INDUSTRIAL TRAINING FINAL REPORT
SESSION: MARCH – AUGUST 2022

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Duration (Date)	: 21 February 2022 – 5 August 2022 (24 Weeks)
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I cannot forget to thank my family for all the prayers, financial and unconditional support in this intense semester. Last but not least, a huge thank you to my friends that has been through this internship together with me. We might be in different company but their helps and support means a lot to me while completing my internship this semester. Without that support, this industrial training would not have been possible. Thank you for all the strength you gave me.

ABSTRACT

This report consists of student's Industrial Training course Diploma in Chemical Engineering (EH110) which has been carried out at a commercial lab, ERALab Sdn Bhd. The internship period is 24 weeks starting from 21 February to 4 August 2022. This course must be taken by all students from Diploma in Chemical Engineering in order to complete their studies. Students will be assigned to the company that they can be evaluate by the company supervisor and as well as the university's supervisor. Within practical training, students can utilize the time wisely to gain experience as much as possible and also apply the theoretical knowledge with real working condition. This report also covers every activity that has been carried in every unit, skills applied, special projects and all the task that students successfully perform during 6 months training in ERALab Sdn Bhd. Additionally, this report also contains background information of the company, details of training, experience gained and problem solving. The challenges and issues faced by student as well as suggestion for improvement during the training period has all been clearly mentioned. Besides, this report also included a brief description of the work that students had learned and performed.

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CHAPTER 1: INTRODUCTION OF INDUSTRIAL TRAINING

1.1 Overview

Industrial training is one of the mandatory requirements for a Diploma in Chemical Engineering student from Universiti Teknologi MARA to complete their study and officially graduate. Before completing Diploma, it is required for all students to complete their six months industrial training program which consists of 24 weeks overall. Industrial training provides students with the opportunity to learn and get a hands-on experience on the real industry. Students will be able to adapt their theoretical expertise to real world situation. Industrial training is an important part on developing the practical and technical skills needed in the Chemical Engineering industry including laboratory, chemical plant, safety as well as assisting with future jobs. This report describes my experience doing internship in ERALab Sdn Bhd.

1.2 Objectives

The purpose of industrial training is to introduce and expose students to the work and environment of their occupational field. It will also give students the opportunity to gain relevant job experience in their field of study. Students may learn about extra skills outside of their studies through training program. Students will be exposed to a real work environment during the training session, which will teach them how to connect and communicate efficiently at all levels of the workplace. This will automatically enhance their soft skills that will be useful to find relatable jobs in the future. By communicating with people in the workplace like colleagues, supervisor and staff, it helps students to foster a sense of camaraderie among coworkers. Students also required to write and complete their report daily and weekly to track their improvement as well as everything they learn during the internship period.

1.3 Industrial Training Placement

For this industrial training, my placement is at ERALab Sdn. Bhd. The address of the company is No.21, Block C, Jalan PJU 1A/3, Taipan Damansara 2, Ara Damansara, 47301 Petaling Jaya, Selangor Darul Ehsan. Environmental Research and Analytical Laboratory Sdn. Bhd. (ERALab) is a private owned business headed by Noor Azimah Mustafa (AMIC), a registered EIA consultant and a Chemist. This company offered a full spectrum of professional services of Environmental Services, Occupational Safety and Health (ESH) consulting, Laboratories Services, and Site sampling to nationwide industrial, commercial, and government clients across multiple markets. ERALab Sdn Bhd aim to provide cost-effective and on-time solutions to today's environmental and occupational health challenges.

Figure 1

1.3.1 Industrial Schedule

WEEK	PARAMETERS	CHEMIST IN CHARGE
Week 1 – Week 5	Heavy Metals	ChM Hafiz
Week 6 – Week 10	Oil and Grease	Miss Leyana
Week 11 – Week 14	Microbiology	Miss Liya
Week 15 – Week 20	Inorganics	Brother Sabhi
Week 21 – Week 24	Organics (GC-MS)	Brother Najah

Table 2

1.3.2 Company Supervisor Information

En. Wan Ezak was assigned as my supervisor to guide and assist me throughout the industrial training for 24 weeks. From figure 1, En. Wan Ezak Shah standing in below, the second from right. Stated below are some information about his background in the industry:

Name	Wan Ezak Shah Wan Abdullah
Title	ChM
Position	Lead Chemist/RO
Email	chemist@eralab.com.my

Table 3

CHAPTER 2: COMPANY PROFILE

Figure 2

2.1 Company Background

Environmental Research and Analytical Laboratory Sdn. Bhd or ERALab in short, commenced operations on 1 June 1995. The office is located in No.21, Block C, Jalan PJU 1A/3, Taipan Damansara 2, Ara Damansara, 47301 Petaling Jaya, Selangor Darul Ehsan. Service offered include consultancy in environmental, health and safety fireld, physical site sampling as well as analytical laboratory services. ERALab has also obtained the Petronas License in these areas. For the laboratory services, ERALab has acquired SAMM accreditation MS ISO/IEC 17025:2005 by the Department of Standards, Malaysia. The ERALab organization consists of multidisciplinary personnel headed by a Managing Director, Noor Azimah Mustafa (AMIC). She is a registered chemist with the Malaysian Institute of Chemistry and holds a Master Degree in Environmental Science.

2.2 Company History

Environmental Research and Analytical Laboratory Sdn. Bhd. (ERALab) is a privately owned business headed by Noor Azimah Mustafa (AMIC), a registered EIA consultant and a Chemist. She is also helped by four other managers from different departments which are Puan Zurida Jamil (Operations Manager), Puan Noraini Shair (Laboratory Manager), Puan Siti Hamimah Ismail (Industrial Hygiene Manager). ERALab started its operations at Seksyen 19, Petaling Jaya with 4 employees on 17th March 1996 and was accredited with ISO/IEC G25 on 17th March 1998. After a decade, ERALab now has more than 50 workers and has relocated their headquarters to Ara Damansara, Petaling Jaya. They also managed to expand and open up two branches. The first branch is in Kuala Terengganu which is managed by En. Wan Mohd Serry Akhry bin Wan Zaki and the second branch named 3Phase Reservoir Technology, is currently managed by En. Mohd Rashidi bin Md Shafi'I. ERALAB offers a full spectrum of professional services of Environmental Services, Occupational Safety and Health (ESH) consulting, Laboratories Services, and Site sampling to nationwide industrial, commercial, and government clients across multiple markets.

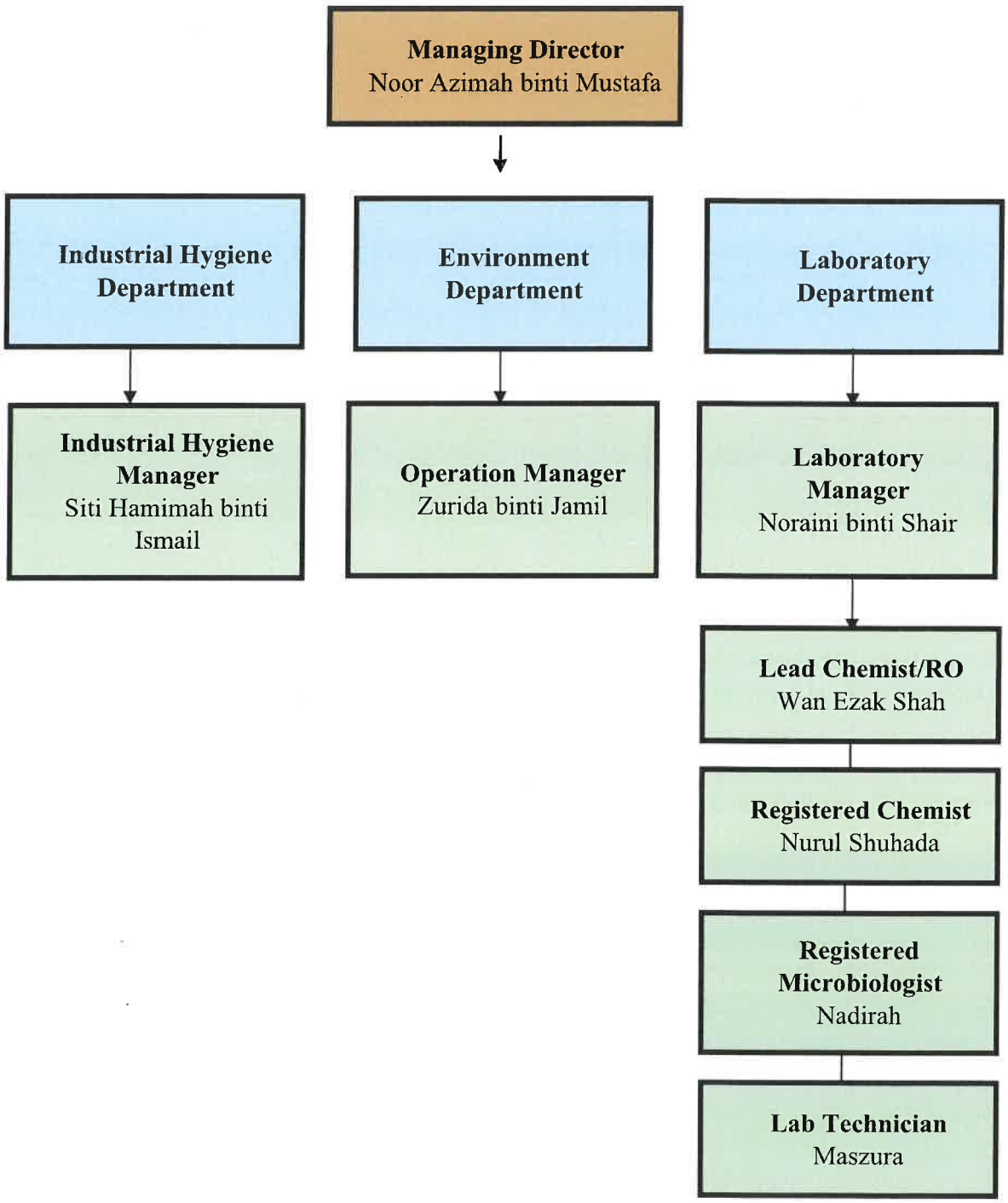
Due to their outstanding work in the commercial laboratory industry, ERALab has managed to become a part of the registered company under PETRONAS and now holds eleven different licenses under environmental, industrial hygiene and workers safety. For laboratory services, ERALab has managed to be accredited under SAMM MS ISO/IEC 17025:2017, as well as ISO 9001:2015 showing their ability to provide consistent products and services to clients. ERALab has also managed to be the 1st runner up for the Women Entrepreneur Award organized by SME Bank on 22nd March 2016 as well as awarded with Facilitation Fund by UKAS, JPM and SME Corp Grant.

2.3 Vision and Mission

Vision: To become the leading national and regional player for analytical services

Mission: To provide clients high quality and professional laboratory services, upstream and downstream, and Health and Safety Executive (HSE) related services for the betterment of employees, community, nation and economy.

2.4 Organizational Chart



2.5 Main Product / Services Provided

ERALab Sdn Bhd provides consultancy, laboratory testing and field monitoring services in Environmental and Occupational Safety and Health related fields. Below are the details of services provided by ERALab Sdn Bhd.

Consultancy (Environmental)

- Environmental Impact Assessment (EIA)
- Environmental Management Plan
- Post EIA Compliance Assessment and Environmental Auditing
- Environmental Site Assessment Phase I
- Wastewater Characterization Study (WWCS)
- Scheduled Waste Management
- ISO/IEC 17025 Consultant
- Application for DOE Written Approval

Consultancy (Occupational Safety & Health)

- Health Risk Assessment (HRA)
- Indoor Air Quality (IAQ)
- Chemical Health Risk Assessment (CHRA)
- Occupational Noise Exposure
- Local Exhaust Ventilation Testing (LEV)

Laboratory Testing

Water Quality (River, Marine Water, Domestic & Industrial Effluent, Drinking Water, Raw Water, Ground Water)

- Physical Parameter (Ph, do, Alkalinity, Acidity etc)
- Organic Parameter (BOD, COD etc)
- Chemical Parameter (NH3-N, Heavy Metals etc)
- Organic Compounds (Pesticides, VOC, SVOC, TPH, BTEX etc)
- Toxicity Characteristic Leaching Procedure (TCLP) & Compositional Analysis of Scheduled Waste (DOE)

Ambient Air Quality

- Dust Particulates (TSP and PM10) and Heavy Metals (As, Pb, Cd etc)
- Gaseous (SO2, NO2, CO)
- Oil Mist and Acid Mists
- Hydrocarbon, VOC
- Physical Parameter (Temperature, Humidity, Wind Speed)
- Dioxin & Furans
- Another chemical compound by request

Stack Emission

- Dust Particulates, Total Organic Carbon, Poly Aromatic Hydrocarbon (PAH). VOC, Heavy Metals (Cd, Hg, As, Pb, Sb) BTEX, HCl, H2SO4, etc
- Dioxin & Furan

Industrial Hygiene

- BTEX, Hg, Mineral Dust, Dust Particulate, etc

Oil Testing

- Water Content, Viscosity, TAN, Wear Metals, etc

Blood & Urine Test

- Mercury Content

Field Monitoring (Environmental)

- Water Quality (River, Marine Water, Domestic & Industrial Effluent, Drinking Water, Raw Water, Ground Water)
- Ambient Air Quality (Area monitoring)
- Industrial Emission (Isokinetic and non-isokinetic Stack emission sampling, Boiler, Chimney)
- Boundary Noise Level

Field Monitoring (Occupational Safety & Health)

- Chemical Exposure Monitoring (Mineral Dust, Oil Mist, BTEX, and other chemicals as specified in USECHH Regulations)

- Noise Mapping, Point Source, Personal Exposure
- Indoor Air Quality
- Local Exhaust Ventilation Testing (LEV)

Training

- Health, Safety and Environment (HSE) Training
- ISO/IEC 17025 Training
- Oil Testing Training

Product

- Personal Protective Equipment
- Fire Fighting Equipment & System
- Corporate Gifts and Souvenirs
- Apparel Related Items
- Health Equipment
- Office Equipment
- Oil Spills Products
- Corporate Video

Figure 3

Figure 4

CHAPTER 3: OVERVIEW OF TRAINING

3.1 Introduction

ERALab Sdn. Bhd. is a commercial environmental testing laboratory which means it performs analyses or tests for third parties for a fee. It is not associated with hospitals or healthcare facilities and often provides a broad range of services over a wide geographical area. ERALab offers physical, chemical, and microbiological analysis of specimens collected from the environment. For example, a water sample may undergo physical testing, chemical testing, and microbiological testing. Sanitarians or water quality technicians often perform basic tests (e.g., temperature, pH, volatility, and physical appearance) at the site where samples are collected. They transmit the results of these basic tests to the laboratory along with the samples, where chemists and microbiologists perform additional presumptive and confirmatory testing.

Results from the basic tests may suggest the need for more definitive testing using instruments such as atomic absorption spectrophotometers, gas chromatographs, and mass spectrometers. The chemists and microbiologists perform much of the routine environmental testing in batches of 10 to 50 samples on semi-automated or fully automated instruments. The raw analytical data are captured, processed, and reported by using software that interfaces directly with the instrument and the laboratory's data management system which is Laboratory Information Management System (LIMS).

Figure 5

3.2 Summary of Training & Experience Gained

Week	Activity
Week 1 (21/2/22 – 25/2/22)	• Report Duty • Attended a meeting with supervisor, En. Ezak on the job scopes for intern in lab department • Introduced to the staffs in ERALab and explored about ERALab's background • Check pH, turbidity, residual chlorin using HACH
Week 2 (28/2/22 – 4/3/22)	• Introduced to TSP, PM 2.5 and PM 10 for ambient air parameters, handled by Puan Maszura and conducted the tests required • Learned about Laboratory Information Management System (LIMS) • Recorded new batches of samples into the LIMS • Organized new samples accordingly • Learn dilution method and calculation for ICP samples before run the equipment
Week 3 (7/3/22 – 11/3/22)	• Disposal of old samples and organized new samples • Prepare Reagent for ICP Metals Digestion using APHA 3120 B Method • Learned about the ICP-MS analysis and sample preparation • Prepared sample for ICP-MS and ran the ICP-MS for water samples and soil samples
Week 4 (14/3/22 – 18/3/22)	• Prepare reagent to run Atomic Absorption Spectroscopy (AAS) • Reagent used in AAS including Carrier (HCl 3%), Reductant (NaBH4) and Potassium Permanganate. • Learn about AAS working principle and theory.

Week 5 (21/3/22 – 25/3/22)	• Exposed to TOC equipment used to identify Total Organic Carbon in a sample. • Weight glucose and sodium carbonate for total carbon calibration and inorganic carbon calibration respectively. • Prepare reagent for Toxicity Characteristic Leaching Procedure (TCLP) sludge and learn the procedure.
Week 6 (28/3/22 – 1/4/22)	• Learn and conduct Chloride method to determine total chloride in the sample. • Learn how to conduct Quality Control (QC) for chloride using titration method. • Disposal of old samples and organized new samples • Cleaned sample room and sanitized the entire lab for a site visit from the clients
Week 7 (4/4/22 – 8/4/22)	• Learn Hardness method to determine total Calcium and Magnesium in the sample • Conduct Quality Control (QC) for hardness using titration method. • Learn calculation for calcium hardness and magnesium hardness with the result from titration procedure.
Week 8 (11/4/22 – 15/4/22)	• Learn and conduct oil and grease using gravimetric method for samples containing oils. • Learn the calculation of total oil and grease from the result • Introduced to TSP, PM 2.5 and PM 10 for ambient air parameters, handled by Puan Maszura and conducted the tests required
Week 9 (18/4/22 – 22/4/22)	• Conduct Nitric Acid Digestion Method 3030 E • Learned about Laboratory Information Management System (LIMS) • Recorded new batches of samples into the LIMS

	• Organized new samples accordingly
Week 10 (25/4/22 – 29/4/22)	• Run TOC for total carbon and inorganic carbon in solid sample such as soil and sludge • Prepare reagent used for running inorganic carbon that is HCl 2N. • Disposal of old samples and organized new samples
Week 11 (2/5/22 – 6/5/22)	• Eid Al-Fitr Break
Week 12 (9/5/22 – 13/5/22)	• Learn and conduct alkalinity method • Conduct Quality Control (QC) for alkalinity using titration method. • Learn calculation for alkalinity with the result from titration procedure
Week 13 (16/5/22 – 20/5/22)	• Learn phenol HACH method 8047 • Learned about Biochemical Oxygen Demand (BOD) handled by the microbiologist, Miss Liya and conducted the tests required • Conducted BOD for water samples
Week 14 (23/5/22 – 27/5/22)	• Learned and conducted Loss on Ignition (LOI) using ASTM D7348 method • Learned about the tests required for microbiology parameters (E. coli, Total Coliform, Fecal Coliform, etc.) and conducted the test required
Week 15 (30/5/22 – 3/6/22)	• Learned and conducted Milestone Microwave Digestion USEPA Method • Conducted microwave acid digestion method for sediments, sludge and soil samples using EPA 3051 method

Week 16 (6/6/22 – 10/6/22)	• Microwave acid digestion method for municipal waste • Example of municipal waste including fiber cloth, contaminated glove and paint as well as contaminated paper bag
Week 17 (13/6/22 – 17/6/22)	• Microwave acid digestion method for aqueous and extract samples • Prepared m-ENDO and m-TEC media • Conducted BOD, T. Coli., E. Coli, and MPN tests.
Week 18 (20/6/22 – 24/6/22)	• Conducted microwave acid digestion for lube and hydraulic oil samples • Disposal of old samples • Organized new samples
Week 19 (27/6/22 – 1/7/22)	• Learned and conducted Total Suspended Solid (TSS) using APHA 2540 D method • Did some calculation for TSS from the result • Recorded new batches of samples into the LIMS • Organized new samples accordingly
Week 20 (4/7/22 – 8/7/22)	• Learned and conducted Total Dissolved Solids (TDS) using APHA 2540 C method • Did the calculation for TDS from the results before key in the record into LIMS
Week 21 (11/7/22 – 15/7/22)	• Learned and conducted Salinity using electical conductivity method • Method used for conductivity is APHA 2520 B method • Learned and conducted Conductivity using laboratory method • Method used for conductivity is APHA 2510 B method

Week 22 (18/7/22 – 22/7/22)	• Learned and conducted microwave acid digestion method for diesel fuel • Learned how to digest samples for sludge samples using ICP-MS and conducted them accordingly • Prepared reagent for NO_2 analysis and conducted NO_2 analysis for new samples • Learned how to document the GC-MS analysis using Microsoft Excel
Week 23 (25/7/22 – 29/7/22)	• Learned and conducted microwave acid digestion method for dried biological sludge from sample such as died fish to determine the toxicity of the river. • Disposal of old samples and organized new samples • Conducted BOD and microbiology tests • Conducted gravimetric method for oil samples
Week 24 (1/8/22 – 5/8/22)	• Conducted Liquid-Liquid Extraction method using separatory funnel • Method used is USEPA 3510 C method • Conducted BOD and microbiology tests • Calculated BOD results and keyed into LIMS • Submission of logbook and internship report

Table 1

CHAPTER 4: DETAILS OF EXPERIENCE GAINED

4.1 Introduction

The scope of my work as an intern at ERALab is mainly to assist the chemists and microbiologists to perform the analysis on the samples provided by the clients. Furthermore, each chemist or microbiologist is responsible for their own parameters. I was also trained to do many of the analysis on my own, which included learning to use automated equipment for several of the parameters that I tested. I was given the Standard Operating Procedure (SOP) which is the instrument manuals for any equipment that I would use. Reading about the procedure in advance allowed me to be informed about any risks associated with that analysis. It also gave me a better understanding of the analysis I was going to perform. The SOP includes possible sources of error for the analysis, preservation and storage requirements of the samples, reagents and standards needed for analysis, documentation and reporting requirements, quality control (QC) requirements, and training procedures.

Before I performed the analysis on my own, I was required to complete cross-training with a chemist who is qualified to perform the analysis. Cross-training is accomplished by following a checklist of training guidelines. During my first week, I also started to learn to use the Laboratory Information Management System (LIMS) software that is used to organize samples and data. When samples are brought to the lab, they are given an identification number or job number and logged in to LIMS. The chemists can then create a list that gives them important information about the samples, such as the name of the clients, the sampling date and the parameters requested by the clients. One example was a project from PETRONAS Penapisan (Terengganu) Sdn Bhd (PPTSB). The due date is the date that the customer requires the data from all analyses. The chemist can then put the samples into a workgroup, based on the parameter that they are going to test, such as turbidity. A workgroup is a batch of samples being analyzed for one parameter at the same time; it may include samples from more than one project. Each sample may be tested for more than one parameter. The label on each sample container lists the analyses required by that sample. After the samples have been tested, the data from the analysis are transferred into LIMS from a Microsoft Excel spreadsheet. LIMS is then used to put together the data package that shows the results of the analysis.

4.2 Details of Training and Experience Gained

4.2.1 Loss on Ignition ASTM-D7348 Method of Solid Combustion Residues

Loss on Ignition (LOI) refers to the mass loss of a combustion residue whenever it is heated in an air or oxygen atmosphere to high temperatures. In the cement industry, use of the term LOI normally refers to a mass loss in a sample heated to 950 °C. To combustion engineers, the term LOI normally refers to mass losses in samples heated to temperatures normally less than 950 °C. These test methods establish a procedure for determining LOI values for combustion residues heated to 750 °C or 950 °C. LOI values from these test methods can be used by industries that utilize combustion residues in various processes and products. These test methods cover the determination of the mass loss from solid combustion residues upon heating in an air or oxygen atmosphere to a prescribed temperature. The mass loss can be due to the loss of moisture, carbon, sulfur, and so forth, from the decomposition or combustion of the residue. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

The procedure for this method is;

1) Preheat the crucible in the oven at 550 degree celcius for 15 minutes.
2) After 15 minutes, carefully take out the crucible and take the initial reading.
3) Weight sample inside the crucible approximately 5 g and take the actual reading
4) Put it back in the oven at 300 degree celcius for 1 hour
5) After 1 hour, carefully move the crucible to the furnace for another 2 hours at 800 degree celcius
6) After 2 hours, switch off the furnace and let the furnace temperature cool down a little bit
7) Take the final weight of the crucible and record it.

4.2.2 Oil and Grease in Water by Hexane Extraction and Gravimetry

This method is applicable to the quantitative determination of Oil and Grease (hexane extractable material, HEM) and Mineral Oil and Grease (silica gel treated hexane extractable material) in water. Oil and Grease provides a measure of hexane extractable non-volatile oils and greases which may be of either petrogenic or natural origin. Mineral Oil and Grease determines only non-volatile, non-polar oils and greases. Most natural oils and greases (e.g. vegetable oils, animal fats) are polar, and are excluded from the Mineral Oil and Grease parameter. The procedure for this method is;

1) Weight a 100 ml flat bottom flask and record it.
2) Measure sample 1L using measuring cylinder
3) Pour the sample into 1L separatory funnel
4) Add 5 ml of 1:1 Hydrochloric Acid to neutralize the pH sample
5) Measure 30 ml of hexane and add to the separatory funnel
6) Put the stopper on and shake the separatory funnel carefully
7) Release the gases through the stopcock. To release the gases, invert the separatory funnel after shake, hold the stopper and open the stopcock slowly. Shake again and repeat this step until the release of gas is not heard anymore.
8) Put the separatory funnel back in the stand. Do not move the separatory funnel to let the separation process happen for few minute
9) Slowly drain he lower water layer from the separatory funnel. Keep the water ina beaker to repeat the step again later.
10) Collect the upper hexane layer in a separate beaker
11) Proceed the second and third extraction using the same step from 4 – 9
12) Put sodium sulfate to the upper layer hexane that has been collected to separate the grease from the oil.
13) Filter the solution and collect it in a 100 ml flat bottom flask
14) Put the flask in a hot water bath to let the all the hexane evaporated and left only oil in the flask
15) After all the hexane has evaporated, take the final weight of the flask and record it.
16) Calculate the result using the formula;

$$oil\ and\ grease = \frac{(final\ weight\ of\ flask - initial\ weight, g) \times 1000 \times 1000}{volume\ of\ sample, ml}$$

4.2.3 Separatory Funnel Liquid-Liquid Extraction Method 3510 C

This method describes a procedure for isolating organic compounds from aqueous samples. It is applicable to the isolation and concentration of water-insoluble and slightly water-soluble organics in preparation for a variety of chromatographic procedures. Usually in ERALab pesticide analysis is carried out using liquid-liquid extraction (LLE). 1L of the sample is measured using a measuring cylinder and transferred to a separatory funnel. 60ml of solvent dichloromethane (DCM) is used to rinse the measuring cylinder and added to the separatory funnel. The separatory funnel is then shaken vigorously for 2 minutes and separation of the organic layer from the water phase is allowed for 10 minutes. The solvent phase is then extracted using a funnel into an Erlenmeyer flask. The extraction is then repeated twice using 30ml of DCM before combining the three solvent extracts.

Next, a Kuderrna-Danish (K-D) concentrator on a water batch is assembled to concentrate the solvent extract until a final volume of 1ml is reached. The concentrated extract is then analysed using GC-MS. This method is restricted to use by or under the supervision of trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method. If analysis of the extract will not be performed immediately, put the stopper on the concentrator tube and store refrigerated. If the extract will be stored longer than 2 days it should be transferred to a vial with a PTFE-lined screw-cap or crimp top, and labeled appropriately.

4.2.4 Nitric Acid Metal Digestion APHA Method 3030 E

Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES) is the equipment that is used for this method. The analytical principle used in the ICP-OES systems is optical emission spectroscopy. A liquid is nebulised and then vaporised within the argon plasma in the same way as the ICP-MS. Unlike the MS however, the atoms and ions contained in the plasma vapour are excited into a state of radiated light (photon) emission. The radiation emitted can be passed to the spectrometer optics, where it is dispersed into its spectral components. From the specific wavelengths emitted by each element, the most suitable line for the application is measured by means of a CCD (charge coupled device). The instrument is capable of determining the concentrations of 40 to 70 elements simultaneously to very low detection limits (ppm to ppb).

Before running the sample in ICP-OES, there are a few preliminary steps for sample preparation. The method of sample preparation or also called metal digestion is as below.

Metal Digestion procedure;

1) Measure 2.5 ml of Nitric Acid and pour it in a 50 ml tube
2) Add sample to the tube and markup to 50 ml
3) Put the tubes into a hot block at 105 degree celcius for 50 minutes
4) After 50 minutes, take out the tubes and let it cool doen to the room temperature
5) Filter the solution in a 50 ml volumetric flask
6) Markup the solution to 50 ml with ICP solvent
7) Put the solution in a bottle and label it. The sample is now ready for ICP-OES analysis.

4.3 Problem Encountered & Problem Solving

As an intern myself, I can point out a few problems that me or the laboratory department staffs of our company need to face while I was completing my training. Firstly, the non-availability of calibration records. All testing and measurement facilities need to be calibrated against certified reference standards at intervals specified in SOP's. Records of such activities in the form of log registers and supporting data should be available and updated without fail. Auditors raise serious objections if it is noticed that an un-calibrated instrument was under use. In case instruments or devices are sent to third parties for calibration then calibration certificates of such agencies should be available for inspection at all times. To solve this problem, the chemists in the lab should to calibration a lot of times before running an equipment or conducting a procedure to ensure a better result. My task is to assists chemist doing this calibration.

Other than that, the lack of periodic inspection of safety devices. Installing and maintaining safety equipment like fire extinguishers, smoke alarms, spill management kits, eye wash stations, and safety showers is a must for all laboratories. A regular check on these devices' functionality is also necessary. The use of these should also be known to laboratory workers in case of emergencies. The first aid kits should also be checked, and any expired supplies should be swapped out for new ones. There is one time where a hazardous chemicals spills on my gloves. The gloves melts and the chemicals absorb to my hands. I can feel slightly burn and quickly run to get the burn cream in the first aid kit. Later that day, I realized the first aid kit was already expired. Luckily, the cream still works fine and it heals my burn. I issued this to my supervisor and the Industrial Hygiene Department take notes of this issue and provide a new first aid kit to the Laboratory Department.

4.4 Professional & Ethical Issue

There are not much of ethical and professional issue to be point out in this segment. Only one thing that I want to voice out about the nepotism and favoritism culture among employees. Favoritism occurs when managers treat some employees better than others for no professional reason. This can reduce productivity and job satisfaction in other employees, which may negatively impact the entire organization. In my opinion, this should not be happening anymore as we are living in a modern world. Everyone should have been more professional and considerate to each other for a much better work environment.

4.5 Health & Environmental Issue

All employees have the right to work in a safe working environments and work conditions. I already mention this in the problem encountered and problem-solving section. The safety and health issue of this company is a little bit lacking. Employee safety especially chemists and staffs that work in the Laboratory Department should be considered because they are handling hazardous chemicals just to bring money to the company. There is not a single smoke detector in the laboratory. If a fire happens, all of the staffs in the laboratory will die. Just recently before I finished my internship there, the company build an emergency stair in case of any emergency. It is good to know that they heard our voices speak about the safety, health and environment to the head of the department.

CHAPTER 5: CONCLUSION

5.1 Conclusion

I was fortunate to have worked in the laboratory for my internship before having my full-time job in the industry. As I progressed through the internship, I became more comfortable performing tests independently. The quality of my data packages improved, as did my time management. I would recommend this type of internship to any science student with an interest in chemistry or industrial chemicals majors interested in protecting the environment.

In order to improve my experience, I would have needed a longer internship. The laboratory department performs many more tests that I would like to have learned about and cross-trained for. 1 would also like to have learned more about the laboratory in general. This might include spending a day collecting samples for analysis, spending a day with sample managers to learn more about their job, or interviewing laboratory project managers. I would be interested to learn more about the decision-making process that goes into deciding things such as what projects to do, what parameters to include, and how often to perform each test.

My internship has proved to be an extremely valuable experience. It has given me the chance to apply knowledge from classes in chemical engineering. I have learned about the daily operations of a laboratory, and about the importance of Quality Control, safety, and communication. ERALab Sdn. Bhd. is a teamwork-oriented environment. I have learned how to work as a part of a team by helping others and by asking for help when I need it. This internship has allowed me to work with technology of automated equipment such as GC-MS and ICP-OES that I would not have had access to otherwise. Most importantly, I have had the chance to connect with people who have given me valuable skills and advice that will help me to advance my career.

5.2 Suggestion and Recommendation

Based on my experience doing my industrial training in ERALab, here are some suggestion and recommendation that I can give. I think this company take health and safety of staffs for granted. They probably think that if we wear Personal Protective Equipment (PPE) and handle chemicals carefully, no accidents going to happen. But in fact, accidents is bound to happen whenever and wherever. As a company that works in Commercial Lab Industry, this are the most important thing that they should take note of.

Other than that, the lack of interns and lab technician make it extra hard to do the work there. There are a lot of samples coming in every single day and this few intern that Department of Laboratory have make it hard to organize the work. As an intern there, I need to learn multitasking as it is the only choice that I have because there are just a few of us. There are also only one Lab Technician. The work is hassle and sometimes client always need to push us to get result as it already overdue. A lot of sample is overdue because of this matter. My suggestion is that ERALab Sdn. Bhd. can employ more interns and Lab Technician so that it will improve the work of staffs and chemists in the Department of Laboratory.

References

ERALab Laboratory Chemist (2019), Test Methods and Procedures Manual – Water & Wastewater (TMPM – W).

ERALab Sdn. Bhd. (2021), Corporate Profile.

Appendices

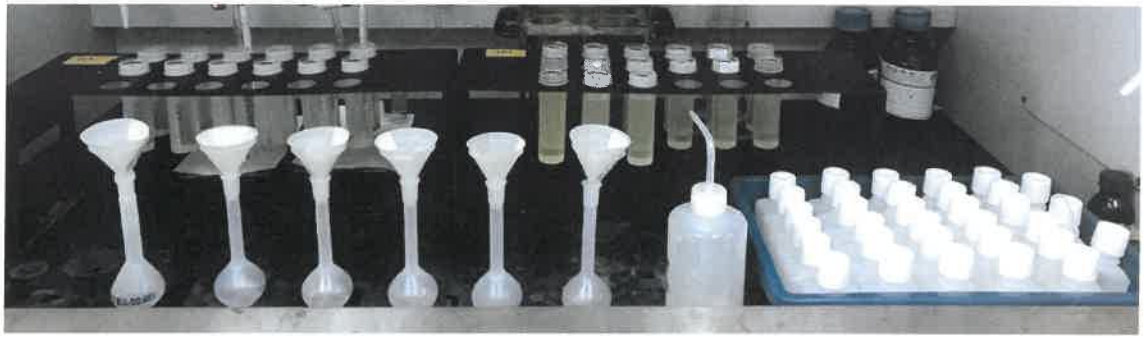


Figure 6

Figure 7

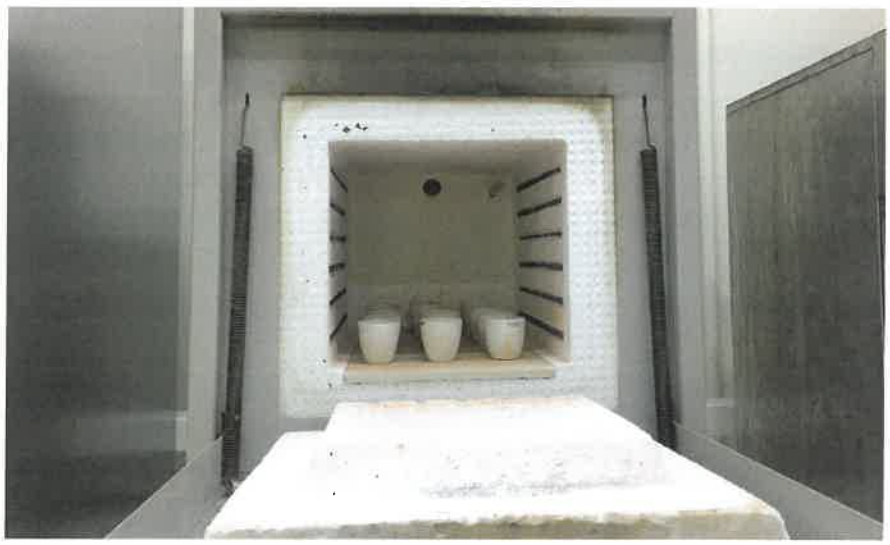


Figure 8

Figure 9

Figure 10

Figure 11

Figure 12

Figure 13

Figure 14