

INTERNSHIP REPORT

Hiyoshi India Ecological Services Pvt. Ltd TICEL Biopark Ltd., Taramani,
Chennai-600 113, Tamil Nadu, India.



TRAINING PERIOD (11.09.2023-26.09.2023)

Submitted to partial fulfilment of requirements

For the award of degree of

MASTER OF SCIENCE

In

CHEMISTRY

Submitted by

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DEPARTMENT OF CHEMISTRY



SATHYABAMA
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DISCLAIMER

This internship report has been prepared by the author as an intern under HIYOSHI India Ecological Service Private Limited, Taramani. The views expressed in the report are personal to the intern and do not necessarily reflect the view of the company where the internship takes place or any of its staff or personnel. This report reflects personnel experience based on the level of interpersonal communication, interaction with the personnel, coordination level and information shared or perceived. There is always a room for improvement. However, it is not necessary for the readers to agree with the content, findings, conclusion and area of improvements as identified there in.

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I would like to express my heartfelt gratitude to all those who have contributed to the successful completion of my internship.

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I am also grateful to the entire **HIYOSHI India Ecological Service** team for providing me with the opportunity to intern at their esteemed organization.

I would like to acknowledge and grateful to my academic institution and the Department of Chemistry of **Sathyabama Institute of Science and Technology**, for their support in pursuing this internship.

This internship has been a significant milestone in my academic and professional growth, and I am thankful to everyone who played a role in making it a meaningful experience.

G PRIYANKA

26.09.2023

Introduction

Water analysis is a critical process for assessing water quality, impacting public health, ecosystems, and sustainable development. This internship report serves as a comprehensive documentation of my experiences and learning during my internship in the field of water analysis. Over the course of (11.09.2023 – 26.09.2023), I had the privilege of working with a team of dedicated professionals at HIYOSHI India Ecological Service Private Limited, gaining practical exposure to various facets of water quality assessment and analysis. This report not only outlines the methodologies and techniques employed in water analysis but also highlights the significance of this field in safeguarding human health, preserving ecosystems, and addressing pressing environmental challenges.

In the following sections, I have given the specific objectives of my internship, the methodologies and equipment used for water analysis, the data collection and interpretation processes, and the broader implications of water quality assessment in today's world. This report aims to provide a comprehensive overview of my internship experience, offering insights into the critical role of water analysis in ensuring a sustainable and healthy environment.

Laboratory Tour

One of the most enriching experiences during my internship at Hiyoshi was the opportunity to explore the inner workings of their laboratory facilities. This section of the report provides a detailed account of the captivating lab tour, during which I gained firsthand insight into the technologies, methodologies, and research practices employed by the company.



pH

pH value of water indicates the hydrogen ion concentration in water. pH is expressed as the logarithm of the reciprocal of the hydrogen ion concentration in moles/ litre at a given temperature. The pH scale extends from 0 (very acidic) to 14 (very alkaline) with 7 corresponding to exact neutrality at 25°C

- In the training we was thought, the temperature interference the pH, so it should be at 25.C as per IS 3025.
- PROCEDURE FOR pH TESTING OF WATER
- We Calibrated the instrument using CRM (Certified reference material)
- A Sample of pH was taken and test was conducted.



Electrical conductivity

Electrical conductivity is a measurement of water's ability to conduct electricity. EC is related to water temperature and the total concentration, mobility, valence and relative concentration of ions. Higher EC means more electrolytes in the water. i.e higher amount of impurities are present which will lead to a higher conductivity.

TDS (Total Dissolved solids)

Filterable residue (TDS). Total dissolved solids (TDS) are the amount of organic and inorganic materials, such as metals, minerals, salts, and ions, dissolved in a particular volume of water. TDS are essentially a measure of anything dissolved in water.

This method is applicable to all type of water and waste water.

Principle: The sample is filtered and the filtrate evaporated in a tared dish on steam-bath. The X residue after evaporation is dried to constant mass at 103-105°C

Procedure: First we should heat the evaporating dish to 180.C for 1 hr.

- Then cool it in desiccator, weigh and store in desiccator for use.
- Filter the sample, pipette the volume required to the weighed evaporating dish placed in steam bath

- Leave some time after complete evaporation of water from residue transfer the dish to oven and dry it.
- Weigh the dish as soon as it has cooled

Calculation: Filterable residue, mg/l = $1000 \frac{M}{V}$

Where M = mass in mg of filterable residue,
and V - volume in ml of the sample.



TSS (Total Suspended Solids)

Gravimetric analysis is the most widely used method for measuring total suspended solids in water. It is a quantitative technique that involves weighing the residues collected on glass-Fibre or cellulose ester membrane filters after filtration.

- This method can be applied to various types of water, including drinking water, surface water, saline water, as well as domestic and industrial wastewater.
- The practical range for determining total suspended solids using this method is from 4 mg/L to 20,000 mg/L.

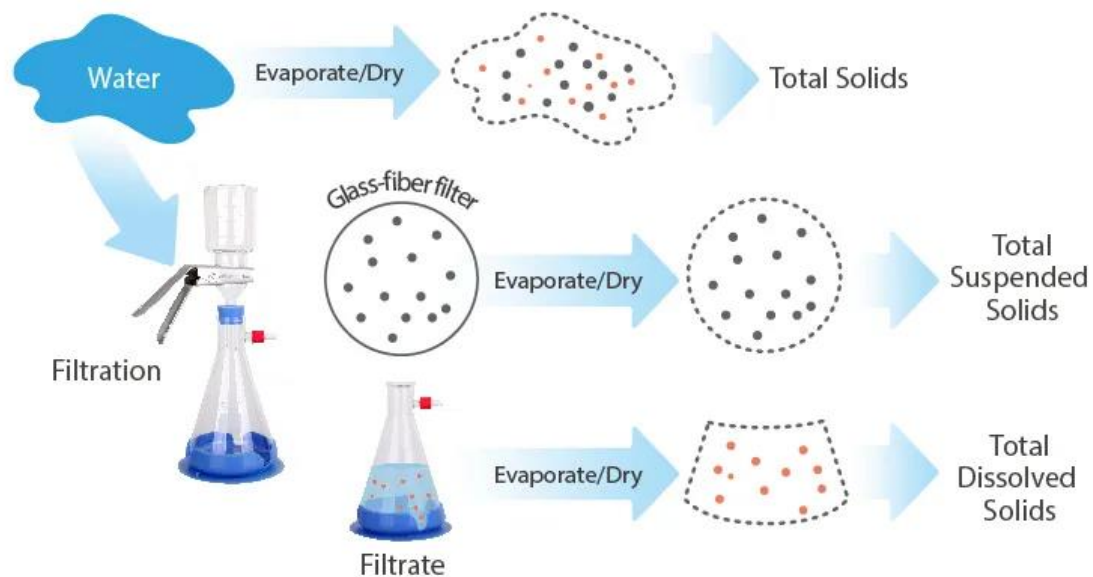
Principle: The sample is evaporated in a weighed dish on a steam-bath and is dried to a constant mass in an oven either at 103-105°C or 179-181°C. Total residue is calculated from increase in mass.

Calculate the non-filterable residue.

$$\text{TSS (mg/L)} = \frac{(C - D) \times 1000}{V}$$

TS (Total Solids)

Total solids are dissolved solids plus suspended and settleable solids in water. In stream water, dissolved solids consist of calcium, chlorides, nitrate, phosphorus, iron, sulphur, and other ions particles that will pass through a filter.



MLSS (Mixed Liquor suspended solids)

The overall concentration of solids in an aeration tank is measured by Mixed Liquor Suspended Solids (MLSS) in wastewater treatment. Non-biodegradable suspended particles, organic materials, and microbes are all included.

Procedure: Take the MLSS grab sample and filter it

- The filter was ignited for around 15-20 mins in a muffle furnace.
- When the filter has cooled, the residue was transferred to a desiccator for chilling purpose.
- Finally weigh the residue that we got on the filter paper.



Desiccator:

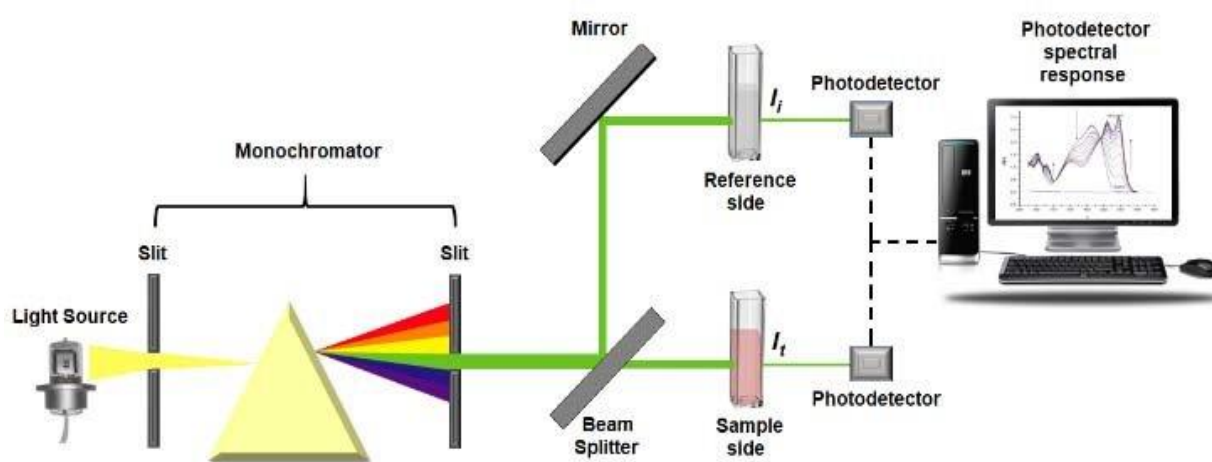
It is an apparatus for absorbing the moisture present in a chemical substance. An airtight, usually glass container containing dried silica crystals or some other drying agent for absorbing the moisture of another substance placed in the container.

UV-Vis Spectrophotometer:

It works on the principle of Beer-Lamberts law which says the amount of light passed or absorbed is directly proportional to the concentration and the path length of the material/absorbent.

- Absorbance- light absorbed Eg, 0.123, 0.056 etc...
- Transmittance- Light transmitted

$$A = 1/T$$



Phosphorous:

Phosphorous is a chemical element having atomic number 15.

Principle: It works on the principle of phosphorous reacts with ammonium molybdate and stannous chloride giving molybdo complex. The molybdo-phosphoric acid formed is reduced to an intensely coloured complex molybdenum blue by stannous chloride.

Procedure: Prepare 100ml of 0.1, 0.5, 1.0, 1.5, 2.0ppm from 100ppm.

$$100 \times V_1 = 0.1 \times 100$$

$V_1 = 10/100 = 0.1\text{ml}$. Like this prepare std for other concentration.



- Make the above ml of phosphorous in 100ml std flask for blank use distilled water and in another take the sample to be analysed.
- Add 4 ml of ammonium molybdate.
- To that add 0.5ml or 10drops of stannous chloride. We can observe blue colours of solution. Now measure the absorbance in UV -vis spectrophotometer.
- Spectrophotometer- suitable range for phosphorous is 690nm.
- The graph obtained will give the unknown concentration from which calculation can be done

Calculation: Phosphorus, mg/l = mg of phosphorus corresponding to control standard $\times 1000$ / volume of sample in ml

Ammoniacal Nitrogen:

Nesslerization Method:

Principle: The sample is buffered and distilled. The, ammonia in the distillate or in the sample is treated with Nessler's reagent and the colour developed is matched with that of a series of standard ammonia solutions or measured photometrically at 400 to 425 nm.

Nessler's Reagent: $\text{HgI} + \text{KI}$ in basic medium i.e. NaOH need to be added.

Rochelle's salt: Potassium sodium tartrate in water, but it is used for removing interference like Ca , Mg , Fe as well as other ions.

Procedure: Remove any interference of other ions by adding few drops of Rochelle's salt.

- After that add 1ml of Nessler's reagent where it will form brown coloured complex and then measured the absorbance at 410nm.
- For blank 0, and other conc. Like 0.5, 1.0, 1.5, 2.0, 2.5 ppm of ammoniacal nitrogen is made up in 100ml std flask.
- For std no need Rochelle's reagent because we are using only distilled water.
- But for sample we must use it. After mixing all, keep the Sol for 10 mins....this depends on parameter.
- Now check the absorbance in UV spectrophotometer.
- The reaction and result depends on the procedure and temperature of environment.

COD (Chemical Oxygen Demand)

Chemical Oxygen Demand (COD) is a test that measures the amount of oxygen required to chemically for organic material and inorganic nutrients, such as Ammonia or Nitrate, present in water. This undergoes a reverse titration.



Digestion: To remove all unsaturated materials and reduce the material to its simplest form. In other words all organic and other wastes will be removed/oxidised.

PRINCIPLE :

Most of the organic matters are-destroyed when boiled with mixture of potassium bichromate and sulphuric acid producing carbon-di-oxide and water. A sample is refluxed with a known amount of potassium bichromate in sulphuric acid medium and the excess of bichromate is titrated against ferrous ammonium sulphate. The amount bichromate consumed is proportional to the oxygen required to oxidize organic matter.

Apparatus: Reflux apparatus, Hot plate- Digester block,

Reagents: Std Potassium dichromate, H_2SO_4 , Std Ferrous ammonium sulphate, **INDICATOR-** Ferroin.

Procedure: 20ml or adequate of sample made up to 20ml will be added in COD tube.

- To this add half spatula of Mercuric sulphate.
- Now add 10ml of potassium dichromate followed by 30ml of silver H_2SO_4 .
- Keep it for digestion.
- Cool it and titrate against 0.1N ferrous ammonium sulphate using ferroin indicator.
- The end point is the colour change sharply from green to wine red.

Calculation:

Normality of ferrous ammonium sulphate $v = 10 \times 0.25 / V$

Where V = volume of $Fe (NH_4)_2 (SO_4)_2$ required for titration, in ml

$COD, mg/l = (V_1 - V_2) N \times 8000 / V_0$

BOD (Biochemical Oxygen Demand): DAY 1



Biochemical oxygen demand (BOD) represents the amount of oxygen consumed by bacteria and other microorganisms while they decompose organic matter under aerobic (oxygen is present) conditions at a specified temperature.

Principle: The biochemical oxygen demand test is based on mainly bio-assay procedure which measures the dissolved oxygen consumed by micro-organisms while assimilating and oxidizing the organic matter under aerobic conditions. The standard test condition includes incubating the sample in an air tight bottle, in dark at a specified temperature for specific times.

Apparatus: Incubation bottle - 300 ml capacity narrow neck special BOD bottles with planed mouth with ground glass stoppers.

Reagent: Phosphate buffer, Magnesium sulphate, Calcium chloride, Ferric chloride, acid and alkali Solution, Starch indicator, alkaline iodide, sulphuric acid, Std sodium Thio sulphate soln.

Dissolved oxygen: $O_2(\text{in sample}) + MnSO_4 + KOH$

Procedure: Take sample in two 300ml bottle one for BOD day1 and Other for Day 3.

- To that add 2ml MnSO_4 + 2ml alkaline iodide solution which turns into a brown ppt. shake nicely and keep it to settle.
- Day one bottle add the following and keep the day 3 bottle inside BOD incubator.
- After that dissolve ppt by adding 5ml H_2SO_4 .
- From that take 200ml in conical flask.
- Titrate against 0.25N sodium Thio sulphate till pale yellow.
- Add starch as indicator and blue colour forms
- The end point is the blue to colourless

Chloride

The argentometric method is suitable for use in relatively clear waters when 0.1 to 10 mg of chloride is present in the portion titrated. This involves the direct titration.

Principle : In a neutral or slightly alkaline solution, potassium chromate can indicate the end point of the silver nitrate titration of chloride. Silver chloride is precipitated before red silver chromate is formed.

Reagents: Std silver nitrate , std sodium chloride, potassium chromate as indicator.

Procedure: Take NaCl in conical flask add potassium chromate as indicator and titrate against silver nitrate. The end point is the brick red colour. This is done to find the give the normality of silver nitrate soln. Now follow the sample procedure for blank and sample solutions. Note the reading and calculate to find the amt of chlorine present in sample.

Calculation: Chloride, mg/l = $(V_1 - V_2) \times N \times 35450 / V_3$

Where, V_1 = volume in ml of silver nitrate used by the sample,

V_2 = volume in ml of silver nitrate used in the blank titration,

V3 = volume in ml of sample taken for titration, and

N =normality of silver nitrate solution.

BOD (Biochemical oxygen demand) DAY 2

The B.O.D. test is among the most important method in sanitary analysis to determine the polluting power, or strength of sewage, industrial wastes or polluted water. The test consists in taking the given sample in suitable concentrations in dilute water in B.O.D. bottles. Two bottles are taken for each concentration and three concentrations are used for each sample. One set of bottles is incubated in a B.O.D. incubator for 3 days at 20°C; the dissolved oxygen (initial) content (D1) in the other set of bottles will be determined immediately. At the end of 3 days, the dissolved oxygen content (D2) in the incubated set of bottles is determined.

Procedure: Place the set of bottles to be incubated in a B.O.D. incubator for 3 days at 20°C. Care should be taken to maintain the water seal over the bottles throughout the period of incubation.

- Determine the initial dissolved oxygen contents in the other set of bottles and note down the results.
- Determine the dissolved oxygen content in the incubated bottles at the end of 3 days and note down the results.
- Proceed as like titration done in BOD day1 and note down the titre value.
- Calculate the B.O.D. of the given sample.

$$\text{mg/L of B.O.D.} = (D1 - D2) / P$$

Sulphate

To determine the amount of sulphate present in the given samples. Sulphate is widely distributed in nature and may be present in natural water in concentrations ranging from a few to several thousand milligrams/litre. Sulphates are of considerable concern because they are indirectly responsible for two serious problems often associated with the handling and treatment of wastewater.

Turbidimetric Method

Principle: The turbidimetric method of measuring sulphate is based upon the fact that barium sulphate tends to precipitate in a colloidal form and that this tendency is enhanced in presence of a sodium chloride-hydrochloric acid. The absorbance of the barium sulphate solution is measured by UV vis spectrometer and the sulphate iron concentration, determined by comparison of the reading with a standard curve.

Reagents: Conditioning agent, Barium chloride, Standard sulphate solution.

Procedure: Take 5ml,10ml,15ml,20ml,30ml of std barium sulphate solution in 100ml std flasks.

- Like wise make up the blank and sample also.
- Transfer this to the beaker and add 10ml of buffer Solution containing MgCl_2 , CH_3COONa , KNO_3 and CH_3COOH .
- Add a spoonful of barium chloride crystals and begin timing immediately. Stir at constant speed exactly for one minute.
- After stirring pour some of the solution into the absorption cell of the photometer.
- Absorbance versus sulphate concentration is plotted and a curve is obtained.
- Finding the absorbance for a given sample, the concentration of sulphates in the solution is determined with the help of calibration curve.

Calculation:

$$\text{SO}_4 \text{ in mg/L} = \frac{\text{mg of BaSO}_4}{\text{mL of sample}} \times 411.6 = \dots\dots\dots$$

CONCLUSION

My internship experience at HIYOSHI has been a profoundly enlightening journey into the world of water quality assessment. Throughout my tenure of 10days I have had the privilege of contributing to critical initiatives and gaining practical insights into the significance of water analysis in safeguarding our planet's most precious resource.

Looking ahead, I am excited to apply the knowledge and skills acquired during this internship in my academic studies and future career. I extend my heartfelt gratitude to the company for this invaluable opportunity and to everyone who has contributed to making this internship a meaningful and enriching experience.

As I move forward, I am confident that the lessons learned and experiences gained during this internship will continue to shape my personal and professional growth.

RO Plant 500 LPH



DM Plant 6000 LPH





HIYOSHI india

Ecological Services Pvt. Ltd.

Certificate of Training

This is to certify that

Ms. G. Priyanka

Of

Sathyabama Institute of Science and Technology (Deemed to

be University), Jeppiaar Nagar, Rajiv Gandhi Salai (OMR),

Sholinganallur, Chennai - 600 119, Tamilnadu, India

Successfully completed the "Internship" in the field of Water

and Wastewater analysis at Hiyoshi India Ecological

Services Pvt. Ltd., Chennai - 600 113, Tamilnadu, India

From 11th to 26th September 2023.



Dr. M. MAYILSAMY

Director

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