UNIVERSITI TEKNOLOGI MARA

INDUSTRIAL TRAINING FINAL REPORT
SESSION: FEBRUARY-AUGUST 2022

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Department During Attachment	: Quality Control
Duration (Date)	: 21 February – 4 August 2022
Lecturer Evaluation	: Sir Azmi

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Acknowledgement

First of all,

This report would not have been feasible without the guidance and assistance of respective individuals who helped to the preparation and completion of this task and bring it in a successful conclusion.

I would like to extend my sincere gratitude to MARA University of Technology Malaysia for providing such an opportunity for students to broaden their understanding of what the real world in the field of chemical engineering looks like and for arranging the internship programme and ensuring its success.

A special thanks to Dr. Tay, the Chief Executive Officer, for letting me do my internship at his company and I would also like to thank Miss Lee Sze Hwui, the Lab Manager for making sure I was able to work throughout my graduate studies, encouragement, counsel, and helping me with my day-to-day tasks while I was there.

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Lastly, I would like to express my deepest appreciation to the members of the department staff as well as my friends who assisted me in successfully completing my internship.

Abstract

This document is a report of the student's industrial work experience for the Industrial Training (CHE354), which was carried out at Elite Advanced Material Sdn Bhd from 21st February 2022 until 4 August 2022. This course is compulsory to all students for the sake of their completion of Diploma in Chemical Engineering at UiTM Pasir Gudang. This report also outlines each activity that has been carried out in every section, special projects, skills that have been applied, and all of the duties that students successfully and effectively execute throughout their five-month internships. In addition, other information on the organisation, such as its history, its facilities, and other relevant details, may be found in this aforementioned report. The obstacles experienced by students regarding the organisational problems, and the recommendations for improvement have all been elucidated in detail. Last but not least, this paper also includes a concise explanation and overview of the content and work that the students had covered throughout the internship training.

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CHAPTER 1:

INTRODUCTION OF INDUSTRIAL TRAINING

1.1 Overview

The academic system division at most universities includes industrial training as an important subject. Aside from that, it was compulsory for all diploma course students at Universiti Teknologi Mara Pasir Gudang to undergo industrial training to complete the diploma and also graduate from the university. Giving students extensive exposure to a genuine industrial setting is the major goal as the abilities they have developed throughout the course of their academic careers will be put to use. Additionally, the experience of working in an industrial environment probably allows students to apply knowledge from all subjects learned to the reality of the workplace and they may expand their skill sets at the organisations to which they are affiliated. With the vision of UiTM, the institution is committed to becoming a centre of excellence in chemical and natural resources engineering, with an emphasis on best industrial practices and applications in order to produce a graduate who is competent in the topic of chemical engineering. The student had no restrictions regarding whether he or she wanted to work for a government agency or for a private company. It is required that students work under the supervision of experienced staff members and Student grades will be based on the report that was prepared by them for this industrial training. An allocated 24-week period starting from 21 February 2022 until 4 august 2022 is allocated for training at the training centre chosen by the student for the Diploma in Chemical Engineering. There will be one lecturer evaluation assigned to each student during the course of the internship period so that the lecturer can assess the student's performance. Last but not least, upon completion of the internship, the logbook and finalised report should be submitted to the college via online and in hardcopy within two weeks of the internship ending

1.2 Objective of Industrial Training

Students are under the impression that the purpose of industrial training is to give them an opportunity to work on specific tasks which have been given by an organisation to gain practical experience. Besides that, students are able to apply what they have learned from the past semester, since this program has more of a theoretical emphasis than a practical one.

i. As a requirement of the diploma program in UITM
ii. Creating a sense of confidence in students after they graduate
iii. Strengthen students' hard and soft skills in a practical, hands-on manner through this internship
iv. Developing skills in the areas of communication and management
v. To encourage students to apply the skills and knowledge gained from the university in a productive way to benefit the organizations in which they work.
vi. Assist students in discovering and pursuing their own career interests, serving as a link between university and the workplace.

1.3 Industrial Training Placement

Address	
No. Tel	
Website	Chemical and disinfectant manufacturer
Business Segment	

Table 1: Industrial Training Placement

1.3.1 Industrial Schedule

Normal working hours	8 hours
Day of working	5 days a week
Business hour	8.30 AM to 6.00 PM
Work in	8.20 AM
Lunch hour	1.00 PM to 2.00 PM
Break hour	Monday-Thursday • 8.30 AM to 8.40 AM (breakfast) • 1.00 PM to 2.00 PM (lunch) • 3.00 PM to 3.15 PM (prayer) • 5.00 PM to 5.15 PM (prayer) Friday • 8.30 AM to 8.40 AM (breakfast) • 1.00 PM to 2.00 PM (lunch) • 3.00 PM to 3.15 PM (lunch)
Work out	6.00 PM

Table 2: Industrial Schedule

1.3.2 Company Supervisor Information

Name	Lee Sze Hwui
Position	Quality Control Lab Manager
Contact Number	
Email address	

Table 3: Company Supervisor Information

CHAPTER 2:
COMPANY PROFILE

2.1 Company Background

Elite Advanced Materials (M) Sdn. Bhd. is Malaysia's first producer of high purity solvents. They market their products to high-value industries such as those in the pharmaceutical, medical device, food and beverage, and diagnostics industries. EAM was founded in 2016. The company exclusively supplies items of the highest possible quality which come from a great contribution of their in-house developed method of purification and quality control system.

EAM has also committed one of its goals to support and assist their customers in establishing a sustainable company by providing specialised distribution methods, unique mixes, participation in the creation of new goods and product development. The drive to provide their customers with items that are of the greatest possible quality is the engine that keeps their business going strong.

company workforce is dedicated to providing their customers with only the initiatives that are the least complicated and most efficient in meeting their requirements. They only expand as a company when the customers do.

2.2 Company History

Dr. Tay Feng Huai won the Entrepreneurial Award at the 2018 Study UK Alumni Awards due to his solid knowledge and skill base, drive to make a difference, and entrepreneurial spirit. He founded Elite Advanced Materials Sdn. Bhd. with his wife and fellow engineering graduate Goo Xin Yi, who served as his co-founder and business partner. The firm is making great strides in the local market as Malaysia's first manufacturer and supplier of premium solvents, resolving a long-standing issue of difficulty in obtaining high-quality solvents.

Feng Huai considers founding his business, Elite Advanced Materials Sdn. Bhd., to be his greatest accomplishment since returning to Malaysia. In addition to being a crucial element in the

processing of chemicals, solvents have a wide range of applications in the production of goods for the electronics, pharmaceutical, personal care, food processing, and diagnostic industries. Despite the wide range of uses, the couple found that, rather than producing solvents, the majority of local chemical enterprises are engaged in the importation, repackaging, trading, and distribution of solvents. Global companies like Merck Millipore, Thermo Fisher Scientific, and Avantor Performance Materials, which together account for more than 75% of the market share, are said to dominate the sector in the area, according to Feng Huai. This indicates that in addition to fluctuating currency exchange rates, the majority of end consumers are paying higher costs because of the expense of logistics and distribution.

Despite Malaysia's abundance of resources, relatively few businesses make use of it. Feng Hui saw a hole in the market and used this chance to solve a persistent issue facing the sector. He started developing a strategy that included buying low-priced, locally made technical grade (low purity) solvents and processing them into high-quality, high-specification goods. His business introduced its items in January 2016 using this method. Additionally, he provides his customers with specialised technical assistance and services with the primary goal of improving their operating operations. His clients now come from a variety of sectors, including Jabatan Kimia Malaysia, the national testing laboratory, TT Electronics, a British optoelectronics firm, Kotra Pharmaceuticals, a Malaysian generic medication supplier, and B. Braun, a manufacturer of medical and pharmaceutical devices. The firm was given the Smart Challenge Fund the next year after being recognised by the Ministry of Science, Technology, and Innovation (MOSTI) as a company dealing in novel technologies, processes, and/or products that would provide long-term solutions and address societal issues.

2.3 Vision and Mission

i. Aim to redefine industry by delivering sustainable products and services through creation and technology

ii. Value in trust and integrity. The company believes in using knowledge and technological advancement to delivery results through working with our customers and suppliers.

iii. Trust and Integrity to build a brand people can rely on

iv. Positive Impact in order to give values to the customers through price, quality and process optimization

v. Constantly Innovating. Research is the core. EAM keep evaluating the process and products to provide what the market really requires

2.4 Organization Chart

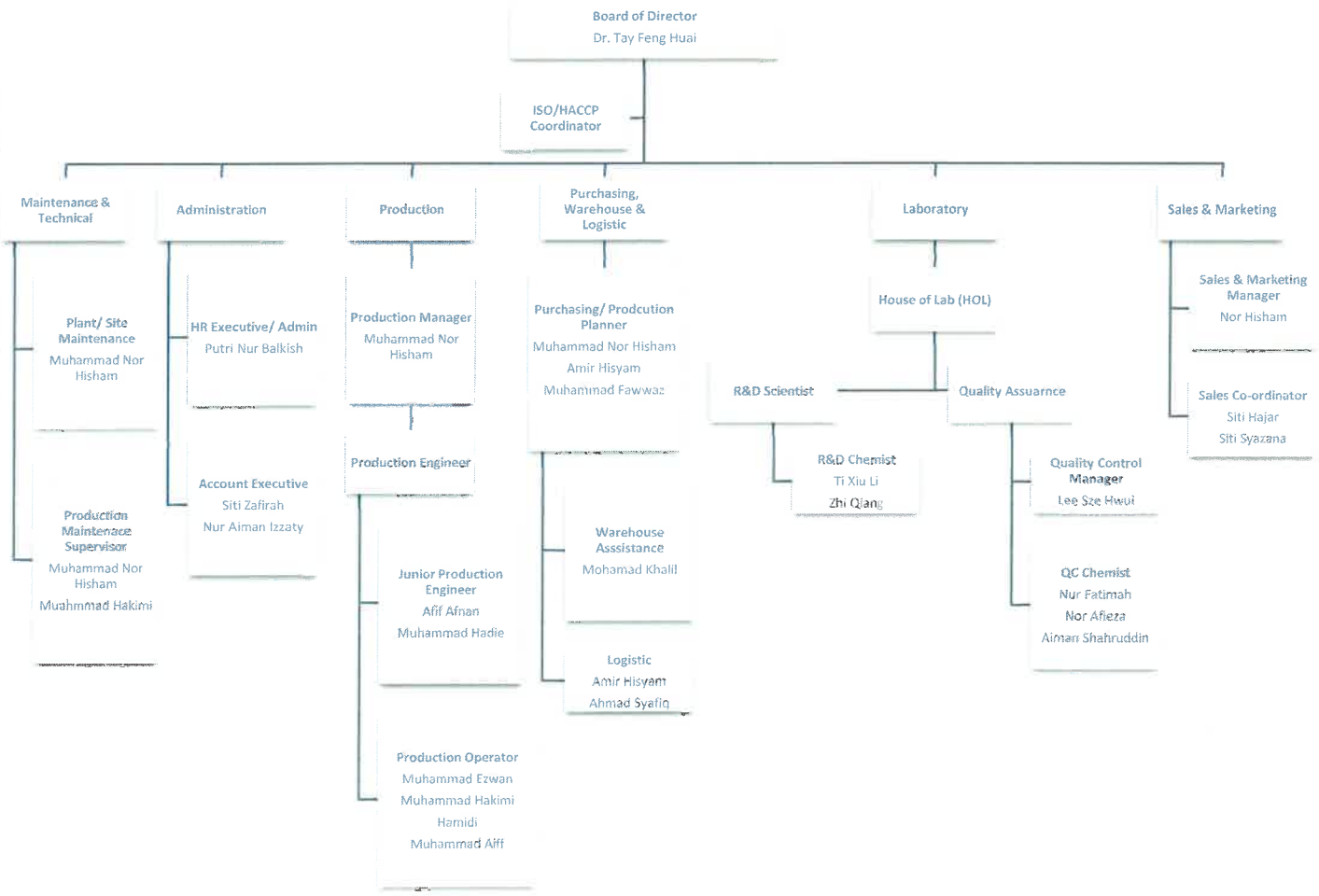


Figure 1: Organization Chart

2.5 Main Product of the company

1. Solvents

EAM provides a wide variety of solvents of high purity, which in many cases can be used with various analytical techniques. EAM is the region's first high-purity solvent manufacturer and has success fully developed solvent lines for critical HPLC and GC applications. EAM also provide consultancy to assist customers in their solvent application.

The listed below are among the solvents produced by EAM:

1. Acetone
2. Acetonitrile
3. Chloroform
4. Dichloromethane
5. Dimethylformamide
6. Ethanol, Absolute
7. Ethanol, Denatured
8. Ethyl Acetate
9. Hexane, Isomers
10. N-Hexane
11. N-Heptane
12. Hydrogen Peroxide, 30%
13. Isopropyl Alcohol
14. Methanol
15. Petroleum Ether
16. Potassium Hydroxide Solution
17. N-propanol
18. Reagent Alcohol
19. Water
20. Xylene
21. Xylene Substitute

Solvents from EAM can be divided into three categories of product grade which are superior, classic and economic. A wide range of product grades, volumes, and packaging materials are available for each quality range. Below is the clarification for each type of the product grade:

i. Superior

Superior solvents are optimised for regulated analysis and the most demanding laboratory applications, including reagents, HPLC, and USP grade solvents. In a broad range of applications, superior solvents provide higher sensitivity, greater accuracy, and greater control during analysis. Pharmaceutical and personal care products are often manufactured with USP grade solvents, which meet the requirements of the United States Pharmacopoeia (USP) monograph.

ii. Classic

Classic solvents include MOS, AR, and AR+ grades of very high purity. They are often used in sophisticated instruments, research and development, and scientific fields that demand high accuracy and quality. Further, Classic solvents can be used to prepare primaries, buffers, and volumetric solutions for laboratory quality control.

iii. Economic

Economic solvents are suitable for laboratory applications and histology methods. Their purity is generally high, but their impurities are unknown. In teaching and educational laboratories, the Economic range solvents are most commonly used. As well as being used for general laboratory work, they can also be used for analytical reagents that are not required.

iv. Other Series

IMPSOLV and Qcura are also available. The IMPSOLV product line consists of ready-made or custom-made blending solutions, while Qcura offers a range of special solvents for medical, healthcare, and pharmaceutical applications. Qcura series solvents are ISO 13485:2016 certified, with additional testing parameters including Bacterial Endotoxins, Total Aerobic Microbial Counts, Total Combined Yeasts & Mold Counts (TYMC).

2. Alcogiene

Alcogiene™ are products that provide the best hand sanitisers and disinfectants which contain of 75% alcohol-based and fragrance- with a WHO-recommended formulation

No.	Product	Categories
1.		Alcogiene Hand Sanitizer ➢ WHO-recommended formulation with a 75 % USP/Medical Grade Isopropyl Alcohol content.
2.		Alcogiene Surface Disinfectant ➢ Containing of 70% IPA ➢ To disinfect surfaces with pathogens living on it.
3.		Alcogiene Food Disinfectant ➢ Clean and disinfect nonporous food contact

Table 4: Alcogiene Products

3. Liveco

LIVECO™ are brand-new eco-friendly home items that promote sustainable living best practises. Constantly, EAM search for safer and more effective home care and personal care products produced from plant-based chemicals.

No.	Product	Categories
1.		Liquid Hand Soap
2.		Liquid Handwashing Dish Soap

3.		Multipurpose Cleaner
4.		Odour Control Solution
5.		Liquid Hand Soap
6.		Water Repellent Coating Solution

7.		Active Surface Decontaminant
8.		Antimicrobial Multipurpose Cleaner
9.		Alkaline Glass Cleaner
10.		Pine Disinfectant

Table 5: Liveco Products

2.6 Service Provided to the Client

i. Customized Blend

The majority of businesses need in-house chemists and manufacturing workers to prepare the formulation. This uses up extra corporate resources that may be better used to boost production. Inadequate handling may lead to cross-contamination and improper formulation mix.

By creating highly customised mixes of high purity solvents and reagents, EAM, a manufacturer of high purity solvents, is able to better service our customers. The highly customised mixes from IMPSOLV are made to precise requirements and then examined in QC lab, which is ISO17025 certified. The production and laboratory team will gain from minimising loss due to formulation mistakes, cost and time savings, enhancing uniformity and quality by doing away with the need to manually create the blends.

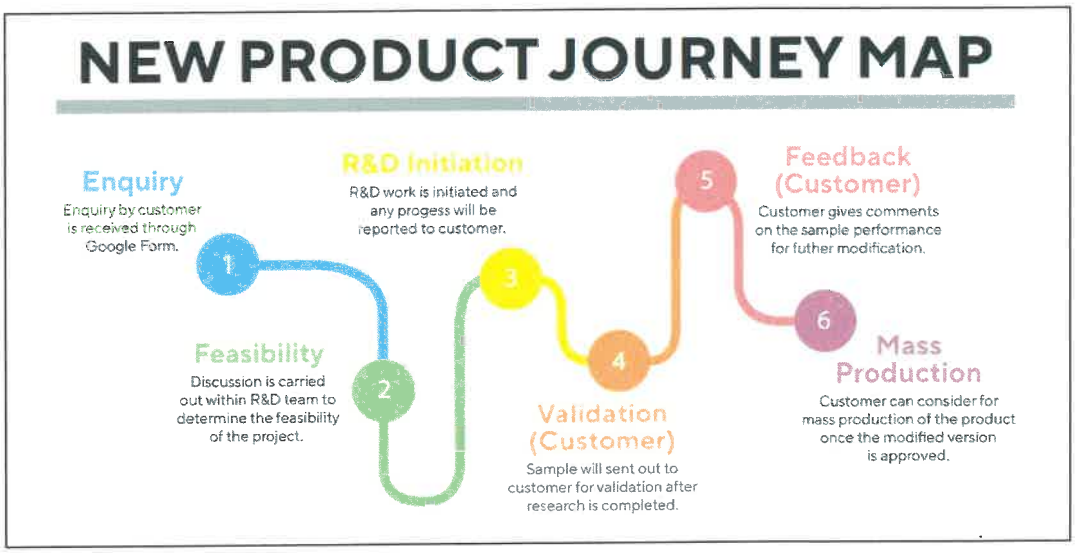


Figure 2: Product Journey of EAM

ii. **IMPSOLV**

With EAM IMPSOLV blend, the tedious tasks of mixing and cleaning equipment manually are no longer necessary. The chemists and technicians may refocus their efforts on higher-value jobs. In addition, they no longer have to worry about blend preparation paperwork, since all EAM-customized blends are given with a Certificate of Analysis proving their quality and traceability.

Besides, customized blend preparation includes many procedures and a controlled environment to prevent cross contamination and human mistake. Any errors might lead to the whole batch being rejected. Such mixes often come with a hefty price tag for disposal. Along with eliminating the laborious manual blending procedure, IMPSOLV also eliminates the safety risks that come with manually mixing, storing, and disposing of chemicals. Last but not least, the production of EAM IMPSOLV blends takes place in a highly regulated setting, reducing exposure and cross contamination. Additionally, these manufacturing procedures prevent batch to batch variance, guaranteeing uniformity from lot to lot.

iii. **OEM and Contract Manufacturing Services**

Elite Advanced Materials SDN BHD is a Good Manufacturing Practice (GMP) factory specialises in cleaning, disinfection, and chemical processing. The company also provide OEM and contract manufacturing services for additional cleaning, personal care, and household cleaning. The OEM/ODM will assist clients with product formulation, choosing a manufacturing route, defining QC parameters and methods, choosing required and packaging requirements, product registration, and obtaining certifications from relevant authorities

The OEM and contract manufacturing services are listed as below:

i. Blending and manufacturing according to client's specifications
ii. Formulation optimisation
iii. Quality assurance from ISO17025 certified laboratory
iv. Sourcing and supply of raw materials
v. Lead time agreement
vi. Packing and labelling
vii. Contract storage

CHAPTER 3:
OVERVIEW OF THE TRAINING

3.1 Introduction

During 24 weeks of training, an internship in quality control was offered by Elite Advanced Materials. Tasks included operating the instrument for sample testing, inspecting the finished product, generating COA for the customer, executing the lab scale mixing for certain products and tally the documents and records from the previous year. As the name implies, quality control refers to ensuring that a manufactured product or service meets the requirements of the client or customer or meets a defined set of quality criteria.

As a QC department, it was a crucial to first determine which standards the product or service must comply with in order to be effective. It is then necessary to determine the extent of the quality control measures (for instance, the percentage of units to be tested from each lot). After gathering actual data (the percentage of units that fail), management personnel must be informed of the results. Afterwards, the corrective action must be determined upon and implemented, such as rejecting or repairing faulty equipment and repeating poor service for free until the client is satisfied. In order to improve the production or service process, a plan must be devised and then put into action if too many units fail or poor service occurs. Finally, QC processes must be ongoing to ensure that the corrective actions have produced satisfactory results, as well as to detect recurrences of trouble and to prevent new incident.

3.2 Summary of the Training and Experience Good

Task 1: Chemical testing of incoming samples and products

The purpose of chemical testing is to determine what a certain material or product is made of. To ensure that their products meet regulatory safety requirements, manufacturers and suppliers use a variety of chemical testing methods. A chemical testing lab determines how well a product performs the function it was designed for, and how long it will last under normal conditions. As part of chemical testing, materials are identified in order to identify their composition, and to determine if they contain any contaminants that should not be present. In order to accomplish this, a chemical testing laboratory is required. Methods and standards for chemical testing vary depending on the type of product. As for EAM chemical testing, samples were passed through the water content, Ultra-violet, Fourier-transform infrared spectroscopy (FTIR), gas chromatograph (GC), non-volatile matter and density test. Further details and procedure on chemical testing were described in chapter 4

Task 2: Certificate of analysis (COA) generating

A Certificate of Analysis (COA) verifies that the product manufactured by a manufacturer meets the specifications of the customer. In order for the customer to feel satisfied with the product they are receiving, they need to be sure that it conforms to their specified parameters and targets. A COA prevents companies from having to deal with costly returns, replacements, or customer complaints. In a world in which countless items are produced, it is often difficult for companies to track materials from the start of the production process all the way to the end of the process. In order to provide quality materials for finished products, companies are relying on their suppliers more and more.

Task 3: Product inspection according to the Acceptable Quality Level (AQL)

As defined in ISO 2859-1, an acceptable quality level (AQL) is the "quality level that is the worst tolerated." The AQL indicates the number of defective components that can be tolerated during random sampling quality inspections. An indicator of defects is usually expressed as a percentage or ratio of the total number of defects. A product is said to meet the acceptable quality level (AQL) if the number of defective items in a sample is below a predetermined amount.

Manufacturers will assess the various parameters in the production process to determine the areas where defects are occurring if the acceptable quality level (AQL) is not reached.

Task 4: Tallied the previous year documentation

In simple terms, a tally is a record of amounts or numbers which are continually changed and added to as the activity that affects them progresses and the activities change. In accordance with the fact that the EAM company produces a wide range of solvents, disinfectants, and cleaning products, all of these products were subjected to a chemical testing process in the laboratory, where they were documented and their details were recorded and recorded. Considering this, a tally must be conducted prior to the upcoming audit in order to verify that the records are still on track and to ensure that they remain accurate. As a QC, the document that has been assigned is to update the record of the previous year for the solvents and good manufacturing products (GMP). In order to complete any missing record or element that is going to be audited, it was mandatory to mean the total quantity of the products.

Task 5: Raw material sample collection

Raw Material sampling is the process of extracting a representative portion or group of units from a greater quantity of raw materials or collections of units. The purpose of Standard Operating Procedure for raw material sampling is to provide a uniform approach for routine sampling and testing of all raw materials (solids and liquids) used in manufacturing plants. Other than that, it is also to describe the procedure for the sampling of raw materials in order to meet the specifications and get the representative sample of the whole lot for analysis. Besides, raw material sampling is also important for the purpose of retaining samples. Keeping the retention samples may support or verify the product's quality, microbiological, physical, and chemical attributes over its lifespan. It is also possible to use retention samples as part of an investigation into a complaint.

Task 6: Indirect duties in laboratory

In addition to the regular or direct duties that are done on a daily basis, there is also an important task which has to be accomplished during the journey of internship, that is, the indirect duties that have to be performed in the laboratory for the purpose of simplifying and easing the side

chores. Among the duties are filing the finished product and raw material report, printing, organising the compartment and rack for sample retention, check listing the glassware and cleansing the vials that were used for GC testing.

Task 7: Executed the mixing for lab scale formulation.

It is a common practice to mix materials in a laboratory due to the fact that mixing is a basic procedure in a lab. The process of mixing means converting heterogeneous substances into one, homogeneous substance whose composition is uniform despite some differences in their physical characteristics. In accordance with the supervisor's instructions, two lab scale mixings were performed, one for gum rosin and one for glue sticks. A feasibility study using small, laboratory-scale equipment is usually necessary before large, industrial-scale novel technologies can be developed. It must be implemented in a science-based manner, with the product benefits first demonstrated in a laboratory environment and the associated risks used to identify enhanced quality in large-scale industrial processes. In cases where evidence strengthens the belief that a process can improve quality and product, it is scaled up for evaluation in small numbers and industrial-scale equipment is developed. Problems encountered at each stage must be evaluated and resolved before larger-scale operations can begin.

3.3 Monthly Activity (Summary of each month)

	Activity
Month 1 (Week 1-4)	1. Introduced by the HR to all the staff members 2. Visited the area around the factory (lab, production site, office, GMP) 3. Got to know all the laboratory instrument to test the moisture content, density, ultraviolet (UV), purity assay, FTIR and non-volatile matter 4. Familiarised with the solvent grade and specification such as HPLC, AR, AR+, USP, Histology etc 5. learned how to write down the incoming samples into record 6. Visited the Good Manufacturing Products (GMP) site with Lab manager 7. Learned how to run the laboratory equipment for FTIR, moisture content, density and UV 8. Read the SOP of the standard operating procedures 9. Familiarised with all the products manufactured by the company such as solvents, disinfectants and cleaning products 10. Introduced to the Acceptance Quality Limit (AQL) on Good Manufacturing Products (GMP) products and key in the record on excel. 11. Learned how to check and print out the Certificate of Analysis (COA) of the product ordered by customers based on the in-coming sales orders given by the warehouse site. 12. Familiarised with all the necessary folders and files for quality department use. 13. Learned how to check the sticker label of the solvent products before being pasted on their packaging

	14. Learned how to do the baseline for UV instruments before it can be used to run test on in-coming samples 15. Generated the COA report for the finished product 16. Executed the mixing for lab trial glue stick before final formulation is sent to the production site. 17. Learned how to do the tally for solvent record of 2021 (starting month: June) 18. Learned how to operate the instruments for Gas Chromatography (GC) injection and how to observe the result

	Activity
Month 2 (Week 5-8)	1. Executed the moisture content test on solvents such as IETOH (15)006, HEP010, MEOH011, PET (40)008, AETOH018, IPA017, AETOH011, IETOH (0.5)111, MEOH011, ETOH006, EKOH (0.5)111 2. Tested the solvents' density, UV and GC (solvents tested are similar like the previously mentioned) 3. Run the FTIR test on: ➢ Solvents such as such as H2O2(30)011 ➢ GMP products such as PAWA70, Alcogiene ➢ External testing such as Lemongrass, Ethanol 80% H2O2 3% 4. Collected the in-coming raw material sample for QC use to test and as sample retention (raw material: Isopropyl Alcohol, 26 IBC) 5. Made the summary report for Isopropyl Alcohol raw material in order to know which IBC are in desired specification so that it can be used by the production team to run the solvent 6. Tally the solvent record of 2021 (record month: September until December) 7. Collected the raw material of Sodium Laureth Ether Sulphate 70% (SLES), Cocamidopropyl Betaine (CAPB), Diethylene Glycol (DEG) and Absolute Ethanol 8. Tested the SLES, CAPB and DEG raw material with FTIR and UV in order to observe whether the specification results stated by the COA through the COA are accurate or not. 9. Worked on the raw material report after they have done been tested 10. Learned on how to mix the formulation of Decon 90 (D90) which was led by lab manager ➢ Decon90 is the most widely used surface active cleaner and/or radioactive decontaminant for laboratory, medical, and specialised

	industrial applications. It may be used for both "manual" cleaning and ultrasonic cleaning. 11. Site visit on the Gum Rosin production at level 1 to collect the gum rosin origin from Vietnam and also had the chance to witness on how it was mixed and produced from raw material until finish product 12. Executed the lab trial for Gum Rosin that was conducted by lab manager 13. Executed AQL on solvents and GMP Products 14. Recorded the Temperature and Environmental Control Acceptance Tolerance Humidity in the laboratory ➢ Temperature range: 23°C - 25°C ➢ Humidity: 50% - 60% 15. Recorded the daily routine for IQC Checklist Non-Volatile Matter ➢ Oven temperature range: 105 ± 5°C ➢ Only dark blue desiccant is accepted and light purple colour is not allowed ➢ Weighing scale range: 1.0000g ± 0.0005g 16. Observed the changes on Gum Rosin from production site and lab trial whether they were stable or separated 17. Did the filing on finished product and raw material report based on their categories

	Activity
Month 3 (Week 9-12)	1. Executed the moisture content test on solvents such as MEOH010, IPA017, IPA010, H2O2(30)011, AETOH011, HEX010, HEX012 and XYL010 2. Created the UV baseline on UV instrument 3. Executed the density, UV and GC test on solvents 4. Did the filing on finished product and raw material report based on their categories 5. Tally the solvent record of 2021 (record month: May, June and December) and 2022 (record month: January) 6. Executed AQL on solvents and GMP Products. All the data and amount that has been inspected were recorded in excel 7. Tested FTIR for EKOH (0.5)111 and GMP product which is Alcogiene 8. Printed the COA of solvents and GMP products to be sent to the customers 9. Checked and AQL the sticker label for GMP product from supplier in order to verify the amount of sticker received were equivalent to the order that has been placed. The sticker label received including ➢ Liveco Labrie A40 ➢ Maxi Quartz M10 ➢ Maxi Surface M06 10. Learned how to clean and wash the vial for the use of GC sample 11. Modified the DIY storage box to store the Gum Rosin sample retention based on their date of production and lot number. 12. Checked on the sticker label for H2O2(30)011. 13. Worked on the summary report for Gum Rosin

	Activity
Month 4 (Week 13-16)	1. Project brief by Dr.Tay, The Head Of Lab 2. Measured the Plastic Resin and household plastic for IDIR project 3. Executed the scheduled waste for contaminated and uncontaminated packaging, used gloves and chemical waste. 4. Check listed on laboratory glassware and updated the record in excel 5. Organised, arranged and labelled the rack for solvents sample retention 6. Executed the lab trial for glue stick using a new batch of raw material and scaled up formulation. Result and changes occurred were observed thoroughly 7. Created the UV baseline for UV instrument 8. Executed the moisture content test on solvents such as DCM010, ETOH011, IPA110, IPA302, IPA011, PET (60)012, PET (40)012, EKOH (40)011, WTR203, WTR010, AETOH018, MEOH011, ACE011, ACN011 and HEP010. 9. Executed the density, UV and GC test on solvents 10. Executed AQL on solvents and GMP Products 11. Collected the raw material of Ethanol, Methanol and Isomer Hexane 12. Checked on the sticker label for Alcogiene, 13. Printed the COA of solvents and GMP products to be sent to the customers 14. Did the filing on finished product and raw material report based on their categories 15. Tally the solvent record of 2021 (record month: July)

	Activity
Month 5 (Week 17-20)	1. Scanned the glue stick using the Near Infrared Spectrometer (NIR) to observe its spectrum. 2. Checked on sample retention for GMP products of 2021 and 2022. Updated the record in excel 3. Attended the Fire and Emergency Training conducted by Najmi, Manager of Elite Stationary. 4. Executed the housekeeping in laboratory 5. Measured the Plastic Resin and household plastic for IDIR project 6. Executed the lab trial for Gum Rosin before the finalised formulation can be used by the production team. 7. Tested the GMP product of hand sanitizer and external product testing using FTIR to observe their spectrum and ingredient percentage so that they were in specification 8. Worked on the summary report for Gum Rosin 9. Sit for audit examination for UV instrument given by Lab Manager 10. Executed the moisture content test on solvents such as ACE011, MEOH010, IPA110, IPA010, DCM010, TOL010 11. Executed the density, UV and GC test on solvents 12. Created the UV baseline on UV instrument 13. Executed AQL on solvents and GMP Products 14. Tally the GMP record of 2021 (record month: September - December) 15. Checked on the sticker label for Methanol and IETOH (15)006, 16. Printed the COA of solvents and GMP products to be sent to the customers

	Activity
Month 6 (Week 21-24)	1. Discussed with Dr.Tay regarding the findings on the blak soldier flies that were measured with FTIR. The name of the samples was as follows: ➢ Decanter cake ➢ Decanter cake frass ➢ Palm kernel expeller frass 2. Inspected on the gum rosin at the production site to observe the blue pigment after mixing in each IBC. several things that needed to look for are: ➢ The colour intensity ➢ The solubility and dissolvement of the solution 3. Worked on the summary report for gum rosin 4. Continued the second trials of lab scale mixing task for the economic white glue 5. Attended the Good Manufacturing Product (GMP) Hazard Analysis and Critical Control Points (HACCP) training, conducted by Frank, the distributor of EAM company. 6. The sticker label was checked for solvents (methanol and ethanol) before it was pasted onto the container. 7. Collected the sampling of raw material for ➢ Diethylene glycol ➢ Sodium laureth sulphate ➢ Isopropyl alcohol ➢ Denatured absolute ethanol ➢ Sodium hydroxide ➢ Methanol ➢ Vietnam Gum Rosin ➢ Ethyl Alcohol

	8. FTIR test on the raw material 9. Executed AQL on solvents and GMP Products 10. Created the baseline for UV instrument 11. Printed the COA of solvents and GMP products to be sent to the customer 12. Executed the moisture content test, density, UV and GC test of in-coming sample of solvents. 13. Tallied the solvent record of 2022 (month: January-March) 14. Performed the schedule waste for the general and hydrocarbon waste, used gloves and broken glasses

CHAPTER 4:
DETAILS OF EXPERIENCES

4.1 Introduction

During the 24 weeks of training, Elite Advanced Materials offered an internship in quality control as part of the training program. As part of the duties, I was responsible for operating the instruments for sample testing, inspecting the finished product, generating the COA for the clients, collecting raw material samples, mixing the formulations for lab scale production, setting up the lab for storage and organizing the samples for retention testing, and a few indirect duties such as filing the report and cleaning the GC vials.

In the case of chemical testing of samples such as cleaners and disinfectant products, the lab manager and other quality control workers were in charge of teaching the introductory and procedure for the chemical tests. It was quite a challenge for someone who is not used to handling lab equipment for testing chemical samples to absorb all the i formation at once, due to the lack of experience in handling these types of machines. The testing chores were successfully executed and indescribable gratefulness to be given such helpful colleagues as I would not have been able to accomplish the task without their help. Additionally, the mini-project of gum rosin, which was assigned just the way that the previous intern had already done, was a continuous project as the observation of the product outcome depended on the quality of the raw materials that the gum rosin was made from which sometimes were not sufficiently stable.

As a quality control member, it is incumbent on it to be able to record in a record book the parameters of all the samples being received for testing. In this way, all the results of the testing can be traced back and reported correctly in order to make sure their validity. Besides, it is also important for it to know how to prepare a report of the finished product and raw materials, since this will be of great assistance when it comes to preparing the certificate of analysis (COA).

Last but not least, the subtopic of 4.2 will provide further clarification on the procedure, methods and details of all the tasks mentioned in the previous paragraph and will be referred to in the next subsection.

4.2 Details of the training and experience gained

4.2.1 Chemical testing of incoming samples and products

A. Water Content Test

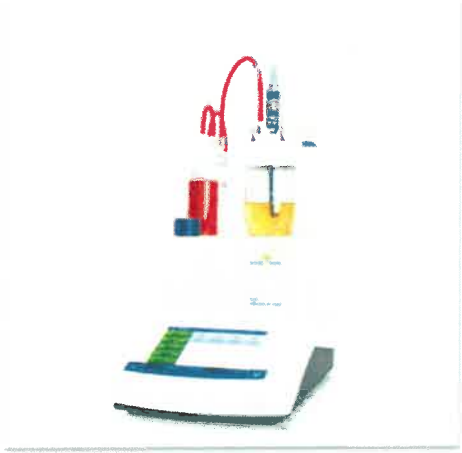


Figure 3: Karl Fischer Titration

1.	Objective	To determine the water content of the sample by Karl Fischer Titration
2.	Method Summary	This method is based on coulometric Karl Fischer titration in which iodine is produced electrochemically in the titration vessel by anodic oxidation of iodide when water is added to the sample. The amount of electric charge consumed for this transformation is used to calculate iodine consumption and water content. The endpoint is detected using voltammetry. In most cases, this method works well for samples with a water content of up to 0.5%
3.	Karl Fisher Procedure	1. The KF titrator was switched on and wait until stable reading was obtained 2. "Pre-Titr" button was clicked 3. The sample's name and density were inserted before injecting the sample 4. The syringe was rinsed twice using the same solvent used for sample 5. The syringe was tarred with an appropriate amount of sample 6. The sample was injected into the reaction vessel and the "start" button was pressed. 7. The syringe was reweighed 8. The "Sample" button was pressed, and the sample weight was entered 9. Titrator results for water content were in percentages (%) 10. Step 2 until 7 were repeated for another two-repeat measurement

B. Ultraviolet (UV) Test

Figure 4: UV-Vis Spectrophotometer

1.	Objective	To determine the absorbance for specific wavelengths of the sample using UV-Vis spectrophotometer
2.	Method Summary	Using a quartz cuvette, this lab method describes measuring UV absorbance in solvents analytically using 1 cm cuvettes. Pure solvent can be determined by its absorbance between 190 and 400 nm, which is one indicator of its purity.
3.	Procedure	**Baseline:** 1. The UV-Vis Spectrophotometer was switched and waited for 30 minutes. 2. The baseline measurement using HPLC or LCMS grade water was executed 3. The general and reference cuvette were filled with water and their outer surface of cuvette were wiped cleanly to ensure there were no dirt, dust and contaminant present 4. Both cuvettes were put into the instrument. The lid was properly and tightly close to ensure any unwanted lights from the outside penetrated the instrument and process. 5. The "Zero" and "Baseline" on instrument software was clicked 6. The wavelength started from 190 until 400 was inserted to observe the absorbance to be in spec 7. Step 3 until 6 was repeated until the baseline flatness was ensured to be $\leq \pm 0.002$

		Test on sample: 1. According to the sample, the correct type of cuvette was chosen either the general and hydrocarbon cuvette 2. The cuvette was rinsed 3 times and the sample was filled into 1 cm cuvette 3. By using the delicate task wipers, the cuvette was wiped to ensure the surface wall of the cuvette was cleaned 4. The sample cuvette was placed in a compartment of the instrument 5. The "Autozero" was clicked and the sample over the wavelength range of 400 to 190 nm was scanned 6. The "start" was clicked, and the sample were named according to its category 7. The desired wavelength was inserted on software and the absorbance result was observed whether it was in specification or not. 8. Step 2 until step 7 was repeated in order to get another two-repeat measurement.

C. Gas Chromatograph (GC) Test

Figure 5: Gas Chromatography Flame Ionisation Detector (FID)

1.	Objective	To determine the purity of sample by Gas Chromatography Flame Ionisation Detector (FID)
2.	Method Summary	Using the In-House Method, the purity and amount of trace impurities are separated and detected using gas chromatography with an FID detector.
3.	Procedure	1. By using same solvent that used for QC testing, the GC vial was rinsed twice 2. The sample was filled inside the vial 3. The sample was named and labelled 4. The vial was put into the designated section on instrument. 5. The GC-FID was run 6. The sample was injected into the chromatography, the data and peak responses were recorded 7. The purity result was observed after the injection has finished 8. The injection was repeated at least 3 times or as required.

D. Fourier-transform infrared spectroscopy (FTIR) Test

Figure 6: FTIR-ATR Spectroscopy

1.	Objective	To analyse the alcohol concentration by using FTIR-ATR spectroscopy in an alcohol-water mixture
2.	Method Summary	The test method describes the analytical measurement of FTIR spectral ranges from 4000 to 650 cm-1. It includes techniques which are useful for the quantitative and qualitative analysis of liquid samples by infrared spectrometric methods although their amount is not a limiting factor.
3.	Procedure	1. OPUS software was opened 2. The ATR crystal was cleaned using alcohol (usually Isopropyl alcohol) 3. The parameter below was ensured ➢ Resolution: 4 cm^{-1} ➢ Sensitivity: 2 ➢ Number of scans: 16 ➢ Spectra Range: 4000 – 650 cm^{-1} 4. The background measurement was executed, and no peak presence was ensured 5. The sample was named and saved in its correct folder 6. The sample was deposited on an ATR crystal 7. The "start measurement" was clicked and FTIR measurement was carried out.

		8. The same sample was deposited on ATR crystal for at least 3 times to obtain repeated measurement and result. 9. The "Evaluate" was clicked and "integration" option was chosen 10. The spectral result was integrated according to the respective sample's integration method 11. The integration results obtained were inserted in calibration excel 12. The sample on the ATR crystal was removed immediately and cleaned with Isopropyl Alcohol

E. Density Test

Figure 7: Density Meter

1.	Objective	To determine the density, purity of sample by Density Meter Anton Paar
2.	Method Summary	Using the In-House Method, a 4-digits density measuring accuracy was obtained to the determine the most accurate of a sample.
3.	Procedure	1. By using same solvent that used for density testing, the syringe was rinsed twice. 2. Instrument must be cleaned before running the testing. Cap was opened to rinse the and dry the measuring cell 3. the "cleaning" option was clicked and wait for few seconds. The air tube was capped back. 4. On the instrument, name for the sample was inserted 5. Sample was filled in the syringe and injected slowly to the instrument 6. When injecting, no air bubbles was ensured in order for the instrument to measure it correctly and to obtain the accuracy of the density result. 7. "Measure" on the instrument was pressed and wait until the measurement finish 8. The syringe was taken out from the injection tube 9. The instrument was once again cleaned by opening the cap at the air tube 10. The density results were recorded.

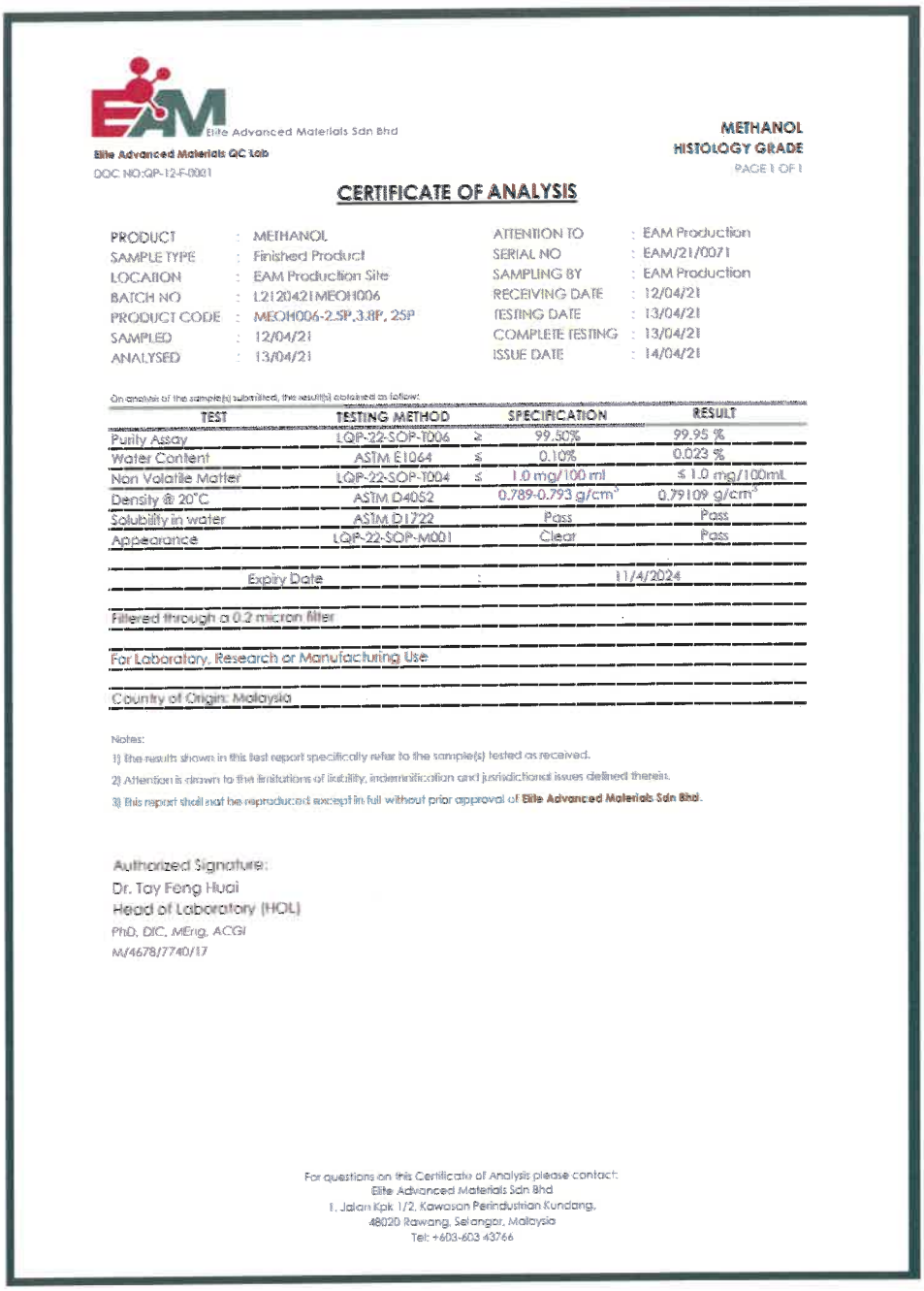
4.3.2 Certificate of analysis (COA) generating

A Certificate of Analysis (COA) describes the results of a scientific test performed on a product. A COA also lists all chemicals used in the manufacture and testing of the product in addition to making sure all of the important regulations are met and that the product adheres to the rules and regulations.

As each industry has its own testing methods and quality standards, COAs can be created in many ways. Chemical solvents produced in EAM, however, require the following elements be present in every COA:

i. Manufacturer's name
ii. Product name
iii. Batch number. As most products that are manufactured and require a COA are usually test-runs in batches, batch numbers provide information about the products
iv. Product specification result tested.
v. Grade
vi. Date of release
vii. Expiry date,
viii. testing date
ix. Detailed information about each test, including its acceptance limits and numerical results
x. Authorised signature

Likewise, it was emphasised that each COA should also be dated and signed by the authorised personnel from the manufacturer's or supplier's quality department personally before the COA is released. In order to generate a COA, all tests on products must be conducted and reports must be created first based upon the results that have been obtained. After that, it must be checked first by the lab manager to examine whether there are mistakes and errors that occur to ensure the accuracy and done as it should. Upon receipt of the sale order from the warehouse team, the COA can be printed only by QC personnel. Picture below shows an example of COA generated by EAM for solvent.



Elite Advanced Materials Sdn Bhd

Elite Advanced Materials QC Lab

DOC NO:QP-12-F-0001

METHANOL
HISTOLOGY GRADE

PAGE 1 OF 1

CERTIFICATE OF ANALYSIS

PRODUCT	: METHANOL	ATTENTION TO	: EAM Production
SAMPLE TYPE	: Finished Product	SERIAL NO	: EAM/21/0071
LOCATION	: EAM Production Site	SAMPLING BY	: EAM Production
BATCH NO	: L2120421MEOH006	RECEIVING DATE	: 12/04/21
PRODUCT CODE	: MEOH006-2.5P,3.8P, 25P	TESTING DATE	: 13/04/21
SAMPLED	: 12/04/21	COMPLETE TESTING	: 13/04/21
ANALYSED	: 13/04/21	ISSUE DATE	: 14/04/21

On analysis of the sample(s) submitted, the result(s) obtained as follow:

TEST	TESTING METHOD		SPECIFICATION	RESULT
Purity Assay	LQP-22-SOP-T006	≥	99.50%	99.95 %
Water Content	ASTM E1064	≤	0.10%	0.023 %
Non Volatile Matter	LQP-22-SOP-T004	≤	1.0 mg/100 ml	≤ 1.0 mg/100mL
Density @ 20°C	ASTM D4052		0.789-0.793 g/cm^3	0.79109 g/cm^3
Solubility in water	ASTM D1722		Pass	Pass
Appearance	LQP-22-SOP-M001		Clear	Pass
Expiry Date		:		11/4/2024
Filtered through a 0.2 micron filter				
For Laboratory, Research or Manufacturing Use				
Country of Origin: Malaysia				

Notes:

1) The results shown in this test report specifically refer to the sample(s) tested as received.

2) Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein.

3) This report shall not be reproduced except in full without prior approval of **Elite Advanced Materials Sdn Bhd.**

Authorized Signature:
Dr. Tay Feng Huai
Head of Laboratory (HOL)
PhD, DIC, MEng, ACGI
M/4678/7740/17

For questions on this Certificate of Analysis please contact:
Elite Advanced Materials Sdn Bhd
1, Jalan Kpk 1/2, Kawasan Perindustrian Kundang,
48020 Rawang, Selangor, Malaysia
Tel: +603-603 43766

Figure 8: Certificate of Analysis (COA) by EAM

4.3.3 Product inspection according to the Acceptable Quality Level (AQL)

It is widely accepted that AQL is an effective method of determining random samples during product inspection, taking into consideration the risks customers and suppliers may face. In accordance with AQL sampling guidelines, it provides a quantitative reference for buyers and suppliers regarding how many defective products are accepted under a single inspection.

The defect is a key concept to understand before discussing AQL. The economic benefits to customers are directly affected by products with different levels of defect in mass production.
An inspection, usually conducted as a final random check, provides information about the quality of the batch of products to be received by the buyer. Using the inspection results, buyers will be able to identify possible defects with a batch of products, and thus make a decision regarding their arrangement.

There are different interpretations of defects, which can be further classified into critical defects, major defects, and minor defects.
Generally, three types of defects can be categorised as follows:

- Critical defects. Incompatibilities with mandatory regulations or safety issues that affect consumers/end users.
- Major defects. A defect that causes product failure and greatly reduces the product's usability or saleability.
- Minor defects. Product defect that indicates deviation from quality standard, but does not negatively impact usability or saleability.

The following are the inspection checklist to examine that can be classified as follows:

a. Leaking on the packaging

- The packaging (pail, bottle, amber glass, container, etc.) should be inspected carefully to ensure that there are no leaks found

Figure 9: leaks on the container

b. The bottle caps

- It is important to check that the liner of the caps does not appear to be loose or partially dangling out, and make sure that the cap dimensions are correct.

Figure 10: caps for the chemical container

c. Label on the packaging and cartons

- Labels should match on packaging and cartons, and no ink stamping should be visible. Also, be sure to double-check information such as batch number and size of the packaging.

Figure 11: label on amber glass and cartons

d. Level of the product filled

- Ensure that the amount of product in the packaging exceeds the minimum level that has already been set

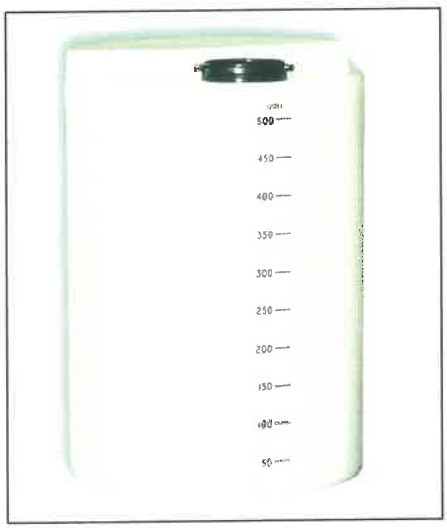


Figure 12: level indicator on the container

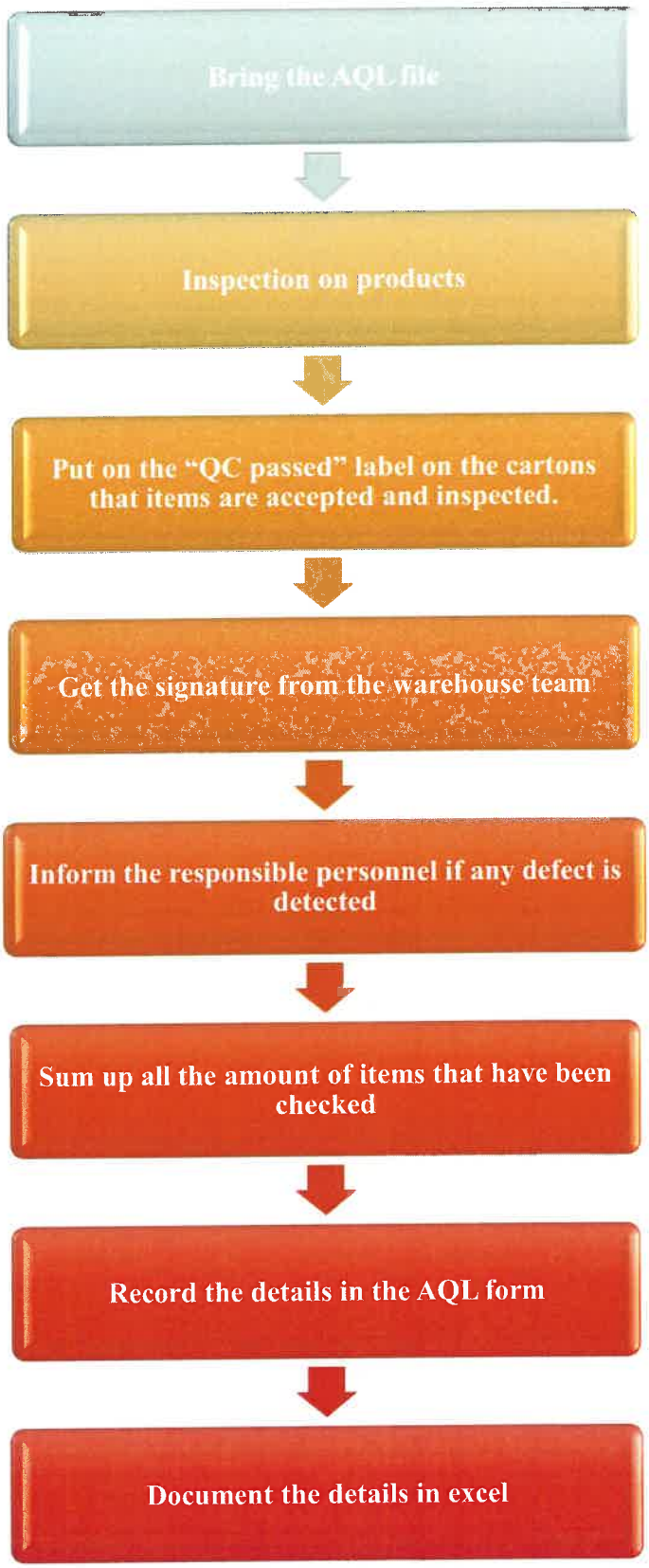


Figure 13: Process of AQL

Figure 14: AQL file and form after production inspection is made

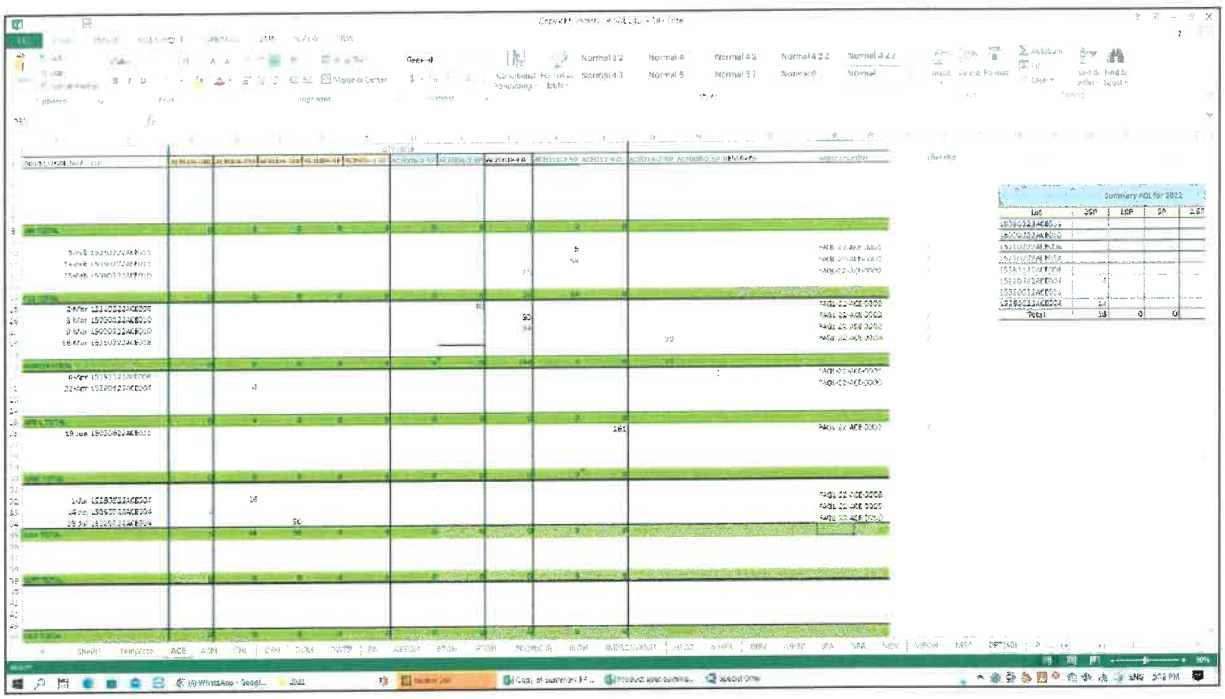


Figure 15: Summary of finished product AQL in excel

4.3.4 Tallying the previous year documentation for audit

Auditing is the best method for ensuring that a company's quality system is adequate and improving its efficiency and effectiveness throughout its operations. It is possible to reduce or eliminate errors caused by internal problems with systems or processes through effective audits. It is, however, necessary to overcome some obstacles first. A quality control auditor typically works in manufacturing or warehouse operations where his or her responsibilities include conducting research and analysis to develop quality control test structures, monitoring the performance of the workforce, reviewing documentation and specifications, maintaining records and carrying out risk assessments

During an audit, there are four phases: preparation or planning, execution, reporting, and closure. Since the supervisor assigned the task of tracing and tallying the documents and records of the previous and current year, it falls under the first segment for audit, preparation and planning. This phase determines whether audits succeed or fail by how well they perform during this stage. This phase involves deciding what to audit, when to audit, and whether to use a process-, system-, or management-directed audit. Company audit objectives, scopes, and durations are determined, audit teams are appointed, and checklists are compiled

Essentially, the task consists of verifying that the recorded and documented system for specification, sampling, testing, and product release is organised, maintained, and executed as described. The document which was given to be tallied is the record of Good Manufacturing Product (GMP) in the years of 2021 (from September until December) and 2022 (from January until June), both years of which are included in the tally.

Following are the steps that show how the tally task was carried out:

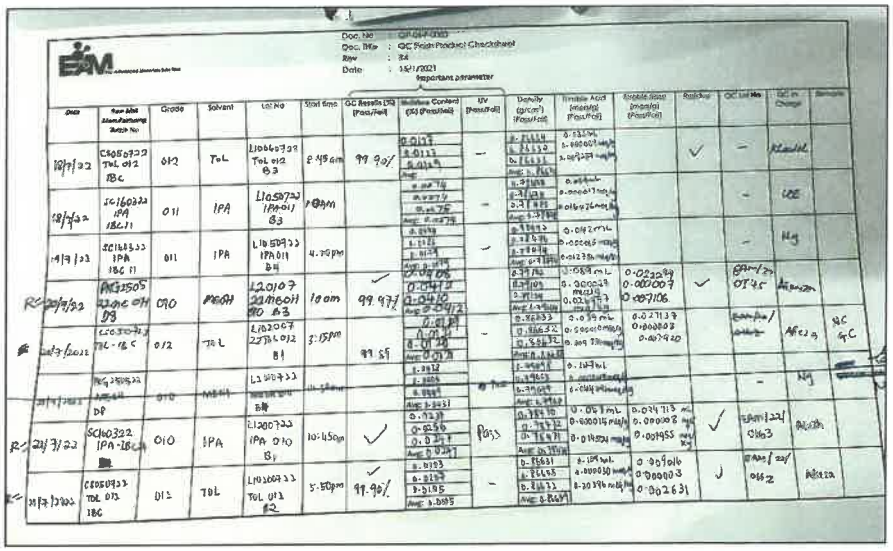
1. Double check the AQL form and excel whether the information key in is identical (quantity of the item, report number, batch number, packaging size and date inspected)
2. Sum up the total according to the respective product and batch number. Make sure that both AQL form and record in excel are the same.
3. The COA and report for each product should be checked to ensure that both documents have been generated for each product

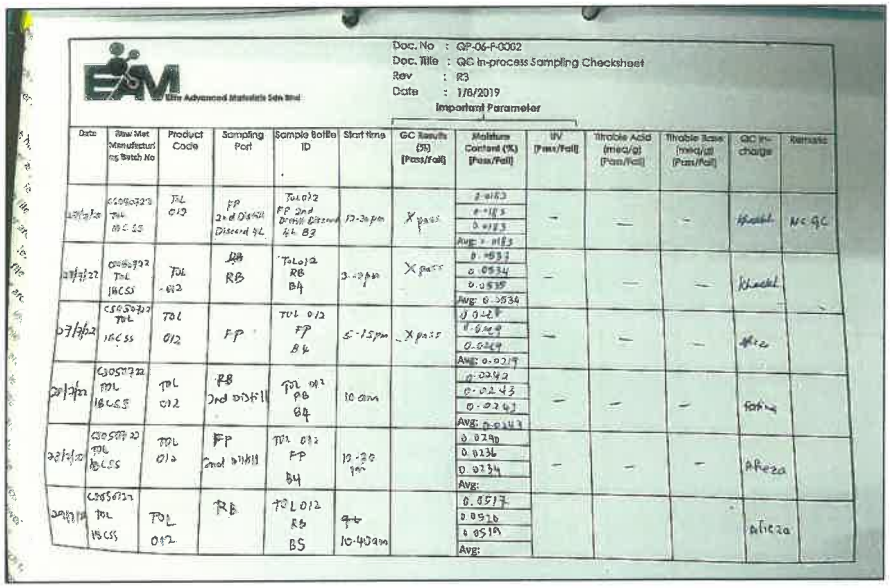
4. Verify whether the hard copies of both the report and COA have already been printed and arranged in the file

Figure 16: file for hardcopies for the finish product and raw material report

5. Note which product is incomplete based on the tally requirement.

6. Work on the incomplete report for products that have not been created yet and print it out for the hardcopy





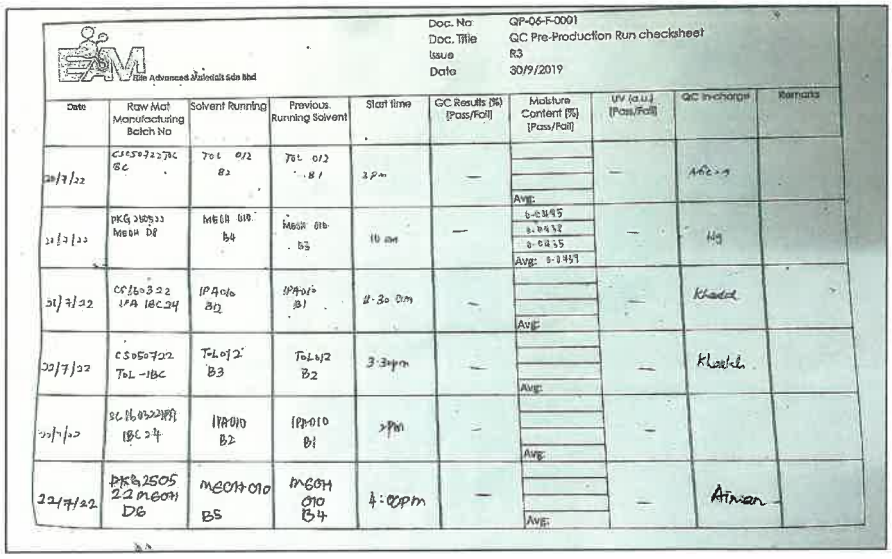


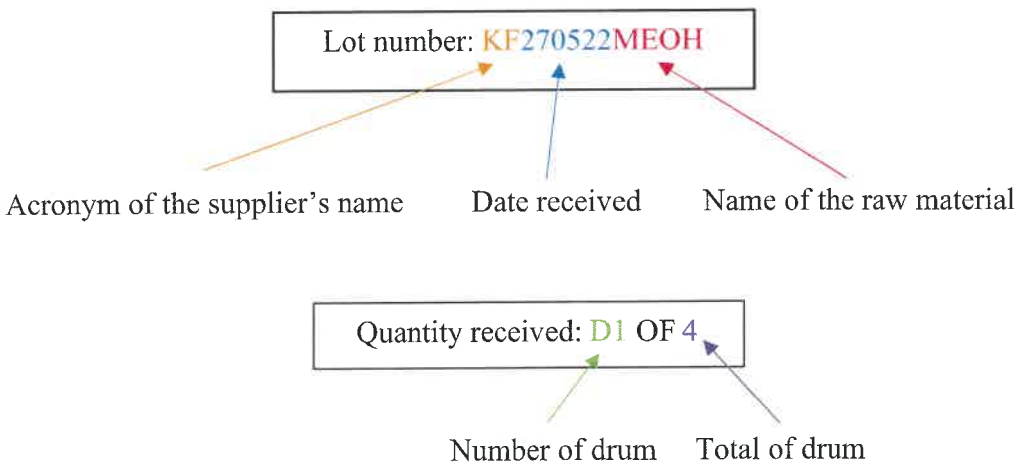
Figure 17: Record of incoming samples from pre-production, in-process and finished product that need to be tallied every day

4.3.5 Raw material sample collection

The raw material sampling process involves the following steps:

1. The COA from the supplier was received by the lab manager and was handed over to the QC department
2. Awaiting confirmation from warehouse team that raw material is ready for sampling collection
3. Review the name of the raw material that has been stated in the COA, identify what kind of packaging and the quantity received as well as the lot number for the raw material.
4. The raw material container and sample must be labelled. By using excel, open "RM Label", write the lot number and the quantity received for the raw material sampling.

   For example:



5. The label was then printed
6. Vials were prepared according to the quantity that needed to be collected. For example, if there are 4 drums of methanol coming, it means 4 vials are needed for the sampling from each drum.

Figure 18: Vials

7. Scissor, Sellotape, dropper or spatula, gloves, printed paper for label, small receptacle and small sticker label were brought to the warehouse site where all the raw materials were loaded.

8. The raw material container (drum, IBC, plastic pail or bottle) was opened using tools such as drum caps seal removal.

a) b)

Figure 19: a) Metal drum b) Intermediate Bulk Containers (IBC)

9. Droppers were rinsed once with the same raw material as the samples to be collected.

10. In the vials, raw material samples were fully filled

11. The printed label was then pasted to the container once it was finished in order to ensure that the sampling process was completed by the QC, as well as for the production team to be able to determine which container they were using as raw material to evolve the production process.

12. Vials were also labelled and named the same as before

13. The cap of the container was closed back to prevent any contamination and spills.

14. The samples were sent off to a laboratory for chemical testing and they were often examined for their water content, UV, purity assay as well as FTIR results.

15. The samples were then retained by QC as retention samples once they were tested.

4.3.6 Indirect duties in laboratory

i. Filing the finished product and raw material report

Documents should be filed safely and easily found because filing means keeping them in a safe place. A well-cared for document won't tear, lose, or get dirty easily. For an organisation, a filing system is the central system for keeping records just like it is implemented in a laboratory. The laboratory should have a quality manual, standard operating procedures, and reference material to provide guidelines for laboratory work. As part of the laboratory quality standards, they are required. They are a reflection of the laboratory's organisation and quality management. Records and documents are kept in laboratories so that information can be retrieved when needed. This is because the verbal instructions we receive are often misunderstood, forgotten, or impossible to follow because they are often unheard.

The documentation of the finished product as well as the raw material report need to be filled in the lever arch file in accordance with the order in which they are sorted and categorised. The report was mandatory to start filing as soon as it had been completed, checked and signed by the lab manager so that they would not be lost anywhere else and the records could be maintained and tracked at all times.

ii. Organising the compartment and rack for sample retention

Retention samples are samples of fully packaged units taken from a batch of finished products. The purpose of storing it is so that it can be identified later on. When the need arises during the shelf life of a batch, one or more of the following can be provided, for example, presentation, packaging, labelling, batch numbers, and expiry date, if necessary. During the execution of the samples to be retained, they were classified and stored according to their category and year of production. They were hoarded in cartons which had enough space to fit 12 amber glass bottles in it. Cartons that have been filled were labelled as per lot number of the samples inside. Then, the samples that had been stored were then documented and recorded in excel under the heading of 'retention sample' in order to ease the process of tracing them back in the future when required.

Figure 20: Sample retention space and compartment

iii. Check listing the glassware

As many of the glassware items in the lab are missing or broken, the task is to locate and count them. The listing must take into account the type and volume of the items. In order to track the recent update and determine which glassware needs to be purchased more, the quantity and availability must be updated and recorded in Excel under the heading of "Glassware checklist."

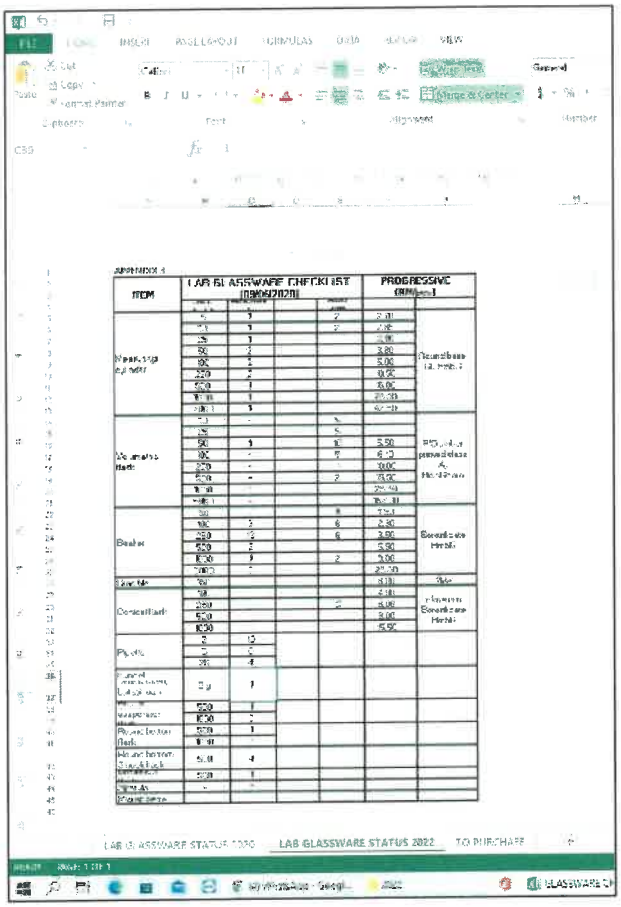


Figure 21: Glassware checklist excel

iv. Clean the GC Vial

To be able to reuse the GC vials for another sample in order to run the GC testing on another sample, the vials need to be clean in order to be able to do so. As there are not many of them that are provided and that are not to be used for just one time, it was necessary to always be aware of them so that the process of running the samples for GC would be as easy as possible.

GC vials can be cleaned using a very simple process in which they need to be washed off by rinsing with tap water, but it must be ensured that the remaining samples in the vials are discarded first before executing the cleaning process. As a final step, dry the vials and caps in the oven for about a half-day so that they will be completely dry. This will also help to speed up the drying process as the time they take to dry will be significantly reduced.

Figure 22: GC vials

4.3.7 Report on mini project for industrial training

4.3.2.1 Vietnam Gum Rosin

Figure 23: Gum Rosin

1. Introduction

Rosin, also called colophony or gum resin, consists of the terpene components of fresh liquid resin that are vaporised when heated to produce a solid form of resin obtained from pines or some other plants, usually conifers. Gum rosin has been used for thousands of years in ancient Rome and Egypt. The material varies in colour from yellow to black and is semi-transparent. When heated, rosin melts, but it is brittle at room temperature. This substance is primarily composed of resin acids, particularly abietic acids.

The material gets sticky when it gets warm, and it has a faint pine-like scent. Typically, gum rosin is obtained from the residue produced from distilling the oleoresin from pine trees (the volatile component is spirit of turpentine), while wood rosin, obtained from solvent extractions from stumps, tends to be darker in colour

2. Characteristic of Gum Rosin

In terms of colour, rosin ranges from pale yellow to dark brown/black. This substance has a semi-transparent, glossy appearance when cool, and is brittle when hot. Depending on its state, it may differ in colour and hardness. Because tree gum has an amorphous structure, its melting point

cannot be determined with certainty. In spite of this, it melts between 80°C and 125°C (roughly 176°F and 257°F). The rosins of plants are readily soluble in alcohols, benzenes, ethers, acetones, and acetic acids. The low aqueous solubility of these organisms makes them sensitive to water

3. Objective

i. To determine the formulation that has no sedimentation and could withstands low temperature as requested by customer for the purpose of construction materials as frothing agent

ii. To determine a better stability of the colour pigment in the mixture by doing a trial-and-error testing on different surfactants.

4. Gum Rosin formulation

A. Lab Scale formulation (20L)

No.	Materials	Amount	Unit
1.	Isopropyl Alcohol (IPA)	180.0	mL
2.	Gum Rosin originated from Vietnam	40.0	g
3.	Sodium Hydroxide (NaOH)	7.0	g
4.	Diethyl Glycol (DEG)	642.0	g
5.	Water	100.0	g
6.	BYK037	0.4	g
7.	Blue pigments paste	0.015	g

Table 6: Gum Rosin Formulation

B. Lab scale formulation with different type of surfactants.

i. Gum Rosin was mixed with other type of surfactants to replace sodium hydroxide which also a surfactant. 00000Following is a list of all the surfactants tested:

a. Methyl Ethyl Sulphonate (MES)

b. Sodium Stearate

c. Sodium Laureth Sulphate (SLES)

d. Butyl Cellosolve

e. Propylene Glycol Methyl Ether

5. Precaution for safe handling

i. Gloves must be worn as sodium hydroxide is highly corrosive and dangerous if it gets contact with eyes, skin and clothing.

6. Procedure

IPA with Gum Rosin were mixed until all chemical dissolve completely (Part A)

DEG, BYK037 and water were mixed until a cloudy solution formed. (Part B)

NaOH and water were mixed and slowly added into Part B. Heat was generated as the exothermic reaction occurred when Sodium Hydroxide was added.

The mixture of Part A and Part B were put together until they were homogeneous and no bubbles formed

The blue pigment paste was diluted into the mixture until it was completely dissolved

The result was observed for an overnight at room temperature and fridge.

7. Result and observation

A. Gum Rosin mixing (20L)

No.	Description	Observation
1.	**Rosin system**  ➢ During the mixing phase of this batch of gum rosin, there were two parts of rosin system which are the water part (clear) and the rosin part (yellow). i. The water part contains water, DEG, BYK037 and sodium hydroxide, ii. The rosin part consists of IPA and gum rosin only. ➢ After the gum rosin has done mixed, 3 sample were taken into vials to observe the colour changes and stability.	i. A colour change occurs when the rosin part of the water was added to the water part, resulting in a colour change from colourless to milky to clear yellow ii. All the materials inside the rosin system were fully dissolved without leaving any significant undissolved materials. iii. This due to the chemical reaction that occurred between the ingredients. Clear solution obtains when system reached equilibrium reaction

2.

Green pigment system

- 30g of green pigment was diluted with 300ml of water and was then added to the rosin
- Samples were also taken to observe the colour intensity and stability at room temperature and inisde the fridge.

At room temperature	
	
Initial condition	After an overnight

In the fridge	
	
Initial condition	After an overnight

i. At room temperature, the green pigment was able to hold for an overnight without any pigment sedimentation at the bottom of the vials. Thus, this means that the system is stable.

ii. Inside the fridge, it was observed that the green pigment has occurred a significant sedimentation at the bottom of the vials which made the colour of the mixture became lighter. Thus, this has proven that green pigment was unstable at low temperature.

iii. Nevertheless, the colour intensity must be increased as ordered by Dr. Tay, the Head of the Laboratory Department, in order to get a much more intense colour

3.	**Green pigment system** ➢ Another 10g of green pigment paste was added and samples were taken to continue observe the changes. At room temperature  Initial condition  After an overnight	i. The colour was a bit intense than the previous colour. After an overnight leave at room temperature, the stability of the green pigment was still in great condition and no sedimentation was observed.
3.	The mixture of gum rosin was filled into a 25L white pail before it was sent to the customer. 	i. There was no leaking detected on the pail and the bottle cap ii. It was observed that all materials were fully dissolved with no apparent undissolved materials floating at the surface of the mixture. iii. The outer surface of the pail was wiped with IPA to remove the remaining spill of the gum rosin.

8. Gum Rosin + surfactants

- Gum rosin were mixed in vial with different type of surfactants and the mixture was shaken until it fully dissolved. The changes were then observed and recorded after an overnight leave at room temperature or in the fridge.

No.	Description	Observation
1.	**Gum Rosin (10g) + Methyl Ethyl Sulphonate (0.5g)** **Before**   **After an overnight**  	i. Initially, the mixture was fully dissolved, but after an overnight at room temperature, the blue pigment separated and sedimented at the bottom of the vial. ii. This means that the addition of Methyl Sulphate to gum rosin was unstable where the pigment has resulted in significant sedimentation and could not hold longer in the mixture.

No.	Description	Observation
2.	**Gum Rosin (10g) + Sodium Laureth Sulphate (0.5g)** **Before**  **After an overnight** 	i. A little shaking on the vial caused the mixture to dissolve completely, but after overnight at room temperature, the blue pigment separated and settled at the bottom. ii. Due to this, the addition of Sodium Sulphate to gum rosin resulted in significant sedimentation of the pigment and could not be maintained.

No.	Description	Observation
3.	**Gum Rosin (10g) + Butyl Cellosolve (0.45g)** **Before**  **After 4 hours (in the fridge)** 	i. Despite the surfactant being liquid, the mixture was fully dissolved with just a few shakes on the vial, but after 4 hours in the fridge, the blue pigment separated and sedimented at the bottom. ii. Thus, the addition of Butyl Cellosolve to gum rosin resulted in significant sedimentation and did not hold the pigment for long.

No.	Description	Observation
4.	**Gum Rosin (10g) + Propylene Glycol Methyl Ether (0.45g)** **Before**  **After 6 hours (in the fridge)** 	i. Due to the gel texture of surfactant, the mixture dissolved in just a few shakes, but within six hours inside the fridge, the blue pigment separated and settled at the bottom of the vial. ii. Because of this, the addition of Propylene Glycol Methyl Ether to gum rosin resulted in sedimentation of pigment, which preventing it from holding in the mixture.

No.	Description	Observation
5.	**Gum Rosin (10g) + Sodium Stearate (0.5g)** **Before**  **After an overnight** 	i. Due to excessive surfactant content, the mixture was unable to dissolve homogeneously. ii. The solution was shaken vigorously but the surfactant still sedimented after it was left at room temperature for an overnight. iii. Since too much surfactant was used in the sodium stearate test on gum rosin, the test was considered a failure. **Action taken:** i. The amount of sodium stearate was reduced to 0.05g and was observed at room temperature and in the fridge. Result was shown as table below (No.6)

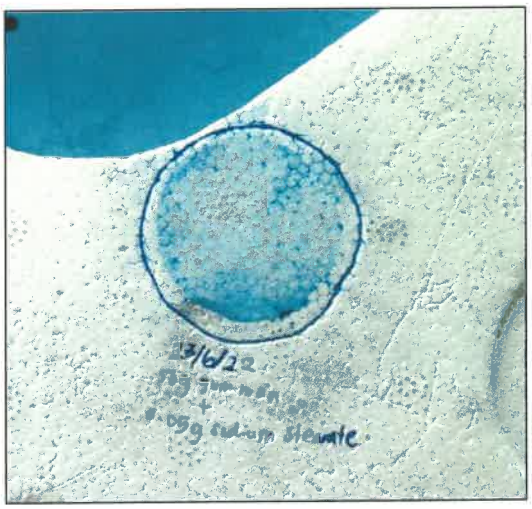
No.	Description	Observation
6.	**Gum Rosin (10g) + Sodium Stearate (0.05g)** **Before**  **After an overnight (room temperature)** 	i. The adequate amount of surfactant used in solution has made it easy to dissolved. ii. It appeared that the pigment was stable at room temperature, as no separation of the materials was observed after overnight storage iii. The texture and physical appearance of the pigment inside the fridge however, were slightly gel-like, but no sedimentation of the pigment occurred. **Action taken:** i. A higher amount of gum rosin was added to the solution to increase its solubility with surfactant at lower temperature. Table below (No.7) shown the result obtained.

	After an overnight (in the fridge) 	

No.	Description	Observation
7.	**Gum Rosin (40g) + Sodium Stearate (0.05g)** **Before** 	i. With increasing gum rosin concentrations to 40g, the solution was dissolved much faster and more easily. ii. Upon overnight storage in the fridge, blue pigment sedimented at the bottom, and this proved that sodium stearate added to gum rosin created an unstable condition where pigment separated from the solution.

Before

Test on Styrofoam



iii. To ensure the feasibility of this testing, the solution was tested on Styrofoam and a drop of water was dropped on top of it. Below was the result observed:
   - As soon as the water drop touched the gum rosin, it spread across the surface.
   - The gum rosin was less sticky
   - The texture was a bit soapy as if it was being coated.

iv. This formula could not be utilized since the aim is to get gum rosin that has a strong sense of stickiness.

4.3 Problem encountered and approach adopted for solving problem

Problem 1: Insufficient of glassware and lab tools

It was unfortunate that when executing the mixing for lab scale, the glassware such as beakers, spatulas and stirrers which were required for the mixing process were inadequate. This made it very difficult for the mixing process to run smoothly, especially when it was urgently required. The reason for this is due to the fact that many of them have been missing or broken and unwashed, resulting in the necessity to clean and wash the glassware that has already been used by others. Sometimes permission is required if samples are present inside them so that they can be transferred to another container.

To solve this problem, it is important to firstly determine and know the total volume of the solution that is going to be mixed. As a result, the right sizes and volumes of the glassware to be used can be correctly estimated and are so readily available before the procedure begins that they can be used in a timely manner.

Problem 2: A changing lifestyle

While it is the first experience at a job, changes in the lifestyle as well as the working conditions and environments need to be adapted. Instead of waking up at eight and attending a few classes a day, now it is mandatory to sit at a desk from 9 to 6. Socialising is clearly becoming more difficult due to the long working hours and the new living arrangement in comparison to before. This is in contrast to the college days, when students were tolerated for being late to class and not submitting their assignments on time. Sometimes, it is very difficult to deal with the issue of time management due to its complexity. Besides, the feeling of not being good enough or not trying hard enough can sometimes be frustrating, and leading to a feeling of being unsatisfied

To solve this problem, it is necessary to acquire new habits and adopt an organised way of life that will enable you to become successful at time and self-management. For me to remain energetic and motivated every day, I am going to make sure to get off to bed early every night and spend 15 minutes exercising after my work day has ended. Further, I think it would be great if I could always create a bond with my fellow co-workers by having conversations with them throughout the day so that I will always feel more alive and connected. Aside from that, I will

always seek guidance and advice from my supervisor regarding the task that I would find rather difficult to complete to help me cope with it.

Problem 3: Hesitation to ask questions

A common intern problem is asking questions. The biggest fear lies in the feeling of being hesitant to ask questions. It is a well-known fact that this is one of the biggest problems with internships. Due to this, it is becoming unwilling to ask questions because you fear being judged or thought to be dependent and self-insufficient, which makes it hard to ask questions. It is a possibility that asking questions will create the impression that a person doesn't know anything and having a lack of ability. It can only be imagined how many thoughts are roaming through the mind at the same time. There is no way of knowing which of the colleagues will help or if they will be disturbed by the situation. Despite the reluctance to interrupt them, I would usually feel the need to do so.

In order curb this issue, my daily reminder to myself is to always remember to not be afraid of being judged. Because no matter what, I understand that the employees know I'm an intern and there's a good chance that I will ask a lot of questions. Almost all of the time, they are waiting in expectation. Apart from that, I will always to set my mind so that I do not assume anything is right or wrong to begin with. The best thing I can do is to ask questions. Writing down the questions and then asking them is always a better solution than saying them out loud.

4.4 Professional and ethical issues

There is no doubt that professional and ethical behaviour is very important, and that it portrays a person's traits, values, and morals in ways that are very representative of their ethics as well as important to the career. The importance of ethical behaviour is something that is very important to me. An ethical quality is a kind of quality that is defined by honesty, fairness, and equity, especially in the context of interpersonal, professional, and academic relationships as well as those involved with research and scholarly activities.

I faced a number of ethical issues throughout the course of my work, including how I determined the boundary between respecting my supervisor's experience and when it was appropriate to challenge someone who I perceived as to be extremely superior to me. Regardless of whether you are an intern or not, I believe it is important to express your views, as constructive criticism is the only way to learn from mistakes. As far as I am concerned, what matters most is the manner in which you assert your opinion. Whenever I had a disagreement with my supervisor or wanted to offer further suggestions to him, I always ensured that I was maintaining ethical behaviour at all times. A very modest and suggestive manner was used to provide me with my insight. My internship job included completing the documentation of the inventory record for the finished product. Several documentation tasks were taught to me by a co-worker at the office. The knowledge I had gained enabled me to confidently discuss and share these issues with my supervisor. The fact that I was able to speak so intelligently and confidently about what I had learned was something that my supervisor found to be very helpful and constructive.

Other than that, at times, there were times when I would finish the work that was given to me by my supervisor, but she was still in the middle of a meeting when I finished the work. Even though I might be tempted to pull out my phone while my desk is visible from the conference room, it is important for me to remain professional during those times when my desk is visible from the conference room. Rather than using this time for personal purposes, I would use it to review my work, offer assistance to the other employees who needed it. Regardless of whether you are directly asked to do it or not, there is always work to be done in a company. As much as I could, I tried to make sure I was using the time I had constructively. I believe that ethical behaviour entails more than just doing your job professionally and offering good customer service to clients, it also entails acting as a motivated and determined individual who understands how to overcome challenges.

Last but not least, I would like to emphasise that it is very important for me to keep my promises during my internship as well. Since I have numerous ongoing projects, I often get confused about my schedule as I have a variety of projects going on at the same time. The best I've been able to do is to keep every deadline and not to break any of the promises I made to myself in the beginning. The fact that I have accepted this internship means I am also accepting many responsibilities which I have to hold in my future work environment as well. And I will continue to do my best so that I can keep my promises and demonstrate great work ethics as a worker and internship student

4.5 Health, environmental and sustainable aspects

During my time at the company, I attended training on ISO 9001:2015 and ISO 140001:2015 standards. The training took place in the meeting room of the Elite Advanced Material on the 14th of June 2022 and was conducted by Mrs. Siti Zafirah, the internal auditor administrator. The training is mandatory for all staff members, as it is crucial to the success of all departments.

ISO 9001:2015 Quality Management System

The ISO 9001:2015 Quality Management System is an international standard used by ISO to define the quality systems. ISO 9001 imposes six mandatory procedures in order to ensure quality, such as control of documents, control of records, internal auditing, corrective action, preventive action, and control over non-conforming products. Training courses like this will help EAM organisations improve their customer retention and acquisition, improve their internal administration, as well as improve their efficiency, productivity, and profit margin with the least amount of waste.

The ISO 9001 specifies that the following quality management should be accomplished during the EAM process of publishing product:

- Provide the customer with quality products and services
- Ensure that these products and services comply with all applicable regulations.
- Customer satisfaction should be enhanced
- Consistently improve the performance of the organisation

ISO 14001: 2015 Environmental Management System.

ISO 14001 standard, on the other hand, is an international standard for environmental management systems or EMS as they are commonly called. This system was created as a means to protect the environment, and it can also be used to respond to the changes in environmental conditions within a given social or economic setting. In order for the system to be effective, all the elements that make an effective environment management system are contained within the system, and in order to ensure effectiveness, the system can be integrated with other management system requirements.

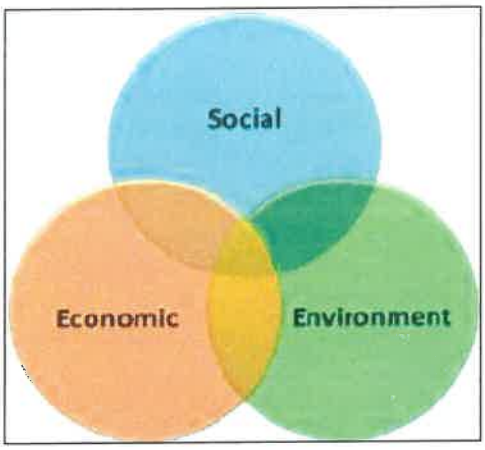
To comply with the standard, the organisation EAM must be implemented as follows:

- Ensuring that any activity undertaken does not cause any detrimental effects to the environment
- Conduct business in accordance with all applicable regulatory requirements in a professional manner
- Maintain and constantly improve the company's environmental practices so as to ensure that it will continue to produce superior results.

ISO 14001:2015 Procedure in EAM:

- EMS-01 Identification of Environmental Aspect and Impact
- EMS-02 Evaluation of Legal Compliance and other Requirement
- EMS-03 Emergency Preparedness and Responses
- EMS-04 Monitoring, Measurement, Analysis & Evaluation
- EMS-0S Non-conformities Required Action - Move to MGT-08
- EMS-06 Vendor Management

Sustainability aspect in Elite Advanced Material



1. **Environmental**

Sustainability in the environment refers to ensuring that natural resources (land, air, water, minerals, etc.) are protected. In order to be environmentally sustainable, programs and initiatives must meet the needs of the population without endangering future generations. This includes the structure and function of natural ecosystems and how these processes interact with people, as well as the duty of guardianship over the environment.

2. **Social**

Through investments and service creation, social sustainability aims to preserve social capital and maintain the EAM society's framework. Besides maintaining and improving social quality, social sustainability emphasises the value of relationships among people, such as cohesion, reciprocity, and honesty.

3. **Economic**

In order for an economy to be sustainable, its capital must remain intact. Economic sustainability is about improving the standard of living, while social sustainability focuses on improving social equality. In Business terms refer to the efficient use of assets to maintain EAM company profitability over an extended period of time.

CHAPTER 5:
CONCLUSION

5.1 Conclusion

Having been part of Elite Advanced Material Sdn Bhd for 24 weeks, I can conclude that I have been able to improve and develop my skills over the course of that internship. I am able to upgrade my technical and soft skills as well as critical thinking. During the process of finding solutions to the issues that were given to me, I have also learned to become independent and responsible. Since I received the necessary skills and knowledge during my industrial training, I was able to apply my knowledge and skills to adapt myself to the requirements of a real working environment. In the course of this practical training, I have gained a great deal of experience on building a great network among the trainees and staff members of the company as well as the importance of teamwork when it comes to completing the tasks.

Furthermore, I also learned how to manage my time wisely when I am trying to complete a task, as well as the previous one I was trying to accomplish. It has been proved to me that this has been true when I did the mini-project on gum rosin and I found it very challenging to complete the work within the time given, since the production team is waiting for the results of my work before they can proceed with running the process on a pilot scale. The process however has succeeded due to the fact that I have learned how to allocate my time in a wise manner. It is also worth mentioning that the special project undertaken by me has had a positive impact on proving my ability and skills since it was the first time, I handled it and gave me first-hand experience. Having the opportunity to be a reference person for the production team even for only a short period of time has undoubtedly been rewarding, as these unforgettable memories have taught me real life working experiences and enabled me to become a well-rounded individual. Additionally, since the task was a success, a stronger networking link was created between the QC department and production team.

Additionally, the industrial training has given me the opportunity to develop my self-esteem, teamwork, and time management skills, which have all had a great impact on the future. This will serve as a valuable asset in contributing to the development of the personality, as well as values and characteristics, in becoming a more well-rounded individual by learning lessons and gaining experiences. Experience is the key to learning good personality traits. In the future, it is hoped that the I will be inspired to explore more in the working environment.

5.2 Suggestion and Recommendations

1. To the EAM company

i. The Management at EAM should invest in more computers, lab tools, vehicles, and prayer rooms so as to enhance the employer's competency and activities. By using this technological advance, the organisation will be able to switch from manual document processing to computerised document processing, thereby providing a proper record-keeping system that will save time and money.

ii. It is suggested for EAM to have more internship opportunities in an organisation would also benefit many students because some are not able to land internships, which is an important requirement of the university.

2. To the university

i. Interns recommend that the university supervise and monitor students continuously throughout the internship training so they can perform their duties completely and accurately. Moreover, this will create a close link between the academic supervisors and the field supervisors in the internship program, in order to be able to assess what the interns are doing in the field in a way that is appropriate.

ii. There should be a continuation of the internship program, because it helps to prepare the students in preparation for their careers in the future, as well as allowing students to practice the theoretical knowledge that was acquired during class practised in a practical environment. Also, it contributes to the development of students' understanding of job expectations, responsibilities, and opportunities in the workplace as well as work ethics.

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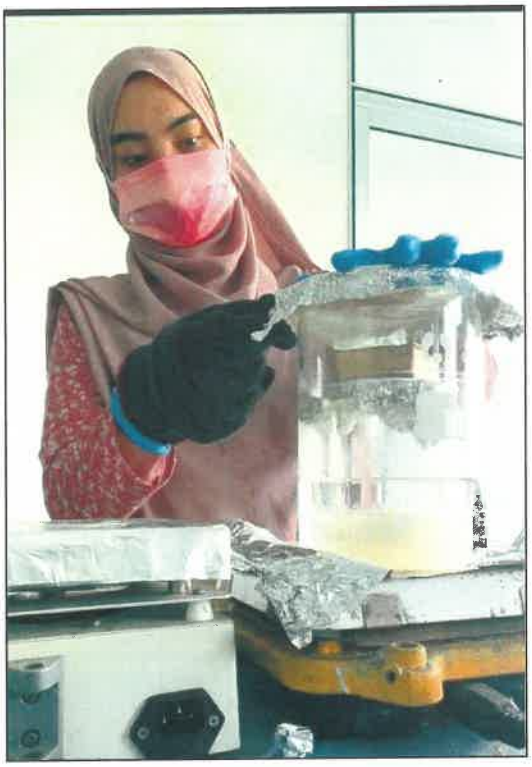
6.2 Appendix

Figures 6.2 (a): Refill the gas for the Gas Chromatography (GC) Instrument

Figures 6.2 (b): Site visit for the gum rosin production

Figures 6.2 (c): Raw material sampling collection



Figures 6.2 (d): Lab mixing task

Figures 6.2 (e): Product inspection according to AQL