INDUSTRIAL TRAINING FINAL REPORT

SESSION : FEBRUARY 2022

Student Name : MUHAMAD AZRAEI ASYMAN BIN HASSANUDDIN

ID No. : 2019263992

Student E-mail

Handphone No.

Organization Name : PUSAT PENYELIDIKAN MINERAL (PPM)

Address Organization
PUSAT PENYELIDIKAN MINERAL (PPM)
JABATAN MINERAL DAN GEOSAINS MALAYSIA,
JALAN SULTAN AZLAN SHAH,
31400 IPOH,
PERAK DARUL RIDZUAN

Supervisor Name : MUHAMMAD AFIQ AFANDI BIN ABDUL AZIZ

Department During Attachment : CERAMIC UNIT, CLAY BASED TECHNOLOGY DIVISION

Duration (Date) : 21/02/2022 – 05/08/2022

Lecturer Evaluation : NURUL HAZWANI HANIB

ACKNOWLEDGEMENT

I would like to express my gratitude to almighty Allah for giving me strength, passion, and perseverance along the accomplishment of this report within the scheduled time. During the period of my industrial training time, I have received generous help from many quarters, which I like to put on record here with very deep gratitude and great pleasure. The training opportunity I had with Pusat Penyelidikan Mineral (PPM) was a great chance for learning. I am also grateful for having a chance to meet wonderful and professionals' people who led me through this training period.

First and foremost, I would like to thank my beloved parents who always give me unending supports throughout my practical training. Besides, I would like to express my gratitude to the Faculty of Chemical Engineering of Universiti Teknologi Mara for providing us with the chance to grow in this hard yet fascinating industry training. Students will be able to extend their minds, receive first-hand experience in the chemical or process industry, and be exposed to various working situations as a result of this training.

Second, I would like to convey my gratitude and utmost respect to my training supervisor, Encik Muhammad Afiq Afandi Bin Abdul Aziz for the constant guidance, advice, encouragement, and every possible help in overall preparation of this report. In every phase of the project, her guidance and supervision shaped this report to be completed.

I am indebted to Tuan Haji Malek Bin Selamat, head branch of Clay Based Technology Division for giving a chance to have my industrial training at this company. Besides, not to be forgotten En. Zarif, En. Sarol, and all staffs who have been guiding me from day one until the end.

ABSTACT

This industrial training report of Muhamad Azraei Asyman Bin Hassanuddin to undergo an industrial training for duration of 6 months which consist of 24 weeks before completing the Diploma courses. Starting industrial training on 21 February 2022 until 5 August 2022 at Pusat Penyelidikan Mineral (PPM) which guided by Muhamad Afiq Afandi Bin Abdul Aziz.

The purpose of this program is to fulfill the course in order to complete the Diploma as well as graduate from the university. The training refers to work experience that is relevant to professional development prior to graduate. In first chapter this report is defining the term of industrial training and description on industrial training objectives. This part explains the details of objectives of industrial training report and industrial report. In second chapter of report is overview of the company and departments.

The next chapter, chapter 3 describes the summary of the duties and various tasks in weekly of industrial training activities that carried out in 24 weeks in Ceramic Unit, Clay-Based Technology Division. The next chapter, chapter 4, I have explained in more details about my tasks and activities as an internship student in PPM. I gave explanation on how I do the tasks and project given to me by my supervisor.

This training gives students a good experience in working something different that I will not get in my class. I have met various people that have broaden my perspective of the world and help in picturing my future. Last but not least, I got opportunities to learn more about PPM and gained a lot of things that can helps me in the future.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION OF INDUSTRIAL TRAINING

1.1 Overview

Students in selected programmes at all levels of higher education at the Institute of Higher Learning (IPT) must do industry training. The curriculum was designed to empower industrial training competency necessary in order to raise the level of work of graduates. LI courses give students with hands-on learning experiences in the industry, allowing them to get valuable experience and enhance their skills.

Students will gain knowledge and experience in technological development, effective communication, collaborative methods, rules, procedures, and regulations, professional viewpoint, and reporting in this course. This training will boost students' passion and proactive attitude, as well as their confidence in their ability to be an exceptional engineer.

In general, the last semester at the Institute of Higher Learning will include industrial training. Industry training takes place for six months at a company or organization chosen by the student or assigned to him. Students must return to college after six months of industrial training to present all activities completed during that time.

Overall, industrial training offers students several advantages and benefits. Students are exposed to a range of activities in the field of tasks throughout the training period, even if the job is not totally done by students for the purpose of confidentiality but regular students were informed and clear guidance are valuable enough as a general knowledge, as well as exposed to the real working environment and can gain social skills such as communication and social connections.

1.2 Objective of industrial Training

The objective of students undergoes internship are:

1. To fulfill the diploma in UiTM.
2. Apply knowledge learned in class.
3. To build students confidence after graduation.
4. Improve both soft and hard skills.
5. Improve communication and management skills.

1.3 Industrial Training Placement

- Address: Pusat Penyelidikan Mineral, Jabatan Mineral dan Geosains Malaysia, Jalan Sultan Azlan Shah, 31400 Ipoh, Perak, Malaysia
- Tel: +605-5477052/3
- Fax: +605-5477185
- Website: www.jmg.gov.my
- Business Segment: Research centre

1.3.1 Industrial Schedule

Table 1.1: Industrial Schedule

Normal working hours	**8 hours**
Day of working	5 days a week
Work in	7:30 am – 9:00 am (flexible)
Break hour	**Monday-Thursday** • 1:00 pm – 2:00 pm **Friday** • 12:15 pm – 2:45 pm
Work out	4:30 pm – 6:00 pm (flexible)

1.3.2 Company Supervisor Information

Name:	**Muhammad Afiq Afandi Bin Abdul Aziz**
Position:	Research Officer Q41
Department:	Clay Based Technology Division
Phone No:	
Email:	

Table 1.2: Supervisor Information

CHAPTER 2

COMPANY PROFILE

2.1 Company Background

Pusat Penyelidikan Mineral (PPM) is a research and development (R&D) division to Jabatan Mineral dan Geosains (JMG) Malaysia. Headquartered in Putrajaya, PPM runs R&D projects related to technologies based on clay, silica, rocks, and the most advanced materials. To encourage the cultivation of mineral resources in a sustainable manner, R&D related to mineral processing technology, mining, quarrying and recovery of mines and quarries is also carried out. The main focus of research and development (R&D) at PPM is to add value to commodity products based on local mineral resources.

2.2 Company History

Pusat Penyelidikan Mineral was founded back in 1951 as one of the small divisions of the Mines Department located in Kuala Lumpur. This research division was established to receive the production of tin industry in which had encounter backslide during the World War lI. Due to abundant of tin mining activities in Perak, the researcher division have been relocated to Ipoh, Perak in year of 1957. It was then officially launched by the first Prime Minister, YTM Tuanku Abdul Rahman dated 4 May 1957. Mr J.H Harris was appointed as the first director of the division.

Pusat Penyelidikan Mineral is an organization that plays an important role in research and development (R&D) area, transferring technologies and the development of the mineral sources to increase exploration productivity and efficiency as well as mining and mineral procession. Research and Development was also carried out to ensure that the product obtained is fully used by the industries.

On 1 July 1999, Department of Mineral and Geoscience was built with the merging of the Geological Survey Department and Mines Department. This merge was initiated by the government with the aim to restructure the public agencies in line with global developments as well as rapid developments of the country itself. Department of Mineral and Geoscience Malaysia is one of the departments under Ministry of Natural Resources and Environment.

Objectives, core tasks and functions of the two original positions (both merged departments) have been devised in accordance with the current and future needs of the department. As one of the government departments involved in mineral and geoscience field, the importance of its role is to supply the latest information and expertise to meet the national needs in these areas.

2.3 Vision and Mission

Vision

"To be excellent centre in mineral R&D in this region."

Mission

"To contribute towards enhancing competitiveness and sustainable development of the mineral sector through R&D."

Objectives of PPM

1. To encourage and diversify use of local mineral resources as to contribute towards the development of the country's industrial sector through R&D.
2. To encourage the development of mineral resources in sustainable manner through R&D.

Functions

- To carry out R&D on local minerals in order to produce feed and value-added materials for industrial use.
- To develop suitable mineral processing and recycling technologies.
- To carry out collaborative research with institutes of higher learning, other R&D agencies, and industries in the field of minerals.
- To commercialize significant R&D result through technology transfer to any interested parties.
- To undertake R&D in mineral extraction and its environmental impact as well as support to the department and providing services to the industries.
- To assume the role as an advisor and reference centre in areas related to research in local minerals.

2.4 Organization Chart

There are 9 sections in Pusat Penyelidikan Mineral (PPM) including:-

1. *Cawangan Teknologi Berasaskan Silika*
2. *Cawangan Teknologi Berasaskan Batuan*
3. *Cawangan Teknologi Bahan Termaju*
4. *Cawangan Teknologi Berasaskan Lempung*
5. *Cawangan Teknologi Pemprosesan Mineral*
6. *Cawangan Teknologi Perlombongan dan Pengkuarian*
7. *Cawangan Teknologi Pemulihan Lombong dan Kuari*
8. *Cawangan Pelaksana Pengkomersialan*
9. *Cawangan Pentadbiran dan Kewangan*

I have been assigned to "Cawangan Teknologi Berasaskan Lempung (CTBL)" . Under
CTBL, there are 3 units namely *"Unit Seramik, Unit Produk Lempung,* and *Unit Pencirian dan Ujian Kualiti".* I was put under *"Unit Seramik".*

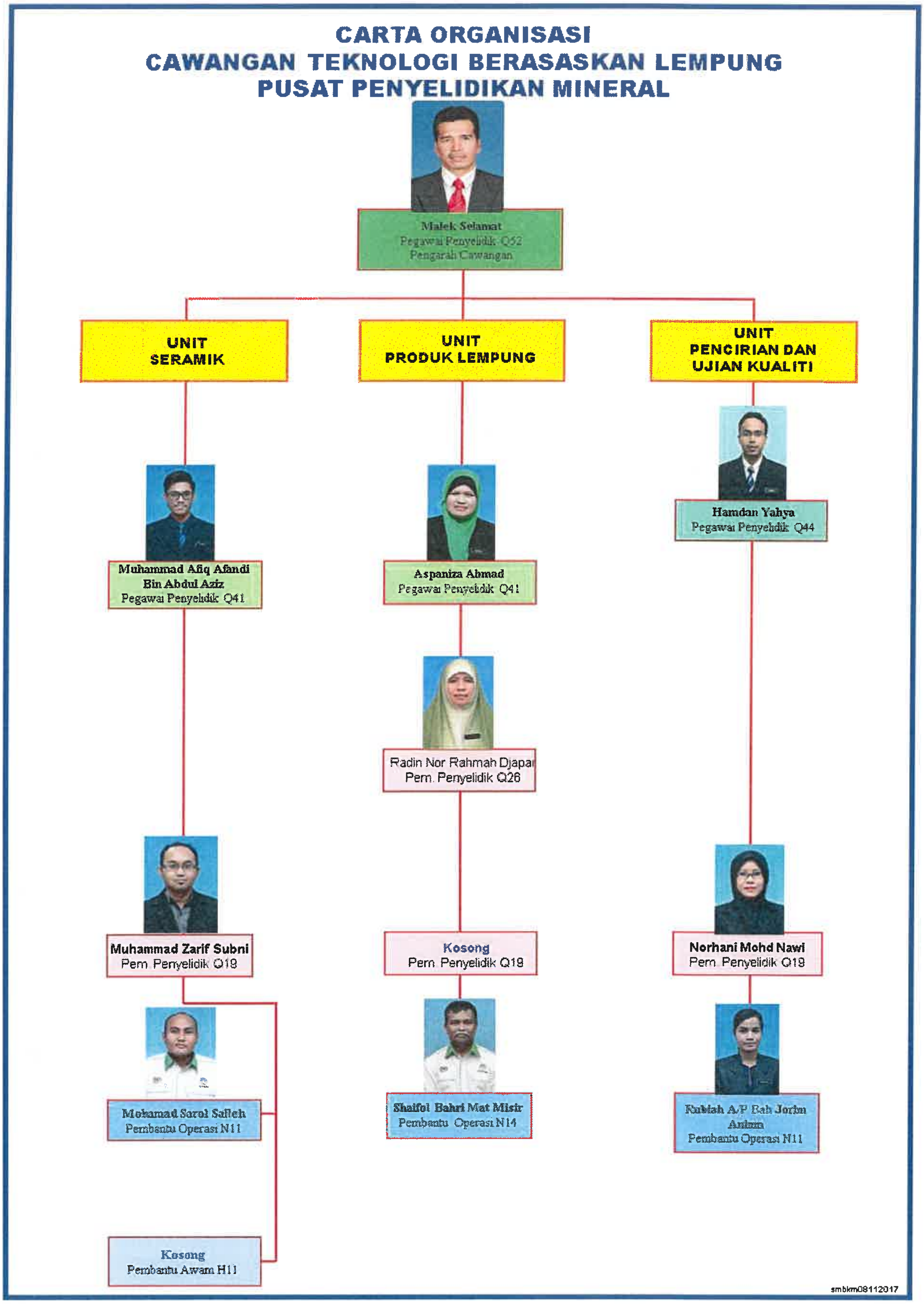

Figure 2.1: Organisation chart for CTBL

2.5 Main Product Provided to Client

Field of Expertise:

- Clay and ceramic raw materials characterization and selection
- Ceramic based materials processing
- Ceramic based product formulation and fabrication

Current Projects:

- Development of refractory ceramic product using local clay and limestone
- Development of halal anti-bacterial porcelain product
- Extraction of rare earth element from local ion adsorption clay sources
- Development of ceramic adsorbent for separation of heavy metals and rare earth

Previous Projects:

- Development of ceramic balls for commercial application in oil and gas industries
- Development of thermal shock resistance whitewares

CHAPTER 3:

OVERVIEW OF THE TRAINING

3.1 Introduction

During 24 weeks of the training, variety of jobs are provided by PPM includes participated in Rare Earth Elements leaching from local clay projects carried out by Clay Based Technology Division. Trainee then will get assigned to assist one supervisor with their project. Trainees will spend almost all their time in the laboratory depending on the task given. During the training period, all interpersonal skill can be strengthened while expending their network of contacts.

3.2 Summary of The Training and Experience Gained

These are the only duties and tasks that doing throughout an industrial training.

<u>Task 1 – Leaching Efficiency Test</u>

During the industrial training period, as a practical student was assigned to run the first experiment of ion exchange leaching of rare earth element project. This experiment run with column leaching method and the objective of leaching efficiency test is to determine the optimum concentration of ammonium sulphate solution (lixiviant) needed. After getting the optimum concentration, lixiviant will then be modified using surfactant there is sodium lauryl sulphate (SLS) and the second objective is to determine the optimum composition of modified lixiviant (using surfactant).

<u>Task 2 – Hydrodynamic Test</u>

After getting result of efficiency test, it will then be tested from an operational aspect using hydrodynamic tests to further confirm the optimum lixiviant composition for column leaching. Follow up the same column leaching method, hydrodynamic test is run with different level of lixiviant that have been set according to constant head permeability test procedures. Objective of hydrodynamic test is to determine the permeability constant of the ore when eluted with different lixiviant composition.

<u>Task 3 – SUGA Maintenance</u>

Aside from laboratory works, maintenance works at Clay Processing Pilot Plant in Stesen Ujian Galian (SUGA) have also been assigned at Ceramic Unit, Clay Based Technology Division to ensure all the equipment is functioning well and working properly. For maintenance, trial run would be conducted first to check any repair or problems regarding the equipment involved. Next, actual run using clay slurry will be conducted to simulate the exact procedures on raw clay processing.

3.2.1 Weekly Activity (summary of each week)

Week 1: Meet all the staff and briefing with supervisor

Week 2: Introducing industrial training project

Week 3: Cone and quartering preparation and XRF test run

Week 4: Site visit to SUGA for the first time

Week 5: Digestion method using aqua regia and soil porosity test

Week 6: Monthly assembly, summarizing project management and milestones

Week 7: Sample preparation for efficiency test

Week 8: Project task – leaching efficiency test 1

Week 9: Project task – leaching efficiency test 2

Week 10: Project task – leaching efficiency test 3 and sending all pregnant solution to ICP.

Week 11: Holiday (Hari Raya Eid)

Week 12: Kinetics test

Week 13: Run leaching test with SLS (first trial) and site visit to SUGA

Week 14: Run leaching efficiency test with SLS.

Week 15: Site visit to tin ore mining Rahman Hydraulic Tin (RHT) Sdn. Bhd.

Week 16: RHT sludge sample preparation

Week 17: Study method hydrodynamic test

Week 18: Project task – hydrodynamic test 1

Week 19: Project task – hydrodynamic test 2

Week 20: Project task – hydrodynamic test with SLS

Week 21: Preparing project report and discussing with supervisor

Week 22: Preparing slide and Project presentation

Week 23: Completing report for the company

Week 24: Completing industrial training report

CHAPTER 4

DETAILS OF EXPERIENCES

4.1 Introduction

Throughout this practical, the main project that I have undergo is research named Ion Exchange Leaching of Rare Earth Element from Local Ion Adsorption Clay. This research is about extraction of Rare Earth Element(REE), from local clay sample. The rare earth elements (REE) are a set of seventeen metallic elements. These include the fifteen lanthanides on the periodic table plus scandium and yttrium. Rare earth elements are an essential part of many high-tech devices. While the rare earth element (REE) from ion sorption clay source is one of the unique rare earth element sources because it contains high content of heavy rare earth elements. Ion-adsorption clay resources are produced through the weathered process (chemically, physically, and biologically) of granitic rocks that liberate rare earth element ions in the form of hydrosil or hydrosil hydrate which are eventually absorbed in clay minerals. In fact, this type of source is usually produced in areas that have hot and humid weather throughout the year.

Nowadays, the mining of rare earth elements from Ion-adsorption clay sources is carried out using the in-situ leaching method. This method involves the continuous injection of adsorption solvent (lixiviant) into the Ion-adsorption clays at high pressure. The adsorption solvent liquid used is ammonium sulphate. The lixiviant will then seep into the Ion-adsorption clay through the pores of the clay and the ion exchange mechanism will take place. Subsequently, the solution rich in earth elements will be pumped into recovery wells for further extraction.

Referring to Figure 4.1, after ammonium sulphate lixiviant was pumped through the clay, ion exchange process will take effect. REE bound by electrostatic bond (ionic bond) on clay will be replace with ammonium ion in the lixiviant. ammonium ions will be entangled in clay minerals and REE ions will enter the solution collected as a pregnant solution.

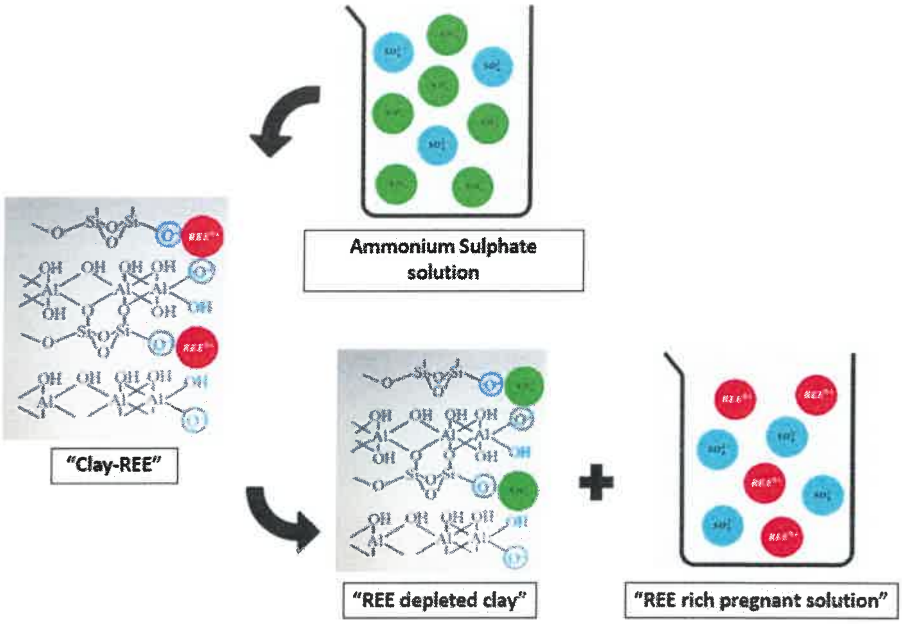

Figure 4.1: mechanism of ion exchange reaction.

4.2 Details of the training and experience gained

4.2.1 Leaching Efficiency Test

The ion exchange leaching was conducted using column leaching method. Before weighing the rare earth sample, it needs to go through cone quartering method to ensure it represent the whole sample. Then, 250 g sample were weighed and inserted into the column, above filter plate and stones (to prevent clay sample leakage at outflow valve). After that, filter paper was placed on the top surface of the sample to make the leaching solution agent which is ammonium sulphate (lixiviant) and modified ammonium sulphate (addition of SLS) flow evenly. In accordance with the liquid–solid ratio of 2:1, the composite leaching solution was slowly added into the sample through the peristaltic pump. The main instruments in this experiment include a column, valve, peristaltic pump, etc. The schematic diagram of the column leaching apparatus is shown in Figure 4.2.

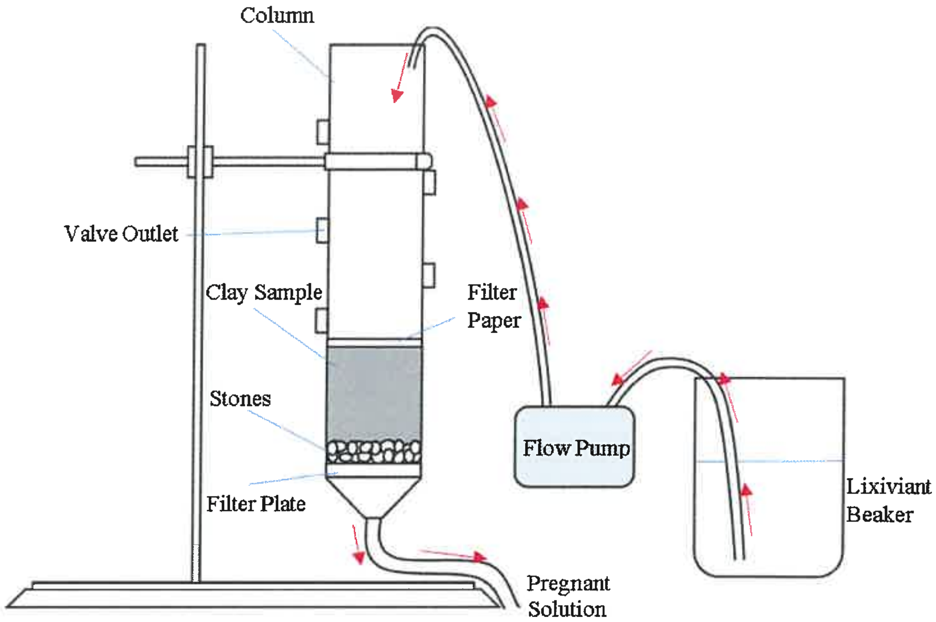

Figure 4.2. column leaching apparatus

Two main experiments conducted using column leaching which is efficiency and hydrodynamics test. Efficiency test was carried out using ammonium sulphate with different concentrations which are 0.1M, 0.3M, and 0.5M as lixiviants to determine the optimum concentration required for highest leaching efficiency. After the optimum concentration of lixiviant was determined, modifications by using surfactant Sodium lauryl sulphate (SLS) were done to improve leaching efficiency.

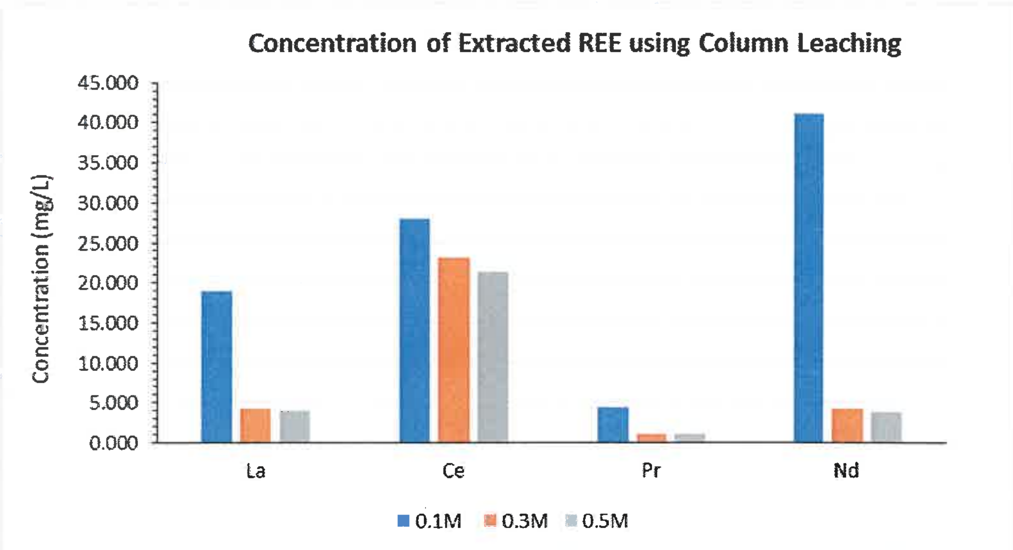

Figure 4.3: REE leaching efficiency result

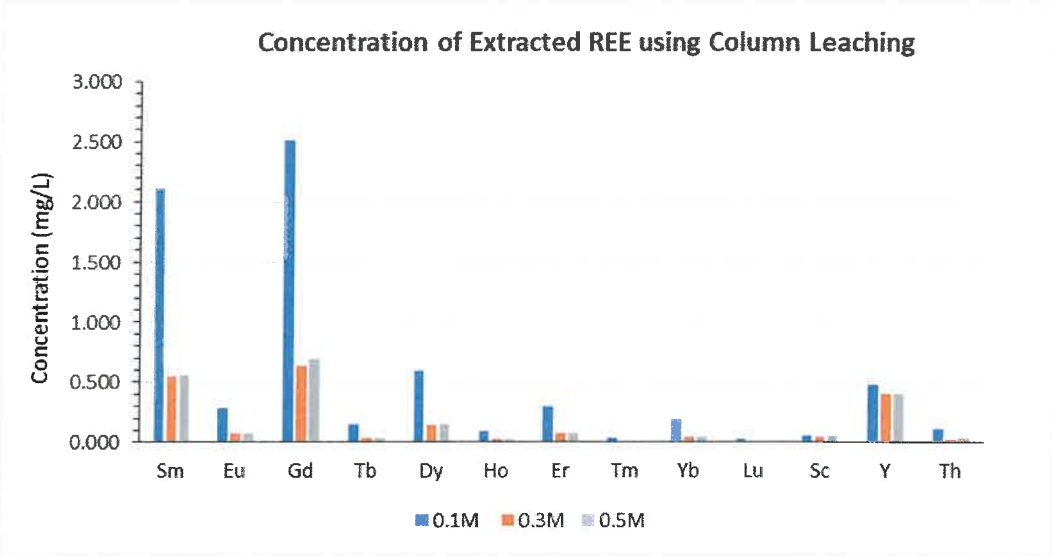

Figure 4.4: REE leaching efficiency result

Figures 4.3 and 4.4 show graphs of concentration of extracted REE from leaching efficiency test using 0.1M, 0.3M, and 0.5M of ammonium sulphate. From the Figure, it can be seen that the optimum concentration of lixiviant is 0.1M ammonium sulphate which capable of extracting the highest amount of REE when compared to 0.3M and 0.5M ammonium sulphate. Neodymium (Nd) recorded the highest concentration extracted that is more than 40mg/L compared to other REE. The efficiency test also indicates decreasing trend of REE recovery when concentration of ammonium sulphate is increased from 0.1M to 0.5M. Increasing concentration of ammonium sulphate will increase viscosity of the lixiviant. As viscosity increased, permeability coefficient of the ore would decrease thus reducing ion exchange reaction between ammonium ions and REE ions in the clay. After identifying the best concentration of ammonium sulphate (0.1M), the lixiviant will be modified using a surfactant which is SLS.

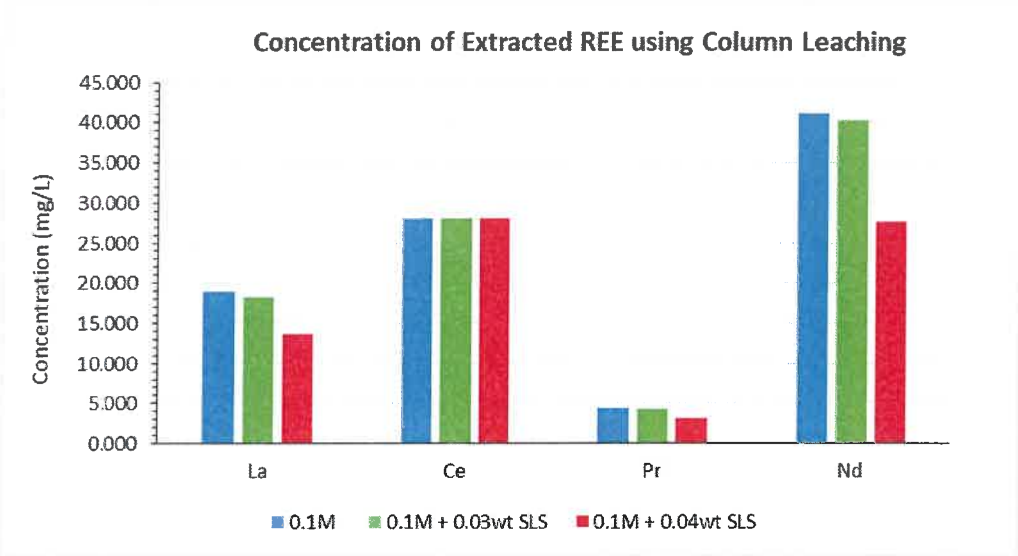

Figure 4.5: REE leaching efficiency result of modified lixiviant

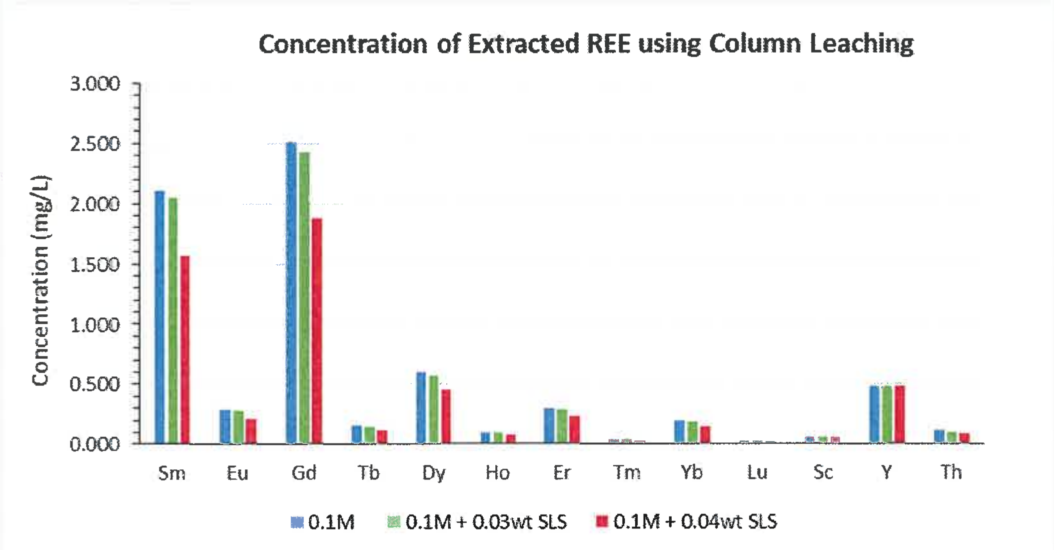

Figure 4.6: REE leaching efficiency result of modified lixiviant

REE Classification \ Types of Lixiviant	REE Concentration (mg/L)				
	0.1M Ammonium Sulphate	0.3M Ammonium Sulphate	0.5M Ammonium Sulphate	0.1M Ammonium Sulphate + 0.03wt SLS	0.1M Ammonium Sulphate + 0.04wt SLS
LREE	97.256	34.021	31.589	95.457	76.001
HREE	1.926	0.796	0.803	1.861	1.585
TREE	99.181	34.817	32.392	97.317	77.585
Th	0.111	0.024	0.040	0.093	0.084

LREE – Light Rare Earth Element
HREE – Heavy Rare Earth Element
TREE – Total Rare Earth Element
Th – Thorium

Table 4.1: REE leaching efficiency result summary

There are two compositions that have been tested, which are by mixing 0.1M ammonium sulphate with 0.03wt% SLS as first composition and by mixing 0.1M ammonium sulphate with 0.04wt% SLS as for second composition. Figure 4.5 and 4.6 show comparison between two modified compositions and the results show that the content of REE that were successfully extracted from both compositions did not show a significant difference. Also, 0.1M ammonium sulphate + 0.03wt% SLS were only slightly lower than 0.1M extraction compared to 0.04wt% SLS, thus it can be concluded that adding 0.03wt% SLS does not reduce the efficiency of the REE extraction and the optimum concentration of ammonium sulphate for column leaching is 0.1M + 0.03wt SLS.

Table 4.1 shows the REE leaching efficiency result summary, it shows the optimum concentration is 0.1M ammonium sulphate (99.181mg/L total rare earth element) which have more REE content than 0.3M and 0.5M ammonium sulphate. While the content of thorium (Th) from 0.1M to 0.3M ammonium sulphate show decline trend from 0.111mg/L to 0.024mg/L and Th content at 0.5M slightly increase to 0.040mg/L. Although 0.1M ammonium sulphate contains the highest concentration of REE, it also has a high Th content.

Next, the optimum lixiviant have been modified using 0.03wt% and 0.04wt% SLS to improve the extracting process, thus the total rare earth element (TREE) extracted from lixiviant 0.1M ammonium sulphate + 0.03wt% SLS is 97.317mg/L where it does not give a significant reduction compared to 0.1M ammonium sulphate. Adding 0.03wt% SLS also reduces the content of the radioactive element, thorium (Th) from 0.111mg/L to 0.093mg/L. Based on Naturally occurring radioactive material (NORM) specification, pregnant solution obtained can be classified as non-radioactive as Th-232 content is below 246.5ppm. It will then be tested from an operational aspect using hydrodynamic tests to further confirm the optimum lixiviant composition for column leaching.

4.2.2 Hydrodynamic Test

While hydrodynamic test is run with different level of lixiviant that have been set according to constant head permeability test procedures. The valve will be opened and recirculated back to the lixiviant beaker to maintain the solution level at valve 2, valve 3 valve4, and valve 5 as shown in Figure 4.6. Solution collected is called pregnant solution. Objective of hydrodynamic test is to determine the permeability constant of the ore when eluted with different lixiviant composition. Description of column leaching test is shown in table 4.2.

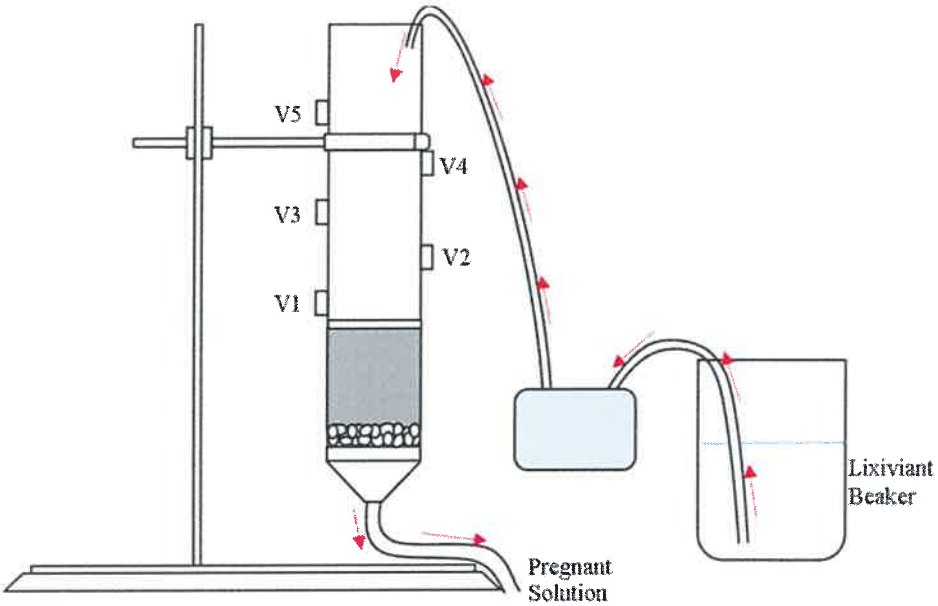

Figure 4.6: Schematic diagram hydrodynamic column leaching

Table 4.2: REE pregnant solution and residue preparation

Experiment 1: Efficiency test	
Control parameters : Concentration of ammonium sulphate, composition of modified lixiviant Fixed parameter : liquid–solid ratio : 2:1 Lixiviant level : 7cm Peristaltic pump flow rate	
Test number	**Concentration of ammonium sulphate (M)**
1	0.1

2	0.3
3	0.5
6	0.1M ammonium sulphate + 0.03wt% SLS
7	0.1M ammonium sulphate + 0.04wt% SLS
Experiment 2: Hydrodynamic Test	
Control parameter : Lixiviant composition Fixed parameter : Liquid–solid ratio : 2:1 Peristaltic pump flow rate	
Lixiviant code	**Composition**
0.1M	100wt% ammonium sulphate
0.1M-0.03SLS	99.97wt% ammonium sulphate + 0.03wt% SLS
0.1M-0.04SLS	99.96wt% ammonium sulphate + 0.04wt% SLS

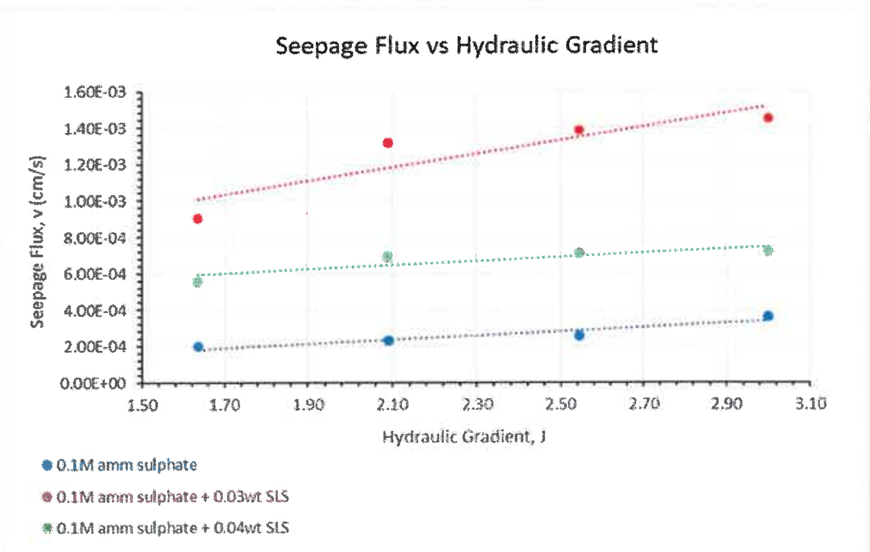

Figure 4.7: REE hydrodynamic result

Table 4.3: REE hydrodynamic result summary

	0.1M ammonium sulphate	0.1M ammonium sulphate + 0.03wt SLS	0.1M ammonium sulphate + 0.04wt SLS
Ore Permeability, cm/s	1.1425×10^{-4}	3.7345×10^{-4}	1.1436×10^{-4}

Objective of hydrodynamic test is to determine permeability constant of the ore using different lixiviant in this context is 0.1M ammonium sulphate, 0.1M ammonium sulphate + 0.03wt% SLS, and 0.1M ammonium sulphate + 0.04wt% SLS. The higher the ore permeability value, the higher seepage discharge of solution into the soil and the calculation is based on Darcy's Law of permeability stated that for laminar flow conditions in a saturated soil, the rate of the discharge per unit time is proportional to the hydraulic gradient.

According to the table 4.3, highest ore permeability was recorded by 0.1M ammonium sulphate + 0.03wt% SLS with 3.7345 x 10-4 cm/s compared to 0.1M ammonium sulphate and 0.1M ammonium sulphate + 0.04wt% which recorded permeability is 1.1436 x 10-4 cm/s respectively. this hydrodynamic result shows this is the optimum lixiviant and the fastest to recover the pregnant solution, supporting efficiency test results.

4.2.3 SUGA Maintenance

Aside from laboratory works, maintenance works at Clay Processing Pilot Plant in Stesen Ujian Galian (SUGA) have also been assigned at Ceramic Unit, Clay Based Technology Division to ensure all the equipment is functioning well and working properly. For maintenance, trial run would be conducted first to check any repair or problems regarding the equipment involved. Next, actual run using clay slurry will be conducted to simulate the exact procedures on raw clay processing as shown in the Table 4.4.

Table 4.4: Raw Clay Processing

Blunging Tank for Raw Clay	First, the raw clay sample will be put into the blunging tank, and the mixing process will take place until the sample is less clumping. Normally, this sample will be milled for 40 to 60 minutes. After that, outflow at the bottom tank will be opened and sample will be drained into the collecting tank for filtered below 850µm. This sample will then be taken to the next process.

Vibrating Screen	Using diaphragm pump, 850μm sample will be flow into next blunging tank and the same process will happen to produce homogeneous sample. Next, it will flow through vibrating screen to get the sample below 250μm . the sample will be collected in the collecting sum.
Magnetic Separator	250μm clay sample then entering the magnetic separator also through a diaphragm pump. In the magnetic separator, all iron content from the clay sample will be removed. This aims to produce enriched clay. It will then be transfer into third blunging tank to make the sample homogeneous again.
Hydraulic filter press	After removing iron in the clay, enriched clay will be compressed in the hydraulic filter press to remove existing water or dewatering the clay sample. Solid clay produced is called filter cake cassette.
Drying Rack	Filter press cannot fully dry the sample. So, after producing the filter cake cassette, it will place in the drying rank and leave it to make sure there is no existence of water left.
Ball Mill	At the end of the process, this dry sample will be brought to the ball mill to produce a "ready-to-use" sample in powder form.

4.3 Problem encountered and approach adopted for solving problem

During my industrial training, there were several problems that occurred throughout the project. When the first column leaching run, pregnant solution collecting process was too slow and we found that valve at the bottom was clogged with clay sample even there is a filter plate in the bottom of the sample. After that we found the solution by doubled the layer with stones and wire mesh. Next, after running column leaching in a while, we realize that all the valves starting to rust. We are using a copper valve and before and we can confirm that this is caused by copper's reaction to ammonium sulphate. Sodium lauryl sulphate (SLS) used as a surfactant or compounds that lower the surface tension of the water, because of that we confront a new problem which is leakage in each valve. Unfortunately, this problem cannot be solved even after we tight up the valve and using valve extender, but this problem does not interfere the calculation after the process. Last problem encountered in column leaching method is cleaning, there is no proper method about how to clean the clay the column after experiment was run.

Next, I encountered problem where after getting the pregnant solution, I will send it to inductively coupled plasma (ICP) to observe total rare earth element in the solution extracted. Then, we are making a calculation and found that the rare earth element extracted is not logic compared to based study. So, we know that there is an error in the experiment run and the only way is to repeat the experiment.

The last problem that we encountered is the inductively coupled plasma (ICP) equipment is experienced failure. Up until now, the equipment is still in the process of being repaired. Although, we were given the opportunity to send the pregnant solution sample to be scan in another place. We only get the result of efficiency test and hydrodynamic test.

4.4 Professional and ethical issues

While working as an intern somewhere, trainees represent not only themselves but also the institution and their current and forthcoming colleagues. Performance at one's own internship site could have an effect that goes well beyond the local circumstances of the student. All interns are required to follow the employer's dress code, conduct standards, and/or employment policies. To avoid any misconceptions, it is advisable that the intern clarify these matters with the employer before beginning industrial training.

The training should always be carried out by interns in a professional manner, which includes, but is not limited to, safeguarding the secrecy of any information gleaned regarding any clients, consumers, workers, prices, and/or other parties associated with the internship location. Ensuring that everyone is treated with respect and decency in all interactions with customers, bosses, and co-workers and accepting accountability for choices and deeds committed while on the internship location.

Regarding confidentiality, as part of an internship, students could be obligated to sign and follow by a confidentiality agreement that requests them to keep some information secret or to refrain from exposing it after the internship has ended. Although these agreements' specifics can vary, they are always enforceable. How effectively the student adheres to the confidentiality agreement determines the student's trustworthiness and potential professional reputation. Remember that sharing any knowledge acquired during the internship or job is unethical if the student decides to leave. The practitioner violates their moral obligation to encourage fair competition by doing this. Be moral and protect your profession's honour.

4.5 Health, environmental and sustainable aspects

Workplace health is about managing hazards wisely to protect your employees and your company. Good health and safety management requires a strong leadership that engages your managers, workers, suppliers, contractors, and customers. Health and safety are also important components of the global movement toward sustainable development. The organization is very concerned about the health and safety of its employees. PPM, for example, offers flexible working hours where the staff have freedom to come work from 7:30am till 9:00am. This is to encourages staff to come work depending on their choices. This work-life balance has several benefits, including improved mental health and increased productivity.

The three pillars of sustainability are typically referred to as being social equity, environmental protection, and economic viability. In order to maintain long-term success and survival, sustainable organisations work to balance the triple bottom line of people, planet, and profit. This means that businesses must safeguard their most important asset, their employees' safety, health, and well-being, in order to continue operating. Sustainability takes into account both what is done and how it is done. It calls for leadership that won't accept second-best performance in any area of operations, setting and attaining objectives that go above legal requirements. Businesses place the same emphasis on sustainability as they do when making purchases.

CHAPTER 5

CONCLUSIONS

5.1 Conclusions

After 24 weeks of undergoes the industrial training, I realized that it is one of the organized ways of advancing engineering students' knowledge and skill set. Besides, industrial training also improves the student performance and aid them in achieving their professional goals. Moreover, taking part in industrial training will not only boosting the self-confidence of the students but also makes taking a challenging project or works easier. By acquiring the necessary genuine corporate exposure, the students will be prepared for the next job or career that they may pursue.

In Pusat Penyelidikan Mineral (PPM), I was exposed to how project research about extraction of rare earth element have been done. From the basic method until the baseline calculation used. I was placed in ceramic unit under clay-based technology division which carry on fully about the project that I have take place which is rare earth element extraction from local clay. Hence, it was my job to run the experiment using column leaching method and record the data that I get. With the guidance of my industry supervisor, I learned a lot of valuable things that I can carry with me as I grow to become a good employee in the future.

5.2 Suggestions and Recommendations

Personally, I think that 24 weeks of the industrial training is too long especially if it is only one faculty that must undergoes the long period of training where the other only for a short period of time. I found that it is unfair for the students to have different period to perform the industrial training. Next as for recommendations for the company that accept internship students, I hope that they will be well prepared for the students when the students reporting to the company. It is because in my first week of attending the internship I was only give material to read and must wait a long time for my PC and my own email. Hence, I feel it will be a waste of time for the students.

References

- Sample Internship Report As prepared by Madam Noor Hidayu Binti Abdul Rani, lecturer at School of Engineering (Chemical), UiTM Pasir Gudang, Johor.
- https://www.jmg.gov.my/

Appendix

Figure 1: Blunging tank

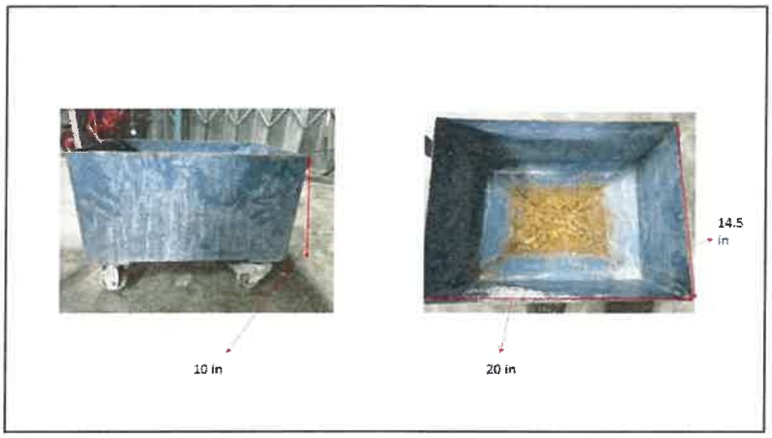

Figure 2: Collecting tank

Figure 3: Vibrating screen

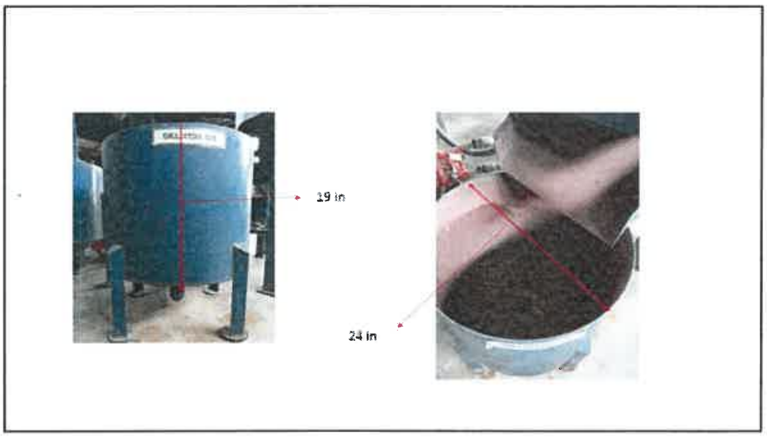

Figure 4: Collecting sum

Figure 5: Magnetic separator

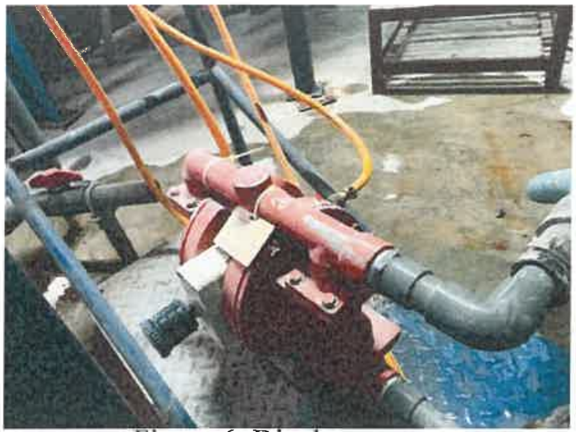

Figure 6: Diaphragm pump

Figure 7: Hydraulic filter press

Figure 8: Ball mill

Figure 9: Drying rack

Figure 10: Filter cake cassette

Figure 11: Pilot plant

Figure 12: CTBL pilot plan

Figure 13: cone and quartering

Figure 14: sieving sample 1mm

Figure 15: pregnant solution

Figure 16: column leaching

Figure 17: acidified the pregnant solution

Figure 18: ICP