INDUSTRIAL TRAINING REPORT

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DURATION	:	21ST FEBRUARY 2022 – 5TH AUGUST 2022 (6 MONTHS)
LECTURER EVALUATION	:	MOHD ZAKI BIN SUKOR

ACKNOWLEDMENTS

In the name of Allah S.W.T, the Most Gracious and Most Merciful. First and foremost, I am grateful to The Almighty God Allah for providing me with this wonderful opportunity in completing the industrial training at Malaysian Nuclear Agency. I also would like to give greatest thanks to Malaysian Nuclear Agency for providing me place for internship that has given me tremendous experience working in research field.

My deepest appreciation goes to Mrs Siti Salwa Binti Mohammed Shirajuddin as my industrial training supervisor, who has been a consistent and reliable source of guidance for me. This project would not have been possible without her unconditional support and perseverance during this industrial training. I also like to take this opportunity to thank the staff from the Division of Radiation Processing Technology , especially Mr Falah, for providing vital advice and guidance throughout my internship period. Secondly, not to forget my university supervisor Mr Mohd Haikal Mustafa and Miss Noor Hidayu Abdul Rani that gave me a lot of support and invaluable advice. The training was not an easy task, but fortunately, with the unending help and support from my family, friends, and respected lecturers, the path seemed effortless. I also thanks to all the people for their help directly and indirectly to complete this project. The completion of this experiment gives me much pleasure.

This opportunity represents a significant step forward in my professional development. I will apply my newly acquired information and abilities as effectively as I can, and I'll keep working to get better to reach my professional objectives. I look forward to working with everyone of you in the future.

ABSTRACT

Industrial training is a crucial topic to take since it enables students to learn about and adjust to the working world. Additionally, this subject aids the learner in putting what they have learned and been taught to use. They gain new knowledge, a new skill, and new job experience as a result of their industrial training. This report's goal is to find out how industrial training is now progressing. It will explain the knowledge and skills we acquired during the company's industrial training programme, which began on March 21 and finished on August 5, 2022. Training lasts for 24 weeks, and throughout that time I learn a lot of new things, meet lots of new people, and make lots of new friends. As is well known, all UiTM students must complete an industrial training programme as part of their diploma courses in order to graduate. My training has been completed at Agensi Nuclear Malaysia. To document all the activities, we underwent during the training session, UiTM mandates that all students complete this report-writing assignment. The major goal of this final report for industrial training students is to keep track of all the pertinent things we performed and help the students' skills and capacities grow. While carrying out the responsibilities assigned, self-assurance, communication abilities, and industrial problem-solving skills are developed and improved.

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CHAPTER 1

INTRODUCTON OF INDUSTRIAL TRAINING

1.1 Overview of Industrial Training

All levels of higher education in Institutions of Higher Learning have mandatory requirements for students to complete Industrial Training (IHL). Industrial training programmes were created to strengthen the necessary competencies to increase the number of graduates qualified for employment. Students who participate in industrial training are given opportunities to learn in the workplace and gain real-world experience, which helps to increase market competence. Industrial training is important for students because it exposes them to real-world engineering experiences and allows them to participate in Chemical Engineering projects before to graduation.

Universiti Teknologi MARA (UiTM) is a university that strives to produce well-rounded graduates and being a top institution with exceptional scholarship and academic brilliance, able to provide leadership to Bumiputera's active participation in all professional sectors of top-notch standards to generate graduates with strong moral character who can compete internationally. Moreover, to improve Bumiputera's knowledge and skills in all disciplines of study through professional programmes, research projects, and volunteer activities based on moral principles and business ethics. Regardless of whether students gain theoretical knowledge from lectures or tutorials, students especially at UiTM must apply these theories in practice. As a result of their industrial training, students might develop skills in work ethics, communication, management, and other areas.

Student of Diploma Chemical Engineering compulsory to complete industrial training twenty-four (24) weeks with 12 credit hours within semester six (6). The internship period start 21st February 2022 until 5th August 2022. Students who have been given permission to continue with this programme must choose a company for the training placement. The industrial training programme should last at least 24 weeks and include 12 credit hours. This is essential since it satisfies the requirements set forth by the Engineering Technology Accreditation Council (ETAC) for undergraduate students and the Board of Engineers (BEM). Additionally, interns are expected to adhere to corporate policies and procedures with discipline. The students who participated in this programme most importantly had the opportunity to interact with professionals from various industries, experience a real-world work environment, demonstrate ongoing skill improvement, and be exposed to new information.

Project Title	: Study of Polymer Materials in Bio-Composite
Type of training	: Research and Development (R&D) / Laboratory Work
Period of training	: 21st February 2022 until 5th August 2022
Workplace/ Department	: Polymer Plant (Block 53)

1.2 Objectives of Industrial Training

- ✓ Perform technical skill learnt in chemical engineering field
- ✓ Demonstrates acceptable social skills and responsibilities during industrial training
- ✓ Comply professional ethics when carrying out tasks and projects
- ✓ Establish effective written and spoken communication skills while undergoing industrial training

1.3 Industrial Training Placement

1.3.1 Industrial Schedule

Normal working hours	8 hours
Day of working	5 days a week
Work in	8:00 am
Break hour	Monday – Thursday • 1:00 pm to 2:00 pm Friday • 12:15 pm to 2:45 pm
Work out	5:00 pm

Table 1.1 Industrial Schedule

Job scope

- Conduct the assigned research project with the title of Study of Polymer Materials in Bio-Composite
- Prepare the sample. Find density of material.
- Handle variety of instruments and machine for the sample experiment
- Sample will be undergone radiation by Electron Beam Irradiation
- Analyse the sample by using mechanical testing which are tensile, hardness and Melt Flow Index (MFI)
- Analyse the results and data required
- Prepare the research report

1.3.2 Industrial Training Placement

Address	
Tel	
Fax	
Website	https://www.nuclearmalaysia.gov.my/
Business segment	• Research & Development • Commercialization of Technology • Education & Training • Publication

1.3.3 Company Supervisor Information

Name	
Position	
Email	
Contact No.	

CHAPTER 2

COMPANY PROFILE

2.1 Company Background

Figure 2.1 Malaysian Nuclear Agency Logo

The notion that Malaysia should participate in the advancement of nuclear science and technology for peaceful reasons was first put forth by Tun Dr. Ismail Dato' Abdul Rahman, then-Malaysian Deputy Prime Minister. This idea led to the creation of Malaysian Nuclear Agency. Following the global oil crisis of the early 1970s, the Centre for Application of Nuclear Energy (CRANE) was the organisation to mark the start of Malaysia's nuclear programme, focusing on manpower development for a nuclear power programme to provide an alternative source of energy. On September 19, 1972, the Cabinet formally approved the creation of the Tun Ismail Atomic Research Centre (PUSPATI), which is housed inside the Ministry of Science, Technology, and the Environment. The Reactor TRIGA PUSPATI obtaining its first criticality on June 28, 1982, was a momentous event that signalled the beginning of a new era for nuclear research in Malaysia.

Puspati changed its name to Nuclear Energy Unit when it was placed under the control of the Prime Minister's Department (UTN). Eventually, the Minister of Science, Technology, and the Environment was given control over the Nuclear Energy Unit. On August 10, 1994, the institution was given the name Malaysian Institute for Nuclear Technology Research (MINT) in keeping with the progress of the country. A new identity was created, and on September 28, 2006, Malaysian Nuclear Agency (NUKLEAR MALAYSIA) was endorsed to reflect the organization's vision, mission, objectives, and operations in the challenging world. Malaysian Nuclear Agency is geographically located next to the Putrajaya Centre, Cyberjaya, and the government buildings.

Through the creation and expansion of significant laboratories and facilities, Malaysian Nuclear Agency mirrored the advancing industrialization and manufacturing programme of Malaysia. These include the Non-Destructive Testing Laboratory, the SINAGAMA Plant, the

Electron Beam Processing Service Centre, the Gamma Irradiation of Rubber Latex Plant, the Non-Ionizing Radiation Laboratory, the Secondary Standard Dosimetry Laboratory, the Radioisotope Production Laboratory, the Environmental Laboratory, the Analytical Chemistry Laboratory, the Radioactive Waste Management Centre, the Flora Centre, and the Tissue Bank. Nuclear science and technology play a substantial and crucial part in the national development programme thanks to these facilities. This pamphlet is intended to give the public important information on the resources and operations at Malaysian Nuclear Agency, a forward-thinking national research organisation.

2.2 Organizational Vision and Mission

2.2.1 Vision and Mission

VISION

Leading Research, Development, Commercialization, and Innovation (R&D&C&I) in nuclear science and technology for national sustainable development

MISSION

Creating Wealth, Generating New Knowledge, and Accelerating Economic Growth & Societal Well-being Through Science and Technology Towards Shared Prosperity

2.2.2 Objectives

1. To generate new products and technologies through research and innovation based on the national development agenda.
2. To enhance organizational excellence through planning and quality management.
3. To strengthen Nuclear Malaysia as a National Technical Support Organization in nuclear and relevant technological fields.
4. To strengthen relationships and cooperation with international organisations.

2.2.3 Organizational Function

1. To conduct R&D&C&I in the field of nuclear science and technology.
2. To provide technical service and training in nuclear and related technology.
3. To coordinate and manage nuclear affairs at national and international level as a liaison agency for the International Atomic Energy Agency (IAEA) and the National Authority for the implementation of the Comprehensive Nuclear-Test-Ban Treaty (CTBT).
4. To act as the National Centre for Radiation Metrology and as the National Radioactive Waste Management Centre.

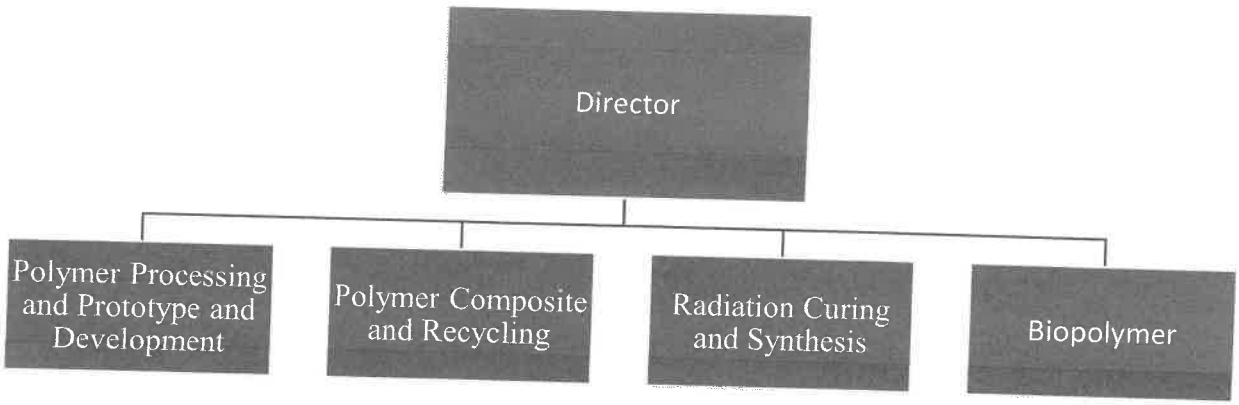
2.3 Organizational Charts

Figure 2.2 Organizational Chart of Malaysian Nuclear Agency as updated on 14 April 2022

Name	Position
ABDUL RAHIM BIN HARUN DR.	Director General Malaysian Nuclear Agency
ROSLI BIN DARMAWAN DR.	Deputy Director General Research & Technology Development Programme
KOSONG	Deputy Director General Technical Service
KOSONG	Senior Director Commercialisation & Planning Programme
DR. MUHAMMAD RAWI BIN MOHAMED ZIN	Senior Director Management Programme
TS. DR. MOHD RODZI B. ALI	Director Medical Technology Division
DR. NOR PA'IZA BIN MOHAMAD HASAN	Director Industrial Technology Division
DR. HASNI BTE HASAN	Director Radiation Processing Technology Division
TS. DR. AZHAR BIN MOHAMAD	Director Agrotechnology & Bioscience Division
DR. KAMARUDIN BIN SAMUDING	Director Environment & Waste Technology Division
TS. DR. HUSAINI BIN SALLEH	Director Radiation Health & Safety Division
DR. ISHAK BIN MANSOR	Director Technical Support Division
DR. FARIDAH BTE MOHAMAD IDRIS	Director Planning & International Relation Division
DR. SHUKRI BIN MOHD	Director Technology Commercialization Division
YM. RAJA JAMAL ABDUL NASSER BIN RAJA HEDAR	Director Human Resource Development Division
IR. IZANI BIN MUSTAPHA	Director Engineering Division
ROSLEEZAM BIN JAMAUDIN	Director Management Service
HABIBAH BINTI ADNAN	Director Information Management Division

Table 2.1 Top Management Organizational Chart

BTS DEPARTMENT ORGANIZATIONAL CHART



2.4 Client Charter

AGENSI NUKLEAR MALAYSIA

Will

- ✓ Carry out research that is based on the organization's mission, market demand and customer's need.
- ✓ Do research and management with ethical, honesty and integrity.
- ✓ Provide continual support to the organization in relation to the administration, services, finance, and security activities through the four priority areas:

2.4.1 Research and Development Technology

- Receive, evaluate and forward to the next process, the application of research project within one (1) month after receiving the complete proposal.
- Prepare the final report of research project within one (1) month after project dateline.
- Coordinate the participation of researchers to innovation competition within three (3) months before the event.
- Manage the patent filling within six (6) months after receiving the application.
- Respond to customer complaints within three (3) days.

2.4.2 Technical Program

- Act on the request of technical services within 14 days after receiving the application.
- Act on technical service complaints within 24 hours.
- Consider the approval of quotation and tender specification within two (2) weeks after receiving the application.
- Ensure the availability of Nuclear Malaysia official portal is not less than 90%

2.4.3 Management Program

- Ensure the development of human capital achieve seven (7) days of training a year.
- Process the billing payment and invoices within 14 days after receiving a complete document.
- Process the applications of quotation and tender within two (2) months after receiving a complete document.
- Issue a Local Orders within seven (7) days after receiving a complete document.
- Approve the training application within 14 days after receiving a complete application.

2.4.4 Technology Commercialization

- Supply products, training and services based on standards and affordable price rates.
- Provide quotation to client within seven (7) days after receiving the application.
- Issue a certificate and analysis report within seven (7) days after completing all the services.
- Prepare a Contract of Cooperation within three (3) months after obtaining memorandum of agreement from the cooperation partner.
- Act on complaints of services and products within 24 hours.

- Provide a technical services and after sales services within 14 days after receiving a complete application.
- Review and fixes the price of Nuclear Malaysia services and product each 5 years

CHAPTER 3

OVERVIEW OF TRAINING

3.1 Introduction

Since the 1990s, Nuclear Malaysia has provided locations and resources for IPTA, IPTS, and public research institution students to complete industrial training (LI), research, and attachment studies (KPS). About 100 to 200 students from public and private universities are placed at Nuclear Malaysia for industrial training every year. At the same time, nearly 50 students and researchers worked on research projects and affiliations for their first degrees (Final Year Projects), master's degrees, and doctoral degrees. The LI programme at Nuclear Malaysia has effectively helped IPT students enhance their technical and soft skills to address the demand to create a qualified workforce in a variety of employment domains as mentioned in the national education system planning. Through the execution of research projects at the Malaysian Nuclear Agency, KPS, meanwhile, contributes to the enhancement of specific technical knowledge and skills in the relevant sector, expertise and competence of students and researchers. Areas of study offered are in the fields of nuclear technology application according to Nuclear Malaysia's research group as follows:-

- Advanced materials and advanced manufacturing
- Environment and waste
- Radio pharmacy and bio pharmacy
- Natural bioresources based products
- Medical imaging
- Renewable energy
- Plant and structural integrity
- Industrial plants including mutagenesis, plant biotechnology, ornamental, and agronomic aspects
- Natural polymers and synthetic polymers
- Engineering development including research reactor
- Radiation safety and health
- Alternative electrical power generation - nuclear power
- Nanotechnology and nanomaterials
- Electrical, electronics, mechanical and mechatronic engineering
- Information technology and communication

Agency Nuclear Malaysia have a flexible time for workers which are 7.30 am to 4.30 pm, 8.00 am to 5 pm and the last one is 9 am to 6 pm. As an intern I was told my working hours are from 8 am to 5 pm and I need to punch in and out the card within the period given. In short, for 24 weeks I was treated and acted like a regular employee. I had to be there at around 7.30 – 8.00 every morning, dressed professionally follow etiquette dress code and ready to have interactions with the machines all the times. Over those 24 weeks, I developed friendship with other students, got task from my superior and was first time experienced working and treated like a fully grown and responsible adult.

I was assigned to work under Polymer Processing and prototype and Development since my project procedure only in a lab scale and conduct for study purpose. First and foremost, this department most focus on produce plastic by using natural fiber and blend in with polymer. Radiation Processing Technology Division is a unique division formed purposely to focus on research and development of radiation processing technique for various application related to polymer industries, healthcare, food, energy, and environment. There are four focus groups under this division who work on every aspect of radiation processing techniques and materials which are biopolymer, radiation curing and synthesis, polymer composite and recycling and polymer processing and prototype and development.

First group was under biopolymer. Makmal Teknologi Sinaran is a group of laboratories under Radiation Processing Technology Division (BTS). This laboratory services include sample preparation, sample testing and consultation services. Minimum charges are normally imposed to users for maintenance purposes. Sample preparation process are internal mixers, extruder, injection moulding, hot press, two roll mill and wet mixing. Subsequently, the sample will be testing and analysis by mechanical test, dilute solution properties, material identification test, thermal test, and sample morphological studies.

Secondly, radiation curing and synthesis. This group specializes in polymer surface coating using radiation curing techniques. Researchers in this group involves a lot in polymer synthesis or biobased materials. Most outstanding projects are applicable as printing varnishes, surface functionalization and surface protection.

Third, polymer composite and recycling. This group involves actively in research and development works mainly to reuse and recycle abundant material into useful products. Various radiation processing techniques are used to enable the effective waste collection, pollution control and material recycling.

Finally, polymer processing and prototype and development. This group focuses on upscaling polymer processing technologies from laboratory scale to pilot scale. Feasible processes using the pilot scale facility are demonstrated in many activities including MOSTI Social Innovation (MSI), SMARTfund, INNOfund and fund from other ministry/agency. Project that cover under this group are bio composite floating jetty component, aquacultural floating cage from nanohybrid bio composite and radiation modified Fused Deposition Method (FDM) Filament for 3D printer.

3.2 Summary of the training and activities

The day of registration I was given an information about Agency Nuclear Malaysia from my supervisor. Student intern need to comply the ethics, rules and regulations, discipline, and disciplinary action during the Industrial Training. Aside from that, Puan Siti Salwa, company supervisor explained the task and job description that will do during six months of industrial training. Setting the goal that will achieved for performance and organizing workflow. Besides, supervisor also describes and explained the process flow of activities by using all the machines that involved to produce the plastics.

In week one it was like an ice breaking session as I get to know the staff and workplace. A short brief from the staff about the machines and instruments that will handle by myself during the internship period. The machine must handle with care and full of safety. On top of that, I must follow recommended procedure and safety precautions when handling the machines. Also, the machines must be supervised by assigned staff so that if anything happen, they can fix and repair the machines. For example, the material stuck in the machine, the assigned staff will come and check the machines. In a word, do not get panic or nervous, just lodge a report to person in charge to act.

Furthermore, I do a research and literature review to gain more understanding about the machines. Read the selected article thoroughly and evaluate them. Following by week two until week three, I was assigned by my supervisor to take a look first and learning the machines that was taught by the staff. I learned on how to start-up and shut down the machines. There are certain part that I need to alert and take note when handling the machines.

My project involving polymer since I was assigned to run a product that related to polymer. Basically, polymer is any of a group of compounds, whether organic or synthetic, that are made up of very large molecules, or macromolecules, which are variations of simpler chemical units, or monomers. To put it simply, polymer are molecular chains, long, repeating,

bonded together. In the plastics and composites sector, the word polymer is frequently used interchangeably with plastic or "resin." Several materials with a wide range of characteristics are included in polymers.

To put it another way, the material will undergo several testing before launch as a final product. There are many testing that will do on the material for example, tensile, Mole Flow Index (MFI), hardness and so forth. I was introduced to do this testing only to do in lab scale. If the material reached the certain parameter, the material would produce in a bulk and distributed to the customer or client that used this product depending on their usage. This process will explain further in the next chapter.

CHAPTER 4

DETAILS OF EXPERIENCES

4.1 Introduction

Internships are first professional experiences in the field, and each will become a steppingstone to the next work assignment. It was a worthwhile experience, and I gained a lot of laboratory-based skills. Both the environment and the view made it a pleasant location to work. The working colleges were incredibly helpful and pleasant to work with. As I joined the Radiation Processing Technology Division (BTS), I gained new experiences. A pleasant setting with helpful employees. They impart their expertise and knowledge to the interns.

As I mentioned in previous chapter, I was briefing by my supervisor to get involved in project such as polymer that blend with fiber. There are many kind of polymer such as polyester, epoxy, nylon, and polypropylene. Meanwhile, for fiber we have kenaf, rice husk, mushroom waste, waste tire dust (WTD) and so forth. Generally, fiber was used to contributes tensile strength and enhancing performance properties in the final part. Thus, if we combined this two material that comes from different state it will produce polymer composite. The polymer functions as a matrix resin that reaches inside the bundles of reinforcement and fuses to it. Polymer composites are being used more often in a variety of engineering applications.

I was assigned to do two project which are High-Density Polyethylene (HDPE) blend with Kenaf and HDPE blend with WTD. First of all, I do my research about the material given. The key point in finding are about the melting temperature, level of hazard and dangerous of the material, application of the product and so on. Other than that, I was introduces all the machines that involving in my project. All the machines need a guidance from the staff or person in charge of the machines will explain on how to handling the machine. Throughout this training, I learn used a various machine such as single screw nano-compounder, hot-press and tensile. On the other hand, I also gained knowledge about the radiation. Simply put, the purpose of radiation in my project is cross-linking in the material.

Moving forward I will explain about the material that I used in this project. Polyethylene is lightweight synthetic resin with several uses created by polymerizing ethylene. The significant family of polyolefin resins includes polyethylene as a member. It is the most commonly used plastic in the world and is used to make items like clear food wrap, shopping bags, detergent bottles, and fuel tanks for cars. It may also be cut, spun into synthetic fibres, or

altered to have rubber's elastic qualities. However, polyethylene have two properties which are Low-Density Polyethylene (LDPE) and High-Density Polyethylene (HDPE). In my project I used HDPE instead of LDPE. This is because HDPE offer higher tensile in term of strength and better is resistance to heat compared to LDPE that have low tensile. Besides, the final product of my project is strong packaging material. For instance, food container and bulk container for industrial use. Therefore, HDPE is most suitable to produce durable plastic part. HDPE comes with two different structure. One from powder and another one is from pellet. For my project, I use HDPE powder because it much easier to blend with fiber.

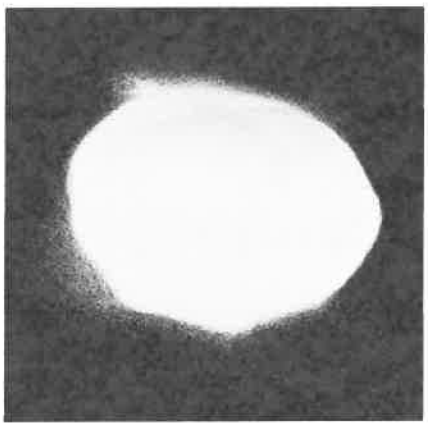


Figure 4.1 HDPE Powder

Figure 4.2 HDPE Pellet

Next, I will explain fiber that use during this project which are Kenaf and WTD. Primarily, Kenaf is lignocellulosic fiber becoming more and more well-known because of its superior mechanical properties, which result in high stiffness and strength values. Commercial kenaf (Hibiscus cannabinus L.), a member of the Malvaceae family and classified as an industrial crop, is grown in a number of places throughout the world, including Central Africa, India, Bangladesh, Thailand, and Malaysia. They are good for use as reinforcement in polymer composites due to their increased aspect ratio. Preferably, the kenaf fibres are made from the bast portion of the plant. By using kenaf fibre, which has lower density than conventional materials but comparable mechanical qualities, such as tensile strength, it is possible to create polymer composites that are both lightweight and environmentally friendly. Bast kenaf fibre is more suitable for high strength applications since it has stronger strength characteristics than core fibre.

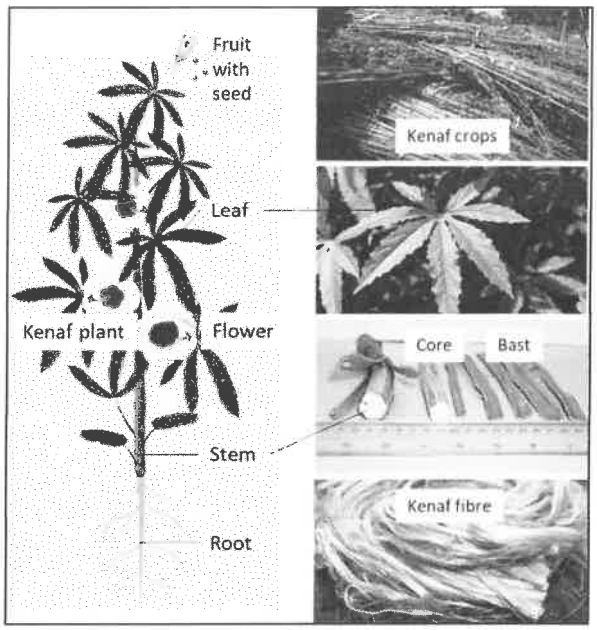


Figure 1.3 Kenaf Plant

The second material for fiber is Waste Tire Dust (WTD). Fundamentally, the management of waste tyres is currently causing significant issues in the areas of the environment, society, and the economy, which has been a huge concern for researchers and industry representatives for decades. The most widely used method for recycling leftover rubber is to combine it with a polymeric substance that flows under specific circumstances so that it can be moulded into various goods. Waste tyre rubber as an inexpensive and environmentally friendly thermoset polymer modifier. There are two main ways to obtain waste tyre dust from tyres: ambient processing, which involves grinding or processing used tyre scrap at temperatures above ambient, and cryogenic processing, which involves freezing used tyre scrap in liquid nitrogen until it becomes brittle and then shattering it into smooth particles using a hammer mill. Fillers are typically added to polymeric matrices to accomplish two main objectives. The first one is connected to the reduction of material costs, which is highly common in the case of items that do not need to adhere to strict mechanical or thermal performance requirements. The second objective is to improve the characteristics of different materials, such as tensile strength, toughness, or sound absorption capabilities. In terms of impact toughness and fatigue strength, natural fibre reinforcements have demonstrated superior performance.

Figure 4.4 Waste Tire Dust

4.2 Details of Training

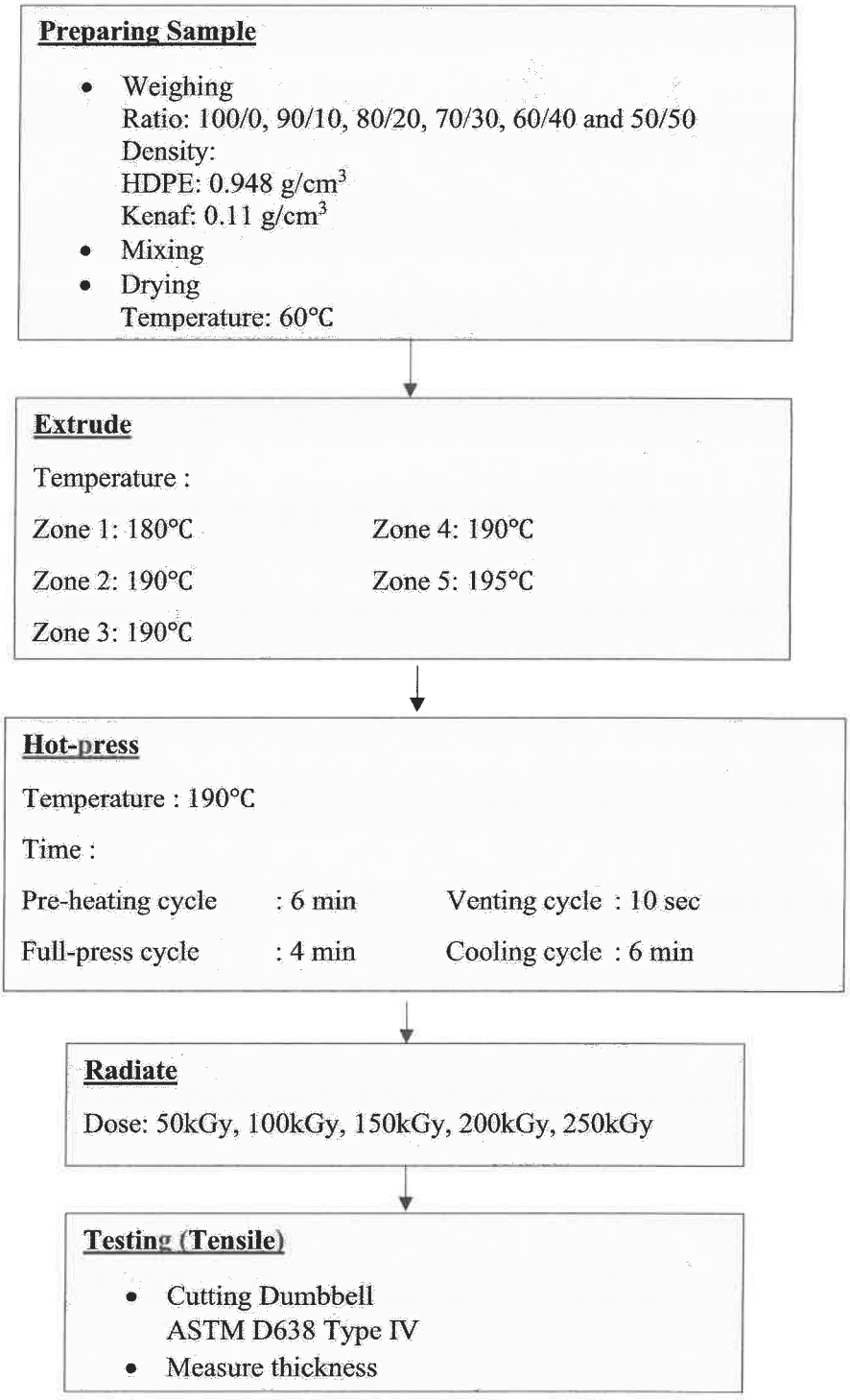
Objectives of this project:

i. To find elongation and tensile strength of HDPE and Kenaf
ii. To find elongation and tensile strength of HDPE and WTD

HDPE and Kenaf/ WTD had same methodology. The different between these material are data results and applications.

Tensile strength	:	The maximum weight per unit area pulled in the direction of length that a given substance can support without breaking is how resistance to longitudinal stress is measured. A crucial characteristic of materials that affects how well they work mechanically. It is a material's capacity to withstand tearing brought on by stress.
Elongation	:	The ratio of the length that has changed after the test specimen has broken to its original length is known as the fracture strain. It illustrates how natural plant fibre can withstand shape changes without developing cracks.

Methodology



Preparing Sample

- **Weighing**

Weighing is the big role during all this process because if we suddenly make a careless mistake, it will affect the final product. Before weighing the sample, I must do a calculation by using of density of material. My material was HDPE, and density of HDPE is 0.948 g/cm^3. Density of Kenaf is 0.11 g/cm^3. Next, I will calculate the material based on ratio that given by my supervisor which are 100/0, 90/10, 80/20, 70/30, 60/40 and 50/50. The 100 indicate pure HDPE and for 90/10, 90 specify for PE and 10 specify for Kenaf respectively. The others ratio calculated same explained as follows. As considering doing a mechanical testing which is tensile, the calculation must follow the volume plate of hot press. The volume plate of hot press is 15cm × 15cm × 0.3cm. Thus, the calculation will get a shape of plate. This is an example of calculation for ratio 90/10.

Figure 4.5 Weighing Balance

Ratio : 90/10

Volume hot press 1 film = 67.5 cm^3 Density of PE = 0.948 g/cm^3 Density of Kenaf = 0.11 g/cm^3

HDPE	Kenaf
Volume ratio = 67.5 cm^3 × 90/100 = 60.75 cm^3	Volume ratio = 67.5 cm^3 × 10/100 = 6.75 cm^3
Mass of PE = v × ρ = (60.75 cm^3) (0.948 g/cm^3) = 57.59 g	Mass of Kenaf = v × ρ = (6.75 cm^3) (0.11 g/cm^3) = 0.74 g
Total mass = Mass of PE + Mass of Kenaf = 57.59 g + 0.743 g = 58.33 g	
Mass for 1 kg:	
PE = 57.59g/58.33g × 1000 = 987.33g	Kenaf = 0.74g/58.33g × 1000 = 12.73
Total mass = 987.33 g + 12.73 g = 1000 g	
Mass for 2 kg:	
PE = 987.33 g × 2 = 1974.66 g	Kenaf = 12.73 g × 2 = 25.46 g
Total mass = 1974.66 g + 25.46 g = 2000 g	

Summary of Calculation

Ratio	Mass of PE (g)	Mass of Kenaf (g)	Total Mass (g)
90/10	987.33	12.73	2000
	1974.66	**25.46**	
80/20	971.81	28.19	2000
	1943.62	**56.38**	
70/30	952.57	47.43	2000
	1905.14	**94.86**	
60/40	928.20	71.80	2000
	1856.40	**143.60**	
50/50	896.02	103.98	2000
	1792.04	**207.96**	

Table 4.1 Summary Calculation of PE/Kenaf

**Bold numbers are for 2kg (PE/Kenaf)*

Ratio	Mass of PE (g)	Mass of WTD (g)	Total Mass (g)
90/10	963.85	36.15	2000
	1927.70	**72.30**	
80/20	922.18	77.82	2000
	1844.36	**155.64**	
70/30	873.61	126.39	2000
	1747.22	**252.78**	
60/40	816.29	183.71	2000
	1632.58	**367.42**	
50/50	747.66	252.34	2000
	1495.32	**504.68**	

Table 3.2 Summary Calculation of PE/WTD

**Bold numbers are for 2kg (PE/WTD)*

- **Mixing**

  These elements serve as reinforcements and raise the material's tensile strength. However, the number of potential material and property changes is significantly increased when chemically distinct types of polymers are combined in a melt mixing process to create a polymer blend. Materials can mix with each other.

- **Drying 24 hours (before/after)**

  Purpose: Polyesters must be dried to be ready for moulding. Polyesters and additional polycondensation polymers are capable of absorbing moisture from the atmosphere. In the absence of drying, moisture in the pellets will react with the molten polymer at processing temperatures, degrading its molecular weight. On top of that, Hygroscopic polymers must be dried before processing to get consistent production outcomes independent of changes in the ambient temperature and humidity conditions that may occur. This is because hygroscopic polymers attract and absorb water molecules from the atmosphere. The sample need to be drying 24 hours to prevent moisture. Thus, I need to fill in the form for drying. Primarily, I will dry overnight and over weekend.

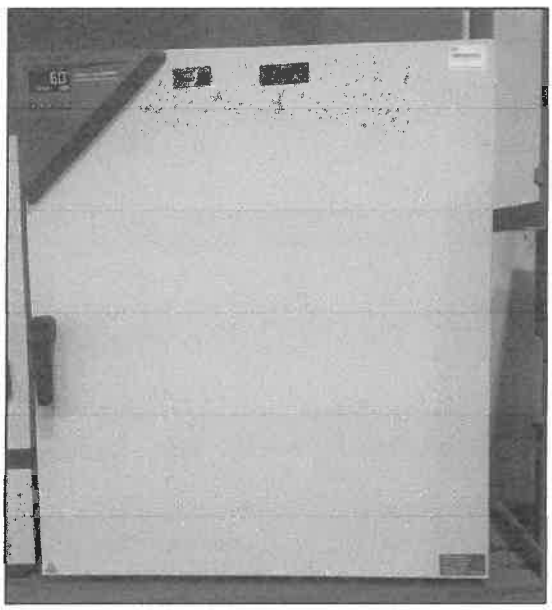


Figure 4.6 Industrial Oven

Extrude

- **Single screw extruder**

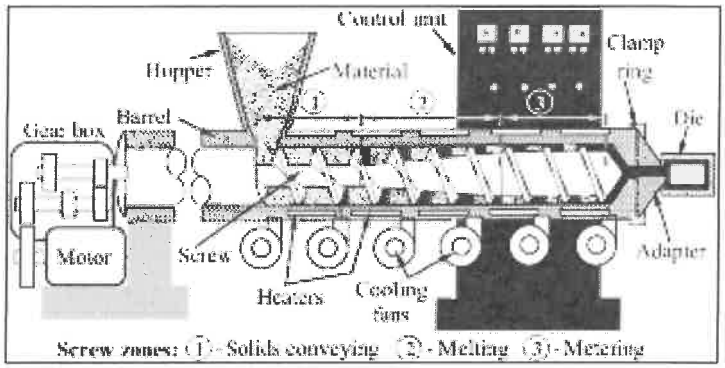


Figure 4.7 Single Screw Extruder Diagram Working Principle

General description:

Fan cooling zone : 4 zones

Zone of heating : 5 zones

Speed of screw : Max.150rpm

Operation:

First, turn on the water-cooling system built into the shell of feed inlet. Then switch on the heating elements in all heating zones, adjust the temperature control system so that the temperature of extruder increases at the rate of 50°C per hour. To heat the screw evenly, conduct hand turning for three minutes every one hour. The fan will start to work automatically. Pay attention to the rotation direction of the blower fan.

Starting extruder:

After one hour heat preservation, start the electric motor from zero to 5~6 rpm. During its idle run, observe the screw's direction of rotation. If the direction is wrong, stop the motor immediately and rewire. In the test run at a low speed, monitor if there any abnormal sound between the screw and barrel and inside the reduction box. The duration cannot exceed one minute. If not, add some resin (PP/PE) into the machine sporadically. Then, increase the resin until molten appears in the exit of the machine barrel. If feel the machine is in normal conditions, stop and clear the extruder. Equip the die head in the discharge end and restart to test run at full load. Be careful with the temperature and continuously add the resin and increase the speed rotation gradually

until molten appears in the die head. As for my project development, the temperature is 190°C by following the melting point of HDPE. Put sample in feed. Sample will be undergone heater barrel and come out with a long shape. Temperature must follow melting temperature of the material. Speed of machine around 30-50 rpm. A long shape must go through a water to reduce a hotness. After that, a long shape will be pellet by using pelletizer machine. Speed of a pelletizer machine need to be control manually (human control).

Zone 1	:	180°C
Zone 2	:	190°C
Zone 3	:	190°C
Zone 4	:	190°C
Zone heater	:	195°C

Figure 4.8 Pelletizer Machine

Hot-press

- **Hot-press**

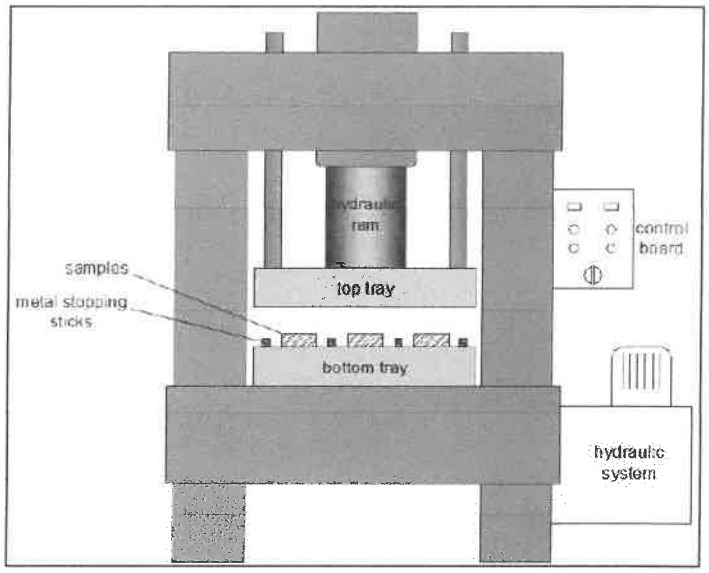


Figure 4.9 Working Princple of Hot-press

In the hot compression moulding process, the composite is initially placed in an exposed, heated tool. To drive the material into contact with all tool areas, the tool is closed, and pressure is applied. Heat and pressure are then maintained until the material has cured. The temperature controller and timer plays an essential role in this project development.

The initial phase in the compression moulding process is preheating and pressurising. The heated matching metal mould set is installed in a sizable hydraulic press, which is how the compression moulding system operates. The press is closed once the mould has been loaded with a pre-weighed charge of moulding compound. The material cures quickly under the pressure and temperature of the tool set. The temperature must follow melting point of the material. I must turn on the power supply before begin the experiment, or, to put it another way, test the connections in the circuit. The switch is then turned on, and the temperature controller is then set to the desired temperature. The heating plate is heated continuously as soon as the switch is turned on until the temperature reaches the pre-set temperature.

As for my project, by using HDPE the temperature was 190°C. Besides, the timer also affect the sample. The hot-press had four timer that need to be set which are preheating cycle, pressing, and venting cycle, full pressing cycle, and cooling cycle.

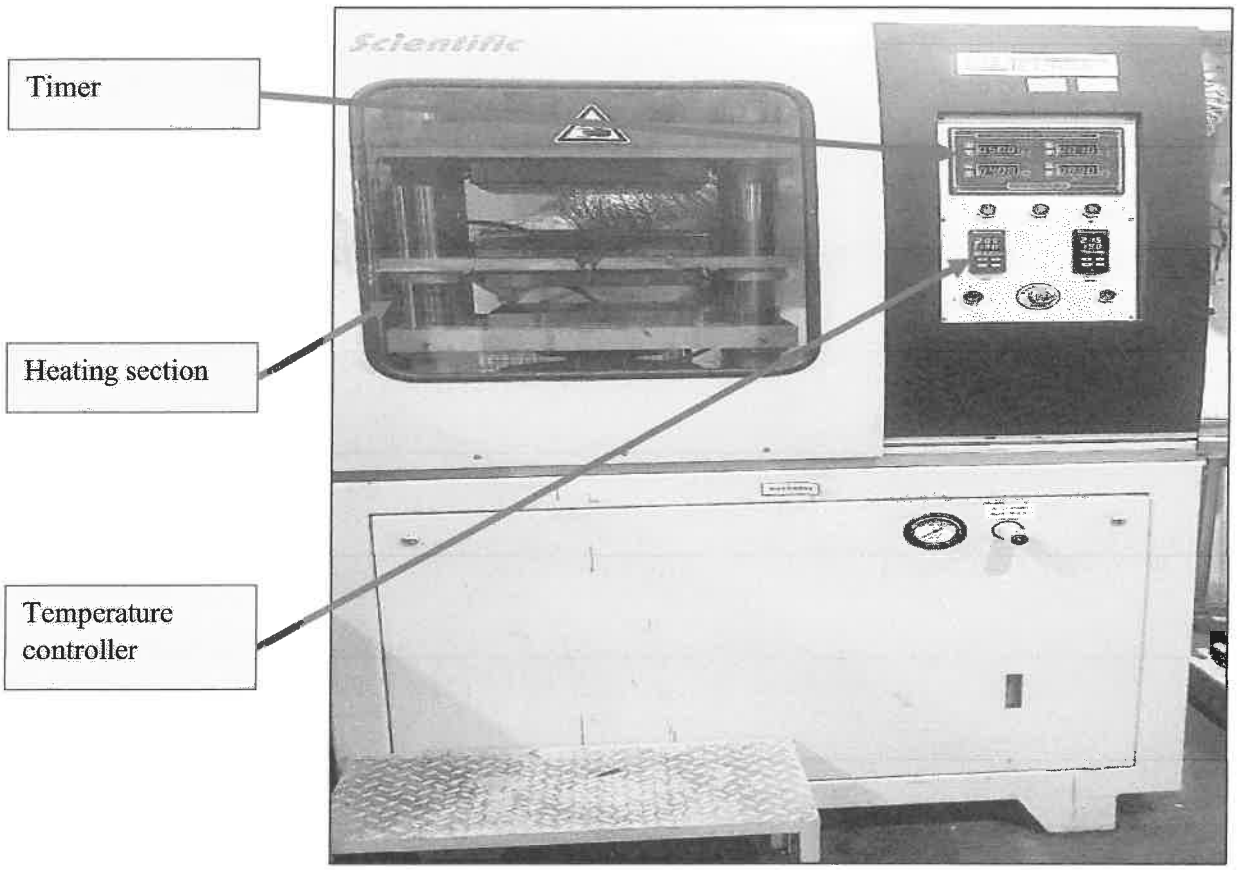


Figure 4.10 Hot-press machine

Temperature HDPE	: 190°C		
Timer	:		
Preheating cycle	: 6 min	Pressing and venting cycle	: 10 sec
Full pressing cycle	: 4 min	Cooling cycle	: 6 min

Put the pellet PE into the mould between the electrics boards and set up certain pressure and temperature. The volume of plate that was used 15cm × 15cm × 0.3cm. The sample will undergo heating cycle first by following the timer 6 min, 10 sec and 4 min. Then, the sample will go through cooling cycle for 6 min to cool down the sample before take it out. There are three plate that was used in this process. First plate is fully

metal which are 30cm × 30cm × 0.3cm and for the second plate is mould. Finally, the top was also a fully metal same as first plate. The between first plate with mould plate, I will put mylar film as a cover to the sample. The purpose of mylar film is to prevent the sample get attached to metal. Next, the second reason was the sample will be easy to remove from the mould. On top of that, as a safety procedure, I need to use a pair a glove when handling the hot-press because the temperature was very high and it quite dangerous, worst-case scenario might will get first degree burn.

However, if the sample was not followed standard testing, I need to redo the process which mean the sample need to cut and undergone the heating cycle. Yet, the sample allowed to experience under thermal two times only by reason of mechanical strength of the sample. If run a sample more than two time, it will make the sample wrecking and give inaccurate results for tensile testing.

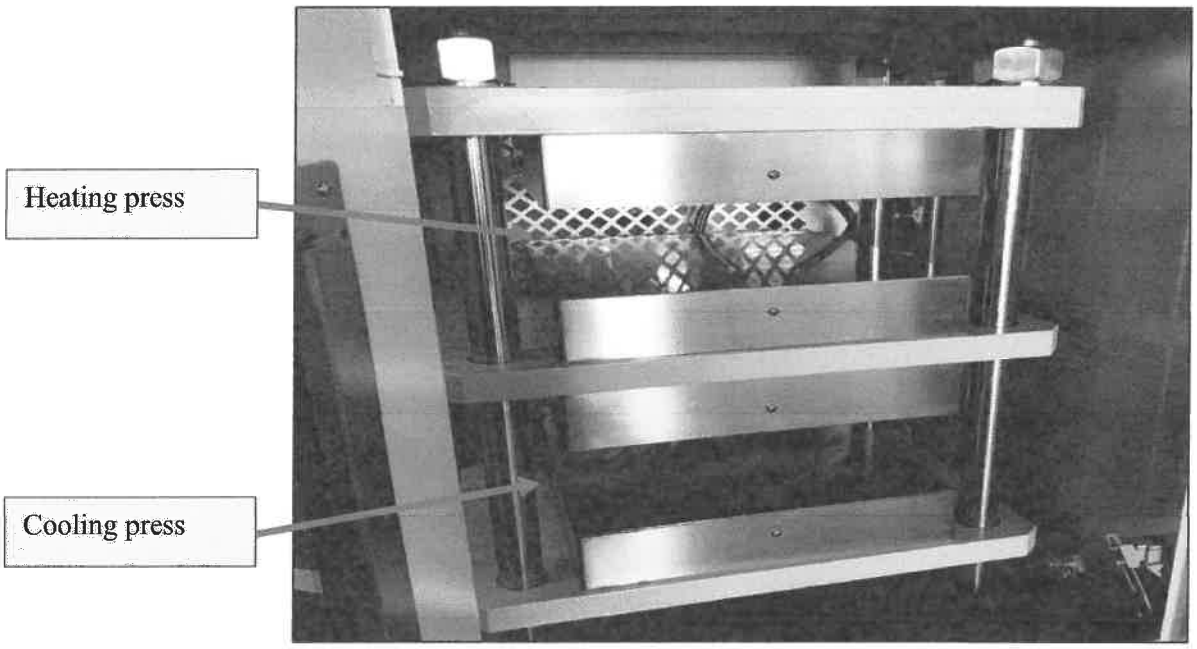


Figure 4.11 Hot compression moulding machine with heating press system

Radiate

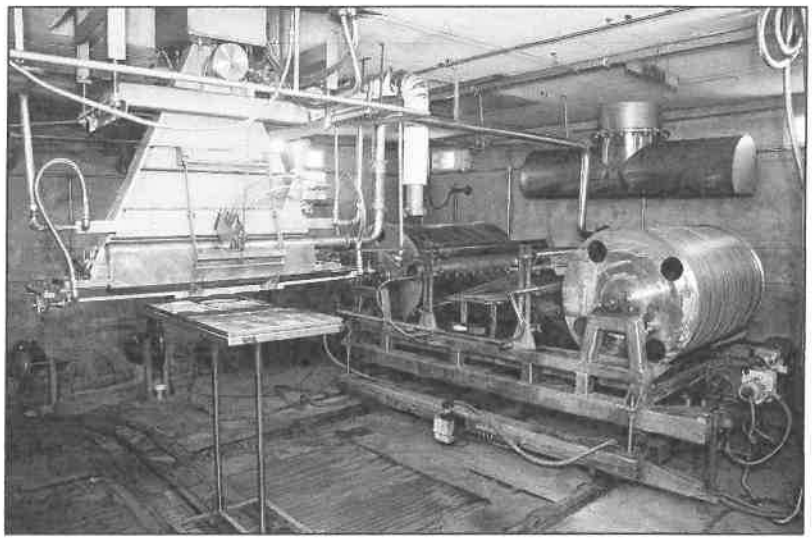


Figure 4.12 Electron Beam

After the sample had undergone the hot-press process, the next step was radiate at Alurtron. The Alurtron, an ISO 9001:2000 certified plant is an electron beam processing facility comprising an electron beam machine (accelerator) and product handling system. It provides fast irradiation processing with a high efficiency, high uniformity, and good control. The electrons generated are directed towards the target material to impart cross linking, degradation, sterilisation, grafting and others. Irradiation is controlled by regulating the irradiation time and achieved evenly over wide areas of materials. The process is carried out at room temperature and afford high throughput.

My samples were radiate at dose 50kGy, 100 kGy, 150 kGy, 200 kGy and 250 kGy. The one sample is 0 kGy as control for each ratio. The sample will be monitored by huge computer and the entire procedure can be completed in a matter of minutes since e-beam irradiation can penetrate a variety of materials and provide the necessary irradiating dose in only a few seconds.

A product is attacked with high-energy electrons during the electron beam process, which causes a cascade of these electrons to go through the target material. High-energy electrons are used in the E-beam technique as its radiation source. An accelerator is used to accelerate the electrons, which are created by regular electrical current, to speeds that are very close to the speed of light. The electrons are concentrated onto a scan horn with a predetermined size, which is then scanned in a sweeping manner

to produce an electron curtain. The item is then moved past the scan curtain at a slow, precisely regulated pace. The actual procedure is done behind a radiation shield, which is normally a sizable concrete building that keeps radiation inside the cell.

Two electron beam machines are in the Electron Beam Irradiation Service Centre ALURTRON: a high energy 3.0 MeV machine (EPS-3000) and a low energy 200 keV machine (Curetron). Each machine has a variety of product distribution methods, and dosimetry and polymer testing are supported by QA/QC labs. The EPS-3000 machine is frequently used in commercial lighting to cross-link wire and cable insulation, heat-shrink tubes, polymer materials, and pharmaceutical products like gloves, syringes, and non-set dressing. It is also utilised for flue gas treatment, wastewater treatment, and industrial sewage treatment.

Testing (Tensile)

Pre-work before tensile:

- **Cutting dumbbell shape** by using standard ASTM D638 type IV
  make sure gauge length clean and sharp

Figure 4.13 Cutter Dumbbell

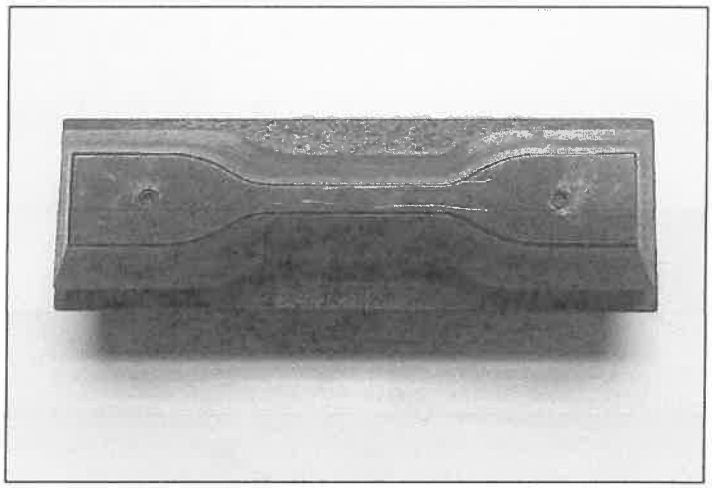


Figure 4.14 Dumbbell shape ASTM D638 Type IV

These dumbbell die cut purposely used for preparation of the standard tensile test by punch the sample before performing tensile by using universal testing machine. Thickness of sample must less than 7mm and material that applicable are rubber, polymer, fiber and so forth. There are optional accessories that necessary in this step which are cutting board and small tool instruments.

These instrument was easy to use since it just cutting the dumbbell shape. Most importantly, make sure area of gauge length get a clean and sharp cut. Gauge length play a critical part in this process because it affect to get the good reading of tensile. As for my sample, the minimum for dumbbell shape is at least five and above. Nevertheless, I need to cut seven of dumbbell shape as a backup if the others sample destroyed or get crack.

- **Measure thickness**

Measure the width and thickness of each specimen by using vernier calliper. For all other specimens, I need to measure the actual width of the centre portion of the specimen.

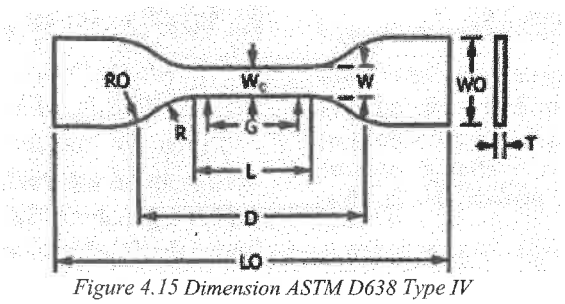


Figure 4.15 Dimension ASTM D638 Type IV

Specimen Dimension for Thickness, T, mm (Type IV)

W- Width of narrow section	: 6	G- Gage Length	: 25
L- Length of narrow section	: 33	D- Distance between grips	: 65
WO – Width Overall	: 19	R- Radius of fillet	: 14
LO- Length Overall	: 115	RO- Outer Radius	: 25

- Mechanical testing tensile

Tensile is test process that provides information about the tensile strength, elongation, and modulus. It measure the force required to break a composite or plastic specimen and extent to which the specimen stretches or elongates to that breaking point. I used Shidmadzu Tensile Testing Machine. The Type IV specimen used for testing non-rigid plastic with a thickness of 4 mm or less. As for speed testing, 50 mm/min since I used non-rigid classification.

Procedure:

1. Place the specimen in the grips of the testing machine, taking care to align the long axis of the specimen and the grips with an imaginary line joining the points of attachment of the grips to the machine. Tighten the grips evenly and firmly to the degree necessary to prevent slippage of the specimen during the test, but not to the point where the specimen would be crushed.
2. Set the speed testing at the proper rate (50 mm/min) and start the machine.
3. Record the load extension curve of specimen.
4. Record the load and extension at the yield point.

Here is the information that I need to fill in the software :

Test mode	: Single
Capacity	: 20kN
Test speed	: 50mm/min
Shape	: Plate
Quantity/Batch	: 7

Shimadzu Tensile Testing Machine was connected with software that called Trapezium. Here, is the step on how to start-up the software.

Figure 4.16 Front Page of Trapezium

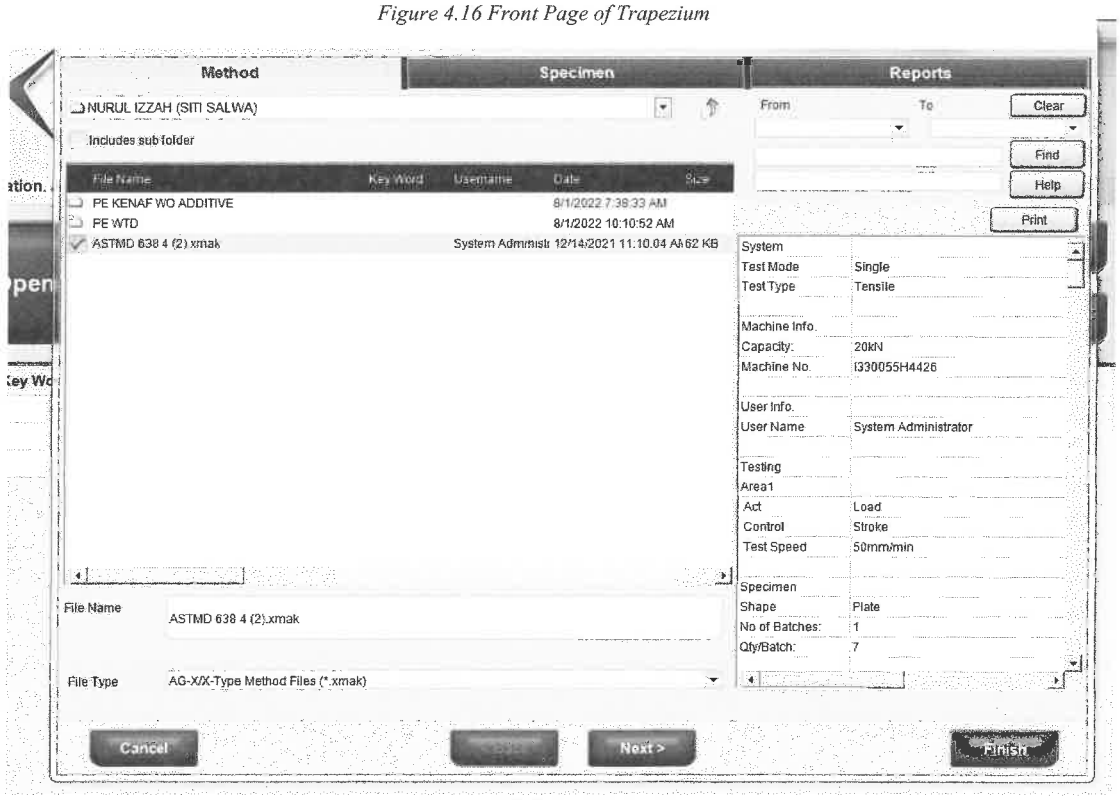


Figure 4.17 Select File for Testing

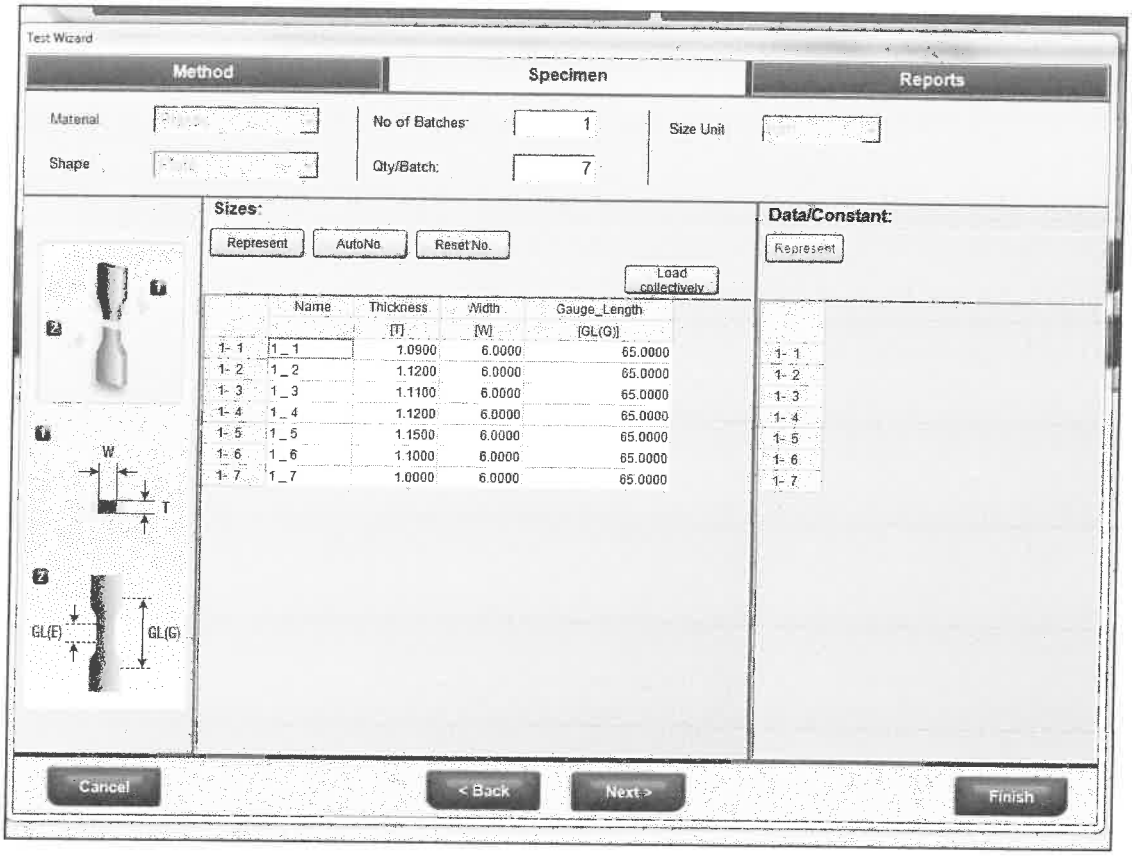


Figure 4.18 Insert Thickness, Width and Gauge Length

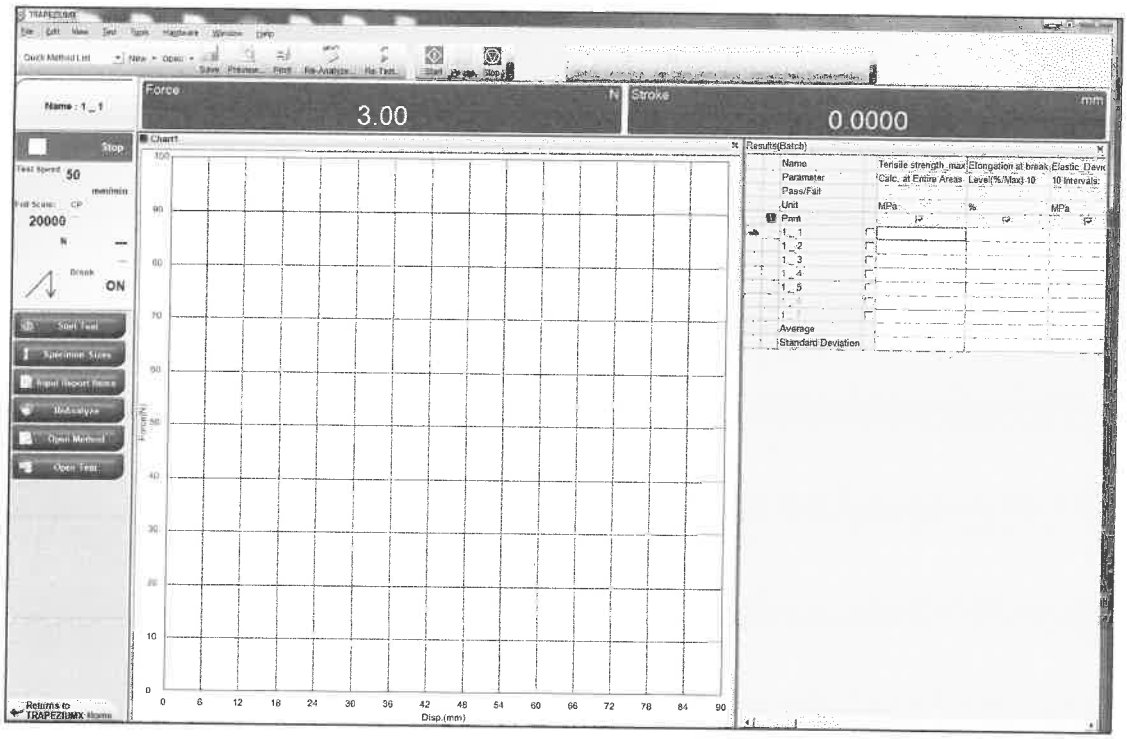
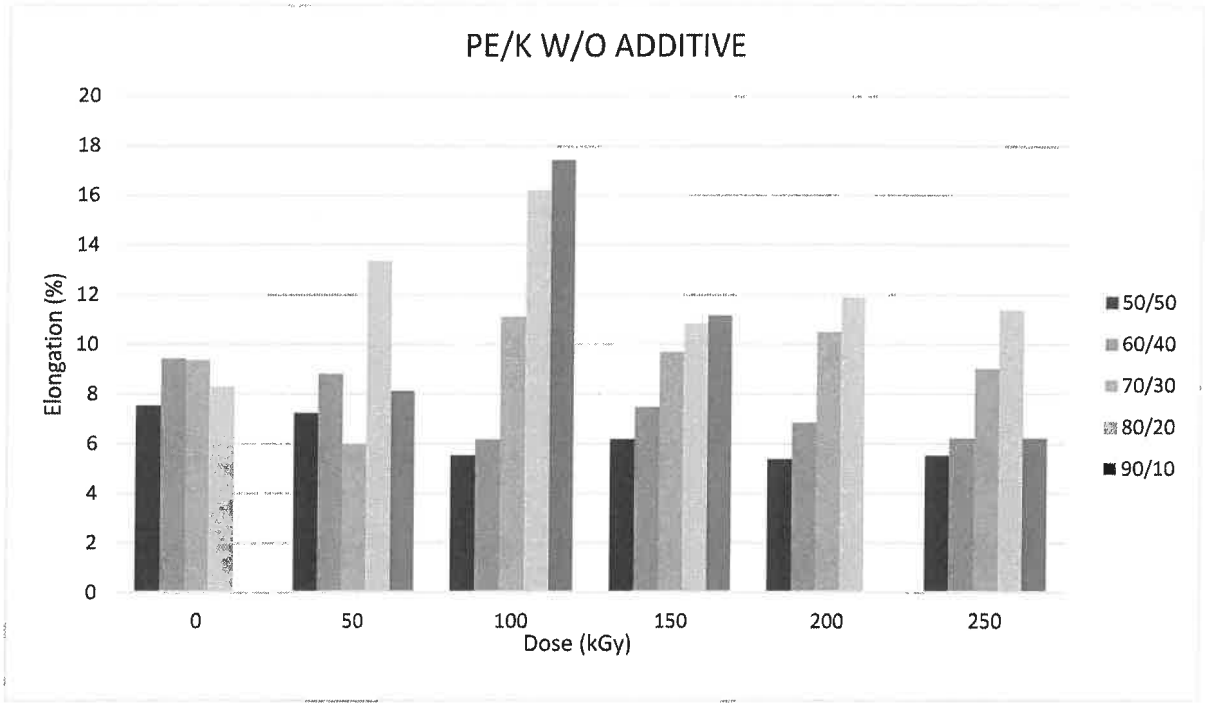


Figure 4.19 Graph Results

ELONGATION

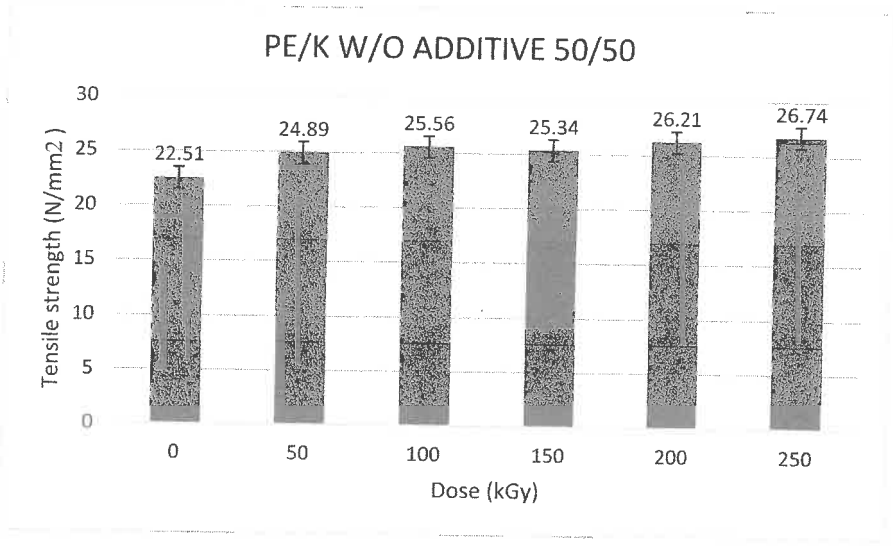


	0	50	100	150	200	250
50/50	7.52	7.23	5.53	6.18	5.37	5.51
60/40	9.43	8.82	6.17	7.48	6.85	6.21
70/30	9.38	5.98	11.12	9.71	10.51	9.03
80/20	8.32	13.38	16.23	10.86	11.91	11.38
90/10	0	8.11	17.42	11.16	0	6.21

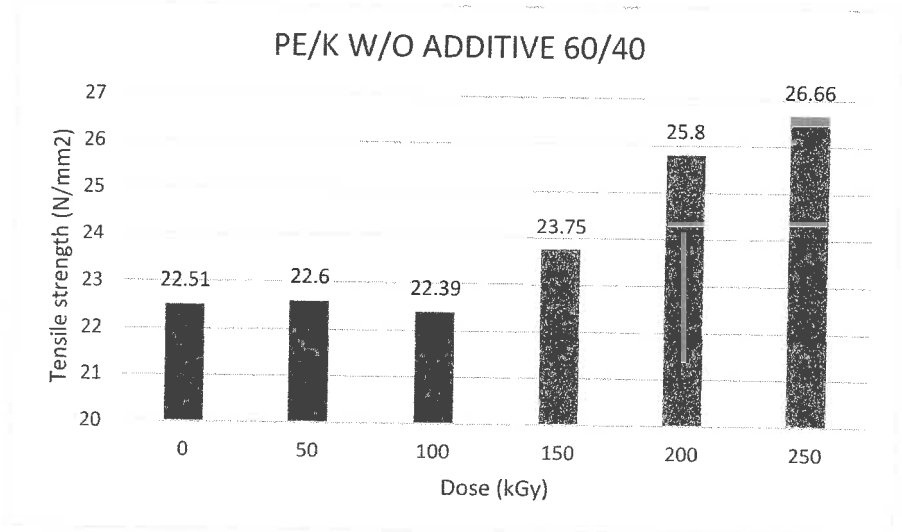
Result

Tensile Strength

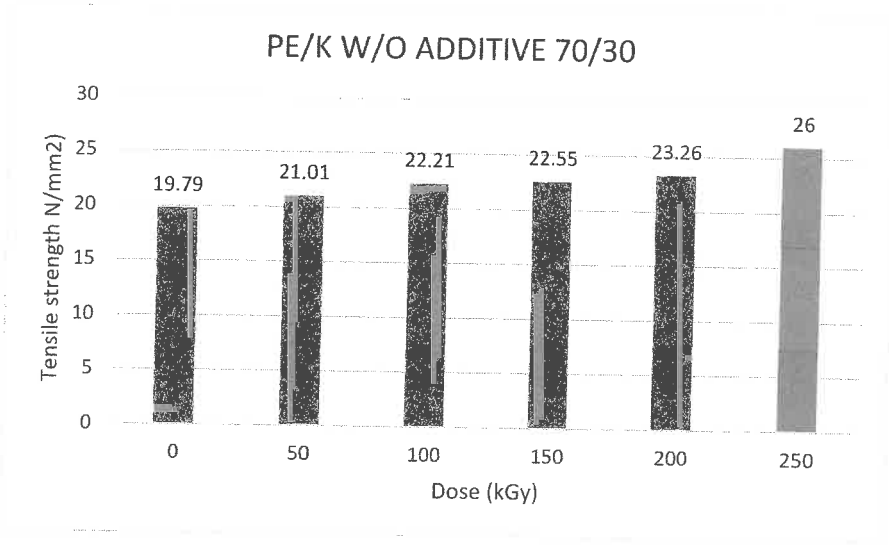
- PE/K Without Additive 50/50



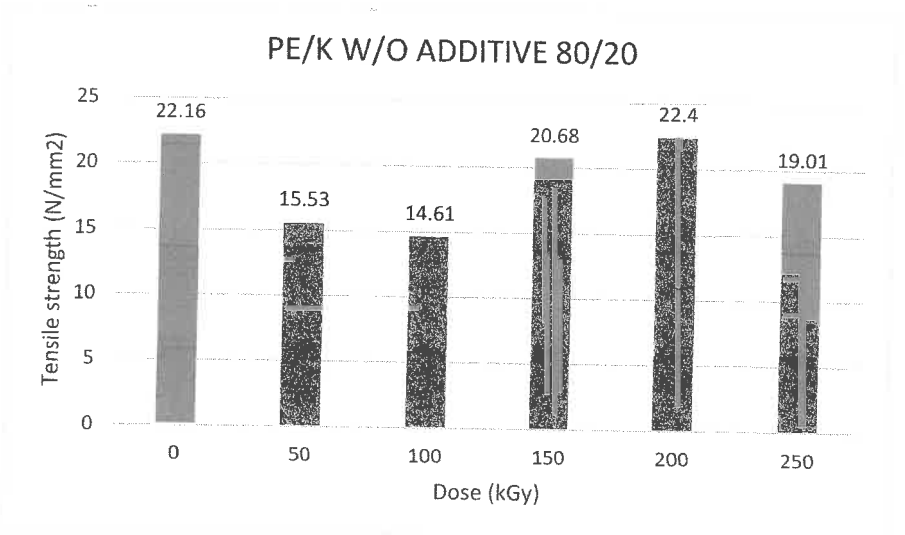
- PE/K Without Additive 60/40



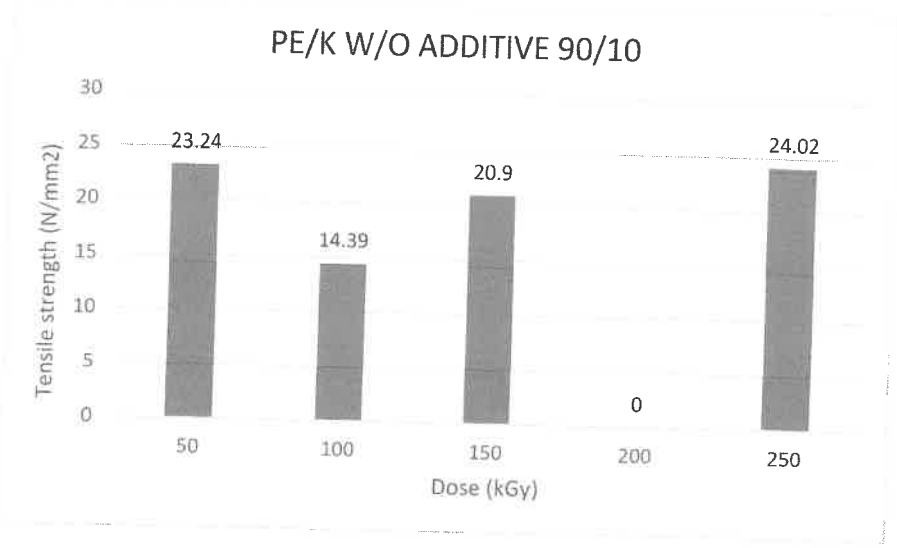
- PE/K Without Additive 70/30



- PE/K Without Additive 80/20

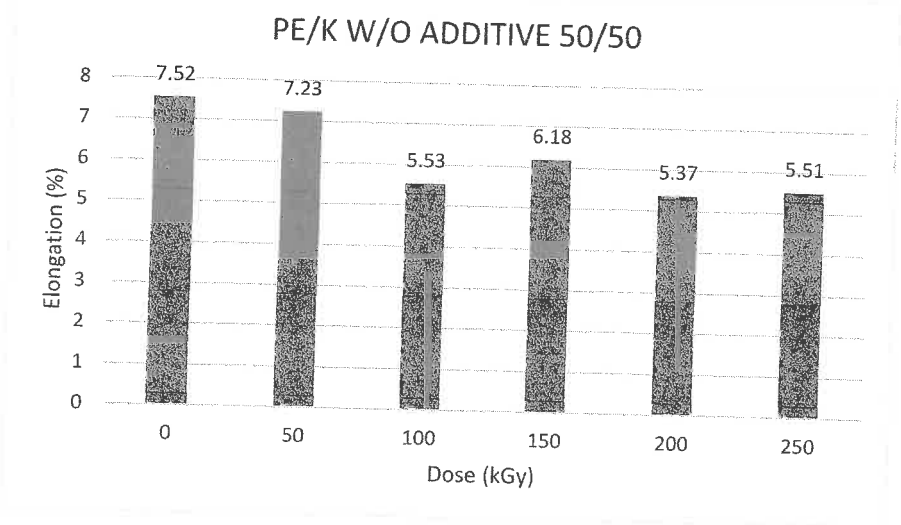


- PE/K Without Additive 90/10

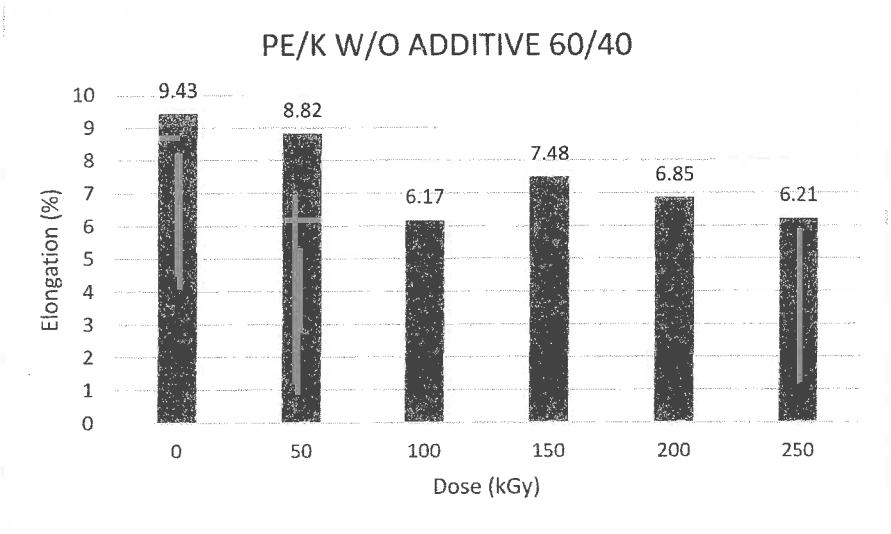


Elongation

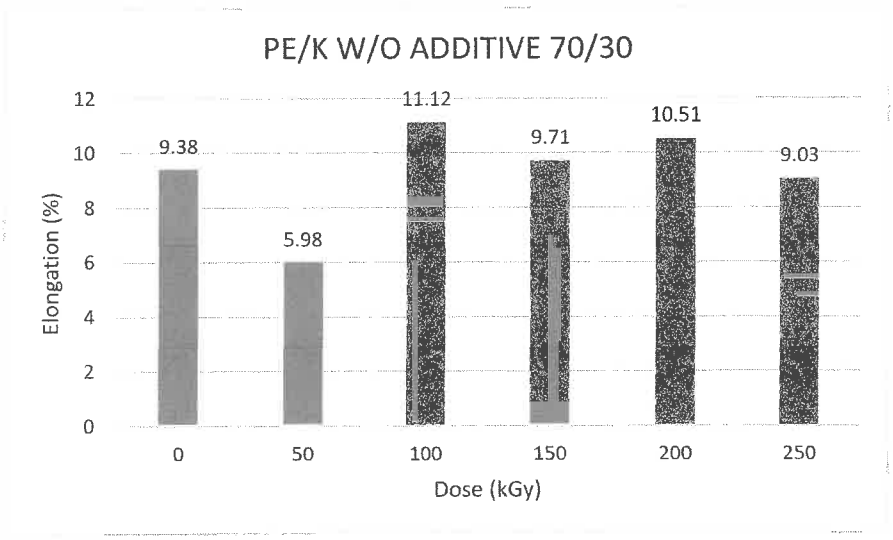
- PE/K Without Additive 50/50



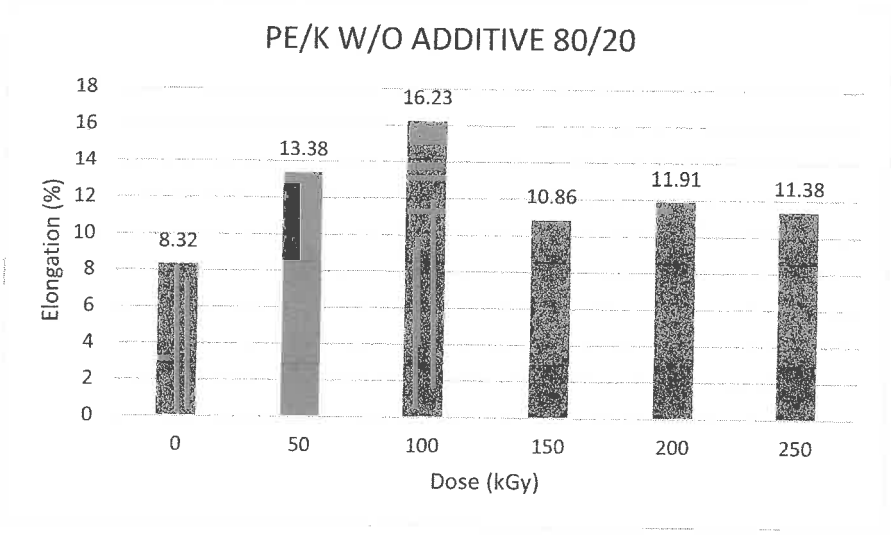
- PE/K Without Additive 60/40



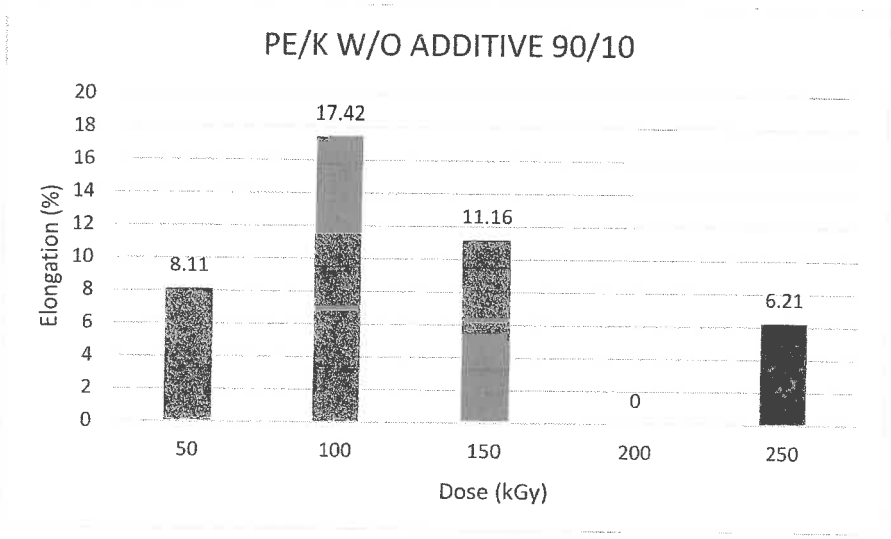
- PE/K Without Additive 70/30



- PE/K Without Additive 80/20



- PE/K Without Additive 90/10



Conclusion from the data:

Tensile strength	:	When value of tensile strength increase, the material have high content of fiber
Elongation	:	When value of elongation decrease, the material have low flexibility due to high content of fiber

4.3 Problem encountered and approached adopted for solving problems

During the internship, there can be some issues and challenges that demand awareness, the capacity to identify them, and the capacity to address them. The intern is at the very bottom of the food chain in the working world. Some difficulties are, in a sense, built into the internship or result from conflicts between the requirements and expectations of the trainee and the everyday tasks of the internship base:

Problems	Solutions
Dealing with senior staff. Frequently, most of the staff had occupied schedule. All the machines must be supervised by person in charge to prevent any accident that might be happened during operation of the machines. Every machines had their own procedure that I need to comply. Certain machine had complicated method and approach. In a basic manner, I learn use single screw machine first. This machines does not have any difficult procedure, but I need pay attention in a detail to the temperature. By reason of that, the machines need to follow melting point of material. If temperature set up below the melting point, it will affect the screw and may cause damage or destruction of the screw. Thus, advice and teaching from the staff is necessary for me as a student intern.	Arrange a suitable time to fit in their schedule in order to ask a guidance from them. Besides, I also make an appointment with the staff to learning the machines. Take note every single of importance part of the machines. If the machines had small problem, there is a way to approach and fix it. Furthermore, the staff also advise that do not panic if encounter any problem. Just follow the emergency procedure to solve the trouble. In case, the difficulty beyond the proficiency, just reach out the help from the staff.
The machines need to start up early due to the life expectancy and longevity of machine. For example, hot-press machine. Hydraulic of the machine not functioning very well and it take time to rise and operates. The machine need at least 2~3 hours to run normally. If machine start at late ,as a consequence I cannot run many sample because one sample take 20 minute. Hence, only three sample in one hour.	Come early in the morning to start up the machine. Usually, if the machine start at 7.30 am, the machines can operate at 9.30 am. In the meantime, I need to prepare item to use in hot-press. For instance, cutting my lar film and weighing the material. On the other hand, clean up the mold plate to avoid previous sample affect new sample.

Insufficient space for drying. Drying is the key in this project. If the sample, not fully drying it will affect at result. The tray had to overlap on each other to accelerate the drying process. The reason plastics must be dried is because they contain moisture and if this moisture is not dried off, it may affect the quality of the finished product. Hygroscopic polymers must be dried before processing in order to get consistent production results independent of fluctuations in the ambient temperature and humidity conditions that occur throughout the year. This is because hygroscopic polymers attract and absorb water molecules from the atmosphere.	As for the solution, I used oven at another block specifically at block 42. Block 42 have a large oven and have an ample capacity to dry the sample. In short, the oven can dry the sample instantly.
Inadequate of tray. The material need to be dry before and after extrude. This is because to reduce the moisture content in the sample. In the previous chapter, I had mentioned that every ratio needed to be done two kg for each sample. Therefore, it require a lot of tray to put the sample.	To resolve the issue, I purchase more tray to place the sample. So, it will be much easier for me to handle the sample after extrude.
Lack of storage. After drying, proper storage is vital to preserves the sample's quality and natural worth. Improper material storage can lead to mess which are bacterial growth and can loss the quality of the sample. Since the sample is similar to baked dough and edible, pest usually attracted to eat, and this will destroy the sample.	Proper storage solutions guarantee a tidy and trouble-free environment. So, I purchase container that had hard cover to maintain the condition and nature of sample. Moreover, the container can prevent the pest to come in.
There are a few common mistake that happen during the process of hot press. First, bubble. The reason why bubble appear in the sample because the sample was not dry properly and had insufficient time during drying procedure. Second problem is blister. Blister appear when the sample also does not sufficient time in cooling.	The solution for this issue is the sample require 24 hours drying, thus I need to fill in the form as permission to use oven for 24 hour. For second matter, I need to increase the cooling time from four minute to six minute. The sample come out fine without any blister.

4.4 Professional and ethical issues

Professionalism in the workplace entails how I conduct myself, how I behave, and how I interact with others. Being professional can help make a good first impression, foster fruitful relationships with others, and build a solid reputation within my company and sector. Etiquette generally emphasises respect. It's crucial to be considerate in an office setting when it comes to your relationships, respecting other people's time, and maintaining your workspace.

Workplace etiquette is crucial since it guarantees that your presence won't interfere with anyone else's ability to perform their job. Professionalism is the behaviour of oneself with responsibility, integrity, accountability, and excellence rather than the wearing of a suit or carrying of a briefcase. It entails having proper and effective communication as well as constantly looking for methods to be productive.

Besides, workplace ethics are a set of moral norms, beliefs, and obligations that both employers and employees must uphold. All employees at the workplace are required to abide by this set of guidelines. Following corporate policies, communicating effectively, accepting responsibility, being accountable, being professional, and having mutual respect for your co-workers at work are all examples of ethical workplace behaviour. These example of ethical behaviour that I apply during my internship.

- **Communicate Effectively**. When addressing problems at work, effective communication is crucial to preventing misconceptions. Effective communication can mean different things to different individuals at different times. In my case, if I confront with the problem, I will refer someone who are expert in handling the machine. The soft skill is needed in the situation because I need to explain the difficulty to the staff. If I just sit around and keep silently, it will affect the reputation of my work.

- **Obey the Company's Rule and Regulation.** Companies may require the employee and internship student to sign a number of documents, including the corporate rules and regulation agreement form, at the beginning of an employee contract. As for my company, student intern need to dress up properly by following the employees dress code. Other than that, I also fill in the form and book the machine early if I want to use it. That is rule that I need to comply during my project. Besides, even this company have flexibility time in working hours, I need to come punctually on the time to nurture high discipline at the workplace.

4.3 Health, environmentally and sustainable aspects

Due to their importance in protecting people's lives and property, especially in high-risk industrial sectors, health, safety, and the environment are seen as top priorities. To reduce the danger of catastrophic incidents, it is crucial to create and implement an efficient workplace health and safety management system.

- **Safety**

  Proper uniform. When handling the chemical or hazardous substances proper personal protective equipment (PPE) require as a safety for the person. For example, I conduct the sample by using hot-press machine. The mould plate is hot since the material follow the melting temperature. Therefore, I wear a pair of gloves to take out the sample. Also, I will make sure to dress up appropriately to prevent any accident that might be occurred.

- **Health**

  In terms of Health, my workplace expose with dust environment. I need to wear double mask or industry mask N95 to protect risk at work. People with allergies, asthma, and other respiratory conditions will be negatively impacted by dust and airborne particles because they can irritate their upper respiratory systems.

- **Environment**

  Waste Disposal Container. As in my workplace suitable containers for the collection of waste are offered. Each container makes it very obvious what kind of garbage it is intended to hold. Only those containers that have been designated for waste must be filled with waste. Containers must be strong enough to stop waste from escaping. Regular waste container emptying, and removal are performed by authorised personnel. All personnel are responsible for making sure that waste is disposed of in containers that have been set aside just for that purpose, keeping in mind any segregation guidelines. A manager must be informed if a suitable container is unavailable so that they can make the necessary arrangements. I was informed by staff that avoid overfilling trash cans. When more resources are anticipated to be needed, alert a responsible person.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

For me, the industrial training was a life-changing experience that was absolutely necessary for one's personal growth. The six months I spent there were excellently displayed full disclosure of the industry. Being able to take part in numerous projects and brainstorming sessions had greatly increased my exposure to the realities of working in the chemical engineering sector. Being exposed to reality also helped me understand how crucial it is for today's young to be knowledgeable and well-equipped to take over the sector in the not-too-distant future. Our generation would soon assume responsibility for upholding the benefits we currently enjoy and enhancing every facet of the world as we know it. Therefore, in order to avoid wasting the chance, students should make the most of the instruction. Other than that, students may now understand engineering concepts realistically rather than just theoretically as they were taught in school.

To cut to the chase, having a conceptual understanding of things alone would not be sufficient because the working world is entirely hands-on. Therefore, it is essential that all students get the opportunity to experience the working world in order to better equip them for the future. It is also important to keep in mind that the workplace environment and how it operates cannot be taught or studied in a traditional classroom setting. Direct participation is necessary for understanding. To sum up, it is advantageous for both students and businesses to support training programmes since it ensures that potential employees have at least some industry experience. Companies and students both benefit from working together, thus supporting one another should be promoted.

I do recommend Agency Nuclear Malaysia for other students as they provide the best internship programme. This is because student able to learn and gain more knowledge either in engineering knowledge or other knowledge such as lab work knowledge and handling the machines. I was pleased to have the opportunity to work with machinery in relation to chemical engineering, and I quickly used the safety knowledge I had acquired on campus while in part one. Since the company's major is not chemical engineering but still contains aspects of this course, it makes me understand how this opportunity has helped me see the chemical engineering career path.

5.2 Suggestions and Recommendations

To the organization:

- The company should increase and ensure more supervision over the employees in order to function efficiently and also eliminate workers who relax, work lazily, and perform actively after seeing their superiors. Serious supervision to the workers and students.
- More opportunities for students to work as interns in their organisation; The intern would also advise the organisation to keep placing as many students as possible in internships because some students lose this opportunity, which is also a crucial requirement of the university, because they didn't receive placements.
- The machines should service annually because failures in the machinery could go unnoticed and result in harm, or worse, death. Any systemic issues will be revealed by routine equipment maintenance, allowing for repairs to be made.

To the university:

- Ensure that students are placed in internships. In order to ease their training periods and also avoid the pain experienced by students in search of internship placements, the university should assist students in securing internship positions in accordance with their respective programmes pursued at the university by providing recommendations to students.
- Should continue with internship programme since it aids in preparing students for future employment and gives them a chance to put the theoretical knowledge they have learned in class into reality. Additionally, it aids in the development of students' understanding of professional ethics, job requirements, obligations, and opportunities.
- Constant monitoring of the students, The intern advises the institution to continuously supervise and monitor students during the internship programme to motivate them to do their tasks completely and correctly. Additionally, it will provide a strong connection between the academic and field supervisors, enabling accurate evaluation of the interns' work in the field.

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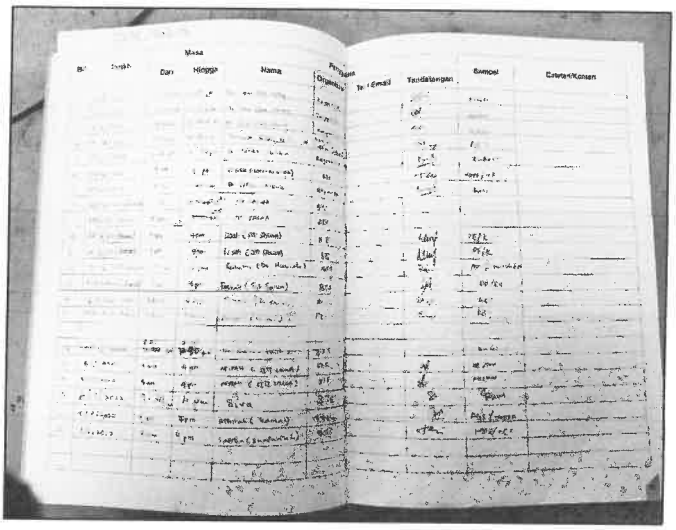
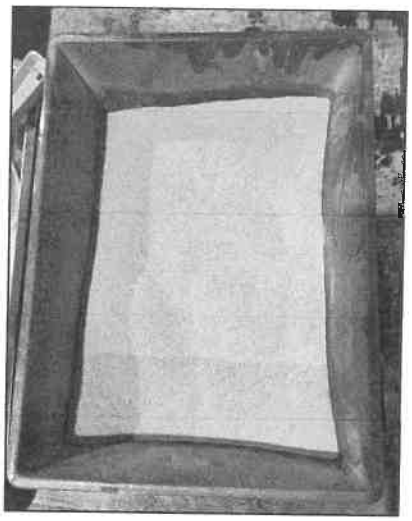
APPENDIX



Logbook Machine



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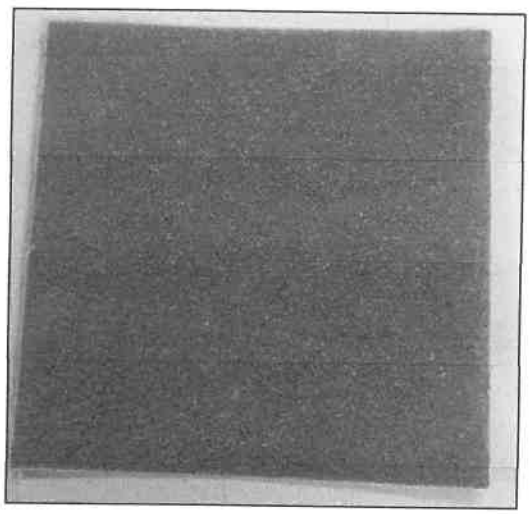
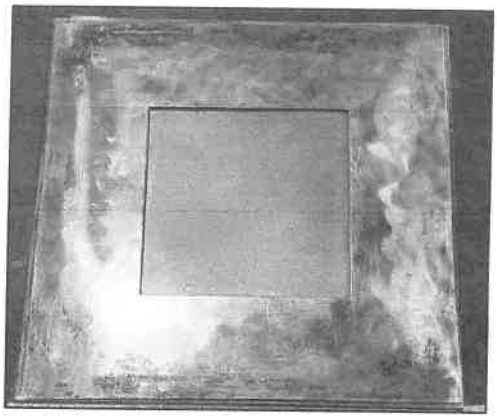
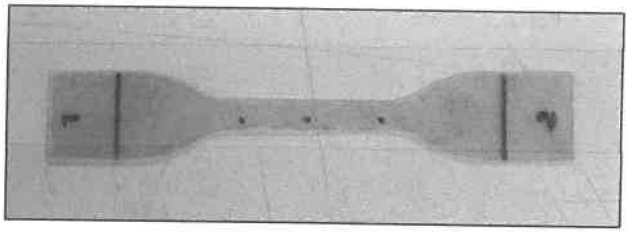
WTD



Hot-press sample



Hot press plate



Dumbbell Shape

Dumbbell Cutter

Tensile Testing