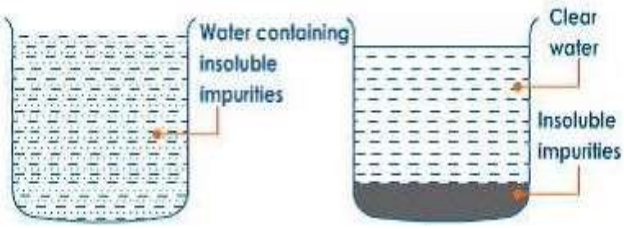

Fig. Sedimentation

1)Samples were collected from oil refinery industry and brought to environment lab 2) First we have taken 0.22m diameter, 0.015m depth tank.3) 3 Littre sample is kept in the tank for time 2.0 hr,2.30 hr,3.0 hr for sedimentation.4)After 2.0 hr, 2.30 hr, 3.0 hr. particles are settled at bottom of tank.5)Insoluble impurities are found and clear water is above settled particles.

Procedure of aeration tank

1.collecte a sample.2) 2.5 lit sample is kept in 0.18X0.18X0.13m tank for aeration process.3)Diffusers are provided in tank .Sample are subjected to aeration for time 2 hr,4hr,6hr.4) In aeration tank air diffusers are fixed for oxygen demand of bacteria.5)In aeration tank influent flow is react with dissolve oxygen (DO) and CO_2 and sulphate is release.6)After process waste water becomes clear water. Circular tank was used for aeration. It was found that the circular tanks are the most energy efficient.

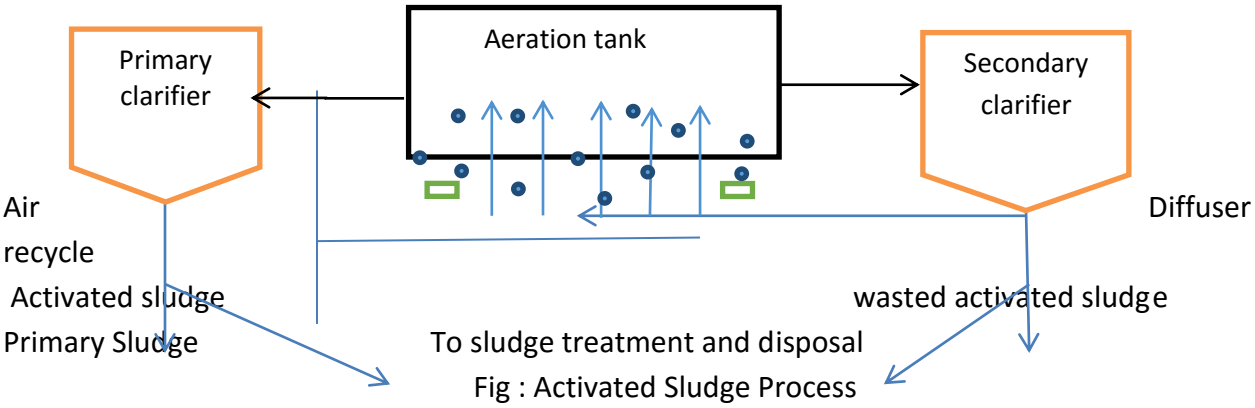

Fig : Activated Sludge Process

Table :Inlet and Outlet of sedimentation tank

Sr No	Parameter	Concentration	Concentration At detention period			Unit
			2.0	2.5	3.0	
01	pH	6.50	6.76	6.90	6.89	-
02	TURBIDITY	142	89	77	73	NTU
03	BOD_5	540	430	350	340	mg/L
04	COD	690	525	530	490	mg/L
05	TS	900	650	600	580	mg/L

Fig. pH meter

Fig. DO Meter

Fig. Nephelometer

Fig. Diffusor

4. RESULTS & DISCUSSION

Table: Outlet of aeration tank

Sr No	Parameters	Concentration At different HRT					Units
		2	4	6	12	18	
01	pH	7.26	7.38	7.7	7.47	7.69	-
02	Turbidity NTU	58.4	35.2	24	20	20	NTU
03	BOD_5	340	330	310	270	70	mg/L
04	COD (mg/Lt)	520	510	500	430	210	mg/L
05	TS (mg/L)	490	470	450	390	250	mg/L

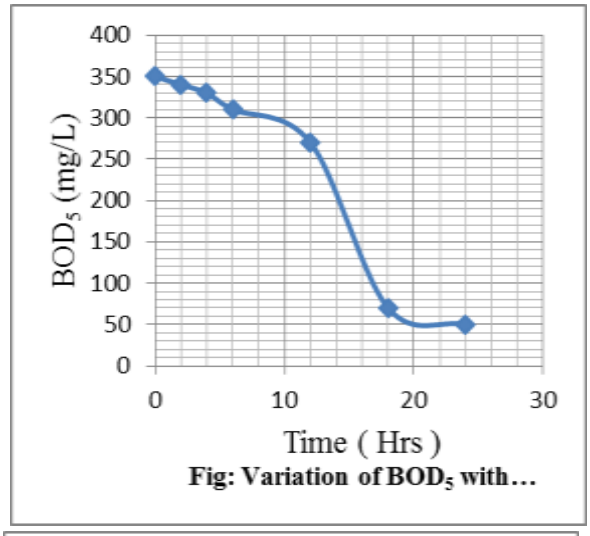

Fig: Variation of BOD_5 with…

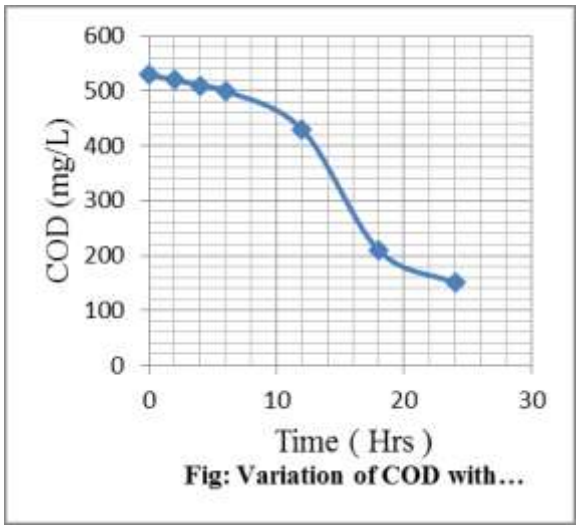

Fig: Variation of COD with…

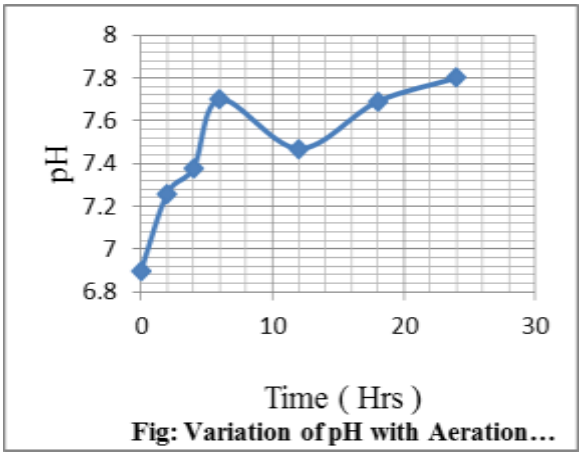

Fig: Variation of pH with Aeration…

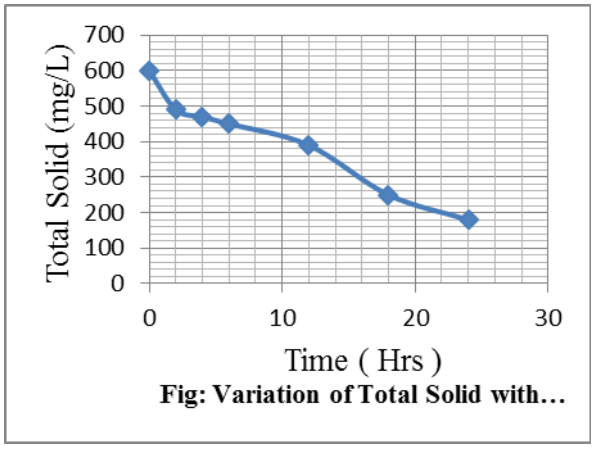

Fig: Variation of Total Solid with…

1. At hydraulic retention time of 2 hrs :TS is reduced from 600mg/L to 490 mg/L i.e. TS is reduced by 18.33%, BOD_5 reduced from 350mg/L to 340mg/L i.e. is BOD_5 reduced by 2.8%, COD reduced from 530mg/L to 520mg/L i.e. COD is reduced by 1.8%,

2. At hydraulic retention time of 4 hr: TS is reduced from 600mg/L to 470 mg/L i.e. TS is reduced by 21.6% .BOD_5 reduced from 350mg/L to 330mg/L i.e. is BOD_5 reduced by 5.7% , COD reduced from 530mg/L to 510mg/L i.e. COD is reduced by 3.77%

3. At hydraulic retention time of 6 hrs:TS reduced from 600mg/L to 450 mg/L. BOD_5 reduced from 350mg/L to 310mg/L i.e. is BOD_5 reduced by 11.40% , COD reduced from 530mg/L to 500mg/L i.e. COD is reduced by 5.66%

4. At hydraulic retention time of 12 hrs: TS reduced from 600mg/L to 390 mg/L i.e. TS is reduced by 35.0% .BOD_5 reduced from 350mg/L to 270mg/L i.e. is BOD_5 reduced by 22.85% , COD reduced from 530mg/L to 430mg/L i.e. COD is reduced by 18.86% .

5. At hydraulic retention time of 18 hrs: TS reduced from 600mg/L to 250mg/L i.e. TS is reduced by 58.3% .BOD_5 reduced from 350mg/L to 70mg/L i.e. is BOD_5 reduced by 80.0% , COD reduced from 530mg/L to 210mg/L i.e. COD is reduced by 60.37% .

5.CONCLUSION

on the basis of the study following conclusion can be made.1)It is seen that the treatment of wastewater by sedimentation & aeration bring many parameter within permissible limit, therefore the treated wastewater can be reuse for gardening and washing purpose.2) It is seen that at hydraulic retention time 18hr the parameters like TS were observed at permissible limit , it can remove turbidity from up to 20 NTU, BOD_5 remove up to 70mg/L, COD remove up to 210mg/L. pH almost neutral, therefore it is suggested that hydraulic retention time 18.hr can be adopted for controlling the pollution load.3)As the water demand and environmental needs grow to overcome this problem water reclamation and reuse will play a greater role in overall water supply system. Therefore water recycling can help to conserve and manage water resource

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