A Dissertation thesis entitled

"A STUDY OF DAIRY EFFLUENT ON THE BASIS OF THEIR PHYSICO-CHEMICAL CHARACTERISTICS: A NEW WAY TO OVERCOME DAIRY EFFLUENT LOAD"

Submitted in partial fulfilment of the requirements

For the award of the degree of

Master of Science

IN

INDUSTRIAL CHEMISTRY

Submitted By

MR. PRANAV D. CHANGELA	[ENROLLMENT NO. 210722009]
MR. AVINASH S. GADHE	[ENROLLMENT NO. 210722013]
MR. KEVAL L. JESADIYA	[ENROLLMENT NO. 210722016]

Under the guidance of

DR. MEHUL L. SAVALIYA
(Guide)
Assistant Professor
Faculty of Science
Department of Industrial Chemistry
Atmiya University, Rajkot.

ER. RAVI S. TANK
(Co-Guide)
Head
Faculty of Science
Department of Industrial Chemistry
Atmiya University, Rajkot.

DEPARTMENT OF INDUSTRIAL CHEMISTRY
FACULTY OF SCIENCE (FoS)
ATMIYA UNIVERSITY
RAJKOT-360005, GUJARAT, INDIA.

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Dedicated to

My Beloved Family

Without their love, support and constant encouragement,
this would not have been possible

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DECLARATION

We undersigned, hereby declare that the work assimilated in the dissertation thesis entitled **"A STUDY OF DAIRY EFFLUENT ON THE BASIS OF THEIR PHYSICO-CHEMICAL CHARACTERISTICS: A NEW WAY TO OVERCOME DAIRY EFFLUENT LOAD"** has been carried out by us at Faculty of Science, Department of Industrial Chemistry, Atmiya University, Rajkot, Gujarat, India, under the supervision and Guidance of **Dr. Mehul L Savaliya, Assistant Professor, Department of Industrial Chemistry, Faculty of Science, Atmiya University, Rajkot, Gujarat, India.**

To the best of our knowledge and belief, the work included in this thesis is quite original and has not submitted to any other Institution or University for the award of any degree either in this or any other form.

CHANGELA PRANAV D.

[210722009]

GADHE AVINASH S.

[210722013]

JESADIA KEVAL L.

[210722016]

We wish to express our sincere gratitude and honour to our Research supervisor **Dr. Mehul L. Savaliya, Assistant Professor, Department of Industrial Chemistry, Faculty of Science, Atmiya University, Rajkot,** for their inspiring, splendid and authentic guidance, moral support and constant encouragement throughout our research work. Their passion and dedication towards research have stimulated, provoked and facilitated us to complete this endeavour. We could not have imagined having a better Research Supervisor and mentor for our M.Sc. study. Their role will always remain fundamental in shaping our future.

CHANGELA PRANAV D.

[210722009]

GADHE AVINASH S.

[210722013]

JESADIA KEVAL L.

[210722016]

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ABSTRACT

Dairy effluent is the wastewater generated by the dairy industry during milk production and processing. This effluent contains a variety of pollutants, including organic matter, nutrients, bacteria, and other contaminants that can have adverse effects on the environment if not managed properly. Effective management of dairy effluent is essential to protect water quality, minimize environmental impacts, and comply with regulatory requirements. This typically involves a combination of treatment and disposal methods, such as ponds, land application, and irrigation, that are tailored to the specific characteristics of the effluent and the surrounding environment. Proper management of dairy effluent is critical for the sustainability of the dairy industry and the protection of the environment [1]. Overall, the study highlights the importance of managing dairy effluent and adopting sustainable practices in the dairy industry to ensure the protection of the environment and public health [2].

1 INTRODUCTION

1.1- GENERAL INTRODUCTION:

Dairy effluent is a byproduct of dairy farming that refers to the wastewater generated from the milking process and other farm activities, such as cleaning of the milking parlors and yards, and washing of milk tanks and equipment. It contains a mixture of milk, manure, urine, cleaning agents, and other organic and inorganic compounds [1].

Dairy effluent can pose a significant environmental and public health risk if not managed properly. If it is discharged untreated into waterways, it can lead to eutrophication, which can cause oxygen depletion and fish kills. It can also contaminate groundwater and surface water with nutrients and pathogens, which can affect human and animal health [3].

Therefore, proper management of dairy effluent is essential for sustainable dairy farming. This can include measures such as separating solid and liquid wastes, treating the effluent to reduce nutrient levels and pathogen load, and using the treated wastewater for irrigation or fertilization of crops. Effective management of dairy effluent can help farmers reduce their environmental footprint, improve the quality of their products, and comply with regulatory requirements [2].

1.1.1- SURFACE WATER POLLUTION:

Water pollution can be caused by various human activities and also occur naturally, much less than pollution caused by human activity. Pollution can have two types (point and non-point) of sources. This depends on how the pollution enters the water. Point sources are sources of pollution situated at one location, often a specific outlet pipe. Factories and waste water treatment plant usually have discharge pipe leading directly to the water body [2]. Pollution from non-point sources does not come from the one specific location; instead, it comes from the many small sources in the large area, it is usually caused by water which flows overland to a river, a lake for example rain water, irrigation water, as this water passes over the ground, it peaks a pollutant and carries them in to local water. Nonpoint source pollution can also result from pollution in the air that falls in to the water or on the ground. In general, point sources are easy to identify whereas non-point sources are more difficult to the identify [1]. The measure consumptive uses of the fresh water are for: a) Agriculture b) industry c) domestic supply. The rapid increases in population, industrialization and heavy dependences on chemical product in the agriculture sector are leading to a serious deterioration of water quality in developing countries [3].

1.1.2- INDUSTRIAL WATER POLLUTION:

In developing countries industrial water generally accounts or less than 10 % of the total use. However, it is estimated that the demand for water for industrial use will increase rapidly over the next two decades in the developing countries. The level of pollution by industries is much higher than agriculture use. The World Bank has study waste streams in our 30 classes of industry and has developed environmental guideline for effluent limitations. The major industrial water pollution comes from sugar and oil seed mills, mineral extraction and processing facilities, coffee factories, tanneries, agro industries etc [2].

1.1.3- AGRICULTURE WATER POLLUTION:

The most important use of water in developing countries is irrigation, which accounts for the bulk of agricultural use. It has adverse impact on the quality of water resources in several ways: drainage and runoff fertilized cropland, heavy organic loading, sediments, microorganisms, high concentration of nutrients, eutrophication, pesticides etc [1].

1.1.4- URBAN SOURCES OF POLLUTION:

The rapid increases in population of urban conglomerations in developing countries during the 1980 has led to such an increase in human and household wastes and municipal effluents that almost no city is able to cope with the deterioration in water quality [3].

1.1.5- SURFACE WATER POLLUTION:

Analysis of organic matter in water and waste water can be classified into two general types of measurements. (1) Those that quantify an aggregate amount of organic matter comprising organic constituents with a common characteristic; and (2) Those that quantify individual organic compounds [3]. Gross fraction of the organic matter can be identified analytically as in the measurement of BOD, which is an index of the biodegradable organic present, oil and grease which represent material extractable from a sample by a non -polar solvent, or total organic halide, which measure the organically bound halogens. Analysis of organic are made to assess the concentration of general composition of organic matter in raw water supplies, waste water, treated effluent of receiving water, and to determine the efficiency of treatment processes [4].

1.1.6- ANALYTICAL METHODS OF EFFLUENT ORGANIC MATTER:

Over the years, a number of different analytical methods have been developed to determine the organic content in waste waters. In general, these methods may be divided into those used to measure gross concentrations of EfOM greater than about 1 mg / L and those used to measure trace concentrations in the range of nano- and micro- sizes Here, EfOM includes both NOM and EfOM and the analytical method to measure NOM is the same as EfOM [2]. The organic pollutants are generally measured in terms of surrogate parameters such as biochemical oxygen demand (BOD), chemical oxygen demand (COD), Dissolved oxygen (DO), Total dissolved solid (TDS), Oil and grease [3].

2. EXPERIMENTAL

2.1 DISSOLVED OXYGEN

PRINCIPLE:

Oxygen present in sample oxidizes the divalent manganous to its higher valency which precipitates as brown hydrated oxygen after addition of sodium hydroxide and oxide after addition of sodium hydroxide and potassium iodide. Upon acidification, manganese reverts to divalent state and liberates iodine from potassium iodide equivalent to DO content in the sample. The liberated iodine is titrated against sodium thiosulphate, using starch as an indicator [4].

APPARATUS:

1. BOD bottles of 300 ml capacity
2. Sampling device for collection of samples
3. 250 ml conical flasks
4. 50 ml burette
5. 10 ml pipette

REAGENTS:

1. **0.0025N $Na_2S_2O_3$ solution:** Weight accurately 1.3g of sodium thiosulphate (because of water of hydration, it cannot be dried to a compound of definite composition) which can be obtained in relatively pure form. Dissolved the solid in distilled water, transfer the solution to a volumetric flask & dilute it to one litre. Mix the solution thoroughly well [5].

2. **Alkaline KI solution:** Dissolved about 50g NaOH approximately 40ml distilled water & 15g KI in 40ml distilled water. Mix these solution & dilute to 100ml in a volumetric flask [5].

3. **$MnSO_4$ solution:** Dissolved 36.4g $MnSO_4$ in distilled water & dilute to 100ml by distilled water [6].

4. **Starch solution as indicator:** Dissolved 20g starch in cold water & pour it in 200ml hot distilled water. Starr well & bring to a boil, cool [6].

PROCEDURE:

Take 300ml of given water sample in a conical flask. Add 1 ml each of alkaline KI solution & $MnSO_4$ solution. Shake the flask vigorously White precipitates will be produced. Now add carefully 1 ml of conc. H_2SO_4 solution & shake [7]. Brownish solution with liberated iodine will be produced. Quickly add 2 ml of freshly prepared starch solution (indicator), which gives blue colour. Titrate slowly again standard 0.025N $Na_2S_2O_3$ solutions till the blue colour just disappears. Repeat the titration 4 times [8].

OBSERVATION:

Burette: 0.025N $Na_2S_2O_3$

Conical: 50ml water sample + 1 ml alkaline KI solution + 1 ml of $MnSO_4$ solution + 1 ml of conc. H_2SO_4

Indicator: 2ml starch solution

End point: Blue to colourless

REACTIONS:

$MnSO_4 + 2NaOH \rightarrow Mn(OH)_2 \downarrow$ (white ppt) + Na_2SO_4

$Mn^{+2} + 2OH^- + 1/2O_2 \longrightarrow MnO_2 \downarrow$ (Brown ppt) + H_2O

$MnO_2 + 2I^- + H^+ \longrightarrow Mn^{+2} + I_2 + 2H_2O$

$2S_2O^{-2}_3 + I_2 \longrightarrow S_4O^{-2} + 2I^-$

CALCULATIONS:

Calculate the amount of dissolved oxygen present in 100 ml of water sample using the following formula:

$$DO\ in\ (mg/L) = \frac{1000 \text{ x mL of titrant x Normality x } 8}{V2\ (V1-V)/V1}$$

Where,

V1 = Volume of BOD bottle, mL

V2 = Volume of the content titrated, mL

V = Volume of $MnSO_4$ and iodized azide added, i.e, 1+1 = 2mL

8 = Milliequivalent weight of oxygen.

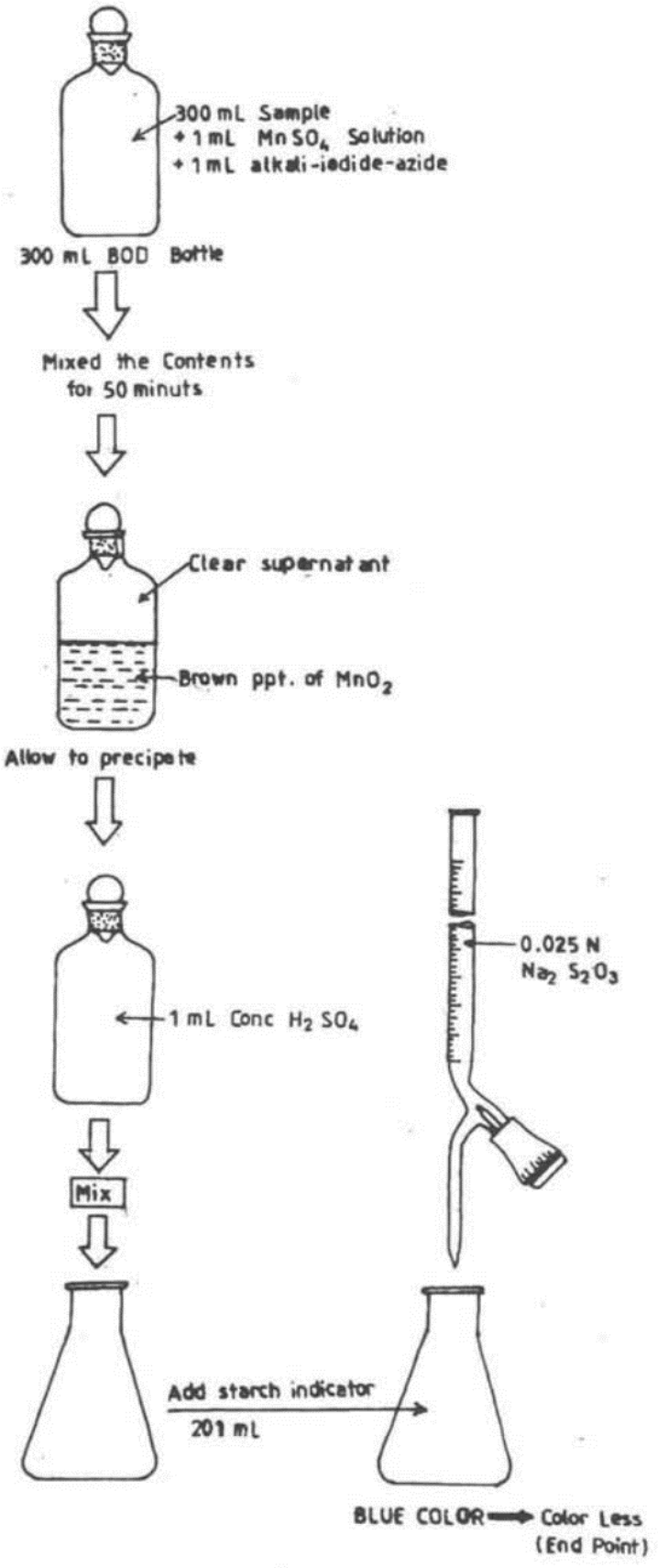


Figure 1: Procedure of Dissolved Oxygen

2.2 CHEMICAL OXYGEN DEMAND

PRINCIPLE:

The chemical oxygen demand is an indicative measure of the amount of oxygen that can be consumed by reactions in a measured solution. It is commonly expressed in mass of oxygen consumed over volume of solution which in SI units is milligrams per litre (mg/1) [9]. A COD test can be used to easily quantify the number of organics in water. The most common application of COD is in quantifying the number of oxidizable pollutants found in surface water (e.g., lakes and rivers) or wastewater [10].

APPARATUS:

1. Reflux apparatus consisting of a flat bottom 250 ml capacity flask with ground glass joint and a suitable condenser.

2. Burner or hot plate

CHEMICALS:

1) Potassium dichromate, $K_2Cr_2O_7$
2) Conc. sulphuric acid, H_2S0_4 (sp. gr. = 1.84)
3) Ferrous ammonium sulphate, Fe $(NH_4)_2$ $(SO_4)_2$ $6H_2O$

REAGENTS:

1. **Standard potassium dichromate 0.1N:** Dissolve 4.9 g of $K_2Cr_2O_7$ in distilled water and dilute to 1000 ml [11].

2. **Sulphuric acid reagent (H_2SO_4)** [12]

3. **Standard ferrous ammonium sulphate 0.1N:** Dissolve 39g ferrous ammonium sulphate in about 40ml distilled water. Add 20ml conc. H_2SO_4 and dilute to 1000ml [13].

PROCEDURE:

Take 20ml of given dairy effluent waste water sample in a conical flask. Add 10ml standard 0.1 N $K_2Cr_2O_7$ & 3 ml conc. H_2SO_4, mix well. Place clean glass funnel on the conical flask [14].

Boil the solution for five minutes with occasional shaking. Now cool the flask under tap water & titrate against O.1N $FeSO_4$ $(NH_4)_2SO_4$ using 1-2 drops of ferroin indicator as done for blank. Repeat the titration two times. [15]

OBSERVATION:

Burette : 0.1N $FeSO_4$ $(NH_4)_2SO_4$ solution

Conical : 2ml of water sample + 1 ml $K_2Cr_2O_7$, solution + 3 conc. H_2SO_4

Indicator : 1-2 drops of ferroin indicator

Colour change : (Green to) blue to wine red colour

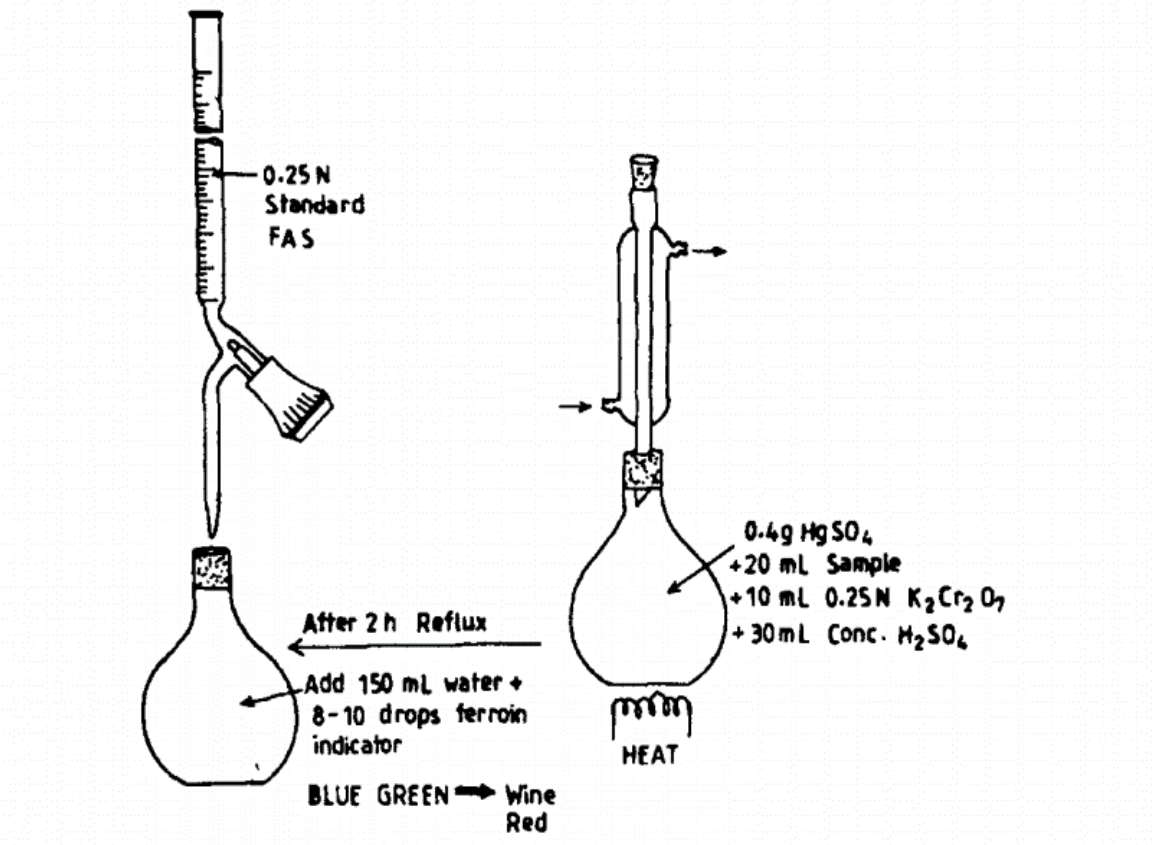


Figure 2: Procedure of Chemical Oxygen Demand

EQUATIONS:

$2K_2Cr_2O_7 + 8H_2S0_4 \rightarrow 2K_2S0_4 + 2Cr_2(S0_4)_3 + 8H_2O + 30_2$

$6Fe^{+2} + Cr_2O^{-2}_7 + 14H^{+} \rightarrow 6Fe^{+3} + Cr^{+3} + 7\ H_2O$

CALCULATION:

$$COD(mg/L) = \frac{(\mathrm{A} - \mathrm{B})\mathrm{x\ N\ x\ 8\ x\ 1000}}{\mathrm{ml.\ of\ the\ sample}}$$

Where,

A = mL of the ferrous ammonium sulphate used for blank

B = mL of ferrous ammonium sulphate used for sample

N = Normality of ferrous ammonium sulphate

8 = Milliequivalent weight of oxygen.

APPLICATION:

1. Extensively used in the analysis of domestic and industrial wastewater.
2. In conjunction with BOD test, COD test is helpful in indicating toxic conditions and the presence of biologically resistant organic substances.
3. COD test is used widely in the operation of treatment facilities because of the speed with which results can be obtained.

2.3 BIOLOGICAL OXYGEN DEMAND

PRINCIPLE:

Biological oxygen demand (BOD, also called biological oxygen demand) is the amount of dissolved oxygen needed (i.e., demanded by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period. The BOD value is most commonly expressed in milligrams of oxygen consumed per litre of sample during 5 days of incubation at 20 °C and is often used as a surrogate of the degree of organic pollution of water [16].

APPARATUS:

1. BOD bottles or 300 ml capacity
2. Sampling device for collection or samples
3. 250ml conical flask
4. 50ml burette
5. 10ml pipette
6. Incubator, to be controlled at 20 ^{O}C

CHEMICALS:

1. Sodium Thiosulphate ($Na_2S_2O_3$)
2. Magnesium sulphate ($MgSO_4$)
3. Calcium chloride ($CaCl_2$)
4. Ferric Chloride ($FeCl_3$)
5. Alkali azide
6. Starch indicator

REAGENTS:

1. **Phosphate buffer:** Dissolve 8.5g potassium dihydrogen phosphate (KH_2PO_4), 21.75 potassium hydrogen phosphate (KH_2PO_4), 33.4g disodium hydrogen phosphate ($Na_2HPO_47H_20$) and 1.7 g ammonium chloride (NH_4CI) in distilled water and dilute to 1000 ml [17].

2. **Magnesium sulphate:** Dissolve 82.5g magnesium sulphate ($MgSO_4.7H_20$) and dilute to 1000 ml [17].

3. **Calcium chloride:** Dissolve 27.5g anhydrous calcium chloride ($CaCl_2$) and dilute to 1000ml [18].

4. **Ferric chloride:** Dissolve 0.2 ferric chloride ($FeCl_3.6H_2O$) and dilute to 1000 ml [18].

5. **0.005N $Na_2S_2O_3$ solution:** Weight accurately 1.3g of sodium thiosulphate (because of water of hydration, it cannot be dried to a compound of definite composition) which can be obtained in relatively pure form. Dissolved the solid in distilled water, transfer the solution to a volumetric flask & dilute it to one litre. Mix the solution thoroughly well [18].

PROCEDURE:

Take 100ml of water sample in a suitable bottle and add 1ml each of phosphate buffer, $MgSO_4$, $CaCl_2$ and $FeCl_3$ solution. Before bring dilution water temperature 20°C for 5 days. Check its initial DO and then dilution water sample bottle kept in to the incubation at 20°C for 5 days incubation. After 5 days incubation determine DO in sample dilutions [19].

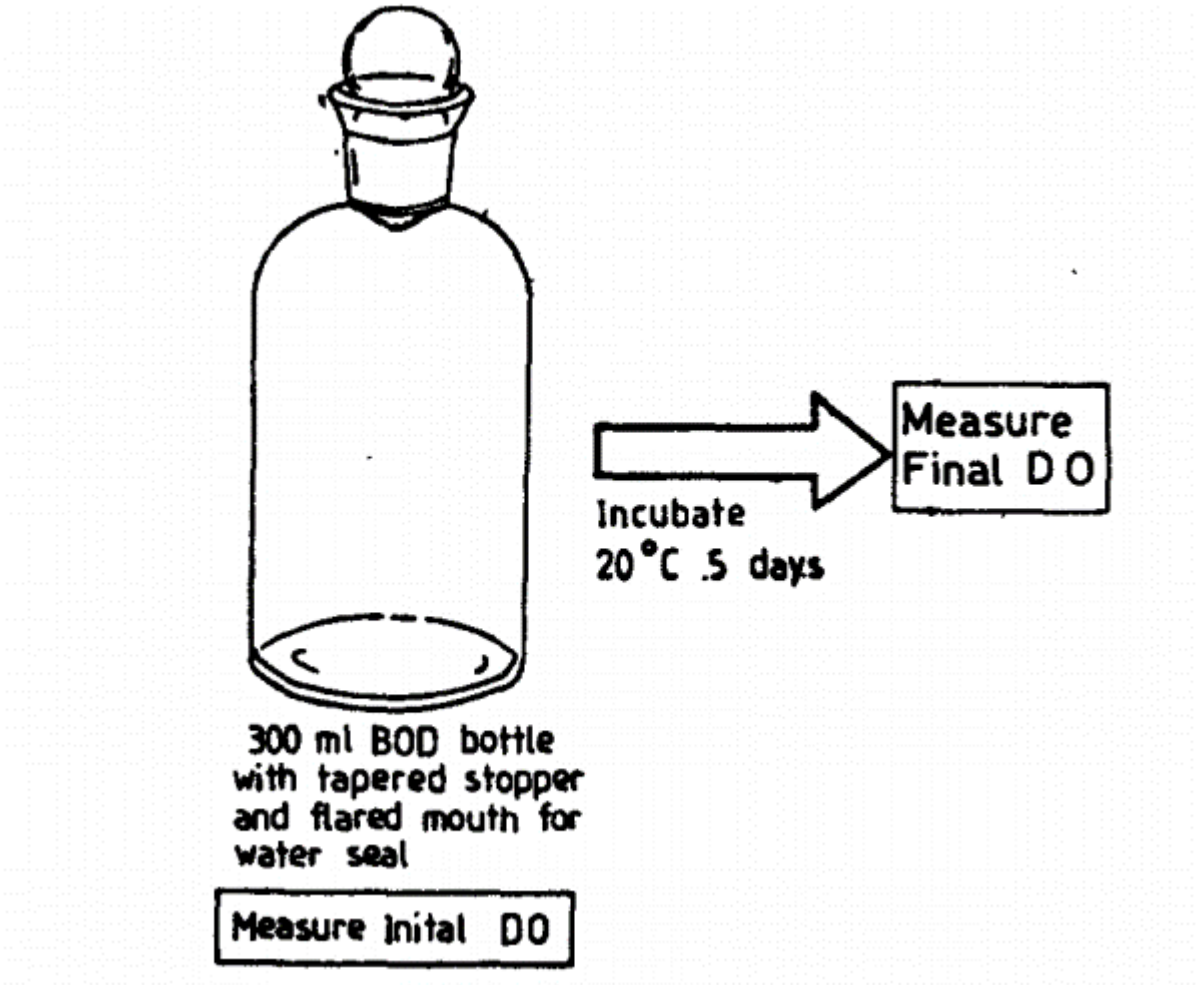


Figure 3: Procedure of Biological Oxygen Demand

CALCULATION:

$$BOD(mg/L) = \frac{\mathrm{D1} - \mathrm{D2}}{\mathrm{P}}$$

Where,

D1 = Initial of diluted sample

D2 = Final DO of diluted sample

P = Decimal volumetric fraction of sample use

APPLICATIONS:

1. To determine the strength of domestic and industrial waste in terms of oxygen required for stabilization of waste.
2. To measure the amount of biologically oxidisable organic matter present in waste.
3. BOD is a major criterion parameter in stream pollution control.
4. BOD data are used to assess the self-purification capacity of receiving water bodies.
5. BOD is one of the regulatory standards for effluent discharge.
6. Used for designing of wastewater treatment plants.

2.4 OIL AND GREASE

PRINCIPLE:

Dissolve or emulsified oil grease is extracted from water by intimate with n-hexane, petroleum ether. Unsaturated fats and fatty acids oxidase readily hence precautions regarding temperature solvent vapour displacement are included in the procedure [20].

APPARATUS:

1. Separatory funnel, 1 L with TFE (Teflon) stopcock
2. Distilling flask, 125 ml
3. Water bath
4. Filter paper
5. Weighing balance

REAGENTS:

1. Hydrochloric acid (HCL)
2. N-hexane
3. Petroleum ether or N-hexane

PROCEDURE:

Collect about 50ml of sample and mark sample level in bottle determination of sample volume. Rinse separating funnel with petroleum ether. Then take 50 ml sample and 100 ml petroleum ether in to the separating funnel [21]. Preferably vigorously for 5-10 min. Then separate the layer. Drain water sample through funnel and collect solvent containing oil & grease into the flask. Then distil solvent from flask in a water bath at 70°C for 15 min. Then weight the flask [22].

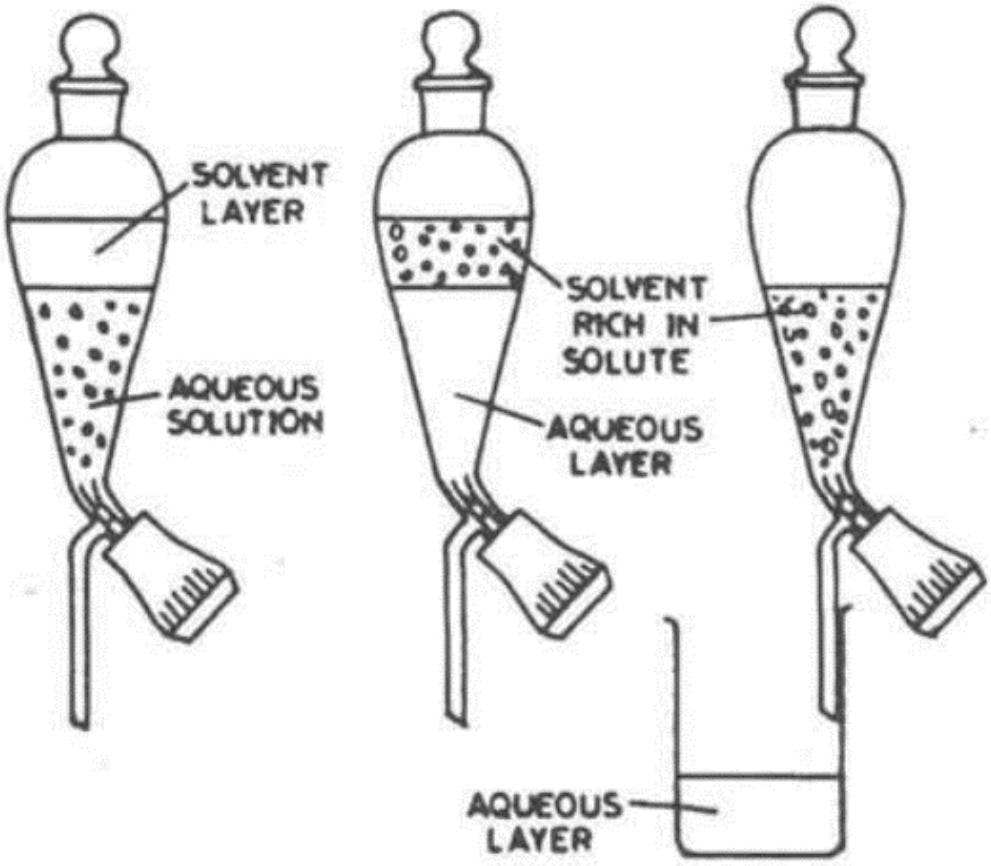


Figure 4: Procedure of Oil & Grease

CALCULATIONS:

$$(mg\ oil\ and\ grease/L) = \frac{(\mathrm{W2} - \mathrm{W1})\mathrm{x}1000}{\text{Volume of sample taken in mL}}$$

Where,

W1 = Solution in the weighted beaker (W1)

W2 = final weight of the beaker (W2)

2.5 TOTAL DISSOLVED SOLID

PRINCIPLE:

Residue left after the evaporation and subsequent drying in oven at specific temperature 103-105 ^{O}C of a known volume of sample are total solid. Total solid include" Total suspected solid" (TSS) and "Total dissolved solid" (TDS) [23]. Where loss in weight on ignition of the sample at 500 ^{O}C, 50 ^{O}C, in which organic matter is converted to CO_2, volatilisation or inorganic matter as much as consistent with complete oxidation of organic matter, are volatile solids [24].

APPARATUS:

1. Electrically heated temperature-controlled oven
2. Monopan balance
3. Evaporating dish
4. Pipettes
5. Measuring cylinder

PROCEDURE:

Take 100ml of water into a pre-weighted clean, dry porcelain dish. Evaporate the water in the basin to dryness over a water bath. Clean the outside of the dish, dry it in air oven at 105 ^{O}C for an hour to remove moisture, cool and weight. The difference between the weight of total soluble salts. Express the results in mg/L [25].

CALCULATIONS:

Volume of sample water taken = V ml

Weight of empty dish = W1 grams

Weight of dish + residue = W2 grams

Weight of total dissolved solid in 100ml sample = (W_2-W_1) grams

$$Total\ dissolved\ solids(mg/L) = \frac{(\mathrm{W2} - \mathrm{W1})\mathrm{x}\ 10^6}{\mathrm{V}}$$

2. RESULTING

2.1 DISSOLVED OXYGEN

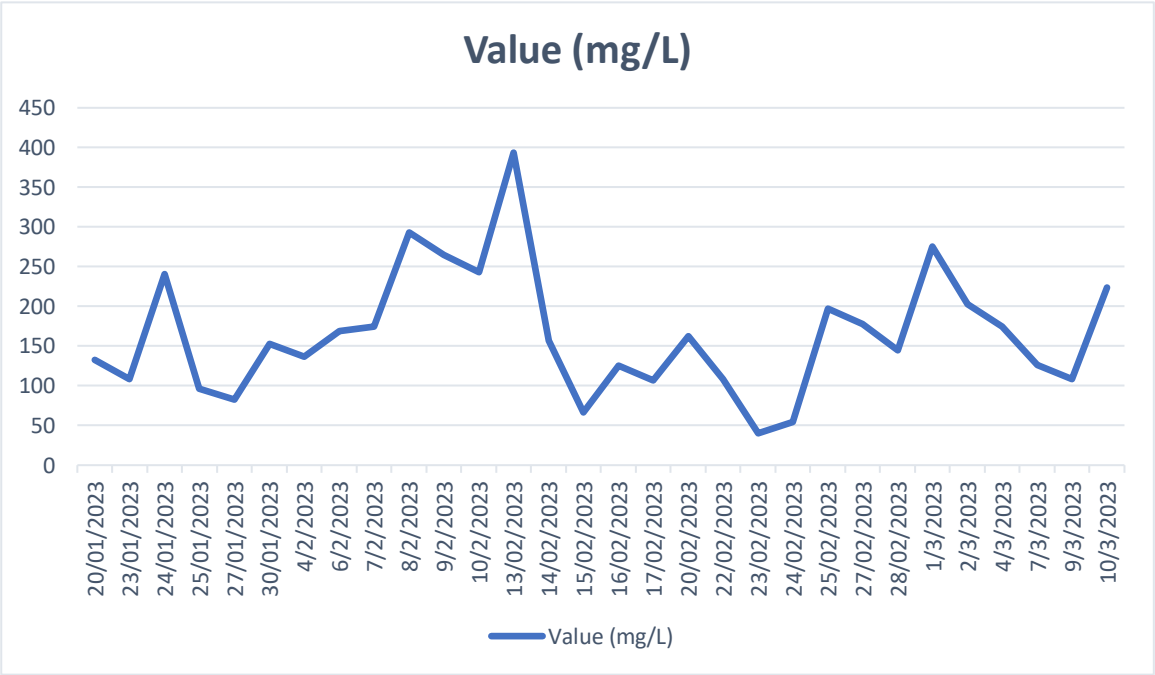
OBSERVATION TABLE:

Table 1: Readings of Dissolved Oxygen

SR. NO.	DATE	VALUE (mg/L)
1.	20/01/2023	132.53
2.	23/01/2023	108.43
3.	24/01/2023	240.96
4.	25/01/2023	96.38
5.	27/01/2023	82.32
6.	30/01/2023	152.61
7.	04/02/2023	136.54
8.	06/02/2023	168.67
9.	07/02/2023	174.69
10.	08/02/2023	293.17
11.	09/02/2023	265.06
12.	10/02/2023	242.97
13.	13/02/2023	393.57
14.	14/02/2023	156.62
15.	15/02/2023	66.260
16.	16/02/2023	125.25
17.	17/02/2023	106.42
18.	20/02/2023	162.65
19.	22/02/2023	108.43
20.	23/02/2023	40.160
21.	24/02/2023	54.210
22.	25/02/2023	196.78
23.	27/02/2023	177.77
24.	28/02/2023	144.57
25.	01/03/2023	275.100

26.	02/03/2023	202.81
27.	04/03/2023	174.69
28.	07/03/2023	126.50
29.	09/03/2023	108.3
30.	10/03/2023	223.29

GRAPH:



Graph 1: Graph of Dissolved Oxygen

3.2 CHEMICAL OXYGEN DEMAND

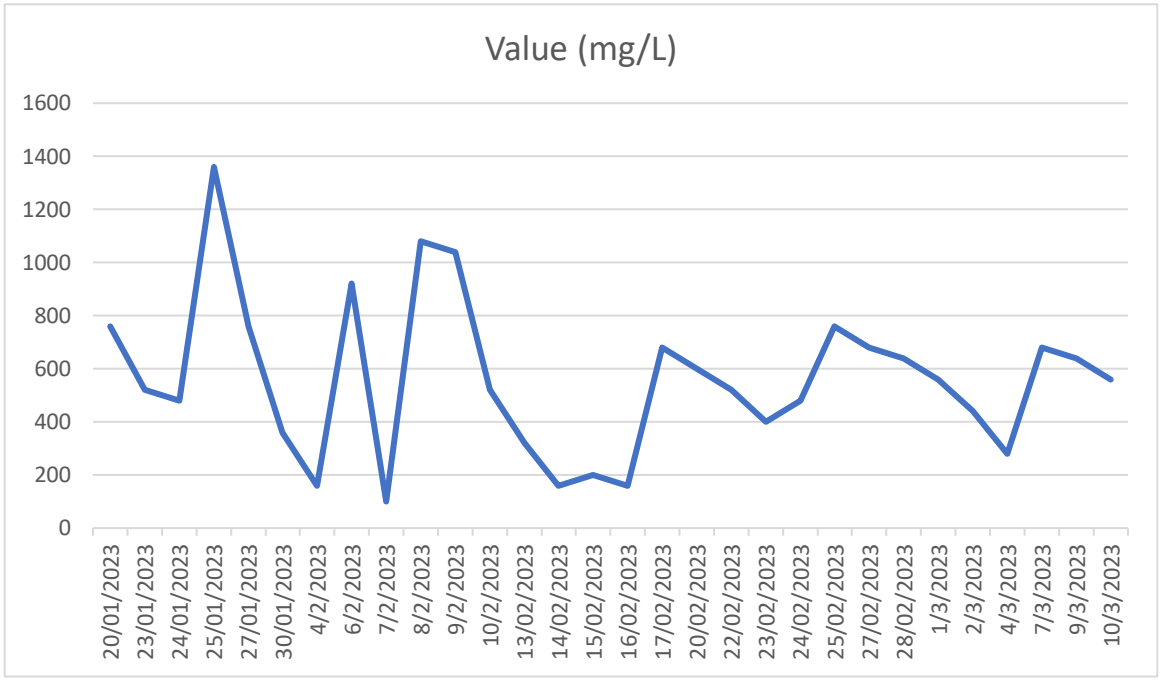
OBSERVATION TABLE:

Table 2: Readings of Chemical Oxygen Demand

SR. NO.	DATE	VALUE (mg/L)
1.	20/01/2023	760.00
2.	23/01/2023	520.00
3.	24/01/2023	480.00
4.	25/01/2023	1360.00
5.	27/01/2023	760.00
6.	30/01/2023	360.00
7.	04/02/2023	160.00
8.	06/02/2023	920.00
9.	07/02/2023	100.00
10.	08/02/2023	1080.0
11.	09/02/2023	1040.0
12.	10/02/2023	520.00
13.	13/02/2023	320.00
14.	14/02/2023	160.00
15.	15/02/2023	200.00
16.	16/02/2023	160.00
17.	17/02/2023	680.00
18.	20/02/2023	600.00
19.	22/02/2023	520.00
20.	23/02/2023	400.00
21.	24/02/2023	480.00
22.	25/02/2023	760.00
23.	27/02/2023	680.00
24.	28/02/2023	640.00
25.	01/03/2023	560.00

26.	02/03/2023	440.00
27.	04/03/2023	280.00
28.	07/03/2023	680.00
29.	09/03/2023	640.00
30.	10/03/2023	560.00

GRAPH:



Graph 2: Graph of Chemical Oxygen Demand

3.3 BIOLOGICAL OXYGEN DEMAND

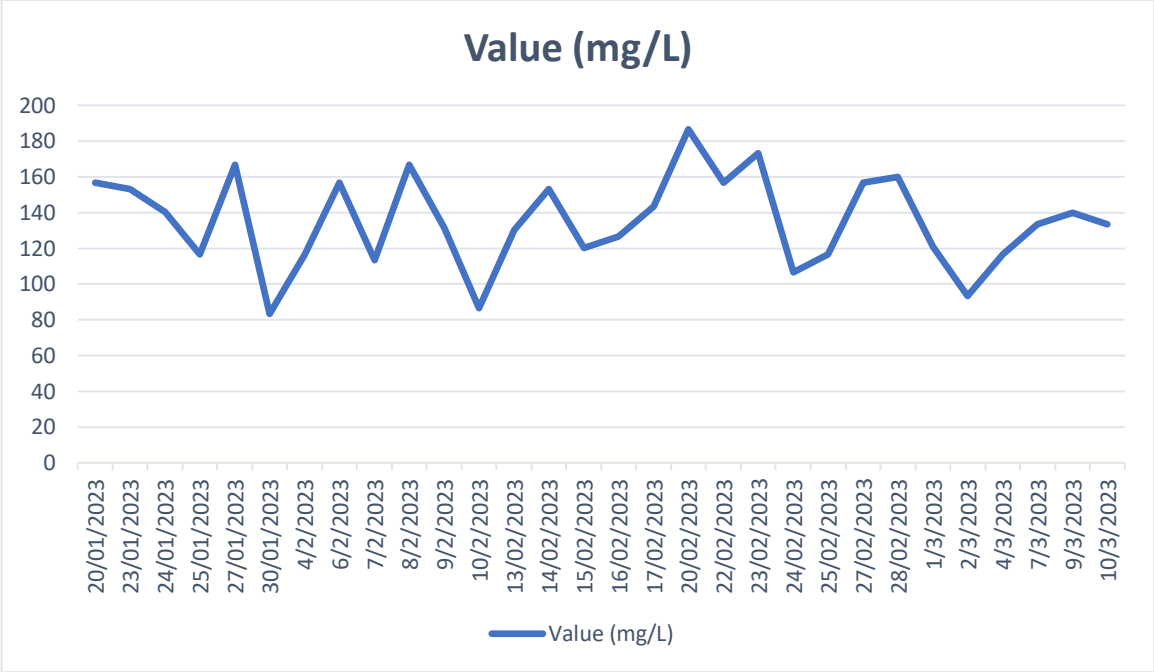
OBSERVATION TABLE:

Table 3: Readings of Biological Oxygen Demand

SR. NO.	DATE	VALUE (mg/L)
1.	20/01/2023	156.67
2.	23/01/2023	153.34
3.	24/01/2023	140.10
4.	25/01/2023	116.66
5.	27/01/2023	166.67
6.	30/01/2023	83.334
7.	04/02/2023	116.66
8.	06/02/2023	156.67
9.	07/02/2023	113.33
10.	08/02/2023	166.63
11.	09/02/2023	131.20
12.	10/02/2023	86.665
13.	13/02/2023	130.28
14.	14/02/2023	153.31
15.	15/02/2023	120.11
16.	16/02/2023	126.66
17.	17/02/2023	143.32
18.	20/02/2023	186.63
19.	22/02/2023	156.66
20.	23/02/2023	173.33
21.	24/02/2023	106.66
22.	25/02/2023	116.67
23.	27/02/2023	156.64
24.	28/02/2023	160.01
25.	01/03/2023	121.00

26.	02/03/2023	93.340
27.	04/03/2023	116.67
28.	07/03/2023	133.33
29.	09/03/2023	140.00
30.	10/03/2023	133.33

GRAPH:



Graph 3: Graph of Biological Oxygen Demand

3.4 OIL AND GREASE

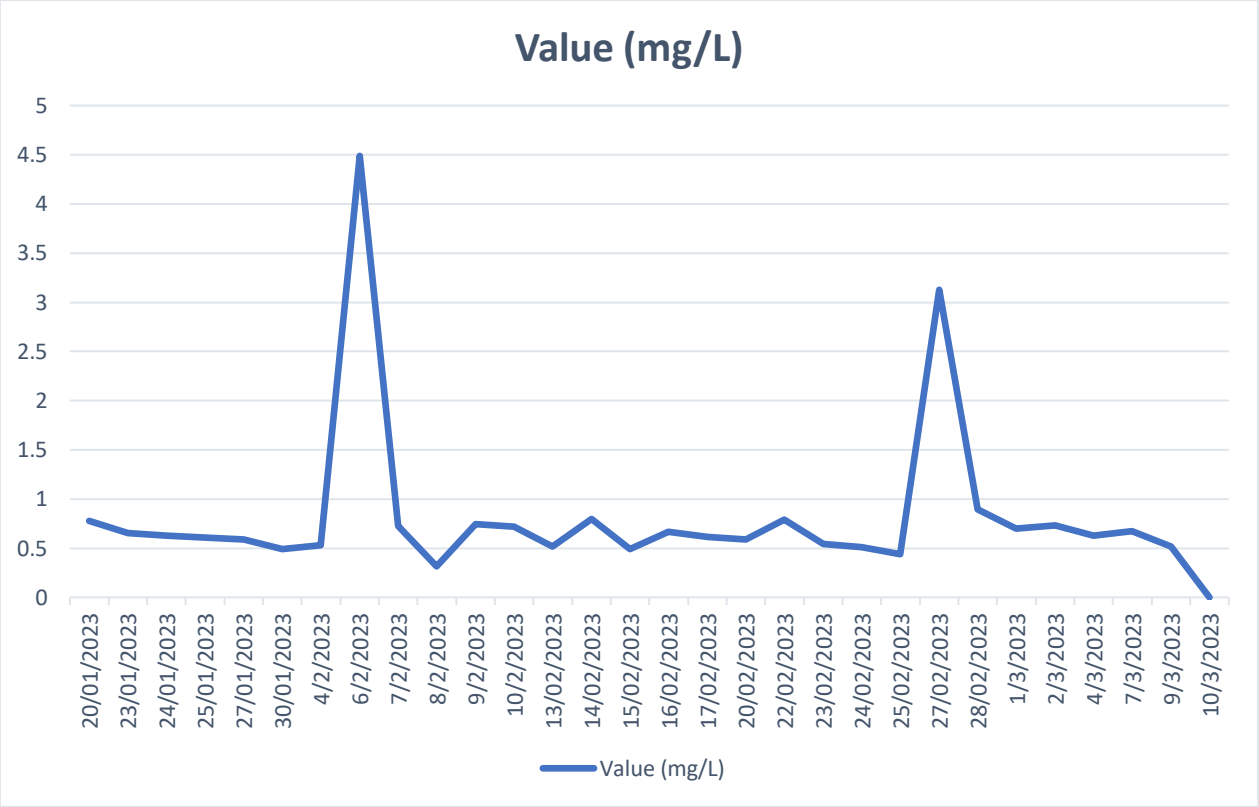
OBSERVATION TABLE:

Table 4: Readings of Oil & Grease

SR. NO.	DATE	VALUE (mg/L)
1.	20/01/2023	0.748
2.	23/01/2023	0.652
3.	24/01/2023	0.628
4.	25/01/2023	0.608
5.	27/01/2023	0.588
6.	30/01/2023	0.488
7.	04/02/2023	0.528
8.	06/02/2023	4.488
9.	07/02/2023	0.728
10.	08/02/2023	0.312
11.	09/02/2023	0.744
12.	10/02/2023	0.716
13.	13/02/2023	0.516
14.	14/02/2023	0.796
15.	15/02/2023	0.492
16.	16/02/2023	0.664
17.	17/02/2023	0.612
18.	20/02/2023	0.588
19.	22/02/2023	0.788
20.	23/02/2023	0.544
21.	24/02/2023	0.508
22.	25/02/2023	0.440

23.	27/02/2023	3.128
24.	28/02/2023	0.892
25.	01/03/2023	0.696
26.	02/03/2023	0.732
27.	04/03/2023	0.628
28.	07/03/2023	0.676
29.	09/03/2023	0.516
30.	10/03/2023	----

GRAPH:



Graph 4: Graph of Oil & Grease

3.5 TOTAL DISSOLVED SOLID

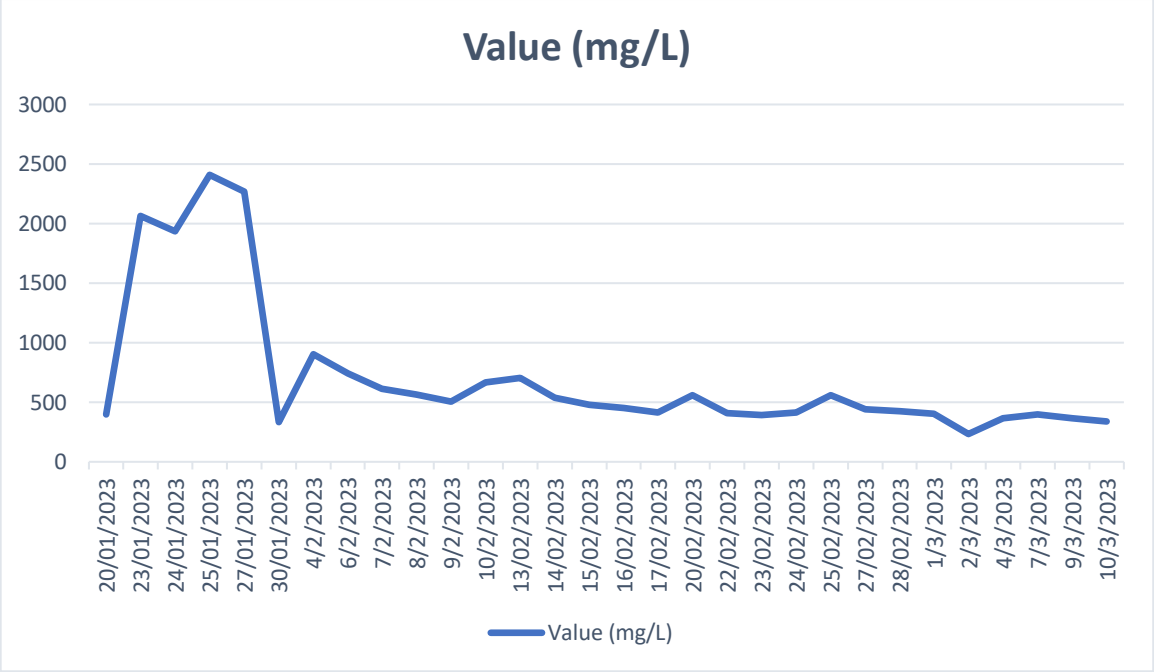
OBSERVATION TABLE:

Table 5: Readings of Total Dissolved Solid

SR. NO.	DATE	VALUE (mg/L)
1.	20/01/2023	400.09
2.	23/01/2023	2066.67
3.	24/01/2023	1933.33
4.	25/01/2023	2409.22
5.	27/01/2023	2266.67
6.	30/01/2023	333.33
7.	04/02/2023	903.01
8.	06/02/2023	740.65
9.	07/02/2023	610.67
10.	08/02/2023	566.67
11.	09/02/2023	503.33
12.	10/02/2023	666.67
13.	13/02/2023	703.33
14.	14/02/2023	540.00
15.	15/02/2023	476.67
16.	16/02/2023	450.43
17.	17/02/2023	416.67
18.	20/02/2023	556.67
19.	22/02/2023	410.12
20.	23/02/2023	390.42
21.	24/02/2023	416.67
22.	25/02/2023	560.59
23.	27/02/2023	443.33
24.	28/02/2023	423.33

25.	01/03/2023	403.32
26.	02/03/2023	233.33
27.	04/03/2023	366.67
28.	07/03/2023	400.03
29.	09/03/2023	363.33
30.	10/03/2023	340.12

GRAPH:



Graph 5: Graph of Total Dissolved Solid

4 CONCLUSIONS

- **Dairy effluent, the waste generated by dairy farms, can be a significant environmental problem if not managed properly. To overcome dairy effluent load, there are several potential solutions, such as:**

1. **Implementing a Comprehensive Effluent Management Plan (CEMP):** A CEMP outlines how dairy effluent is to be managed on the farm, including storage, treatment, and disposal. It can help to reduce the environmental impact of dairy effluent and ensure compliance with regulatory requirements.

2. **Utilizing anaerobic digestion:** Anaerobic digestion is a process where organic matter is broken down by bacteria in the absence of oxygen. It can be used to treat dairy effluent and produce biogas, a renewable energy source.

3. **Implementing soil-based treatment systems:** Soil-based treatment systems involve applying dairy effluent to land to provide nutrients to crops and vegetation. It can also help to improve soil health and reduce nutrient runoff.

4. **Using technology to monitor and manage effluent:** Technology, such as sensors and automated systems, can help to monitor effluent levels and manage effluent application. This can reduce the risk of overapplication and potential environmental harm.

5. **Reducing the amount of effluent generated:** Reducing the amount of effluent generated through improved animal management, such as reducing herd size, can also help to reduce the environmental impact of dairy farming.

- **Overall, the key to managing dairy effluent load is to adopt sustainable practices that reduce the overall load of the effluent and ensure that nutrients are managed in an environmentally friendly manner.**

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