INDUSTRIAL TRAINING FINAL REPORT

SESSION: FEBRUARY 2022

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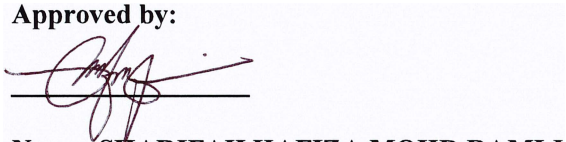
In the name of Allah, the most Beneficent and most Merciful, All praises to Allah, Lord of the universe and peace be upon His Messenger. I want to acknowledge Him on top of all for blessing me with patience and tenacity of mind to complete the Internship report. It is undeniably a vital requirement for certified Diploma with flying colors and I have received outstanding helps from many quarters which I would like to put on record here with great pleasure and deep gratitude.

Firstly, I would like to thank and compliment my industrial training supervisor, Madam Sharifah Hafiza. She is very kind in person and keen enough to give any newbie her full attention including me. Without her endless care and wit, I wouldn't have made any clear progression and understand the purpose of being an intern at all. Most thanks for her support, feedbacks and all the worthwhile lessons. I would also want to express my gratitude to dear lecturers who guided me and other companions throughout the internship programme from the very beginning till its completion.

Secondly, I would like to express my gratitude towards Mr. Ahmad Fadhlul Wafiq Abdul Rahman that had taught me various skills throughout my training period. Along with his help, I have experienced a lot of things such as critical thinking and problem solving when the task required manpower observation. Apart from that, sincere thanks to other staff who diligently taught and guide me. Their continuous support had played a big role in preparing myself for future and improve my social skills.

Furthermore, the appreciation to my fellow coordinator, Ms Hidayu and Sir Mohd Haikal for keeping touch with the students to make sure everything goes as planned. Last but not least, a big thank you to my family and friends for their endless support during my training period. Their support has kept me going to finish my studies. Finally, I would like to thank myself for keep going and believe in myself for doing all work and never gave up and stay true to myself.

Approved by:



Name: SHARIFAH HAFIZA MOHD RAMLI

RESEARCH OFFICER/INDUSTRIAL SUPERVISOR

ABSTRACT

This industrial training report of Wan Aleeya Naziera binti Mohd Zawawi to undergo an industrial training for duration of 6 months which consist of 24 weeks before completing the Diploma courses. Starting industrial training on 21st February 2022 until 4th August 2022 at Malaysian Agricultural Research and Development Institute which guided by Madam Sharifah Hafiza.

The purpose of this program is to fulfil 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 Engineering Department of MARDI. The next chapter, chapter 4, I have explained in more details about my tasks and activities as an internship student in MARDI. 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 MARDI and gained a lot of things that can helps me in the future.

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CHAPTER 1

INTRODUCTION

1.1 Overview

Industrial Training (IT) is a mandatory requirement for students in certain programmes at all levels of higher education at Institutions of Higher Learning (IHL). Industrial training programmes were introduced to strengthen the competencies required to increase the level of graduates' ability to work. Industrial Training (IT) refers to exposing students to real-world engineering experiences and getting them involved in Chemical Engineering projects before graduation. One of the requirements for the award of a Diploma in Chemical Engineering is that the student complete at least twenty-four (24) weeks of Industrial Training with 12 credit hours within semester six (6) OR after passing all of the courses taken from semester one to semester five.

Industrialmanship aims to introduce UiTM students to industrial culture and working environments while also increasing students' employability by enhancing their industrial skills. They will also go through several briefings as guidance for the trainee. This internship will last 24 weeks, beginning on February 21st, 2022 and ending on August 4th, 2022. The student must report to the company at the time and date specified during the Industrial Training briefing. During the internship period, the student will be assigned to one (1) Lecturer Evaluation to evaluate their performance. The logbook and finalised report are due to the college two (2) weeks after the internship ends, both online and in hardcopy.

Industrial Training (IT) courses provide students with hands-on learning opportunities ın the workplace in order to improve market reliability. Industrial training aids in the preparation of students for careers as engineering technicians by producing chemical engineering technician graduates with excellent technical skills and soft skill competency. Theories learned in all core and non-core courses can be applied by students in industrial training, so it is expected that students can solve problems or projects assigned by supervisors in a creative and innovative manner. Furthermore, industrial training helps students gain confidence, improve communication, and teamwork skills. In addition, students are expected to exhibit high levels of integrity, ethics, and accountability in engineering practise.

1.2 Objective Industrial Training

The main objective of Industrial Training (IT) is to give students learning opportunities in the world of work to receive practical experience in order to improve the reliability of the market. In preparing the students as an engineering technician, the industrial training helps to produce chemical engineering technician graduates with excellent technical skill and soft skill competency. The other objectives are:

- Mastering technical skills
- Gaining essential knowledge
- Perfecting interpersonal skills
- Building a Network of Contacts

1.3 Industrial Training Placement

- Malaysian Agricultural Research and Development Institute (MARDI)

1.3.1 Industrial Schedule

Normal working hours	9 hours
Day of working	5 days a week
Work in	8.00am to 9.00am
Break hour	**Monday – Thursday** • 1:00pm to 2.00pm **Friday** • 12:30pm to 2:30pm
Work out	4:30pm to 6:00pm

Table 1.1 Industrial Schedule

1.3.2 Company Supervisor Information

Name:	Sharifah Hafiza Mohd Ramli
Position:	**Research Officer**
Department:	**Engineering**
Phone No.:	
Email	

Table 1.2 Company Supervisor Information

Chapter 2

COMPANY PROFILE

2.1 Company Background

Figure 2.1 Logo of MARDI

The Malaysian Agricultural Research and Development Institute (MARDI) has been established since 1969 and it is a statutory body under the Ministry of Agriculture and Agro-based Industry Malaysia which has been mandated to conduct research in agriculture, food and agro-based industries. Among the objectives is to lead the agricultural technology and food processing in increasing agricultural productivity. MARDI headquarters is located at Serdang Selangor. It has eight main research stations and 24 support stations which cover 7,065 hectare of land area in Malaysia. It consists of 3,198 staff with 633 in the professional category and 2,566 support staff. Besides performing the contract research & development (R&D) projects, MARDI also provides technical services and entrepreneurship development in food, agriculture and other fields related to the industry. The technical services are in the forms of advisory, consultancy, technical trainings, analytical laboratory services and quality assurance, product development and processing and also technology upscaling.

2.2 Company History

MARDI was established with the main objective of generating and promoting new, reasonable and efficient technology for the advancement of the food industry, agriculture and the basic farming industry. The MARDI Act 1969 led to the establishment of MARDI on October 28, 1969. MARDI was fully operational in 1971. MARDI is managed and guided according to the rules and regulations decided by the MARDI Management Board with the approval of the Minister of Agriculture and Farming Industry. For financial matters, the approval of the Minister of Finance is also required. The MARDI Science Council also ensures that MARDI's technical programs achieve the maximum level of quality and effectiveness.

The amendment of MARDI's Deed in 1990 has confirmed MARDI's involvement in commercialization activities. As a result of the amendment, MARDITech Corporation Sdn. Bhd. was established in 1992. A second Deed Amendment was done in 2002 to allow more room towards commercialization. With persistent efforts in quality management, MARDI was awarded the MS ISO 9001:1994 certificate in 1998. This certificate was upgraded to MS ISO 9001:2000 in 2004. MARDI's analytical laboratory has also been accredited with MS ISO/IEC 17025 (food and agricultural chemistry and microbiology in 2001 and pesticide residues in 2006).

The establishment of a technology delivery system as part of a comprehensive innovation approach was carried out with the establishment of test-beds and technology incubators in 2005 as a component of the entrepreneur development program.Cultivating knowledge management in the MARDI operating system from 2005. Restructuring of the organization so that MARDI's position is in line with current demands. The current structure took effect on February 1, 2002. Establishment of several additional research stations based on agro-climatic zones within the state, including in Sarawak and Sabah. Out-of-state stations have also been established such as in Mali and Malawi in Africa. International recognition is achieved through collaborations with research organizations and universities in the United States, Canada, Japan, Australia, Taiwan, China, ASEAN countries and the EU. Collaborative research efforts were also conducted with international research institutions such as INIBAP, ACIAR, IRRI, IPGRI, CABI, ABC (Hungary), AVRDC, EU/ALTERA Greenworld Research, IAEA and FAO. Technical negotiations on agricultural development were also offered to Kyrgyzstan, Bosnia-Herzegovena, Syria, Qatar, Kampuchea and Ivory Coast. MARDI

Corporation Sdn. Bhd. is also involved in promoting the results of MARDI's activities at home and abroad.

2.3 Vision and Mission

2.3.1 Vision

Innovative technology scouting for agricultural industry sustainability and competitiveness in 2030.

2.3.2 Mission

- Increase agricultural productivity and sustainability by investing ın and transferring modern, efficient, and cost-effective technologies.
- Increasing research and development financial resources, competencies, facilities, and infrastructure.
- Improve visibility and management by implementing effective, efficient, transparent, and accountable management practices.

2.4 Organization Chart

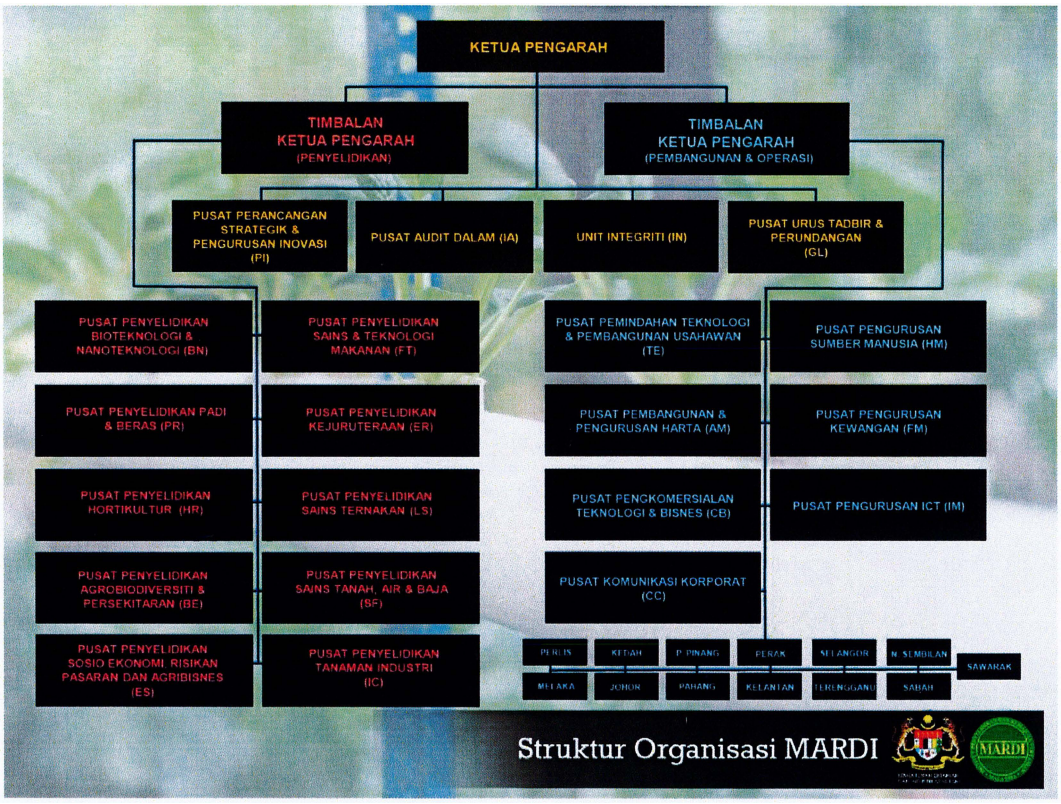


Figure 2.2 Organization Chart MARDI

Figure 2.3 Organization Chart Engineering Department

2.5 Main Service Provided to the Client

MARDI is dedicated to producing reasonable, capable, and advanced technology and to providing technological leadership to customers involved in the development of the food and agriculture sector. MARDI strives to satisfy customers in order to achieve this goal.

- Produce 40 technologies per year with the potential to be scaled up, pioneered, or commercialized to benefit the food, agriculture, and related industries.
- Improve target group performance through the use of technology
- Based on international expertise, provide quality and accredited services related to food and agriculture sector development.
- Within seven (7) working days, provide customer feedback on the status of requests for advice, information, training, and expertise based on MARDI technology.
- Pay for supplies and services within 14 days of receiving complete documentation from the supplier.

Chapter 3

OVERVIEW OF THE TRAINING

3.1 Introduction

During 24 weeks of the training, variety of jobs are provided by MARDI includes participated in MARDI's project regarding food mechanization. The engineering department ER1 is mostly engaged with agriculture. The trainee will get assigned to one supervisor where they can assist their supervisor with their projects or any other research officer that needs assistance. The trainee will mostly be working in workshop or laboratory depending on the tasks given. During the training period, all interpersonal skill can be strengthened while expanding their network of contacts.

3.2 Summary of the training and experience gained

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

Task 1: Particle Size Reduction

During the industrial period, trainee was assigned to reduce the grain corn's size intro crusher. The main responsibility of the intern is to assist during the project by repacking the sample intro appropriate bag to record data of initial weight, final weight, final weight of waste, recovery of waste and processing time. Next, after the reduction of grain corn size, the trainee needs to analyze the grain colour using machine provided.

Task 2: Particle Size Distribution

Trainee is required to prepare the test sieve shaker for the crushed grain corn. Firstly, trainee to measure the average size of the crushed grain corn and then refer to the chart for mesh size. Then, trainee need to prepare samples and put the sieve on the shaker. Record the data obtained to draw graph of particle size distribution.

Task 3: Comparison of raw vegetables and vegetables puree

Trainee are tasked to used ThermoMix TM6 to make puree to check the moisture content, water activity, total soluble solid and colour. First, find recipe in the recipe book

provided by ThermoMix to check the ingredients needed with measurements. This is to check how much time and ingredients needed to create the puree. Then, trainee will be recording all data to get the standard deviation, average and colour.

Task 4: Removing impurities of dried grain corn

Trainee was asked to assist in removing impurities by hands for small pieces of impurities that cannot be separated by machines. This project was done to remove any impurities for repackaging the grain corn into dry samples and wet samples. Then, trainee will need to record data of moisture content and water activity to see any difference between all 24 samples.

The details of the task will be explained in chapter 4

3.2.1 Weekly Activity (summary of each week)

Week 1: Briefing with IT supervisor.

Week 2: Industrial Training Project – Particle Size Reduction and Distribution.

Week 3: Test run with ThermoMix TM6.

Week 4: Make vegetables puree and test cook glutinous run using TM6.

Week 5: Collecting data vegetables and puree.

Week 6: Assisting in making watermelon jam.

Week 7: Self-learning.

Week 8: Removing inferiority of grain corn.

Week 9: Removing impurities of newly harvest dried corn.

Week 10: Self-learning

Week 11: Holiday (Hari Raya Eid)

Week 12: Collecting data of moisture content and colour of dried grain corn.

Week 13: Test grinding dried grain corn using TM6 and collect water activity.

Week 14: Continuation collecting water activity of dry sample. (Grain corn)

Week 15: Continuation from Week 14.

Week 16: 3D food printing.

Week 17: 3D food printing

Week 18: Assisting in other research office's project.

Week 19: Gotong-Royong at ER1 workshop.

Week 20: Doing correction on report.

Week 21: Research on moisture content in vegetables for reference.

Week 22: Research on direct and reverse spherification.

Week 23: Meeting with new industrial training students.

Week 24: Industrial Training Presentation.

Chapter 4

DETAILS OF ECPERIENCES

(REPORT ON JOB/TASK/PROJECT)

4.1 Introduction

Since I undergo my internship at MARDI in Engineering Department, I have been dealing with hands on work where I will assist in my supervisor project and other research officer as they are related to my job scope regarding food mechanization. The experiences that have been taught on proper work ethnics, networking, documentation and more. My supervisor encouraged me to work independently by giving some works and give me freedom on how to do it. This teach me on to be more aware of my responsibility and how to properly work in the industry. Thus, most of the time I will be spend my time doing some helping with other project and do my own schedule on what I should be doing next by making arrangement with En. Fadh who are assigned to help me with any practical job I will be doing in workshop and laboratory.

4.2 Details of the training and experience gained

4.2.1 Particle Size Reduction

This project is implemented specially for industrial training student. The trainee needs to repackaged 40kg bag of dried grain corn into 3 bags of 10kg per bag. The total grain corn needed to crush will be 30kg. Firstly, I need to record the initial weight of grain corn before relocate the grain corn to post-harvest laboratory to use the crusher. Before using the crusher, the crusher need to be clean so that there will be no other foreign material mixed up with grain corn and affect the results. Mr. Fadh gave a briefing of SOP when using the crusher as mishandle the crusher can cause injuries. After that, check the disk size to make sure it is the desirable size we need to reduce grain corn's size. The disk size is 7cm in length and 22cm in width. After that, make sure the container to contain the crushed grain corn are under the crusher so that there will be less loss. Make sure to take the time taken to crush each bag of 10kg grain corn. After crushing everything, we went to get the final weight of grain corn and the weight of waste obtained after each crushing process. Then, I was tasked to calculate the

recovery grain to see if the recovery was 95% above or lower. The result I obtained after that, all 3 bags have about 98% recovery which means only 2% losses happened during crushing that might be related to weight of grain corn that are light so it can easily be blown by wind. Other than that, the size of container where the container used are larger in width but not in height so that means we need to regularly flatten the surface of container so no grain corn spilled out from the container.

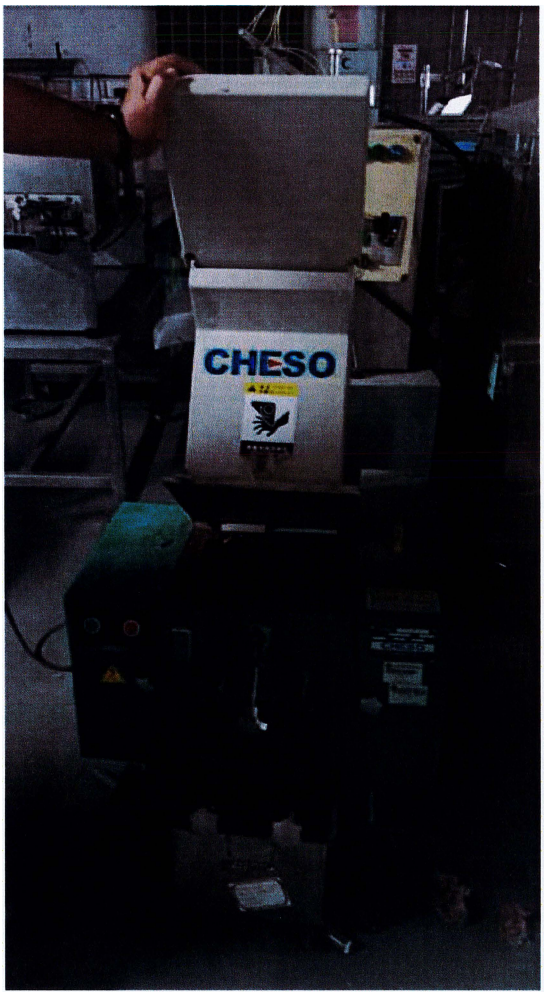


Figure 4.1 CHESO Crusher

Figure 4.2 3 bag of grain corn (10kg/bag)

Sample 1

No.	Size (mm)	grain Retained	Accumulated Retain	% Mass	% Passing
7	2.83	279.80	279.80	60.20	39.80
10	2.00	89.95	369.75	79.55	20.45
12	1.68	2.74	372.49	80.14	19.86
16	1.19	29.57	402.06	86.50	13.50
18	1.00	8.79	410.85	88.39	11.61
20	0.84	10.04	420.89	90.55	9.45
Pan		43.91	464.80	100.00	0.00

No.	Size (mm)	grain Retained	Accumulated Retain	% Mass	% Passing
7	2.83	277.96	277.96	58.08	41.92
10	2.00	68.95	346.91	72.48	27.52
12	1.68	34.70	381.61	79.73	20.27
16	1.19	36.44	418.05	87.35	12.65
18	1.00	9.21	427.26	89.27	10.73
20	0.84	7.96	435.22	90.93	9.07
Pan		43.39	478.61	100.00	0.00

Sample

Size (mm)	grain Retained	Accumulated Retain	% Mass	% Passing
2.83	308.48	308.48	57.11	42.89
2.00	53.60	362.08	67.03	32.97
1.68	94.51	456.59	84.53	15.47
1.19	33.97	490.56	90.82	9.18
1.00	7.89	498.45	92.28	7.72
0.84	6.64	505.09	93.51	6.49
	35.07	540.16	100.00	0.00

No.	Size (mm)	grain Retained	Accumulated Retain	% Mass	% Passing
7	2.83	249.26	249.26	59.57	40.43
10	2.00	40.41	289.67	69.22	30.78
12	1.68	34.90	324.57	77.56	22.44
16	1.19	34.49	359.06	85.81	14.19
18	1.00	10.71	369.77	88.36	11.64
20	0.84	7.40	377.17	90.13	9.87
Pan		41.29	418.46	100.00	0.00

Sample 5

Size (mm)	grain Retained	Accumulated Retain	% Mass	% Passing
2.83	306.97	306.97	55.27	44.73
2.00	89.64	396.61	71.41	28.59
1.68	79.63	476.24	85.75	14.25
1.19	30.05	506.29	91.16	8.84
1.00	7.93	514.22	92.59	7.41
0.84	4.89	519.11	93.47	6.53
	36.27	555.38	100.00	0.00

Table 4.1 Data of Particle Size Distribution (10 min)

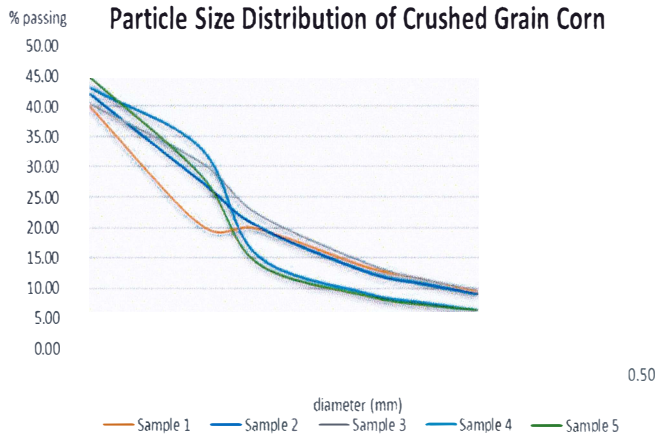


Figure 4.3 Graph of particle size distribution (10 min)

Sample 1	15 min				
No.	Size (mm)	grain Retained	Accumulated Retain	% Mass	% Passing
7	2.83	312.56	312.56	62.32	37.68
10	2.00	86.73	399.29	79.61	20.39
12	1.68	29.83	429.12	85.56	14.44
16	1.19	29.24	458.36	91.39	8.61
18	1.00	7.07	465.43	92.80	7.20
20	0.84	5.78	471.21	93.95	6.05
Pan		30.33	501.54	100.00	0.00

Sample 2	15 min				
No.	Size (mm)	grain Retained	Accumulated Retain	% Mass	% Passing
7	2.83	323.26	323.26	65.30	34.70
10	2.00	72.08	395.34	79.86	20.14
12	1.68	28.62	423.96	85.64	14.36
16	1.19	28.08	452.04	91.32	8.68
18	1.00	6.71	458.75	92.67	7.33
20	0.84	11.33	470.08	94.96	5.04
Pan		24.95	495.03	100.00	0.00

Sample 3	15 min				
No.	Size (mm)	grain Retained	Accumulated Retain	% Mass	% Passing
7	2.83	306.91	306.91	61.76	38.24
10	2.00	85.03	391.94	78.87	21.13
12	1.68	29.95	421.89	84.90	15.10
16	1.19	30.00	451.89	90.93	9.07
18	1.00	7.60	459.49	92.46	7.54
20	0.84	5.85	465.34	93.64	6.36
Pan		31.61	496.95	100.00	0.00

Sample 4	15 min				
	Size (mm)	grain Retained	Accumulated Retain	% Mass	% Passing
	2.83	306.20	306.20	60.92	39.08
	2.00	86.73	392.93	78.18	21.82
	1.68	29.19	422.12	83.99	16.01
	1.19	30.06	452.18	89.97	10.03
	1.00	7.38	459.56	91.44	8.56
	0.84	11.70	471.26	93.76	6.24
		31.34	502.60	100.00	0.00

	15 min				
	Size (mm)	grain Retained	Accumulated Retain	% Mass	% Passing
	2.83	311.88	311.88	62.62	37.38
	2.00	83.81	395.69	79.44	20.56
	1.68	29.59	425.28	85.39	14.61
	1.19	29.55	454.83	91.32	8.68
	1.00	7.09	461.92	92.74	7.26
	0.84	5.64	467.56	93.87	6.13
		30.51	498.07	100.00	0.00

Table 4.2 Data of Particle Size Distribution (15 min)

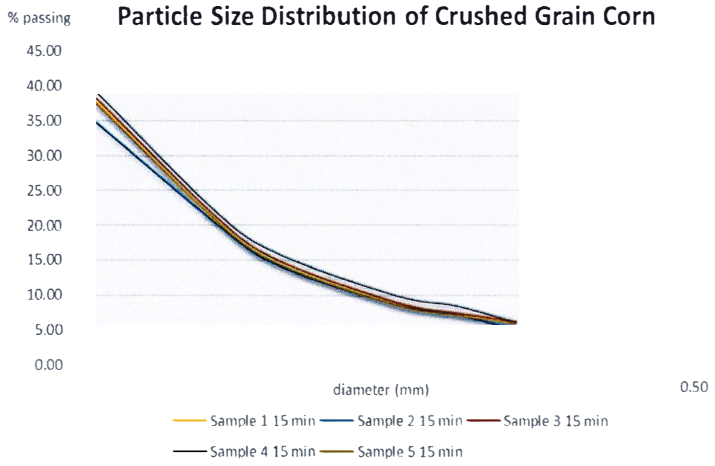
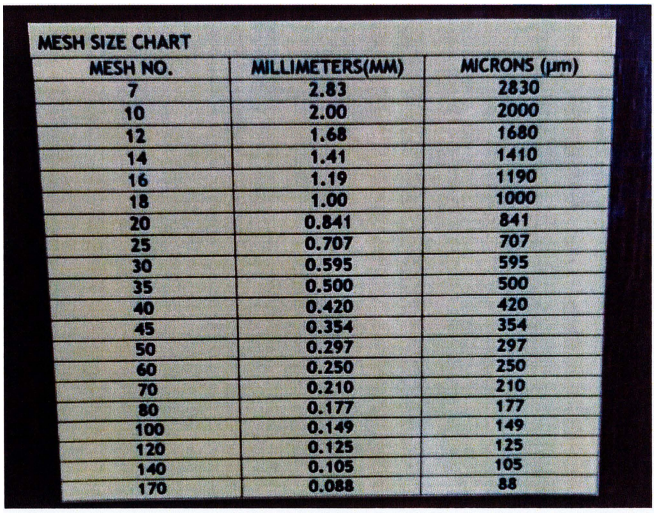


Figure 4.4 Graph of particle size distribution (15 min)

4.2.2 Particle Size Distribution

Particle size distribution is dependent on measurement principle is a huge issue that stems from the very concept of particle size distribution. Particle size distribution is an index (means of expression) indicating what sizes (particle size) of particles are present in what proportions (relative particle amount as a percentage where the total amount of particles is 100 percent) in the sample particle group to be measured. Particle amount is measured using volume, area, length, and quantity as standards (dimensions). However, the volume standard appears to be widely used. Frequency distribution indicates in percentage the amounts of particles existing in respective particle size intervals after the range of target particle sizes is divided into separate intervals. In contrast, cumulative distribution (for particles passing through the sieve) expresses the percentage of particles of a specific particle size or smaller. Cumulative distribution (for particles remaining on the sieve) expresses the percentage of particles of a specific particle size or larger. To introduce the concept of "particle size distribution," first define "particle size." Almost no particle's shape can be expressed simply and quantitatively as "spheres" or "cubes." Particles have complex and irregular shapes, and particle size cannot be determined directly. This is why the phrase "sphere-equivalent diameter" is used. Under this definition, when a certain particle is measured based on a certain principle of measurement, the particle size of the measured particle is expressed by the diameter of a spherical body that displays the same result (measurement quantity or pattern).

This task is done after the task 1 where we crushed the grain corn into smaller pieces for sieving process. We met with Madam Faewati to check the mesh size for test sieve. Mr. Fadh tasked me to measure the grain corn's size by taking few samples and use the vernier caliper. I need to get the average measurements to cross out size that are not needed for the test. Then, I went to meet Madam Faewati with my supervisor to proceed the test while having the discussion. After discussed with both of them, we decided to use mesh size of 7, 10, 12, 16, 18 and 20. The shaker can only handle 500g of grain corn so I need to repack 3 bags of crushed grain corn into 10 samples where 5 samples for 10 min sieving and another 5 for 15 minutes sieving. After finishing the test, I met with Madam Faewati to learn how to draw the graph of particle distribution.



MESH SIZE CHART

MESH NO.	MILLIMETERS(MM)	MICRONS (µm)
7	2.83	2830
10	2.00	2000
12	1.68	1680
14	1.41	1410
16	1.19	1190
18	1.00	1000
20	0.841	841
25	0.707	707
30	0.595	595
35	0.500	500
40	0.420	420
45	0.354	354
50	0.297	297
60	0.250	250
70	0.210	210
80	0.177	177
100	0.149	149
120	0.125	125
140	0.105	105
170	0.088	88

Figure 4.5 Mesh Size Chart

4.2.3 Comparison of raw vegetables and puree

This project is done by using TM6 and their provided recipes to cook puree. Before we get started, me and my supervisor went out to buy the vegetables which are carrots, pumpkins and sweet potato. After that, by referring to recipe book from ThermoMix. After that, I need to collect data of moisture content, water activity, total soluble solid and colour of vegetables and puree. This is to get average and standard deviation of the results. Not only that, by reading journals regarding this experiment, I need to give my opinion on what is happening in the results. Example, which vegetables and puree have the highest lightness, yellowness and greenness. What factor that can affect the result.

Figure 4.6 ThermoMix TM6

Figure 4.7 Vegetables and puree

Vegetables	Moisture Content		Water Activity		Total Soluble Solid	
	Raw	Puree	Raw	Puree	Raw	Puree
Carrot	90.48 ± 0.007	86.42 ± 0.007	0.778 ± 0.001	0.716 ± 0.017	1.3412 ± 0	1.3431 ± 0.0038
Sweet Potato	80.26 ± 0.014	82.16 ± 0.012	0.771 ± 0.007	0.726 ± 0.019	1.3427 ± 0.002	1.3454 ± 0.0002
Pumpkin	90.86 ± 0.009	89.45 ± 0.009	0.772 ± 0.004	0.736 ± 0.001	1.3414 ± 0.0001	1.3427 ± 0.0001
Spinach w/ water	89.14 ± 0.010	100.21 ± 0.041	0.780 ±0.004	0.736 ± 0.001	1.3376 ± 0.0004	1.3383 ± 0.0003
Spinach w/o water		90.93 ± 0.016		0.719 ± 0.016		1.3430 ± 0.0002

Table 4.3 Data of raw vegetables and puree

Vegetables	L	a	b	L	a	b
	Raw			Puree		
Carrot	49.4 ± 1.9	15.89 ± 1.4	21.97 ±4.65	38.92 ± 0.21	11.49 ± 0.33	9.59 ± 0.26
	57.56 ± 1.11	15.9 ± 0.66	26.37 ± 1.33	40.59 ± 0.65	6.45 ±0.16	10.4 ±1.23
	62.21 ± 6.44	6.93 ± 0.69	36.05 ± 7.00	44.08 ± 0.41	3.82 ± 0.33	18.01 ± 0.69
Spinach w/ water	40.09 ± 3.61	-4.66 ± 0.93	7.28 ± 1.19	34.26 ± 0.59	-0.03 ± 0.22	2.14 ± 0.5
Spinach w/o water				34.42 ± 0.32	0.05 ± 0.2	2.32 ± 0.31

Table 4.4 Data of raw vegetables and puree (colour)

4.2.4 Removing impurities of grain corn

I was asked to assist in removing the impurities of dried grain corn that was recently harvested. This removal is done by using two kinds of machines. There was instance where we need to remove small pieces of impurities by hand because the machine cannot cleanly remove everything. After that, all dried corn will be package in four types of packaging and will be store for one month where half of it will be stored in 8°C and ambient temperature. After one month, I needed to get the data of water activity.

Figure 4.8 Removal process

Figure 4.9 Dry samples of dried grain corn

4.3 Problem encountered and approach adopted for solving problem

During my industrial training, there were problems where the data I collected did not match the initial data. This happened during the test sieves shaker where the total weight of each sample is 500g but there are 2 samples who exceeded the initial weight. Unfortunately, there is no solution other than restarting the test all over again. But as I discussed this problem with my supervisor, we deemed there might be an error during the scaling process where the scale did not reset to 0 even after pressing the tare button. This might be because as we dealing with crushed grain corn so there will be small size particle that can be counted as fine powder that stick into the plastic bags so the weight of bags become different. Other than that, there might be some grain corn that got stuck in sieve during the test and get accumulated by time. So, the only solution is to make sure to clean the sieves and scale thoroughly before and after the test.

Next, I experienced problem where the machine I am supposed to use is actually broken. This happened because there is problem with the sensor which caused the reading to be inaccurate. I approached Mr. Fadh regarding this matter on how to know whether the sensor is broken or not. Mr.Fadh come and check the broken machine which is the aw meter by using water that are used to check the meter. The meter needs to get the reading exact on 0.500. If it is any less or more, that means the sensor need to be repair before it can be used. Thus, the task I was given are cancelled as the duration needed to fix the sensor are undetermined.

Last and not least, when I tried to put mashed potato inside a tube for 3D printing where the mashed potato keeps getting spilled out and make a big mess. First, I used a spoon as that is the only available apparatus that can be used to transfer the mashed potato inside the tube. So I suggested to Mr. Fadh if he can make a piping plastic bag by using any size of bag and the sealer so that the transfer of mashed potato to tube become much easier. After that, we used the newly made piping bag plastic and it does make the transfer easier and less mess.

4.4 Professional and ethical issues

A code of professional ethics establishes specific norms that reflect the professional community's shared understanding of what is and is not expected of its members. Individual circumstances may place an engineer in a position where he or she must. When an appropriate course of action is not obvious, the code establishes priorities. For what is regarded as ethical and responsible conduct throughout this training period, issues of professionalism and ethics I had a problem with is communication when dealing with workplace issues. Communication is essential for avoiding any misunderstandings. Communication that is effective can be different things to different people at different times.

Next, establish a professional relationship with co-workers. Good professional connections not only foster collaboration among teammates, but they also help individuals advance in their careers. Developing professional relationships with co-workers or other professionals outside of the workplace will also boost productivity, either directly or indirectly. Professional relationships among teammates will make it easier to discuss ideas and pass information on to junior colleagues. As a result of senior employees' guidance, the corporation may comfortably have an intern work on a difficult project to meet an impending deadline.

Finally, there is accountability. Team members must accept responsibility for decisions made both individually and collectively. This is a leadership trait that anyone aspiring to a managerial position should have. Team members are understandably hesitant to accept responsibility for a specific incident if they want to keep their jobs. They must not let their fear drive them away from the team.

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. MARDI, 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.

An environmental aspect is a part of company's operations, goods or services that always interacts with the environment. To identify environmental factors, considering certain activity, product or service which cause any pollution. Environmental factors that can related is food waste where most of the tasks are mostly related to food. Fortunately, the organization always make sure any food that are used are safe to be eaten and does not contain any chemicals that can be bad for people. Sometimes, the food that are created during the test will be given to anyone who wants to take it home or eaten during free time.

Economic viability, environmental preservation, and social equality are frequently referred to as the three pillars of sustainability. Sustainable organizations strive to balance the triple bottom line of people, planet, and profit in order to ensure long-term success and viability. This means that corporations cannot exist unless they protect their most valuable resource: the safety, health, and well-being of their employees. Sustainability considers not only what is done, but also how it is done. It is an attitude that requires leadership that will not settle for second best in any aspect of operations, defining and achieving goals that go beyond regulatory compliance. Companies value sustainability in the same way that they do before purchasing something.

Chapter 5

CONCLUSIONS

5.1 Conclusions

In conclusion, industrial training had been beneficial for both student and the company. There are many things that student can learn from the task or any project assigned from supervisor to fulfil the requirement of being an internship student. MARDI had been very kind in accepting students in pursuing their study to finish their program. The industrial training at MARDI had given me many new experiences, knowledge and exposure throughout the internship duration. As for myself, I have learned various things that are very fun to learn. The work they given have created opportunities for myself to develop and sharpen my soft skills in many aspects such as communication and management. Besides that, the training has helps me in preparing myself in physical and mental so that I can enter the working environment in the future. This is because all the tasks given to me is to benefit me more when I entered the working or continuing study if I wish to. Overall, MARDI helps me a lot in preparing me for my future endeavours.

5.2 Suggestions and Recommendations

MARDI had treated all trainees very well because of the flexibility to learn freely and decide on any activities to be done. However, it is recommended for the organization to create a modulus for trainees in case of trainees does not have anything to do for long period. This can help the trainees to plan and manage their time better because they have their own duty that must be done to finish their training.

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Individual

- Madam Sharifah Hafiza Mohd Ramli (Industrial Training Supervisor)

Appendix

Figure I: Test Sieve Shaker

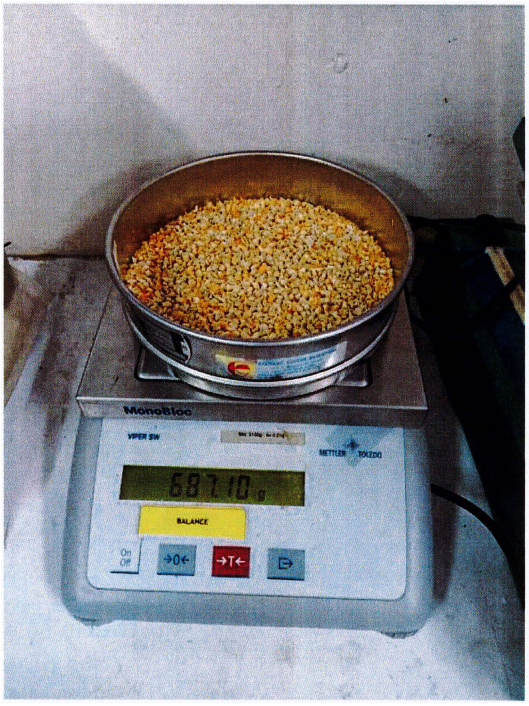

Figure II: Scaling grain corn after test

Figure III: Checking total soluble solid in puree

Figure IV: Printing food with mashed potato

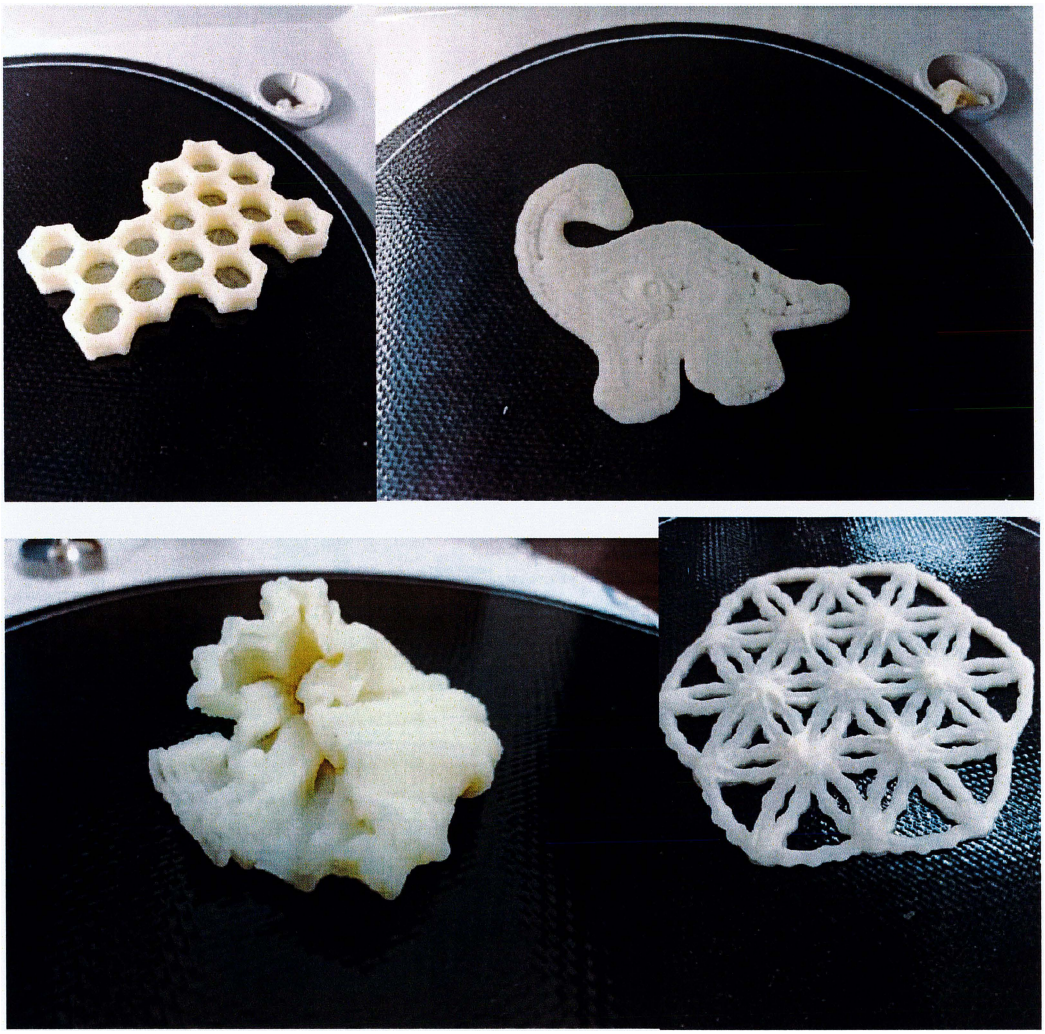

Figure V: Examples of trial food printing

Number of Servings	Salt
2	½ tsp
4	1 tsp
6	1½ tsp
8	1¾ tsp
10	2½ tsp

Butter	Cold Milk	Boiling Water	Potato Flakes
2 tsp	¼ cup	¾ cup	⅔ cup
1 Tbsp	½ cup	1½ cups	1⅓ cups
2 Tbsp	¾ cup	2⅓ cups	2 cups
2½ Tbsp	1 cup	3⅛ cups	2⅔ cups
3 Tbsp	1¼ cups	4 cups	225g

Figure VI: Recipe for mashed potato (3D Food Printing)