

ENGINEERING INDUSTRIAL TRAINING
AT
AC MECA (M) SDN. BHD.

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ABSTRACT

Industrial training (SKMM 3915) is a compulsory 5 credit subject required for the student of Universiti Teknologi Malaysia to be taken in order to graduate. The main objectives of internship are to expose students to the actual working environment, apply the skills gained throughout academic years, enhance knowledge and abilities at companies that they are attached to, assists the companies handling any related job and allow UTM to identify current needs of the industries thus improve weakness discovered. This report is divided into two sections which are economic part and technical part. The economic part contains company profile, the history of the company, and the sub-division structure of the company. In the second part of the report which is technical part, consists of the function of the students during the industrial training along with different activities of the students. This include the project through the training. From this I be able to utilize the knowledge that I have been learn in the class and get some the new knowledge which is so important to adapt for our preparation to face the real working life experience.

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CHAPTER 1

INTRODUCTION

1.1 Introduction to the Industrial Training

1.1.1 Background

It is compulsory for all undergraduate students from Faculty of Mechanical Engineering to attend the Engineering Industrial Training for about twelve (12) weeks to graduate from the University. This is to achieve the university's objective in producing a well-rounded graduate that technically competent as well as possess other traits such as critical thinking, communication and other skills. Also to enable students to engage or expose directly in real work scenario in company and try to build up a character and mindset as a problem solver in certain ways of how to tackle issue, how to make a firm decision based on all possibilities, how to communicate with customer and staff and all the aspects that make a person becoming a good problem solver and good decision maker.

Throughout the 3 months training period, students are given tasks or project to keep them occupied and from the training it will utilize their problem solving skills and team working skills which ensure the execution of the project and task undergoes smoothly.

Industrial training is a very important program that it had been made as a mandatory program by the Ministry of Education to all students in higher learning institution in Malaysia. This is because of the industrial training program can provide early exposure to students about the true nature of working life especially from the aspect of knowledge applications learned during the class

sessions. Student will be more proactive in what they do and be more matured in what they stand in the future.

1.2 Objective of Industrial Training

The objectives of the industrial training are:

- 1) Provide the students an opportunity to experience the real-life working experience of their respective course or field.
- 2) Produce a well-rounded graduate that technically competent as well as possess other traits such as critical thinking, communication and other skills.
- 3) Built a team working spirit.
- 4) Develop skills in work ethics and improve possible chances to sell themselves to the market.
- 5) Increase academic knowledge to the current existing engineering practice as well as awareness on the current technologies.
- 6) Train students to prepare technical reports related to the Industrial Training conducted.

1.3 Scope of Industrial Training

The scope of industrial training in AC Meca (M) include the general knowledge on function operation procedure for CNC router. General function how to link machine with programming, introduction machine zero point home position and work piece zero point and the understanding. Moreover, process planning for machining part sample also Ucam V11 software programming knowledge on 2D and 3D CAD and video tutorial on CAD function. Plus the students need to explore programming function and show sample making with CNC machine and software. The most important is to know the machine ability and limitation. In the end, students are able to draw the design, prototype making and machining and assemble. All of that are to improve ability in solving problems, working efficiently, confident, innovative, creative, and perform a given task perfectly during training.

1.4 Summary of Industrial Training

During these 12 weeks of industrial training started from 20th July 2020 until 9th October 2020 under AC MECA (M) Sdn. Bhd. had offered me very great experiences and knowledge about real world job related to my course of study which is Mechanical Engineering. They exposed to me for a actual sample product fabrication and process planning with CNC router machine, Ucam V11 software, factory equipment and tooling. Through the process, I may be able to perform from a fresh new beginner to a technical person to manipulate and understanding the process flow of a product design, practice to judge and analysis the best process, base on the actual machine, software and tooling limitation and ability to suit the product.

There are overall of three (3) main project and also several task from the manager, supervisor and manager. For the first project, the main purpose to know how far and how much knowledge I have learn in two weeks in company. So the product base on the three simulation which are profile machining, area clearance and 3D corner engraving. I did three time of practices and the last one I obtain the better result. For the first time, the product is totally broken due to some reasons. And one of the reason is the material, MDF board are expand due to the surrounding. The another reason is because of the wrong technique of simulation. Suitable technique suppose id a profile machining.

Second project is the best since the industrial training. I got to learn a very valuable experience that I was sure I cannot get from the other company. This time I was assigned to finish 3 out five product. The products are grill panel, turtle and sofa. Those three product are just prototype not the real product. The size also suitable for the presentation to the clients. Just nice I can complete the product within three weeks only with finishing. Process that require a lot time to finish the product is finishing. That because I have a lot layer that need to be clean up the surface. Especially for the turtle and sofa. Turtle have overall of 12 layers while sofa have 29 layers in total. Besides, I need to create the spacer for

the sofa. The technique also different from what I have done before. Not forget the grill panel which I need to the 3 grill panel at once.

Last but not least, for the last project is an individual project where I need to brainstorm own ideas. The theme still about traditional game or souvenir. As manager have mention Congkak before during first meeting, so I did try to find a very unique Congkak using a technique of layering. Finally I decide to make a banana leaf type of Congkak. Besides, I was assigned to do another product which is butterfly. The technique also using a technique of layering. Luckily, I have done my project a day before I finish my industrial training.

CHAPTER 2

BACKGROUND OF INDUSTRIAL/ORGANIZATIONAL

2.1 General Overview



Figure 1 : Company's logo

AC MECA (M) Sdn. Bhd. established in the year 2002 as engineering and trading company, they have developed a new computer numerical control (CNC) system for plasma cutting machine. Its outstanding products and profesional expertise make ACTECH CNC Plasma Cutting Machine a reliable partner for customer and shareholders alike. Now, they are proudly as a pioneer in manufacturing affordable CNC's machine to all small and medium industry.

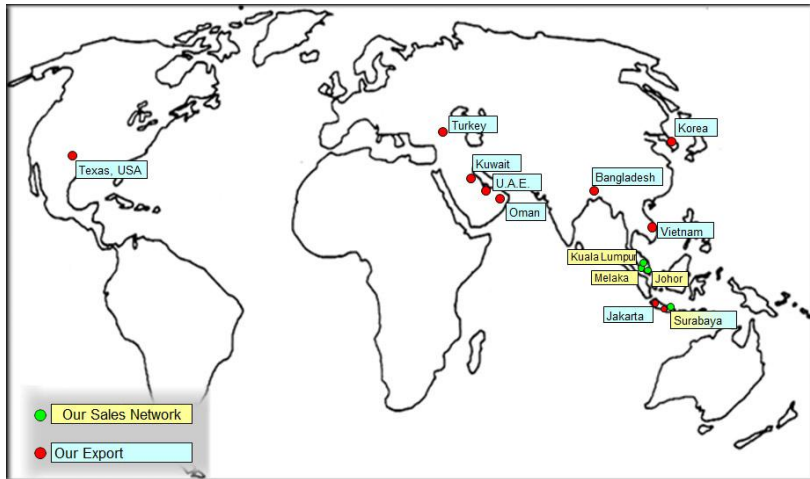


Figure 2 : Worldwide map

As continuous growth, they have indeed expanded their business region beyond national boundaries into USA, Korea, Sri Lanka, China, Indonesia, Singapore, Myanmar and other South East Asia Countries. Apart from that, they also sell a regular

2.1.1 Company Vision

- i. As the leading provider of affordable CNC machine and system solutions to the metal industry.
- ii. As cost pressure grows, production times are becoming shorter and skilled staff is harder to find. Customers are no longer want invest machine with weak system solution and technical support. Instead, they are looking for compatible system solutions that set new standards of productivity, effectiveness, autonomy, precision and user friendliness.
- iii. Corporate Value: “ A ENTHUSIAST & RELIABLE PARTNER AIMING FOR EXCELLENCE”

2.1.2 Company Strategy

- i. Competitive advantage through innovation and technology leadership in affordable CNC Plasma Cutting Machine.
- ii. Increase value added for the customer with commitment in machine technology, quality and durability, services, spare parts, wear parts and consumable from a single source.

2.1.3 AC MECA Current Product

Type	Products	Features
<p>CNC Fiber Laser</p>	 <p><u>CNC Fiber Laser</u></p>	<p>posses great advantages while cutting in thin metals</p>
<p>CNC Plasma</p>	 <p><u>ACT CNC PLASMA</u></p>	<p>used in all types of industry ranging for light duty operation to all day production.</p>
	 <p><u>Mega Sonic CNC Plasma</u></p>	<p>-</p>
	 <p><u>GIGA CNC PLASMA</u></p>	<p>suitable for precision cutting in the most demanding of applications.</p>
	 <p><u>NANO CNC PLASMA</u></p>	<p>designed as a 'folderable' machine which reduces the space of shipping case</p>

	 <p><u>GIGA JUNIOR CNC PLASMA</u></p>	<p>a great cutting solution for companies that have little to no plasma experience</p>
	 <p><u>NANO INTECUT CNC PLASMA</u></p>	<p>designed associated with features of flexible, easy to install and operate (Plug-N-Play), mobile machine, least foot print which solves your space constraint, practical for home and light industrial workshop use</p>
<p>CNC Router</p>	 <p><u>ACG0609 AND ACG0404 CNC ROUTER</u></p>	<p>built to be rugged and rigid that highly appropriate to wood working industry</p>
 <p><u>ACG1212/1224 CNC ROUTER</u></p>		
 <p><u>ACM1325A</u></p>		
 <p><u>AWJ3015 CNC Waterjet</u></p>	<p>suitable to cut all kinds of ferrous and non-ferrous material</p>	



	<u>Cutting Machine</u>	
CNC Plasma/Router 2 in 1	 <p style="text-align: center;"><u>ACM TWIN 1325</u></p>	-
Robotic	 <p style="text-align: center;"><u>Universal Robots</u></p>	<p>a highly-specialized, low-cost robotic arm to streamline your production</p>

Table 1 : AC MECA current products

2.1.4 Organization Structure

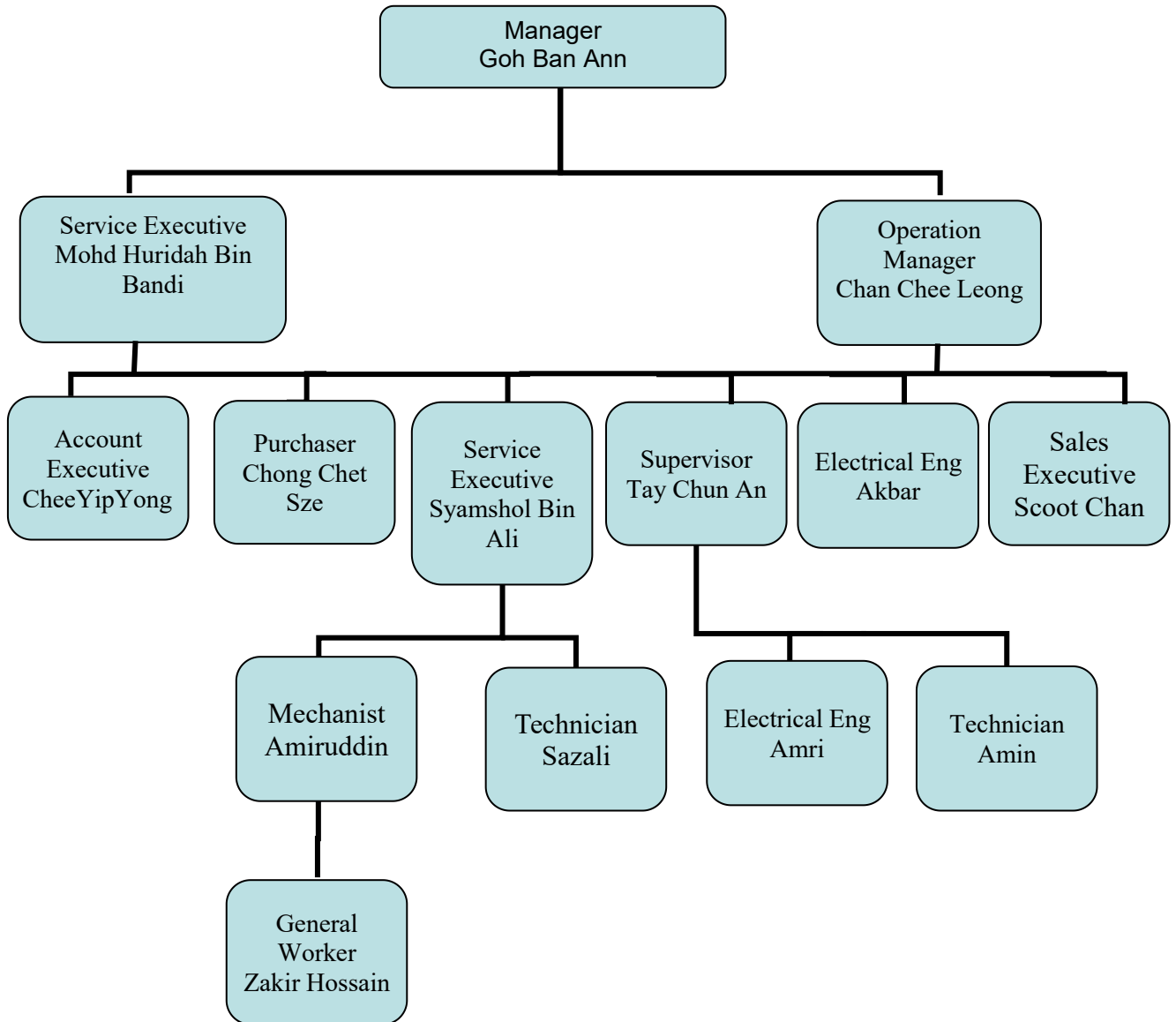


Figure 3 : Organization structure

2.2 AC MECA (M) Sdn. Bhd. Overview

2.2.1 About ACTECH CNC Plasma cutting

Plasma cutting is by far the simplest and most economical way to cut a variety of metal shapes accurately. Plasma cutters can cut much finer, faster and more automatically than oxy-acetylene torches.

Because of their effectiveness, plasma cutters especially CNC plasma cutters threaten to obsolete a large number of conventional metal working tools. A Plasma cutters works like a lightning bolt. Direct current, high voltage electricity arcs from a negative potential (the electrode inside the torch) to a positive potential (the work piece) through a jet of ionized gas.

Plasma cutting system requires two basic elements, gas and electricity. It is a thermal cutting process that uses a high temperature plasma jet to a melt metal. This plasma jet is a form by the combination of gas and electricity from a power source. Plasma cutting cut faster than oxy-acetylene cutting or mechanical cutting processes such as milling, circular cut off wheel and saw.

It did not require a preheat cycle and able to cut any metal that conducted electricity. It cut metal that oxy-fuel cannot cut for example stainless steel and aluminium. With a less heat affected zone and small cutting kerf width, plasma cutter is also suitable for cutting high-gauge metal for example heating, ventilation and air conditioning (HVAC) duct work.

2.2.2 Characteristic of Plasma Cutting System's torches

All plasma cutting system torches consist of a swirl ring, electrode, nozzle, retaining cap and shield.

- i. Swirl ring is for distribute and spin plasma gas into gas vortex. Electrode carries negative charge from power source through torch lead.
- ii. Nozzle focuses the plasma jet to the material.
- iii. Shield cap protects the nozzle from touching the material and spatter. It also fuse the shield gas jet, assists in cut quality by blowing molten material and cools the front end of the torch. The co axial assist jet is Hypertherm designed shield gas technology.

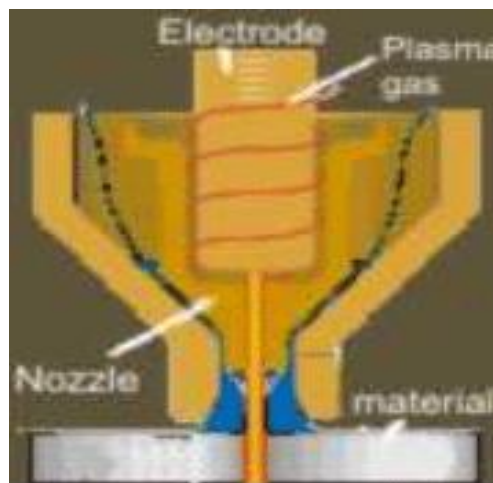


Figure 4 : Plasma cutting system torch

2.2.3 Advancement Plasma Cutter Technology



Figure 5 : Type of shape of material

“ Led to improvement in smaller bevel angles, less dross and smoother cutting surface, cutting speed and also reducing cost per foot.”

Today's plasma system using boost inverter with microprocessor control had reduced the system's price, improving consumable's life and consuming less power compare to Chopper or IGBT Technology. There are high definition plasma system and conventional oxygen plasma system which coupled with CNC Cutting Machine and torch height control system that can cut steels with a dross-free edges, eliminating secondary finishing process. The high definition plasma is a cost effective alternative to laser.

High definition plasma or precision plasma produces high energy density in the arc with a very accurate gas flow control and power output. This produces narrow kerf cutting and less cutting bevel angles.

2.2.4 Plasma Cutting Quality

a) Elements of cutting quality

Kerf is the width of the cut or the amount of material removed by the plasma arc. Obviously, kerf is important to the accuracy of a work piece being cut to specific dimension. The rule of thumb for estimating the kerf in DAC is that it will be about one and one half to two times wider than the diameter of nozzle orifice. Factors that affect kerf include nozzle size, cutting speed, amperage setting and standoff.

b) Cutting quality improvement

Dross : Plasma dross is oxidized molten metal which is not fully ejected from kerf during the cutting process. Plasma dross formation is dependent on many process variables including cutting speed, arc current (amperage), standoff distance, gas selection and the type and thickness of metal either too high or too low of travel speed which can cause dross. But usually a 'window' in between that will give you 'dross free' or 'minimum dross' cut.

Low speed dross forms because when the cutting speed is too slow, the arc column grows in diameter, widening the kerf to a point where it gets harder for the pressurized jet to blow away the molten metal.

High speed dross, on the other hand forms when a higher cutting speed is used without increased current. The arc begins to log back in the kerf leaving a small portion of uncut metal along the bottom of material. When this happens, the arc becomes unstable and creates dross that requires extensive machining to remove.

Top spatter is a light accumulation of a dross that forms on the edge of the work piece along the cut edge. In addition to the usual factors that create dross,

top spatter may be the result of low speed cutting, a standoff that is too high or a worn out torch nozzle. Top spatter is most affected by speed and standoff.

Variable in cut quality. Several process variable collectively determine the ultimate quality of a plasma cut part. While most are under the control of the operator, some are not. Two variables that cannot be controlled are metal type and thickness. However, it is important to note that different metal types and thickness have different cutting characteristics. It is recommended to refer to the plasma arc cutting system operator manual for cut charts reference.

Cutting speed. The torch speed needs to be adjusted to get a good quality cut. A cutting speed that is too slow or too fast will cause cut quality problems. But usually is a 'window' in between that will give you 'dross free' or 'minimum dross' cut.

c) How to reduce dross ?

Low speed:

- 1) Reduce the plasma system's amperage.
- 2) Increase the distance in between material and torch or standoff.
- 3) Increase the travel speed of cutting torch.
- 4) Using smaller nozzle size.

High speed:

- 1) Reduce the travel speed of the cutting torch.
- 2) Reduce the standoff.
- 3) Increase the plasma system's amperage.

2.2.5 Reasons to buy ACTECH CNC from AC MECA

1. You can learn to operate a CNC machine within a few days with little basic computer experience within a few days to run a cutting service centre business and they will even help you to generate sales enquiry for your business.
2. You can train a non skill worker to operate the machine and generate for your profit than 5 persons or even 10 persons of skill workers you employ for those works.
3. You can make a part in 5 minutes which usually take you 2 hours.
4. You can make things you could never have done before by hand.
5. The machine makes you super easy to go from your idea or imagination to a quality cut parts.

Who else wants to know how to earn USD 300 a day with this CNC Plasma Cutter ?

If you are interested in increasing the profit of your business or explore to a new business opportunity then this is going to be the most exciting message you ever read.

Now small shop owners, ornamental iron works, wrought iron furniture makers, engineering workshop, HVAC fabricators and others on limited budgets can afford CNC Plasma Cutter technology. We had make CNC plasma cutting more easy and economical than ever before. This system is causing engineers and metal fabricators to rethink the whole approach to design and manufacturing. You can make things you could never done before by hand.

Imagine being able to build unique metal products, railings, gates, furniture, HVAC ducting, etc. And really compete with mass production products imported from China. Wouldn't that be great ?

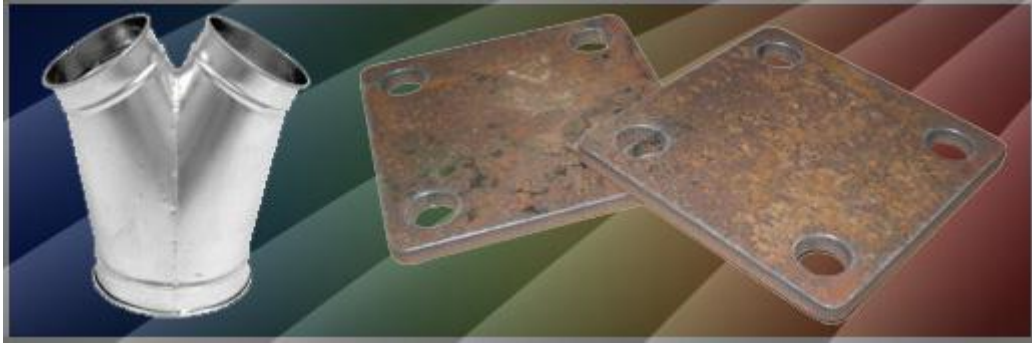


Figure 6 : Company's product produce

Or what about you could now invent, design and produce new mechanical devices so fast that your competitors won't have a chance to keep up. How would that feel if you could do that ?

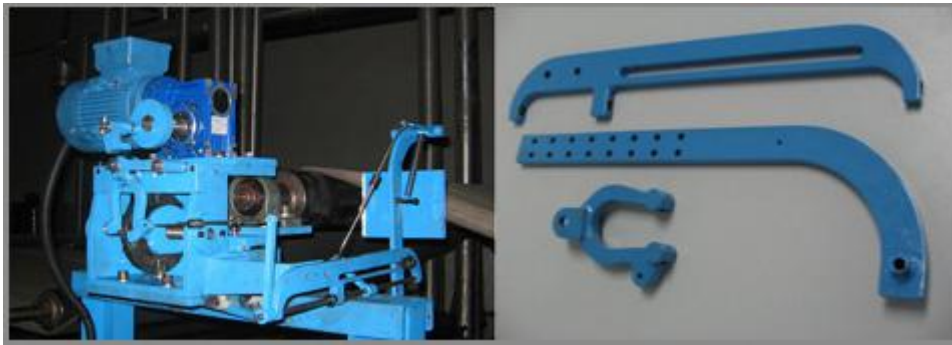


Figure 7 : Machine's stuff

Imagine being able to cut a metal art products or sign for yourselves and people wonder how you are doing it. It truly is possible, but you need to know how.



Figure 8 : Ideas of product

That is what this smart designed machine could help you to do.

It covers nearly everything you need to know about to cut parts with a CNC machine within a few days, to run a service centre business and even we will help you to generate sales enquiry for your business.

CHAPTER 3

COMPREHENSIVE TRAINING INFORMATION

3.1 Introduction

AC MECA (M) Sdn Bhd recruit only two internship student from same background of study which is Mechanical Engineering. Both students including me are under same department and use to be a classmate before for all 6 semesters. We have known for a very long. As this company only have about 10 staffs overall, we both were put under supervisor Iqbal and under control operation manager, Chan Chee Leong. There are no specific department in this company but we both will undergo fabrication process along the industrial training.

3.2 Objective Training

To expose internship student for actual sample products fabrication and process planning with CNC router machine, Ucam V11 software, factory equipment and tooling. Through the process, they may be able to perform from a fresh new beginner to a technical person to manipulate and understanding the process flow of a product design, practice to judge and analysis the best process, base on the actual machine, software and tooling limitation and ability to suit the product.

3.3 Training Information

3.3.1 AutoCAD and Ucam software

Both AutoCAD and Ucam V11 are software that are used for drawing and design for the project. Apart from that, Solidwork and nanoCAD also being used for this process. To produce a product, the first step is to design our own product using AutoCAD or nanoCAD. AutoCAD need to be pay and the price is quite expensive before install. Not for nanoCAD, certain version is free of charge and easy to install. This application is the easiest as we get familiar and know each function. As for me, I only used nanoCAD software as the function is the same as AutoCAD. For the project, most the time I used to trace the given drawing and then copy and paste process. Hence, it was easier to draw as our project only focus on 2D drawing. Circle and rectangle shape have been our main shape for all project.

After that, the process is transfer into Ucam V11 software to edit for simulation. There are three (3) simulation that have been introduced which are profile machining, area clearance and 3D corner engraving. Ucam V11 software is the most expensive software which around RM 5000 each. Before start installed it, we need to watch the video first from the demo. The demo is in term of compact disk, CD where there are a lot of tutorial including installation and simulation. After that, we are given a licence inside the pendrive. Those pendrive are belong to the company and we cannot bring out of the company without manager know.

3.3.2 Experienced gained

Those software are new to me and I was so fascinated by the facts of technology nowadays. At first, I faced a challenges where I need to learn the basic thing first before proceed to the complex drawing. Day by day until week 3 I quite familiar and good in using those software. Since the first day, the only thing I did is get familiar and used to the software either nanoCAD and Ucamcam V11. In between three weeks, there are an individual project to see how far and how many knowledge I get from learning everyday.

At first, my project was totally broken because of the technique used in simulation is wrong. I supposedly used technique profile machining instead of area clearance. At last, the product produce is quite satisfied even though I choose simple design. I got a quite not good comment from operation manager, Chan Chee Leong regarding my simple design but about the technique is quite satisfy.

3.3.3 CNC Router Machine



Figure 9 : CNC plasma router machine

This machine is a very high technology machine. The size is quite big which can fit 1200 x 2400 mm of MDF board. To be able handle machine, I need to win a trust from the supervisor and operation manager. First, I need to know the basic thing include zero point, home position and work piece zero point. After that, I need to include the work ethic during handling machine and obey the safety rule. The most important is to know the rule of the machine.

Hence, most of the product produce is based on the fabrication process. As the objective of the company is to expose the internship student for the actual sample products fabrication and process planning. So, the product produce mostly is MDF board and some pine wood material. As for me, I only use 3 mm, 6 mm and 9 mm MDF board for all the product produce.

Besides, I was exposed to the coding. As the machine operate based on the coding set up during simulation, I need to know how to run the G code program. Then, I need to know about the cutter type and cutting speed. I also need to know the ability and limitation of the machine. The most important is to know how to fix material on the base or platform.

Basic information on general function procedure for CNC router machine also important to learn. For an example, general function on how to link machine function with programming.

3.3.4 Experienced gained

At first I was struggle on handling machine as I know the effect if not careful while doing the machining process. So, the first week I need a fully guided from the supervisor and staff of the company. I was fully familiar and getting use in a week 3 where I gain confident and become extra careful. After that, I was the one that guide Fisa to start over the project as she was someone that are clumsy and unpatient person. I was someone that become more focus on doing work or task and that was a good trait that can lead me to have a better work ethic in the future.

CHAPTER 4

PROJECT INFORMATION/TRAINING IN SPECIFIC

4.1 Background of Main Task

During undergoes industrial training for 3 months, there are about 3 main project. The first project is to know how far and how many knowledge I have been received from learning three basic simulation or technique from Ucam software. This project is more like to improve skills and knowledge about fabrication. Next project is about to fulfilled requirement of the company to produce product for the clients. The product then have to be shown to the clients. There are about 5 products overall. Those five product are using different technique be it layering and among others. I did three out of five product. This time, we are working as team and need to help each other. Last one is an individual project before finish industrial training. The product produce is more to the traditional craft and suitable as souvenirs.

4.2 Project 1

4.2.1 Project Idea

For this product produce, I get an ideas from searching an information via Google and Pinterest website. Then I need to choose the product that will used three basic simulation or technique from Ucam V11 software which are :

- i. Profile machining
- ii. Area clearance
- iii. 3D corner engraving

The given duration to finish this project is only a week. Within a week, I need to trace the drawing from the chosen photo from Google or Pinterest website. There are about three drawing that I have been draw including toilet sign, AC MECA sign and burger sign. But the main idea I get are :



Figure 10 : Example Idea 1 from Google



Figure 11 : Example Idea 2 from Google



Figure 12 : Example Idea 3 from Google

Then I transfer the drawing into the Ucamcam V11 software to enable the simulation and edit some part before machining and save it in the file. Before that, I need to decide the suitable simulation based on my own view and knowledge. Before save in the file or pendrive to be machining, I need to run the simulation first by clicking the toolpath simulation in the Ucamcam V11 software. Hence, I need to decide the first step of moving toolpath so that it not ruin the product while machining.



Figure 13 : Simulation for toilet sign

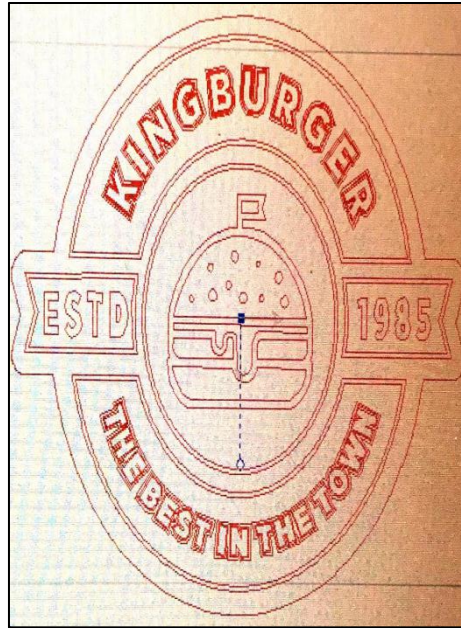


Figure 14 : Design of burger sign in Ucam V11 software

After satisfy with the simulation, I then make sure the toolpath output result is correct. I also make sure the coding is correct so that it easier to find coding when machining if there is error.

4.2.2 Machining Process

Machining process required a lot of attention and care. So, every action taken must be in our own consideration. Safety rule and work ethic must be my priority during handling machine.

The first thing for the machine to operate is to switch on the main plug of CNC router cutting machine. Then, make sure the cutting tool is at the home position which mean to reset to the original position after all working done before. Clear the base or platform before placing the material. Then place the material, MDF board with the thickness of 9 mm on the platform and press the vacuum button to suck the material. Vacuum is important to make sure the material is exactly in the position and not moving while machining.

The important step is to decide suitable cutting tool. For this project, the cutting tool that suitable are:

- i. End mill

Tools which have cutting teeth at one end, as well as on the sides. The words end mill are generally used to refer to flat bottomed cutters, but also include rounded cutters and radius cutters. They are usually made from high speed steel or cemented carbide and have one or more flutes. They are the most common used in a vertical mill.

Designed to cut axially which are used in milling applications such as profile milling, tracer milling, face milling and plunging. A very popular helix angle for general cutting material is 30°. for finishing end mill it is common to see more tight spiral with helix angles 45° and 60°. End mills can last longer due to less wear and improve productivity in high speed machining (HSM) applications.

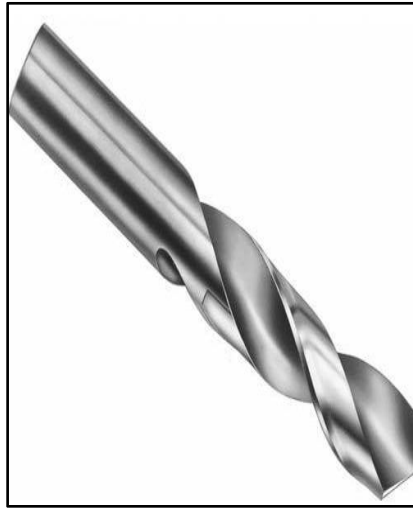


Figure 15 : Example of End mill



Figure 16 : Type of End mill

ii. Conical

Suitable to be used for 3D corner engraving simulation method. Engraving involves running a tool with constant depth of cut along the center of a contour. The tool diameter determines the width of cut. To achieve this is a sharp corner of a contour and corresponding to the conical angle of the engraving tool, a 3D toolpath is created to ensure the smallest conical radius is maintained at the top contour, leaving a sharp corner.



Figure 17 : Conical D45



Figure 18 : Another type of conical D45

Next step is to decide the work piece zero point. Work piece zero point is where the the cutting tool start cutting material at the X and Y axis then Z axis is decided the depth of the cutting tool to be machined. After all are ready, suck the pendrive into the panel and start copying the file. Then, ready to be machine.



Figure 19 : Machining process of toilet sign



Figure 20 : Machining process of burger sign

4.2.3 Result Project 1

Based on the picture below, the toilet sign is totally broken and not satisfy. The reason of that was the technique used is wrong. Suppose the technique used is profile machining by using cutting tool of end mill with diameter of 3 mm instead of area clearance.

The last result is very clean and simple. The technique is totally correct and need another complex task to make it look elegant and beautiful.



Figure 21 : Result of toilet sign



Figure 22 : Result of burger sign

4.3 Project 2

4.3.1 Project Idea

This is the interesting part since joining the industrial training where I was assigned to do a lot of product within a three (3) weeks. Even though look easy and simple, there are a few times I feel want to give up and having a serious headache. This time, the product produce will be presented to the clients of the company. There are total of five (5) products. I did three (3) out of five (5) products.

4.3.1.1 Grill Panel

The design of the grill panel is fix and I need to produce product same as the picture given by the operation manager, Chan Chee Leong. During the first meeting, he already stated the time frame and the technique to be used. The material is still MDF board with 6 mm thickness.

The first thing I did was traced all the three (3) grill panel by using nanoCAD software. The tracing technique is mostly use spline line and arc. There, I need to change several shape to have a sharp edge instead of rounded edge.



Figure 23 : Example of grill panel

Then transfer the data into the Ucam V11 software to enable the simulation and convert into coding. Editing process take a lot time than tracing process because a lot of line are not connected to each other. For the simulation, the technique use are totally profile machining. The technique is to cut through all the thickness. As the thickness is 6 mm, layer depth is needed which the cutter will cut through twice with first depth is 3.2 mm and second time also 3.2 mm. This is because, the cutting tool of end mill with 3.175 mm diameter is too small to cut through the material at once.

Here is the result from tracing and simulation,

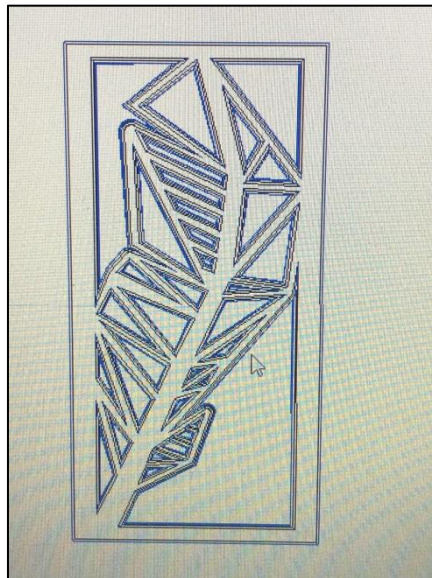


Figure 24 : Design of grill panel in Ucam V11 software



Figure 25 : Simulation of grill panel

4.3.1.2 Turtle

This is the first time I did technique layering. There are total of twelve (12) layers in total. Suppose this turtle have fourteen (14) layers total but I did reduce two layers to make the shape more ideal. First, the step still using tracing process. I did trace for all layer in the nanoCAD software. As there are total of 14 layers, I differentiate all layer by using different colour. For example, the first layer I used red colour and the second layer is green colour. This is more easier for the process of copy and paste later.



Figure 26 : Example of turtle

After finish in tracing, I did transfer the coloring turtle into the Ucam V11 software. Then, I did copy and paste process for overall 12 layers all together. This take a longer time than I imagine. This time, there are a lot more line that are not connected. So, I did a lot of editing for this part for all layers. Technique for the turtle are the same with grill panel. The profile machining technique are used to cut through the material.

For this product, 3 mm thickness of MDF board are used with overall layer of 12 layers with thickness about 40 mm.

Here are the result from tracing process,

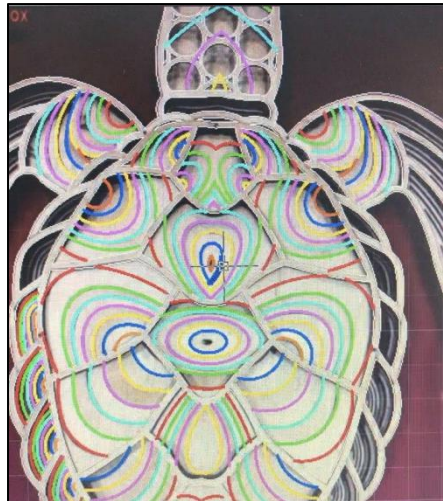


Figure 27 : Coloring turtle after tracing

4.3.1.3 Sofa

For the sofa, not a lot thing I did to produce this product. As I lack of time, the design already done by the operation manager, Chan Chee Leong. I skip for the tracing process as the shape already done. The only I did is run the simulation in Ucanan V11 software and make sure the coding is correct. I decided to use 6 mm thickness of MDF board.

Spacer is important for this product. Size of spacer is about 30 mm diameter with diameter of hole of 6 mm. There are total of 29 layers.



Figure 28 : Example of sofa

4.3.2 Machining Process

Mostly for all product are only use technique of profile machining. So it was easier to control and set the zero point of the cutter. The cutter use also the same for all product which is end mill 3.175 mm diameter. But only for the grill panel, the outer line of the product need o be cut through using 6 mm diameter of end mill.

For the grill panel, zero point is decided as what I wanted. Then, I changed the cutting tool of 3.175 mm diameter of end mill first to cut through the inside line. The spindle is moving twice as the cutter is too small to cut through all the material. After done the inside line, I change into the 6 mm diameter of end mill to cut the outside line. Step is the same for another two grill panel. So, I did three grill panel with different design.



Figure 29 : Machining process of grill panel

Next, turtle step still the same as the grill panel. First I need to set the zero point and make sure the Z axis is suitable for the cutter to cut through the layer. Before that, make sure the machine are at the home position before start machining. Then, choose 3.175 mm diameter of end mill to cut the material. The material used is 3 mm thick of MDF board. The inside line and outside line still use the same tool bits.

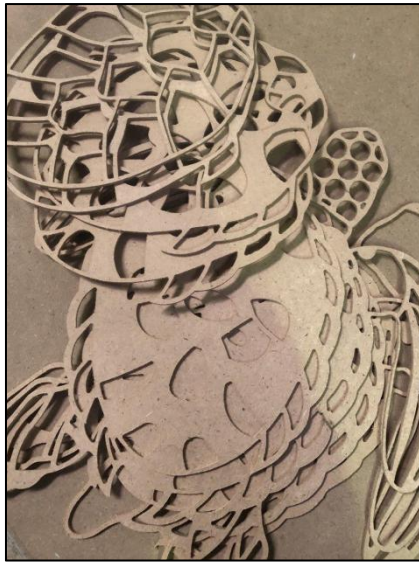


Figure 30 : Layers after machining process



Figure 31 : Combination of several layers

4.3.3 Result Project 2

The result for the grill panel at the end are not satisfying. This is because I did tried many time to get the desired shaped. First the result for grill 1 produce a lot of burr. The reason is because of the material are left out on the platform for a long day cause the material, MDF board to expand from the initial thickness.

Result from that, a lot of time taken for the finishing. High resolution of sand paper is used so the surface of the product is smooth and clean.



Figure 32 : Result of grill panel

Turtle product is the most satisfying product that I have been done. Even though at first I faced so many challenges, I did feel at ease at the end. Because of that, I decided to continue to use this technique for my last project which is project 3. To combine all layers, craft's glue is used.

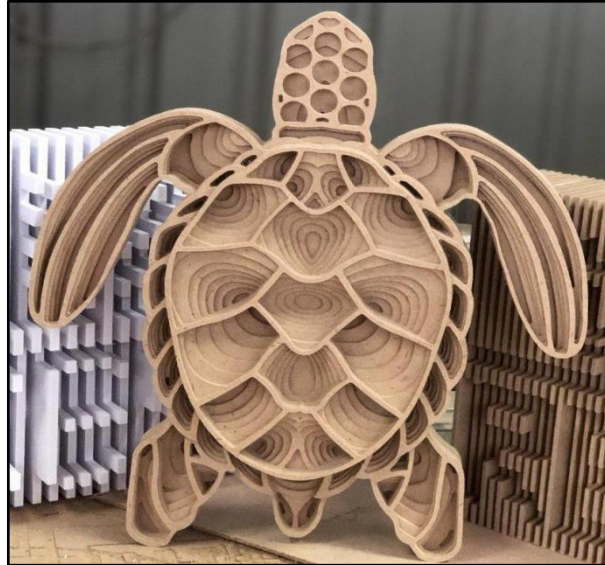


Figure 33 : Result of turtle

Lastly, the shape of sofa as what the manager desire. I was just happy that could finish his work until a very last step.



Figure 34 : Result of sofa

4.4 Project 3

4.4.1 Project Idea

Finally, after going through about 2 months and a half, I could breath peacefully as I already about to finish my internship journey. But still I have a last task which I need to brainstorm idea to produce own product. Before that, the theme still not run from the souvenir and traditional games.

After having last thought, I decided to make Congkak. The shape of Congkak is rarely seen by anyone and hard to be produce. At first, I decided to design the ship but manager want something different. So at last, the design is more likely of banana leaf.

The hole of Congkak also a bit different where the big hole has the shape of mandala and the another one is just general leaf. Here are the result of the Congkak.

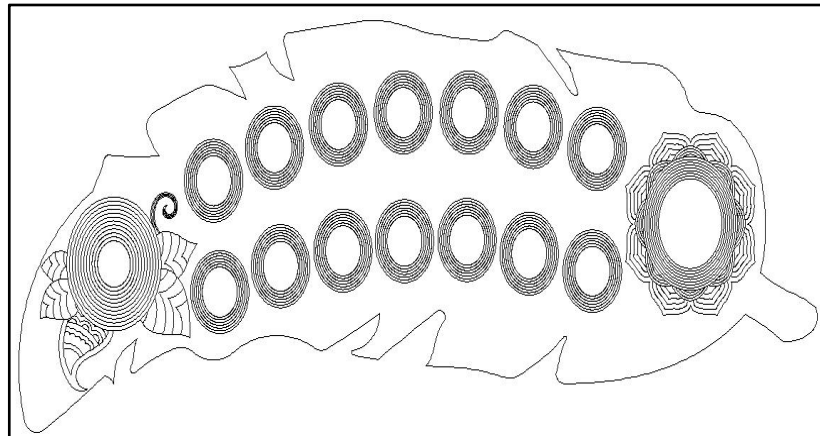


Figure 35 : Final design of Congkak

For this product, I directly use Ucam V11 software where I start design my own banana leaf. Then, I slowly added line and shape to the leaf. At the same time, I add simulation for each layer. This Congkak had a total of 18 layers with thickness about 60 mm.

Hence, I required to do another task which is same like turtle before. This time I required to trace for the butterfly.



Figure 36 : Example of Butterfly

The same step as butterfly. First, traced in nanoCAD software before transfer into Ucamcam V11 software. Then edit a little bit and run the simulation.



Figure 37 : Coloured butterfly in nanoCAD software



Figure 38 : Layers of butterfly

4.4.2 Machining Process

Suppose the process of machining should be done on the new CNC router cutting machine which is small in size. But I did only a few layer and left out about 2 or 3 layer to be machining later on the new CNC router cutting machine.

After cutting through until layer 8, I found a problem which the hole of Congkak is broken due to the inside line meet with the outside line. I then need to redraw and continue in editing back. I face a problem where I need to cut through all the layer again. Finally I get what I want for the shape of Congkak.



Figure 39 : Machining process of congkak

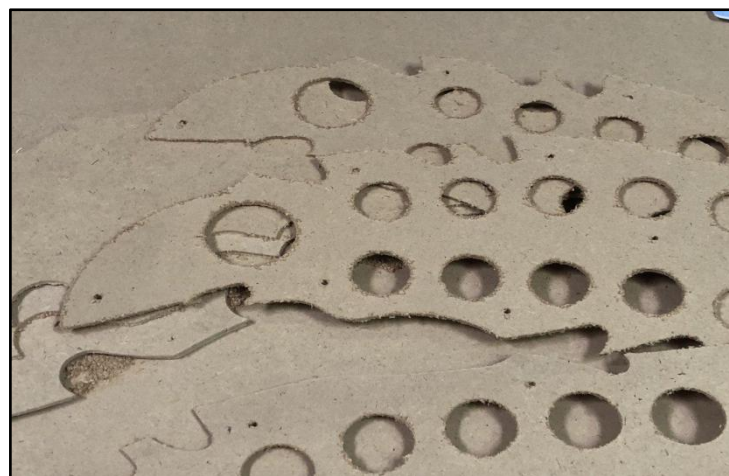


Figure 40 : Result from machining

For the butterfly, I had a very good experience before with turtle, so I had no issues in finishing all the work. As usual, I left about two layers to be machine on the new CNC router cutting machine.



Figure 41 : Process of machining of butterfly



Figure 42 : Result from machining butterfly

4.4.3 Extra Footage



Figure 43 : New CNC plasma router machine

The left out design that need to be machining using new CNC router cutting machine. The design include Congkak and butterfly part. For the Congkak, the layer that need to be machined is the first layer and the last layer. But different for the butterfly. Layer that need to be machined is the second layer and the sixth layer.

The different of new CNC router cutting machine with the old one is the vacuum. There is no vacuum to suck the material for the new CNC router cutting machine. As the shape is very small, only one part can be done at a time compare to the old machine. But, it easier to install the material and to start the machining. No step for the suction of vacuum.

The same step is use for the new machine,

1. Switch on the plug of the machine.
2. Make sure the spindle at the home position.
3. Set up the material on the base or platform.
4. Set up the tool bit in the spindle.
5. Set up the work piece zero point.
6. Install the data in the computer panel.
7. Ready to run the machine.



Figure 44 : Process of machining of congkak from new machine



Figure 45 : Machining process of butterfly from ne machine

4.4.4 Result Project 3

To combine overall layer together, countersunk screw is used from upper and bottom part. The connection of the countersunk screw is by using pipe with the thread. All the pipe is cut with the length of 54 mm and countersunk screw of 5 mm diameter. Then the first layer and the last layer is combined by using craft's glue.

As the result, Congkak look more unique and the surface is smooth.



Figure 46 : Congkak

After done on finishing, I required to do video for the overall step. The video include the first step from design, simulation until the finishing. The reasons to make video as the reference for the clients in the future and as the proof of the product produce by the internship student.

Then, I make sure Congkak is worth to be present to the clients. I did last touch up on cleaning the surface of the Congkak by using sand paper and I also bought the marble from the nearer shop. Luckily, I have time to present to the staff in the company and teach them on how to play Congkak.

Luckily to form a solid butterfly only required seven layers overall. So only glue is suitable to be use to combine all the layers. Same as Congkak, I need to perform a video. Showing all the step required start from trace, copy and paste process until finishing.



Figure 47 : Butterfly

4.5 Extra Tasks

Not only doing or finish the project, we also did some task that have been assigned from the staff, supervisor and manager. There are total of three small task. The task that was assigned from the operation manager was to run the simulation for the cover of plastic vase. The material involved is white foam board. The shape is circular shape with big circular and rectangular hole.

As the shape have been designed by the manager, what I did next is to decide the suitable simulation to cut through the material. The thickness of white foam board is 6 mm. Then, I need to design and make the groove pattern to enable the water to flow. The grooving pattern is using end mill of 6 mm diameter. The result from machining is then to be place on the plastic vase.



Figure 48 : White foam board

From my view, I did learn a lot of things since going through internship journey in the AC MECA (M) Sdn. Bhd. One of it was I enable to produce something that I never imagine before. High technology of machine nowadays could lead to the increase of income and generate more ideas and knowledge of young generation. As an example, I need to grab the opportunity to learn new things in producing the product. Even though some students that they have been torture by the staff but here I take it as a challenge and tried to improved skills out of my comfort zone.

So, the product produce here is one of example that can increase income and boost interest especially the gardener to plant the vegetables.



Figure 49 : Result of white foam board

Next task is from Mr Sam, one of the staff of company. He assigned me to do the simulation for the acrylic material and then decide the suitable tool bit for the cutting process. As the thickness of acrylic material is 1 mm, the tool bit will cut through the material with 0.5 mm depth only. I need to make 3 complete set of that acrylic material. Function of making those nameplate using those acrylic sign is to display on the electrical box of the CNC plasma machine.

Last task is from supervisor, Iqbal. He assigned me and Fisa to redraw the design either in autoCAD or nanoCAD. There are five drawings that need to be redraw. So, I decided to do 3 out 5 drawings stated. The drawing is very simple and I could finish it only in one day.

CHAPTER 5

CONCLUSION & RECOMMENDATION

5.1 Conclusion of the Report

AC MECA (M) Sdn. Bhd. had offered me very great experiences and knowledge about real world job related to my course of study which is Mechanical Engineering. The 12 weeks of sweats and hard works to complete all the tasks given had made me who I am today. I have successfully done my industrial training to achieve the goals and objectives that was required by university. Even though there were many obstacles before and during my industrial training period, I am very proud as I still can manage to complete my industrial training. I can also conclude that this industrial training program was well organized. All people include colleagues & supervisors were willing to give advice. With their guidance I managed to practice what I had learned from campus into the real work life. New knowledge about the project management job was developed too. At the same time, functional skills & soft skills had been improved.

Exposing myself in the field of working environment makes me realize that theories learn in classroom may not be necessarily applied into reality. Theories may be developed but different situations and tribulations needs different approaches and sometimes that is unconventional. Working independently is what I usually prefer during my course as an undergraduate. However, in the working life team work is the almost important. I also experienced their professional working attitude from those staff who that have been approached. They take pride in their work and show a personal commitment to quality, reach out for responsibility, show initiative, do whatever it takes to get the job done, eager to learn as much as they can about the field they served.

Underwent industrial training in AC MECA also trained me to be more realistic and optimistic. Besides, there were some tasks that need creativity to complete the tasks. Hence, I had to study and did observation first before start any tasks. Last but not least, all experience and knowledge that I gained from all staff here were very helpful for me to become a mature person. It also help me to become more responsible and discipline in completing my tasks. Discipline is an important element in becoming a good worker so that we can ensure our work quality.

5.2 Problems

Each of us has encounter many problems and challenges in their life. So do I experienced a lot of problems before, during and after the industrial training. Hence, each student had to face the problem in order to experience the real working environment. Those problems had to faced with an open minded and think the best solution to solve it. Think positive is the way other than blame ourselves on the problem occurs. So, here the list of problems that I encounter.

5.2.1.1 CHALLENGES FACED BEFORE INDUSTRIAL TRAINING:

First and foremost, the big challenge faced is due to pandemic of COVID-19. About two company had to reject my application due to that pandemic. The first reason was because the company just start operation and need to stop in taking the internship student. The another reason was because the person incharge had to admit to the hospital due to serious illness. So no body will take place of that supervisor during my internship. But, the most important was because of drop of stock and income of company due to pandemic.

Next, the difficulties to seek for another internship placement from another company. I need to apply about ten application through email, jobstreet and direct contact to the company before I finally received an email from AC MECA (M) Sdn. Bhd. three days before start my internship.

Then, I faced problem where I need to find the accommodation and transport to the workplace after my application is accepted. This is due to late accepted from the company. In the end, I decided to stay in Universiti Teknologi Malaysia, UTM and my friend from same company willingly to pick up and send back to the UTM. I was so glad having someone that willingly to help me in this hardship.

5.2.1.2 CHALLENGES FACED DURING INDUSTRIAL TRAINING:

After a few days in the company, I received a call from my father that my brother was in a critical state due to his illness. So, I take an emergency leave on Saturday, 25 July 2020. On the same day, he passed away after fight his illness about eleven (11) month. Due to that, I take a week leave to be with my parent.

Next, I need to regain back energy and soul to continue living after losing one of my family members. Other than that, I need to catch up what I have left during my leave. Luckily, Fisa and supervisor, Iqbal willingly to help in a new activities and task handle. They help me until I familiar with the software and machine. The best part is when the operation manager, Chan Chee Leong gives moral support and wise word along the day in the company.

Then the problem faced when I lack of skill and knowledge in AutoCAD, Ucamcam V11 software and Solidwork. During my year in UTM, I lack to be expose into the technical application and software. So, I was struggle to use that software and slowly get familiar each day. I seek a lot of help from the operation manager and supervisor. I also watched a lot of videos of tutorial in the youtube and compact disk of Ucamcam software.

Lastly, I had to do hands on work which I need to handle machine by my own. This the biggest flex as I never did before. Handle machine required a lot of care and attention. So, I need to seek help from supervisor first before he approved. I need to learn the best way on handling machine and learn if something undesired thing happened.

5.2.1.3 CHALLENGES FACED AFTER INDUSTRIAL TRAINING:

The challenges I faced after industrial training was I only have a week to complete my Industrial Training Report and need to submit to the faculty supervisor within a week. At the same time, I need to prepare for a new semester. Hence, low of internet connection at home is hard for me to find information regarding the company and submit via online. Lack of company information also one of the problems faced to complete in writing report. All in all, I need to manage my time wisely in order to finish in writing report.

5.3 Suggestions

There are some suggestion I would like to propose for better improvement and give some benefits to all parties included students, organization or company, and university. I hope my suggestion can be proposed and accepted by all parties.

5.3.1.1 Suggestion to Universiti Teknologi Malaysia Johor Bahru:

I would like enlighten the faculty or UTM to serve more week of industrial training from 12 weeks to 20 weeks or 24 weeks which mean from 3 months to 5 or 6 months. This is to give the students to experience and learn from all section related to the company. For certain big company, 12 weeks industrial training is too short duration to know the flow of the company or organization.

5.3.1.2 Suggestion to AC MECA (M) Sdn. Bhd.

I would like to suggest that the company remain in providing internship placement to the practical student and also provide same benefits as their associates. For examples are accident insurance, annual leave, transport allowance and health benefits. This is because internship students also may risk for accidents during working. Besides, with the health benefits, students can get treatment at company clinic free of charge.

Personally, I recommend my junior of same course, Mechanical Engineering to apply their internship in this company. The experience and knowledge is good enough for those who interested in drawing and handling machine. Not to forget, the staff and manager here are so kind and friendly enough. This in turn would be surely benefit the students greatly in future.

CHAPTER 6

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CHAPTER 7

APPENDICES

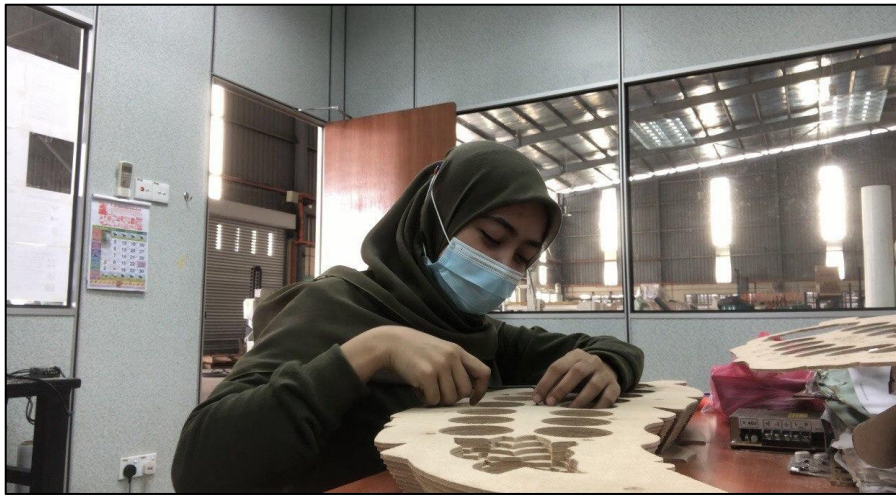
APPENDIX A



Site visit from supervisor, Dr Ahmad Humaizi

APPENDIX B





Activities during Industrial Training

APPENDIX C



Product from project 2



Product from project 2



Product from Project 3

APPENDIX D

Link of e-portfolio

<https://eportfolio.utm.my/user/nurul-syazwani-binti-zaba/industrial-training>