



INDUSTRIAL TRAINING FINAL REPORT

SESSION : FEBRUARY – AUGUST 2022

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To begin, I am grateful to God because with all the abundance and grace that has been given to me, I finally successfully completed the Industrial Training session that I conducted for almost 6 months starting from 20th February 2022 until 4th August 2022 as required by the Chemical Engineering Faculty, UiTM Kampus Pasir Gudang.

First and foremost, my heartfelt gratitude goes to Almighty God, who has blessed me with a good health and a long life, because without it I would not been able to complete this internship. I would like to express my gratitude to Dr Pramila Tamunaidu, Manager of MJARC and En Muhammad Bukhari Bin Rosly, Research Officer of MJARC as my supervisor during this internship for allowing me to continue my internship at this organization. Despite their busy schedule, they were gracious enough to accept me into the organization and guide me through my internship with advice and positive feedback.

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Finally, I want to thank me for believing in me. I want to thank me for all this hard work . I want to thank me for having no days off. I want to thank me for never quitting. I want to thank me for always be a giver and try to give more than I receive. I want to thank me for try to do more right than wrong. I want to thank me for just being me at all the times.

ABSTRACT

An essential part of the academic curriculum at Universiti Teknologi Mara (UiTM) Kampus Pasir Gudang is the industrial training module (CHE 354). In the year 2014, students were first introduced to industrial training. One of the required courses for Diploma in Chemical Engineering students is industrial training. To receive their diploma certificate, each student must participate in industrial training for 24 weeks (20 February 2022–4 August 2022) on the final semester.

In addition, industrial training programmes were introduced to strengthen the necessary competencies to raise the level of graduates who can work. Students who enrol in industrial training programmes get real-world experience in the workplace that helps the market be more reliable.

This is also a programme that allows students to learn, understand, and acquire knowledge about engineering problems outside of the classroom. Industrial training implies a brief services-for-experience trade between the organisation and the student. Engineers are more likely to share their knowledge in order to encourage the development of future engineers.

In most cases, an intern has a supervisor who assigns specific tasks and assesses the intern's overall performance. It will be the supervisor's job to mentor and instruct an intern. The trainee must also abide by all organisational rules and regulations that have been adopted by the business.

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CHAPTER 1 :

INTRODUCTION TO INDUSTRIAL TRAINING

1.1 Overview

Students in certain programs at all levels of higher education in higher institutions are required to complete Industrial Training (IT). Industrial training programs were established to strengthen the necessary competencies in order to increase the level of graduates who were employable. Industrial Training (IT) is the process of exposing students to engineering work in the real world and involving them in Chemical Engineering projects before they graduate. One of the requirements for the award of a diploma in chemical engineering is that the student complete at least twelve (12) credit hours of industrial training within semester six (6) OR after passing all of the courses taken from semester one to semester five.

The Faculty of Chemical Engineering at Universiti Teknologi Mara (UiTM) has included the subject Industrial Training (CHE 354) in its course outline, which provides students with pre-professional work experience. The subject requires students to complete industrial training at a selected organization over a six-month period from 20th February 2022 until 4th August 2022. Students must select any organization for their industrial training placement, whether it is paid or unpaid. Students are encouraged to contribute to the organization by participating in activities and carrying out their responsibilities professionally during their industrial training. Industrial training is important because it allows students to demonstrate their abilities and prepare for a real-world working environment soon. This 24-week period will include industrial environments such as adaptations to safety in a workplace, industrial experiences such as site visits, and knowledge gained from supervisors and staff throughout this industrial training. This report will also include some information about MJARC UTM Pagoh regarding its history and activities in which it has been involved.

1.2 Objective of industrial training

The main objective of industrial training is to expose students to real industrial and working environments besides providing them with vast experiences. Furthermore, this internship gives opportunities to students for applying their acquired knowledge and skills during their study at the campus in the working area.

In addition, student can develop their critical thinking and new skills at the companies that students are attached to through the “hands-on” activities. Critical thinking is vital in the real-life situation as it help to solve any unexpected problems arise which require the students to make on-the-spot decisions that can affect the desired outcome. Other than that, internship is emphasizing on ethics and professionalism such as punctuality, work manner, team spirit a trustworthiness which can help to build up the positive character of the students.

Besides, the industrial training make a good relation for both UiTM and the practical company involved as they shared the social obligation together. Internship is one of the mediums for UiTM to show industries’ current needs, hence improving any weakness discovered. As a result, the university will be able to strengthen its curriculum and produce the proactive graduates that required by the industries.

1.3 Industrial Training Placement

- removal from aqueous waste solution.

- B. Eng (Chemical Engineering) Universiti Teknologi Malaysia, 2016

PROFESSIONAL AFFILIATIONS

- Graduate Engineer Board of Engineers Malaysia

HONORS AND AWARDS

- Bronze Award

Project : Supported green liquid membrane prototype for metal ion recovery, 19th
Industrial Art and Technology Exhibition 2017

- Dean's Award

Bachelor of Engineering (Hons) (Chemical),2016

CHAPTER 2

COMPANY PROFILE

2.1 Company background

The Malaysian-Japan Advanced Research Centre (MJARC) is a new and vibrant entity at the University Teknologi Malaysia (UTM) Research Centre in Pagoh, Johor. It is a research facility run by the Malaysia-Japan International Institute of Technology (MJIIT). MJARC was established as an international research and development (R&D) centre in the field of Sub-Critical Water Waste Management System (SCW-WMS) through the initiative of the 10th Malaysia Plan in April 2018. They are conducting ground-breaking research in waste management and waste-processing technologies to convert materials that are currently considered waste into high-value products and energy. The operating schedule of MJARC UTM Pagoh shown below :

Table 2.1 : Operating schedule of MJARCH UTM Pagoh.

Days	Working Time	Operating Period
Sunday to Thursday	8.00 a.m – 1.00 p.m (working hour)	5 hours
	1.00 p.m – 2.00 p.m (lunch hour)	1 hour
	2.00 p.m – 5.00 p.m (working hour)	2 hours
		(Total 9 hours)
Friday to Saturday	Weekend Holiday	

2.2 Company History

University of Technology Malaysia (UTM) is a prestigious Malaysian public research university that is ranked 187th in the world. UTM has three campuses which the main campus located at Skudai Johor Bahru, and it was the first university in the state of Johor. It has an area of 1148 hectares and is the second largest public university after Universiti Putra Malaysia (UPM). It is about 20km north of the state capital, Johor Bahru.

The branch campus is located on Jalan Semarak in Kuala Lumpur and covers an area of 38 hectares. Diploma students, part-time students (also known as the SPACE programme), undergraduate students (Malaysia-Japan International Institute of Technology), and foreign students taking business courses are all housed at the branch campus

On May 2, 2017, the new branch campus in Pagoh was officially opened. The Universiti Teknologi Malaysia Innovation Centre in Agritechology for Advanced Bioprocessing (UTM-ICA) is strategically located in Muar, Johor, off the Pagoh interchange on the north-south expressway. A 50-hectare campus with shared facilities linked to Bandar University Pagoh. UTM Pagoh has three distinct facilities: Innovation Centre in Agritechology (ICA), Malaysia-Japan Advanced Research Centre (MJARC), and Low Carbon Transport Centre in collaboration with Imperial College London (LOCARTIC).



Figure 2.2.1 MJARC facility.



Figure 2.2.2 Main entrance UTM Pagoh.



Figure 2.2.3 Malaysia-Japan Advanced Research Centre (MJARC) Logo

2.3 Vision and Mission

Vision

To Provide Sustainable and Innovative Solutions for Solid Waste Management and Conversion to High Quality Products

Mission

To become a world class advanced research centre, excelling in science, technology, and socio-economy

2.4 Organization chart

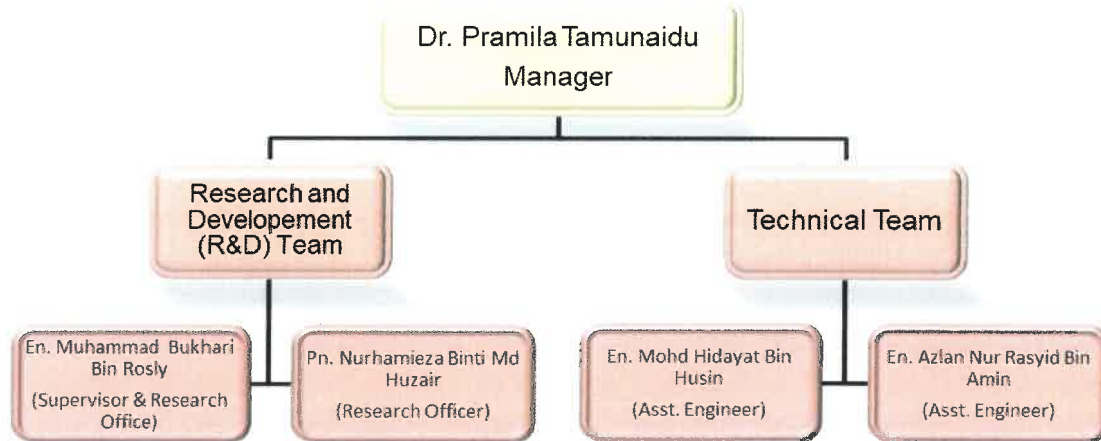


Figure 2.4 Organization chart of MJARC

2.5 Main Product/Service Provided to the client

MJARC main product that have been provided to the client are organic solid fertilizer and organic liquid fertilizer. Each product is produced in the facility at UTM Pagoh. The production of the product followed the demand from the client. Other than that, MJARC also provided research and development (R&D) services, training services, consultancy or feasibility study and OEM or ODM to client. Figure 2.5 shows the sample of product produced after undergo SCW process.



Figure 2.5 Product produced from different raw material at MJARC.

CHAPTER 3 :

OVERVIEW OF THE TRAINING

3.1 Introduction

During this industrial training, there are many trainings that have been given and taught by the company. All activities carried out have been observed by experienced people. Most of the training given is related to the field of chemical engineering, especially about the subcritical water process that has been done here. In chapter 4, trainees will explain briefly about the experience gained during this industrial training. All the training given was observed by different staff according to their expertise. For example, in research and development project, it is monitored by En. Bukhari and Pn. Hamieza. Meanwhile, for the boiler and MRM process is monitored by En. Azlan and En. Hidayat.

3.2 Summary of the training and experience gained

The training that has been experienced by the trainee are explained as below :

Task 1 : Run a boiler.

MJARC has 2 boilers for this subcritical water process. Trainee were taught how to operate the boiler by the ass. engineer. The type of boiler owned by MJARC is a water tube type boiler. A water tube boiler is a type of boiler in which water circulates through tubes heated by the fire from the outside. Inside the furnace, fuel is burned, producing hot gas that boils water in the steam-generating tubes. It is because the process of the subcritical water is generated from the steam. From this task, trainee is able to do the startup and the shutdown procedure for the boiler. This task was monitored by En. Azlan, Asst Engineer of MJARC.

Task 2 : Subcritical water process PFD drawing.

PFD drawing is done to see the process clearly. Trainee have applied the knowledge that have been teach by the lecturer during the studies in this task. PFD is a diagram used in chemical and process engineering to show the overall flow of plant processes and equipment.

The PFD depicts the relationship between major plant equipment but excludes minor details such as piping details and designations.

Task 3 : Data collection of projects.

Data collection is an important role in research and development (R&D) department. This is because through this data, it can show that the project is running. Furthermore, this data is also collected to see if the recorded data is the same as the data that has been set by a certain party. The data referred to is according to the type of project. It can be said, this data is a parameter in a project in MJARC. During the training period, there are lot of projects that required the data collection to be taken. There were a lot of ways to collect the data throughout this internship.

Task 4 : Research

During this internship, trainee was also assigned to do some research about all the projects that are related. There were a lot of articles that trainee need to find especially regarding the process that have been done in MJARC. Other than that, the purpose of finding the new article and do research are to make sure that trainee can understand what is going to happened before starting any project.

3.2.1 Weekly Summary

Week : Week 1

Date : 21st February 2022 – 24th February 2022

Self-reporting by submitting forms from the UiTM as proof of industry training is the first step in the first week of industrial training at MJARC, Pagoh. Later, Pn. Nurhamieza Binti Md Huzir from the research and development team gave me a briefing on my responsibilities and role during this industrial training. She also introduced trainee to the staff in the department.

That week I received an instruction to focus on the process of subcritical water treatment and the boiler in the facility. The explanation of the process was given by En. Azlan Nur Rasyid bin Amin as the Assistant Engineer in the organization. There was also a safety inspection from

the Department of Safety and Health (DOSH) officer. The inspection was done on the 2 M-Recycling Machine and 2 boilers. The purpose of this inspection was to make sure that the equipment in good condition before used.

Week : Week 2

Date : 27th February 2022 – 3rd March 2022

Activities : In the second week, trainee was assigned to prepare a slide about the subcritical water process and handle the germination project. This germination project was under Pn. Nurhamieza Binti Md Huzair, Research Officer. Other than that, trainee also learnt on how to use the moisture analysis content equipment. Trainee need to learn about the process on how to start the germination project.

Week : Week 3

Date : 6th March 2022 – 10th March 2022

Trainee took a medical leave due to covid-19 positive for a week.

Week : Week 4

Date : 13th March 2022 – 18th March 2022

On the fourth week, the trainee was assigned to do a slide entitled “Mechanism of Subcritical Water”. The slide has been monitored by Pn. Nurhamieza to make sure that trainee did not put the wrong information about the process. Pn Hamieza also teach on how to do a proper slide by follow the format of the company. Furthermore, trainee also continued the research for the germination project. On this research, trainee need to find the morphology of Pak Choy green because the plant was used in this project. This week trainee also gets to know more information about the soil degradation in global and the soil degradation in Malaysia.

Week : Week 5

Date : 20th March 2022 – 24th March 2022

On the fifth week, trainee started to sow the Pak Choy green for the germination project purpose. Before doing that, trainee was responsible to find the information regarding the rice husk and rice straw because the media that is used in this project included both of it. In this week, it is important to monitor the project. The result taken from the monitoring, there are a few seeds started to grow. Furthermore, from this project, trainee get to learn on how to use the pH and EC measurement equipment. Both equipment, pH and EC meter that have been used is the digital meter which from the brand Hanna. On 24th March this week, there was a site visit from Lembaga Perindustrian Nanas Malaysia (LPNM). It is a collaboration project between the company and LPNM. There was a talk session regarding the history of the pineapple, ways to plant and grading it.

Week : Week 6

Date : 27th March 2022 – 31st March 2022

This whole week, all the staff in this department degrading the pineapple sucker based on their size. Ways that the trainee learnt to degrading pineapple is cut the root and leaves within 2 inches. Trainee continued monitoring the germination media and the soil. Result on this monitoring, the germination was unsuccessful because there are only a few of spinach grows.

Week : Week 7

Date : 4th April 2022 – 7th April 2022

On this week, trainee planted the Pak choy green seed into the seeds tray. The transplanting was monitored by Pn. Nurhamieza. Result from the monitoring is the plants die due to the transplant shock. The bed did not cover with the shade. Furthermore, trainee also continued to write the report of the germination project.

Week : Week 8

Date : 10th April 2022 – 14th April 2022

This week, trainee was tasked to draw a PFD drawing of the subcritical water treatment process. The drawing was done by using the Microsoft Visio Software. This drawing has been monitored by En. Bukhari, supervisor for this internship. Next, trainee was assigned to do the

startup procedure of the monitor. This step has been monitored by En. Azlan Nur Rasyid Bin Amin, Assistant Engineer of MJARC. From this startup process, trainee get to know about the process flow of the subcritical process. Other than that, En. Azlan also teaches about the types of the valve, pipes and instrumentation that have been used in the equipment. The equipment studied are M-Recycling machine and boiler.

Week : Week 9

Date : 17th April 2022 – 21st April 2022

In this week, trainee still need to monitor and water the germination media on the seeds tray and garden bed. Other than that, trainee need to redraw the new PFD after submitted to the supervisor. By drawing this PFD process, trainee also was tasked to do some research about the types of valves. Started from this week, trainee need to monitor the temperature and humidity of the pineapple plantation. Other than that, trainee also was tasked to measure the soil moisture of the pineapple plant. Trainee used the moisture analyzer from Uni-Bloc. The steps of using the equipment were teach by Pn. Hamieza. Last day of the week, trainee need to take a photo of selected pineapple plant for data purpose.

Week : Week 10

Date : 24th April 2022 – 28th April 2022

This week, trainee still need to monitor the pineapple plantation project. Trainee still needs to take the data of temperature and humidity of the pineapple plantation. The purpose of this is to see the difference between the value. The equipment that has been used for this observation is 4 in 1 soil survey instrument. All the value was jotted on the paper and the was transferred to Microsoft Excel to make sure that the data can be referred to. Trainee shared all the data with the supervisor and the staff here through Google Drive. Furthermore, trainee also had a fertilizer testing for Hibiscus Project. The testing has been done with the collaboration of Sime Darby Plantation. For the first day of testing, trainee need to take a few samples of the hibiscus leave, soil, and grass for some research. The purpose of taking the leaves sample is to measure the length of the leaves, width of the leaves, area surface of the leaves and to monitor the colour

of the leaves. This sample is taken before the testing. Other than that, the sample of the soil also is taken to take the moisture percentage.

Week : Week 11

Date : 8th May 2022 – 12th May 2022

In this week, trainee check the pineapple plant after a week. Trainee make sure that there is no sick plant at the plantation. Other than that, trainee also did some research regarding the morphology of pineapple plant for the project. The task was asked by the supervisor for the trainee to gain more knowledge regarding the project. Next, trainee started to write the final report for the industrial training in this week. On 11th May 2022, trainee was asked to design and do the “assembly point” sign by En. Azlan, asst. engineer at our facility. Trainee used the adobe software to make the sign. Furthermore, trainee also needs to monitor the germination project plant. The plant is become healthy on this week and the project running smoothly. On 12th May 2022, trainee started to write the report about the project. Trainee also took the photos of selected pineapple plant for data purpose.

Week : Week 12

Date : 16th May 2022 – 19th May 2022

On 16th May 2022, trainee check the sample of the pineapple project before collect the data. Next, trainee took a day off due to fever with the medical certificate from trusted doctor. This week, trainee need to check the pH and the EC for the pineapple plant. Trainee used the 4in1 soil survey instrument to take the date. Trainee key in the data taken on Microsoft Excel.

Week : Week 13

Date : 22nd May 2022 – 26th May 2022

This week, trainee was assigned to do some tagging on the selected pineapple plant. This task was monitored by En. Bukhari, the supervisor for this industrial training. Trainee completed the pineapple project report by this week. On 23rd May 2022, trainee measure the electric conductivity of the pineapple soil. The sample used 10g soil and 25 ml distilled water. The purpose of this task is to check either the value is within the standard of soil or not. Next day, trainee learnt about the soil flux equipment. The equipment used was LI 6400XT Portable Photosynthesis System. The ways to use the machine was explained by trainee supervisor, Mr. Bukhari. The purpose of learning this equipment is to see the biological activity in the soil. The data taken was then transferred to our facility head department. By using this equipment, trainee also get to know the range of CO₂ and O₂ around the pineapple plant. Last two days in this week, trainee supervisor showed the way hoe to formulate the chemical fertilizer and organic fertilizer. For the chemical fertilizer, the ingredients are urea, chalk powder, zinc sulphate, cooper sulphate, ferrous sulphate, and water.

Week : Week 14

Date : 29th May 2022 – 2nd June 2022

On the first day of this week, our company had a Hari Raya Aidilfitri Celebration. Next day, trainee started to do the slide presentation for the industrial training purpose. Furthermore, trainee did some research about the morphology of the Pak Choy plant. Pak Choy is the second media for the germination project. For this week., trainee need to check all the data taken for pineapple project to avoid error.

Week : Week 15

Date : 7th June 2022 – 9th June 2022

On this week , trainee take the pH and the moisture of the pineapple plant. Other than that, trainee also check the schedule of the pineapple project to make sure the project running smoothly. The schedule is the date for fertilizing.

Week : Week 16

Date : 12th June 2022 – 16th June 2022

On this week, trainee started write the report for industrial training. On 13th June 2022, trainee cardboard tagging for the pineapple plant. The purpose of the tagging is to make sure that there are no confusion when fertilizing. Other than that, trainee joined the talk and meeting with the other company for another project. The talk was about our subcritical water and the company came to our facility to see the SCW machine. Trainee get to know on how to treat and give a proper explanation with client. On 15th June 2022, En. Azlan showed LoCartic department at UTM Pagoh. LoCartic means Low Carbon Technologies for transport application. At this LoCartic department trainee get to know about the new technology regarding the carbon information.

Week : Week 17

Date : 12th June 2022 – 16th June 2022

This week trainee has been learnt about how to do the inventory in the facility. This task as supervised by En. Azlan our Asst Engineer. En. Azlan have taught about the types of equipment that have been used in MJARC such as the types of spanners, lubricant oil, grease oil, personal protective equipment PPE, valve, chemical and some instrument. Next, after learning about the inventory, trainee helped En. Azlan to clean and arrange all the equipment in the MJARC facility. Other than that, En Azlan also gave some advice on how to work in the industry area especially engineering area. There were a lot of knowledge that he gave to the trainee which can help in the future. In this week also, trainee still need to monitor the green Pak choy in the seeds tray. This is because it needs to be in a good and healthy condition before proceeding to do the transplant. Furthermore, trainee need to key in all the important data to the Microsoft Excel. The data's then will be shared with all the MJARC staff here for the research purpose. Last day of the week, trainee was prepared with the garden bed of the Pak Choy for the transplant.

Week : Week 18

Date : 26th June 2022 – 30th June 2022

Trainee started to transplant the Pak Choy to the garden bed. After the transplant, trainee watered the plant twice a day. On 28th June 2022, trainee was tasked to calculate the new leaves for the pineapple plant. The data was then transferred to the Microsoft Excel for studies purpose. After the data was transferred, trainee need to re-check the data gained to make sure there are no error in this project. This is because if the data is in error, there will affect the project. Trainee also joined the Durian Fest event in UTM Pagoh. This event included all the staff in the university. From this event, trainee is able to do the networking with everyone. Furthermore, it helps to increase trainee confidence by talking with other staff.

Week : Week 19

Date : 3rd July 2022 – 7th July 2022

Trainee started to write and prepare the slide for the industrial training. Next, trainee visited the pineapple plantation to make sure there are no dead plant. Trainee also took some soil sample for analysis. After that, trainee run a soil test analysis for the electric conductivity (EC). The EC meter measurement were used in this analysis.

Week : Week 20

Date : 10th July 2022 – 14th July 2022

Hari Raya AidilAdha on 10th July 2022 until 12th July 2022. Trainee continue the germination project and monitor the Pak Choy on the garden bed. Other than that trainee also visited the pineapple plantation for fertilizing.

Week : Week 21

Date : 17th July 2022-21st July 2022

Trainee need to monitor the transplant project to make sure all the plant are in good conditions. Trainee also have gathering with all the MJARC staff for lunch. This helps to improve trainee's social skill. Next, trainee also check the schedule of fertilizing to make sure that we still keep on track for the project.

Week : Week 22

Date : 24th July 2022 – 28th July 2022

On this week trainee continue doing the presentation slide and report for industrial training. Find more info about the project that have been done during the industrial training. Other than that trainee also met with Dr. Pramila, manager of MJARC. Next, trainee visited the pineapple plantation for the fertilizing purpose with supervisor and other staff of UTM Pagoh. This week, we used the solid fertilizers as suggested from MPIB officer. Trainee also accompany En. Bukhari, industrial training supervisor for a talk and meeting with MPIB staff. Trainee was tasked to jotted down all the important info during the discussion with the client. After the meeting, trainee have improved the social skill and did some networking with the client.

Week : Week 23

Date : 28th July 2022 – 1st August 2022

This week , trainee and all the staff continue on fertilizing the pineapple plantation using the solid fertilizer suggested by the MPIB officer. There is a specific way on how to fertilize sing this solid types. In this project, we used the pocket method to fertilize the pineapple plant. Other than that, trainee also get to run the SCW process. This is because MJARC got a new client where they want to produce the fertilizer by using the fish waste. Before the process begin, Mr Bukhari asked the trainee to jot down all the information data such as raw material loading time, retention time, operating pressure, operating temperature, fire off time, water fill time, fuel level, water level, start time, end time and types of feedstocks. During the process, trainee was tasked to monitor the temperature and pressure during the process. After all the process completed, trainee need to do the SCW curve line by using Microsoft Excel. The graph that needs to be done are temperature vs pressure, time vs temperature and time vs pressure.

CHAPTER 4 :

DETAILS OF EXPERIENCES

4.1 Introduction

A temporary job position often related to one's academic field of study or career interests is known as an internship. A career beginner may benefit from the opportunity to gain hands-on experience in a formal setting. Internships can also help young professionals finish their higher-level studies and give them insight into the culture and daily operations of a particular industry.

Trainee can expand the knowledge and gain real-world experience. Internship also help students to decide if they are in the right career field. In addition, the purpose of this training is also to give the first-hand experience in the working world. Other than that, it also gives the chance to learn about the career path leading to the position we want. Business and technical knowledge are not the only things that the industry demands of professionals working for companies. Students also need skills because, no matter how talented we are, we will not succeed in any profession unless they learn to work collaboratively and as a team player.

Additionally, student must understand how to work under pressure and the significance of deadlines. An internship exposes students to the difficulties of the workplace and having direct experience knowledge of these challenges will help the students in future interviews by demonstrating their adaptability to the company.

In this chapter, it will explained about the main project that have assigned to the trainee during the training period. It contains 3 different main projects done in the MJARC. For instance, the SCW project, pineapple project and germination project. All the projects are all for the client request except the germination project. The germination project is one of the research and development(R&D) area. Furthermore, the projects are all focus on the fertilizer produced by MJARC.

4.2 Details of the training and experience gained

4.2.1 Subcritical Water

Task 1 : Research on Subcritical Water (SCW) Process

Research on the subcritical water process is crucial in this company during the internship because the clients are aware that MJARC Pagoh provide the product produced by subcritical water process. Trainee was tasked to find information regarding the process to make sure that the services running smoothly in this facility. In MJARC UTM Pagoh, SCW technology is used to convert nearly all solid wastes into rich organic solid and liquid products. The organic materials are broken into smaller molecules. It is a green technology because it uses water as solvent with low temperature and low pressure. The organic materials are decomposed by hydrolysis process. The reaction of an organic chemical with water to form two or more new substances is known as hydrolysis, and it usually refers to the cleavage of chemical bonds by the addition of water. Under sufficient pressure, SCW refers to water that maintains its liquid state at temperatures between its boiling point of 100 °C and its critical point of 374 °C.

Task 2 : Understand how it works.

In addition, the trainee was required to comprehend the SCW's process flow during this training. At 1 atm, water boils and vaporises at 100°C , but increasing the air pressure in a closed space prevents water from boiling at higher temperatures because the air pressure prevents the water molecules from evaporating freely. Increasing the temperature and pressure in this state causes the water to turn into a vapour at a temperature of 200°C at 20 atm, which is where we developed the term "subcritical water" (SCW). It is a state which water molecules that have been pressure together reach their limit and begin to separate and bounce around violently inside the chamber. In this state, other molecules that enter the water are immediately broken down. It reached their breaking point when water molecules under pressure start to separate and bounce around irregularly inside the chamber. Other molecules that enter the water at this point are immediately broken down.

After the SCW waste has been placed in the tank, the steams from the boiler are blown into the tank to begin the process. As its temperature and pressure rise, the steam helps to

generate the process. All organic materials, including wood chips, plastic, and vinyl, are made of carbon-based chains. The SCW process then separates this chain into smaller organic molecules. Vegetable and fruit waste, sawdust, fish waste, empty fruit bunches, rice straw, rice husk, and cut grass can all be broken down by SCW processing equipment. In general, anything made of organic matter can be broken down by SCW. Basically, the SCW process only needs water. As a result, this process is safer than others because there is no risk of pollution. Additionally, it differs from incineration because there is no risk of air pollution or dioxin discharge. Before the SCW was introduced, everything was burned. Outside the building, where there formerly was a large smokestack, there is now a small chimney that only emits steam. When compared to incineration, fuel costs are also low. Additionally, it does not emit smoke or odours, making it environmentally friendly.

Other than that, the decomposed waste is pure organic matter it can also be pure organic matter. It can also be used as high-quality organic fertilizers. Moreover, changing the pressure can turn matter into powdered or liquid form. This is what we have been applied in MJARC. MJARC have been produced a variety type of organic fertilizer from waste. Figure 4.2.1 and figure 4.2.2 shows the process flow of the subcritical water :

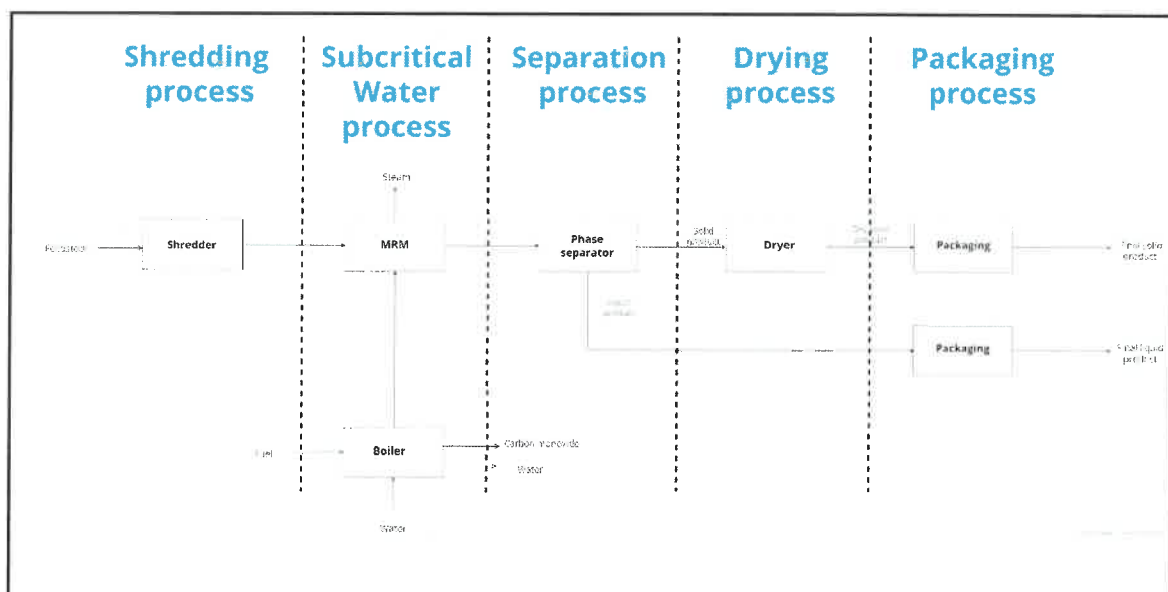


Figure 4.2.1.1 : Block diagram of SCW

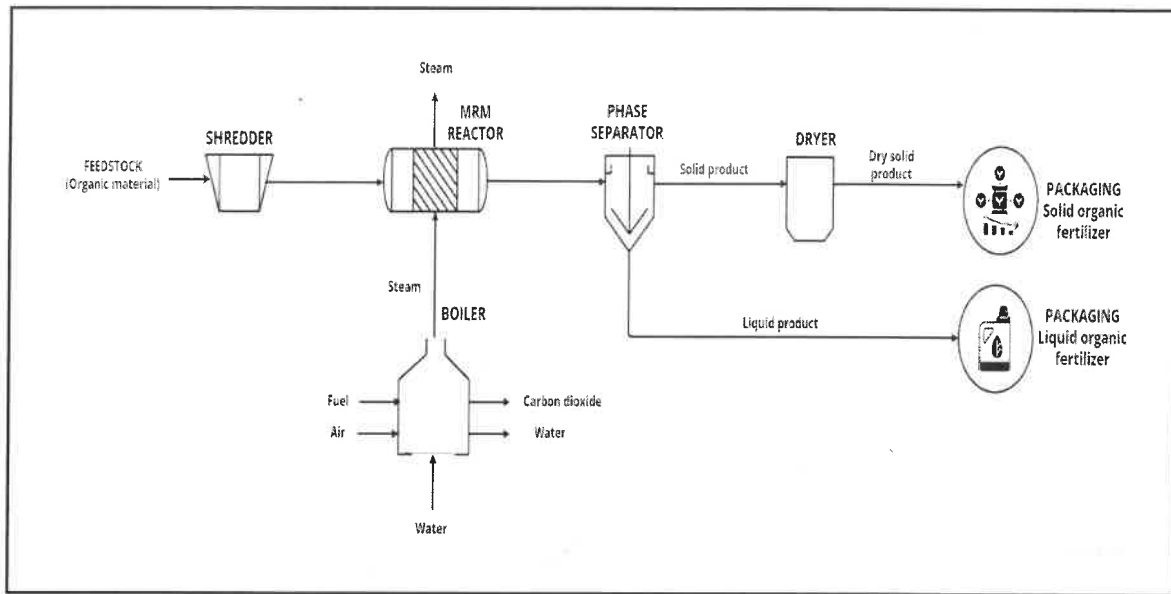


Figure 4.2.1.2 : Process flow diagram of SCW

Task 3 : Run the SCW process (Fertilizer production)

Trainees had the opportunity to see the subcritical water process. The loading process has been shown in appendices section. Trainee involved in this process from the beginning until the end. For this fertilizer project, MJARC have received fish waste as raw material. The amount of fish waste that has been received at our facility is 1.2 tons. Before this process was carried out, trainees were given the task of recording important information throughout the process. Among the information is, types of feedstocks, raw material loading time, start time, retention time, end time, product unloading time, process complete time, operating pressure, operating temperature, water fill time, fire off time, fuel level, water level and electric consumption. All the information that has been taken will be recorded in the production book log. This data is recorded for future research purposes.

In addition, after the trainee has recorded all the necessary data, the trainee is also told to observe the pressure and temperature throughout the process. This is because pressure and temperature are important parameters in this process. It is crucial because without the use of an additional catalyst, chemical reactions like hydrolysis and degradation can be catalysed by the ion product of subcritical water, which significantly increases with temperature and

pressure. After that, trainee need to do the curve line of the SCW process. The graph that needs to be done are pressure vs temperature, time vs pressure and time vs temperature. This is because we need to see the relation between those parameters.

4.2.2 Pineapple Project (Fieldwork)

Task 1 : Pineapple plantation.

First and foremost, this project started with receiving about 3000 pineapple tendrils from the MPIB. The tendrils were sent by them before 24th March 2022. There were about two trips of lorry to complete the number of tendrils. After that, the suckers need to be graded at our facility before the planting process. The grading process were taught by the official MPIB officer, En. Sharom. He guided all process which from the grading process until the plantation process before we proceed by ourselves. There are three different sizes in pineapple sorting. For example, small-sized, medium-sized and large-sized pineapple tendrils. All tendrils will be cut in the specified size before being separated according to the size mentioned earlier.

After that, the pineapples are separated according to a certain size, they will be brought to the farm for planting purposes. Before the planting process was carried out, some of the staff had built 16 crop borders for the purpose of growing pineapples. The purpose of this crop border is to make the plants appear more uniform and neater. Not only that, the purpose of this crop border is also to facilitate the future fertilization process. For the first crop boundary, the type of pineapple planted is Josephine, while for the second boundary, the type of pineapple planted is MD2.

Task 2 : Data collection for the pineapple project.

Data readings will be taken twice a month. During the first month, the trainee was tasked with taking a photo of one of the selected pineapple plants for each plant boundary. The objective of this activity is to compare the plants' characteristics before they are harvested and to take a picture of the young trees before they are fertilized. In addition, the trainee was also tasked with taking soil moisture readings at the pineapple plantations. For the analysis, the 16 samples taken from the soil were analysed using the Uni-Bloc moisture analysis tool.

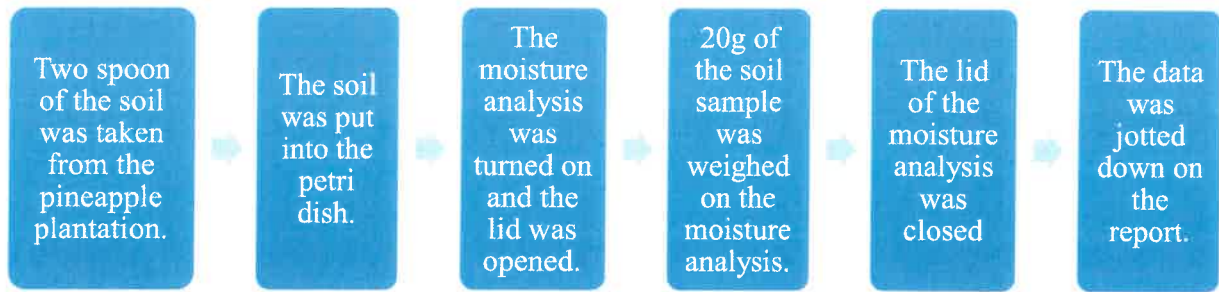


Figure 4.2.2.1 Moisture analysis procedure

Soil moisture data is very important for this project as it can help to determine the amount of nutrients that are available to the plant. Also, the yield of a crop can be determined by the amount of water that's available to the plant. The standard soil moisture level ranges from 20% to 60%. Thus, the data was near to the standard value of moisture that have been approved.

Apart from that, trainee have been tasked with taking a pH reading for each pineapple plant border. This step was carried out using a soil instrument which is the 4in1 soil survey. The instrument will the measure the pH level in the soil. The amount of nutrients and chemicals that are soluble in soil water, and thus the amount of nutrients available to plants, is affected by soil pH. A soil pH between 4.5 and 5.6 is ideal for pineapple production. Based on the data collection, the pH value for our project is almost near to the ideal.

Other than that, temperature of the soil is important in this project. Soil temperature is a vital factor that affects the development and growth of biological systems, such as those involved in agriculture and land treatment. It also controls various other processes that are involved in the environment's subsurface environment. We have two different devices that are used to measure the soil's temperature. One of these is a 4in1 soil survey instrument and the other is a Watchdog 1000 series micro station. Both devices have the same function, which can measure the soil's temperature. The soil temperature can have a significant effect on plant growth by affecting the nutrient uptake and root and shoots growth. For instance, when the temperature is low, the water uptake rate decreases. This is because the increased viscosity of

the soil contributes to the decreased absorption rate of water. Thus, it will help to improve the growth of the plant.

Task 3 : Fertilizer formulation.

In this project, the use of fertilizer is very important. Therefore, trainees have been assigned and taught to do the fertilizer formulation produced in MJARC. In this project, there are 2 types of fertilizers that have become parameters for this research. Fertilizers come in two main categories: chemical and organic. As the name implies, organic fertilizers are made from natural materials like plants and animal manure. Chemical fertilizers are created by applying chemical processes to inorganic materials. These two types of fertilizers have been formulated by MJARC for research purposes. For the formulation of chemical fertilizers, there are several materials used. Among them are urea, chalk, zinc sulfate, copper sulphate, ferrous sulphate and water. This formulation has been studied before we try it on the plantation. As a matter of fact, any inorganic substance that is added to soil to support plant growth and is wholly or partially synthetic in origin is referred to as a chemical fertilizer. Generally, with the help of chemical fertilizers, it can increase the crop yield on a particular plot of land. This is the mission of our facility to test the chemical fertilizer on our project. We want to see the growth of the pineapple plant during harvest. As a matter of fact, by using the chemical fertilizer have both advantage and the disadvantages. Mainly, overuse of chemical fertilizers can cause soil acidification and soil crust, which lowers the amount of organic matter, stunts plant growth, changes the soil's pH, and even triggers the release of greenhouse gases.

A vital source of soil and plant nutrients is organic fertilizer. In contrast to chemical fertilizers, organic fertilizers build healthy soil while supplying nutrients for the plants. They are regarded as a greener alternative. Large amounts of organic matter in the soil help it stay loose and light, hold onto more water and nutrients, and encourage the growth of soil microorganisms, which benefits plant health and root formation. "Organic manure" is another name for organic fertilizer. Organic fertilizer can be simply defined. Typically, it refers to compost produced from animal waste or residues from plants and animals that are abundant in natural byproducts. Commonly there are two types of organic fertilizer such as compost and manure. In this project, we are using the compost type. The organic fertilizer has been through

some formulation before we try it on the plantation. It is a mixture of pineapple liquid fertilizer, vegetable liquid fertilizer and effective microorganisms (EM).

The fertilization done in this pineapple farm has followed the schedule set by the supervisor. The schedule drawn up is in accordance with the recommendations that have been proposed by the MPIB. Not only that, in this project there is also the use of solid fertilizer. Solid fertilizer is used only 2 times during this project until harvest.

4.2.3 Germination Project

Task 1 : Research on the germination media.

The first project that was assigned for the first week of the internship is the germination project. Germination is the process by which an organism grows from a seed or spore. The term is applied to the sprouting of a seedling from a seed of an angiosperm or gymnosperm, the growth of sporeling from a spore, such as the spores of fungi, ferns, bacteria, and the growth of the pollen tube from the pollen grain of seed. The purpose of the germination project that has been conducted was to monitor the plant whether it grown up well by using the different organic fertilizers. It also wants to emphasize that by using organic fertilizer the product will grow bigger than using chemical fertilizer. The fertilizer used was made by using our machine, MRM. Furthermore, the plant that has used in this project was Pak Choy. Before trainee started the project, trainee had to find a lot of sources and information regarding the germination project. UiTM Database was used to unlock all the journals. Luckily, the document can be unlocked after following the steps.

There are 9 different germination media used in this project such as soil (control), sawdust, subcritical water rice straw (SCWRS), subcritical water rice husk (SCWRH), palm waste, sawdust + soil, sawdust + SCWRS, sawdust + SCWRH and sawdust + palm waste. SCWRH and SCWRS are the product that has been processed using the MRM in the company. All the germination media was added to the seeds tray. The moisture of the soil was measured using the Shimadzu Moisture Analyzer, MOC63u. The start-up process of using the analyzer have been taught by the research officer, Puan Nurhamieza Binti Huzair. Based on the article that

has been studied, the ideal soil moisture for the plant to grow up is between 20% - 60%. The method for preparing the germination media is shown below:

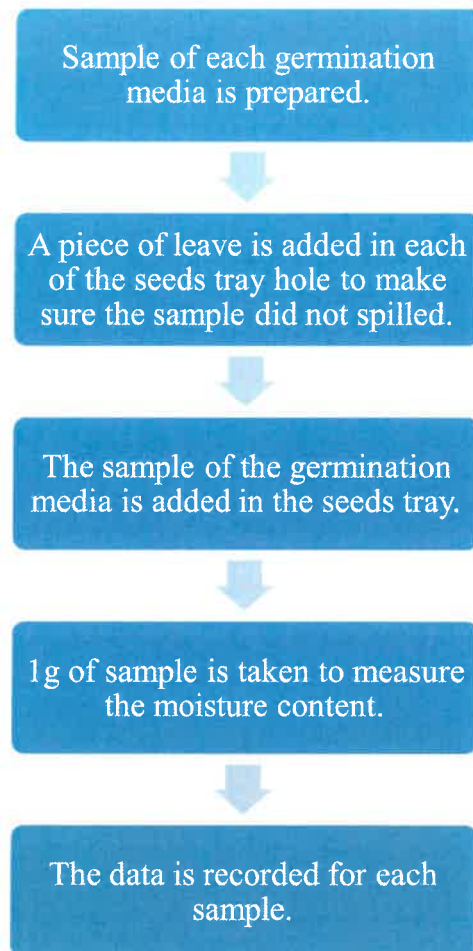


Figure 4.2.3.1 Preparation of germination media

The germination process can start once the seeds have reached at the new location. The process of seeds growing into new plants is called germination. The first thing that can cause a seed to grow is its environment. Usually, the depth of the seed, the availability of water, and the temperature all play a role in this. When there is an abundance of water, a process known as imbibition causes the seed to fill with water. Enzymes, which are unique proteins, are activated by the water to start the seed's growth process. The seed first develops a root to reach the water below. Then, the growth above ground starts to show. The seed sends out a shoot that will eventually grow leaves to obtain energy from the sun. A process known as photomorphogenesis causes the leaves to keep expanding to the direction of the light source. However, using too much water can be harmful. The plant cannot use the sun to produce food

while the roots are forming. Energy must be produced using the food that has been stored inside the seed and oxygen from the surrounding air. The plant won't thrive if the soil is too wet because there won't be enough oxygen. It is crucial to measure the pH and EC of the soil for the germination project. This is done to ensure that the plant receives sufficient nutrients. Key nutrients that are available to plants are influenced by pH.

Unfortunately, this project was not successful due to several factors. The first is the unpredictable weather throughout the project. A month earlier when this project was carried out, the weather in this area was quite hot. This causes stunted tree growth. Next, Next is insufficient time. For example, this project was carried out a few weeks before a long holiday. The leave period given by trainees is one week. During the week, the planted trees did not get enough water. This has caused the tree to not get enough nutrients. This is because for perfect tree growth it needs sufficient water.

4.3 Problem encountered and approach adopted for solving problem

During the internship trainee have encountered a few problems especially regarding the project. Among the problems faced is lack of work during training. This problem has caused trainees to not know what needs to be done when working. In addition, lack of work can also cause trainees to not have the opportunity to add new knowledge during on-the-job training. The solution that has been done by the trainee is that the trainee will ask the staff about the work related to the industry. Trainees have also often asked about work that needs to be done or things that can be helped while in the office. This has helped trainees get enough training and work. Trainees can also increase their confidence in speaking to the public.

Furthermore, another problem that have been encountered during the internship is not enough time to complete the project within the training period. This is because most of the project required a year to complete. Trainee only involved the in the beginning and the middle of the project during the training period. It quite upset because trainee did not know either the process will be successful or not. Thus, in other to solve the problem, trainee asked the

supervisor to keep on updated regarding the project that involved the trainee. By doing this, trainee still can know the progress of the selected project. Other than that, this helps trainee to do the networking with the staff in MJARC. This might be helpful in the future for trainee to find a work.

4.4 Professional and ethical issues

Professional ethics are values that guide how an individual or group behaves in a professional setting. Professional ethics serve as a guideline for how one should behave toward other people and institutions in such an environment, like principles. All codes of conduct for professionals are founded on ethical principles. Different ethical standards may apply depending on the profession. However, there are some ethical standards that are applicable to all professions without exception, such as honesty, trustworthiness, loyalty and respect for others.

It is genuinely required of all employers to provide a secure and healthy work environment for their workers. The primary profession utilising scientific and engineering methods to safeguard employees from hazardous workplace conditions, toxic chemicals, dust, and other air contaminants is industrial hygiene. Engineering controls are ranked first in a hierarchy of worker health protection strategies in the basic industrial-hygiene approach to the workplace. The ethical standards of the profession enforce this method.

In MJARC, there were no professional and ethical issue happened. All the staff here are all in good condition. They also taught to trainee to be kind with each other in working environments. Other than that, MJARC also follow the rules of occupational safety and health (OSHA). They also provided proper PPE to anyone run the process.

4.5 Health, environmental and sustainable aspects

Depending on the local geography, infrastructure, season, time of day, and activity engaged in, people experience their environment as a combination of physical, chemical, biological, social, cultural, and economic conditions. The various risks to human health posed

by the environment can be separated into "traditional hazards," which are linked to slow development, and "modern hazards," which are linked to unsustainable development.

The concept of sustainable development refers to the ability of a country to meet the needs of its present and future generations without compromising its ability to meet its future needs. Due to the harmful effects of climate change and environmental degradation, governments and communities are more focused on ensuring that the development of their economies is carried out in a sustainable manner.

The environmental health effect that has been sustain in MJARC is the green technology process which is the SCW process. This process helps to sustain the environmental issue since it did not use any hazardous chemical. As a matter of fact, the number of global waste production is higher than expected. Based on statistic, annual global waste is between 2.01 billion metric tonnes until 3.4 billion metric tonnes in 2050. This world has the poor management of waste because common food waste disposal is by open dumping, burning or end up in landfill. Thus, this can lead to worst environment pollution such as air pollution and global warning. Other than that, it also can cause soil and water contamination, This due to the leachate from breakdown of organic matter steps into soil and water bodies. SCW process can contribute to sustain the environment and health in this world.

CHAPTER 5 :

CONCLUSIONS

5.1 Conclusions

As a requirement for the diploma programme, students from the Faculty of Chemical Engineering at UiTM must complete a 24-week industrial training programme. This programme aims to expose students to the real working world and enhance their employability after graduation. Throughout the industrial training period, I was exposed to the research and development sector, and I can now relate it to the theoretical knowledge I acquired in the faculty during my diploma programme. In terms of maintenance, service, and process flow, I would say that the theoretical information I learned in Fluid Mechanics and Process Control is applied in the real industry.

I also understand that to succeed as an engineer, I must keep learning, increase my technical knowledge, and develop a variety of technical skills. We will meet a lot of people when we are working on the job site. Thus, it is important to sharpen the communication skills. Staff from MJARC inform us that we must adapt to these environments, whether we like it or not. I can use this to my advantage going forward as I work to expand my perspectives and boost my self-assurance. In a nutshell, the industrial training was successful even though it lasted only 24 weeks, which is a very ideal amount of time to learn and acquire skills. I gained a lot of knowledge about procedures, fieldwork, and laboratory work. Finally, this training has helped me be more disciplined and punctual.

5.2 Suggestions and Recommendations

There are several suggestions that can be suggested from the trainees. Among them is to add equipment to perform analysis. MJARC has relatively limited equipment to do a project. For example, to take a soil analysis. The equipment needed to analyze the soil is not available at our facility. In conclusion, the analysis could not be carried out. We will send samples to another department to do it. It takes a bit of time because you have to wait for your turn to do the work.

Next, upgrade equipment. This is because most of the process is done manually. So, labor force will be used excessively. It is better if the process can be carried out automatically. This is because it can avoid taking the wrong reading. For example, the measured temperature and pressure should be taken manually. This process takes time because the trainee has to sit in front of the machine to observe whether the pressure changes or not. Time is also uncertain because it follows the raw material that is put into the MRM. If the trainee does not concentrate during the process, then the data taken may contain errors.

Lastly, trainee would suggest giving an opportunity to conduct an event. Each institution has a unique strategic planning process. The MJARC has its own schedule of activities for the entire year. The trainee was obligated to comply with all the management team's planned activities. This has reduced the trainee's opportunities and chances to independently design any project or event. Although the planned activities were all excellent, the trainee had little room for creativity because they had to comply with all staff instructions.

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- iii. Universiti Teknologi Malaysia Pagoh Campus (<https://pagoh.utm.my/>)

Individual

- i. Mr. Muhammad Bukhari Bin Rosly (Industrial training supervisor)
- ii. Mr. Mohd Hidayat Bin Husin (Asst. Engineer)
- iii. Mr. Azlan Nur Rasyid Bin Amin (Asst. Engineer)
- iv. Mrs. Nurhamieza Bin Huzair (Research Officer)

APPENDICES



Appendice 1 : Boiler and MRM inspection with OSHA officer.



Appendix 2 : Fish waste as raw material for the SCW process.



Appendix 3 : Load the fish waste into the MRM.



Appendix 4: Final product of the fish waste after SCW process. Comes out in liquid form.



Appendix 4 : Example of product that have been produced using different raw material at MJARC.



Appendix 5 : MJARC solid fertilizer packaging



Appendix 6 : Steam released after the process completed.



Appendix 6 : Temperature, humidity, light and moisture data collection.



Appendix 7 : Soil flux measurement.



Appendix 8 : Soil flux equipment LI-6400XT Portable Photosynthesis System



Appendix 9 : Make 221 mudballs with UTM Pagoh staff



Appendix 10 : Visit the LoCartic department



Appendix 11 : Transplant process of the Pak Choy plant to the crop border.



Appendix 12 : Installation of partial shade after the transplant to avoid the “transplant – shock:”



Appendix 13 : pH and temperature of the soil data collection.



Appendix 14 : Example of tagging at pineapple plantation.



Appendix 15 : Pineapple suckers from MPIB.



Appendix 16 : Moisture analyzer equipment.



Appendix 17 : Trainee run the boiler under En. Azlan supervision.



Appendix 18 : Temperature and humidity surrounding data collection at pineapple plantation.



Appendix 19 : Chemical fertilizer formulation.



Appendix 20 : Pineapple plantation for the pineapple project.



Appendix 21 : M-Recycling Machine (MRM)