POLITEKNIK MALAYSIA

SULTAN SALAHUDDIN ABDUL AZIZ SHAH

DIPLOMA ENGINEERING MECHANICAL (PACKAGING)

PROJECT - DJJ5141

SESSION DECEMBER 2019

TITTLE: AUTOMATIC ARC WELDING MACHINE

PROJECT ADVISOR: MR ROSLAN BIN KAMARUDDINN

CLASS: DMP5B

PREPARED BY:

MUHAMMAD HAZIQ HAKIMI BIN MOHAD SHAHRIZAL

(08DMP18F1080)

ACKNOWLEDGEMENT

Grateful for divine intentions, we are able to successfully complete the final project within a set time frame without facing any difficult issues. We would like to thank everyone involved directly and indirectly especially our supervisor ENCIK ROSLAN BIN KAMARUDDIN who has provided us with all the guidance, advice, encouragement and constructive criticism we have been able to complete in the final report on this project. Please do not forget our friends and family members and our academic advisor SIR BRYAN TZE KEON HEE who was very helpful in terms of vision and finances in completing this final project assignment.

We are grateful to Allah SWT for this final project. We hope that this report will serve as an example and a guide to future parties.

ABSTRACT

Safety in welding is a very important aspect. Welding is one of the most widely used metal fabrication methods in world wide. Welding is safe operation when carried out under normal and correct workshop conditions, but it must be pointed out that equipment free from defects and well arranged, properly ventilated , tidy workplace are important factors for safe working. Even though, welding is carried out widely across the world, when certain basic measures and precautions are not followed, it results in injuries, discomfort, loss of eye sight after a longer period, or sometimes even leading to death of the people work there.

There are a large variety of welding and allied processes used in the modern industry. In general welding processes can be divided into the two basic categories, as fusion welding and solid-state welding. These processes differ in the manner with which heat, pressure or both are applied and the equipments used for the process. Shielded Metal Arc Welding (SMAW), Submerged Arc Welding (SAW), and Gas Metal Arc Welding (GMAW) account for 60-70% of welding activities in most of the industries. Its' ease of operation, flexibility, and efficiency make welding a viable and attractive process in modern industries.

Welding is one of the major processes in High Pressure Boiler Manufacturing Industries also. Here, modern welding machines are used to produce more productive and high quality Boiler components. Various processes of welding are adopted at High Pressure Boiler manufacture. In High Pressure Boiler Production, Tubular Production is the very important process, since it involves welding of tubular products where and iv steam at very high pressure and temperature of about 570 atmosphere and 600°C shall be circulating inside. The existing welding process of the Tubular Production and the environment in which the welders work in these machines are studied to bring out improvement in their working conditions.

TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1 Introduction

Welding is a fabrication or sculptural process that joins materials, usually metals or thermoplastics, by using high heat to melt the parts together and allowing them to cool, causing fusion. Welding is distinct from lower temperature metal-joining techniques such as brazing and soldering, which do not melt the base metal.

In addition to melting the base metal, a filler material is typically added to the joint to form a pool of molten material (the weld pool) that cools to form a joint that, based on weld configuration (butt, full penetration, fillet, etc.), can be stronger than the base material (parent metal). Pressure may also be used in conjunction with heat or by itself to produce a weld. Welding also requires a form of shield to protect the filler metals or melted metals from being contaminated or oxidized.

Many different energy sources can be used for welding, including a gas flame (chemical), an electric arc (electrical), a laser, an electron beam, friction, and ultrasound. While often an industrial process, welding may be performed in many different environments, including in open air, under water, and in outer space. Welding is a hazardous undertaking and precautions are required to avoid burns, electric shock, vision damage, inhalation of poisonous gases and fumes, and exposure to intense ultraviolet radiation.

Until the end of the 19th century, the only welding process was forge welding, which blacksmiths had used for millennia to join iron and steel by heating and hammering. Arc welding and oxy-fuel welding were among the first processes to develop late in the century, and electric resistance welding followed soon after. Welding technology advanced quickly during the early 20th century as world wars drove the demand for reliable and inexpensive joining methods. Following the wars, several modern welding techniques were developed, including manual methods like shielded metal arc welding, now one of the most popular welding methods, as well as semi-automatic and automatic processes such as gas metal arc welding, submerged arc welding, flux-cored arc welding and electroslag welding. Developments continued with the invention of laser beam welding, electron beam welding, magnetic pulse welding, and friction stir welding in the latter half of the century. Today, as the science continues to advance, robot welding is commonplace in industrial settings, and researchers continue to develop new welding methods and gain greater understanding of weld quality.

1.2 PROBLEM STATEMENT

When welding work is carried out, users often have problems that it is difficult to break the distance between the electrode and the material to be welded. This is because, when welding must have the right angle to get a good result.

In addition, the product also has a defect because the inconsistent distances such as the coils are too thick, not straight and spatter splatter.

Next, the user must hold the welding gun during the welding process. This will make the user feel uncomfortable if they do a lot of work.

1.3 OBJECTIVE

The objectives of this study are to:

i) Easily estimate the distance between the welding material and the electrode

ii) Welding results will look pretty and even

iii) No need to hold the welding gun during the welding process

1.4 RESEARCH QUESTIONS

i) Is it easy to carry anywhere?

ii) Is it adjustable to the required distance or angle?

iii) Does it reduce the risk of injury during welding work?

1.5 SCOPES

Every product that is designed or manufactured must have its own limitations and limitations not out of the actual scope of its design. Some of the scopes of the "FAN BLADE CLEANER" are:

- Can be adjusted to the specified size only
- Use of equipment does not use electricity
- Easy to move anywhere

1.6 RESEARCH INTEREST

Welding is the process of mixing one material with another using a special material. This welding process requires the right angle to achieve good results. This tool can give you the right angle without having to hold a welding gun. Indirectly it can facilitate students' work of welding materials.

CHAPTER 2

LITERATURE RIVIEW

2.1 INTRODUCTION

In this chapter, an overview of the concepts related to the Arc Welding Machine tool as well as the materials used in an orderly way will help readers better understand the concepts and ways to solve problems by making comparisons between previous methods with this machine. This literature review is very useful and important in preparing this final project. Therefore, once this literature review is accepted the project will continue with the next step to ensure that it can open up industries and communities out there.

From this comes the development of an Arc Welding Machine tool which makes it easier for users to avoid using old welding methods which is a bit risky difficult to break corners and time consuming. This Arc Welding Machine saves time and reduces risk to users compared to existing methods.

2.2 WELDING HISTORY

Until the end of the 19th year, the only welding process was welding, where ironworkers had been using it for centuries to connect steel with steel for heating and forging. Gate welding and gas welding was an early process developed in the late 19th century and electric welding soon followed. Welding technology developed rapidly in the early 20th century during the First World War and World War II, prompting the demand for easy connection methods. After the war, several modern welding techniques were developed including human methods such as "shielded metal arc welding", now one of the most popular welding methods, including semi-automatic and automatic processes such as gas metal gate welding, bottom gate welding water, flux core gate welding and electrostatic lag coating. Continued development with the invention of laser welding, electron welding, magnetic pulse welding and "friction stir welding" at the end of the century. Now, science is growing. Robot welding is common in the manufacturing environment, and ongoing research is developing new welding methods and learning more about welding quality.

Welding is a process of mixing one material with another using a special material, such as metal or thermoplastic. This welding process involves the melting of one type of metal to form a bond

between one structure and another. Sometimes pressure is also used in addition to heat to produce the weld. This is different from soldering, which only melts the connection material (solder) to form the connection, not the structure itself. Welding is an important connection method that is widely used in engineering today especially in building structures, oil platforms, automotive industry shipbuilding and so on.

There are various methods of welding. These include high voltage welding, gas welding, laser or electron beam welding and ultrasound welding. The welding we do in the workshop is the welding that uses the arc process. This process uses a welding power supply to create and maintain an electric arc between the electrode and the base material to melt the metal at the welding point. It can use direct current or shutter. and the electrode is exhausted or permanent. Welding areas are sometimes protected by an inert or partially inert gas. known as protective gas. and fillers are sometimes used as well. As for welding connections, there are several types of connections Among them include tee joints, corners, and even connections. But this time around, we were taught the dux connection method only the connection and tee connection connection.

2.3 CONCEPTS / THEORY

Welding is the method in which metals are joined together by melting them and using a filler to join the parts. To weld, a combination of heat and pressure is used. The earliest form of welding is called forge welding and dates back to 2000 B.C. In this, the metals are heated and hammered to fuse them. Nowadays this is only practiced by blacksmiths. There are various methods that are followed after the advent of electricity. Now different sources of energy are used for welding purposes - gas flame, electric current, laser, electronic beam, friction and ultra sound. Some of them are Arc welding, Gas welding and Resistance welding.

The method that is mostly used is arc welding. This is also called stick welding. In this, inexpensive equipment is used and a continuous supply of AC or DC is required with constant voltage. Welding is done by an electric arc between the electrode and the base materials. At the point of welding, the metal is melted. Shielding gas protects the area. The work is done speedily. It has a high concentration of heat and so the distortion is less. Some of the processes are - shielded metal arc, gas tungsten arc, gas metal arc and submerged arc.

2.4 PREVIOUS RESEARCH ON EXISTING PROJECTS

a) ARC Welding SMAW

This common method of welding was invented in the year 1802 and involves the use of a consumable electrode that has a flux-coated core wire that gives electric current. When in contact with the metal being welded an electric arc is created at the gap generating high temperatures of up to 6500o F. This heat melts the electrode and the metal thus creating a weld. This welding method is beneficial in that it does not require shielding gas and is effective on rusty metals. However, thin metals can complicate the process, necessitating the presence of a skilled and experienced operator.

Arc welding is best used on heavy metals of size 4mm and above and is used in repairing heavy equipment, steel erection, and pipeline welding as well as in the manufacturing and construction industry.

b) Metal Inert Gas (MIG) Welding or GMAW

This common type of welding was perfected in the 1960s. MIG welding uses a gun that is continuously fed with a consumable electrode. The process uses an external gas to shield the welded metal from environmental factors like oxygen making it continuous and quick. This method is easy to learn, produces less welding fumes, has high electrode efficiency and requires less heat input. However, the equipment is costly, the process does not work effectively on thick materials and it requires an external shielding gas.

MIG welding works well with a variety of alloys like stainless steel, aluminum, silicon bronze, magnesium, copper and nickel. It is used in automotive repairs, construction, plumbing, robotics, fabrication and maritime repairs.

c) Flux-cored Arc Welding

This method of welding is similar to SMAW except that it uses tubular wire-filled flux in place of a solid wire. It can be self-shielded or dual shielded with an additional external gas. It is used in welding thick materials, heavy equipment repair, and construction as well as in steel erection.

Welding processes have highly evolved in recent years giving rise to a variety of new and innovative methods. As such, it is necessary that you understand these techniques so that you know which one is right for your job. This will largely dictate who you will want to hire to complete it. Every method of welding has distinct advantages and disadvantages, and you will want to take the time to consider which process will be optimal for your application. No matter what welding method is right for your project Swanton Welding can aid you today.

2.5 MARKETING AND INNOVATION PRODUCT DIFFERENCE

PRODUCT MARKET	INNOVATION PRODUCTS
Make full use of human power	Use motor power to move
Less effective and productive	More effective and productive
There is no adjustable speed level	Can adjust the speed level

2.6 SUMMARY OF LITERATURE

In order to create a machine or tool, the creator must be aware of all the materials that need to be used on the project to be executed. It includes the rate of ductility, fragility and durability of the material against the forces acting on it. The creator also needs to know the functions of the tool to be used to avoid any error when using the tool. Also, damaged equipment should not be used as it will cause unnecessary harm desired.

The creator must also make sure that the tools are safe to use and that no problems will occur during the project. Safety should also be taken into consideration when carrying out the process of making a machine or tool as it will facilitate work and prevent any accidental accident. Also, the creator should follow the security measures while in the workshop for example wearing safety shoes, google, workshop clothes and so on.

CHAPTER 3

PROJECT METHODOLOGY

3.1 INTRODUCTION

Research methodology is a process, a set of tools for conducting research and information acquisition, as well as the art of performing a work.In general it has been classified into 3 research methodologies namely:

- **Quantitative Study**

  - This is a statement of the problem of the identified one based on a test of a theory that has been computed by variables, measured by numerical representation and analyzed using statistical techniques.
  - The most common quantitative studies are experimental and observational studies.

- **Qualitative Study**

  - Qualitative work is a form of social statement that focuses on the way people practice and the logic of their experiences and the environment in which they live.
  - Qualitative studies include studies, case studies, and specification studies.

- **Hybrid Method**

  - Methods of integration study between quantitative and qualitative research methods.

3.2 PROJECT METHODOLOGY

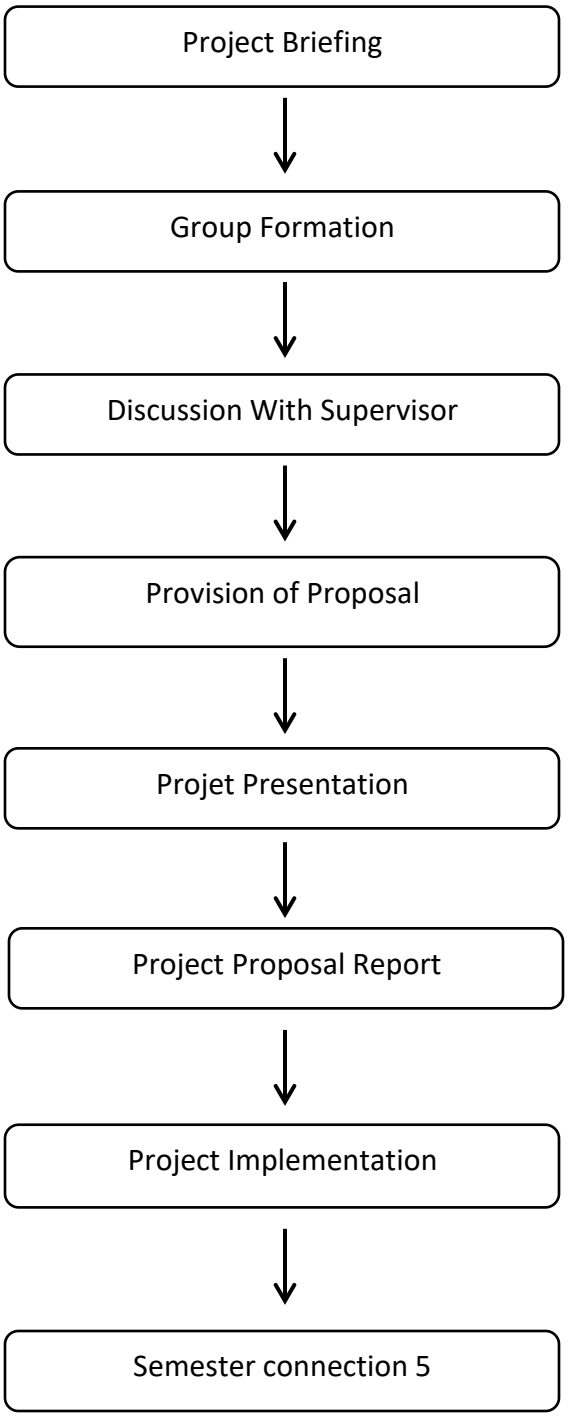
Project methodology can be defined as a systematic activity sequence for solving a problem by developing a programming application.

A methodology will use a technique used to perform specific activities. There are several types of methodologies for development that can be used in developing a system application. Each approach chosen should be appropriate to the project.

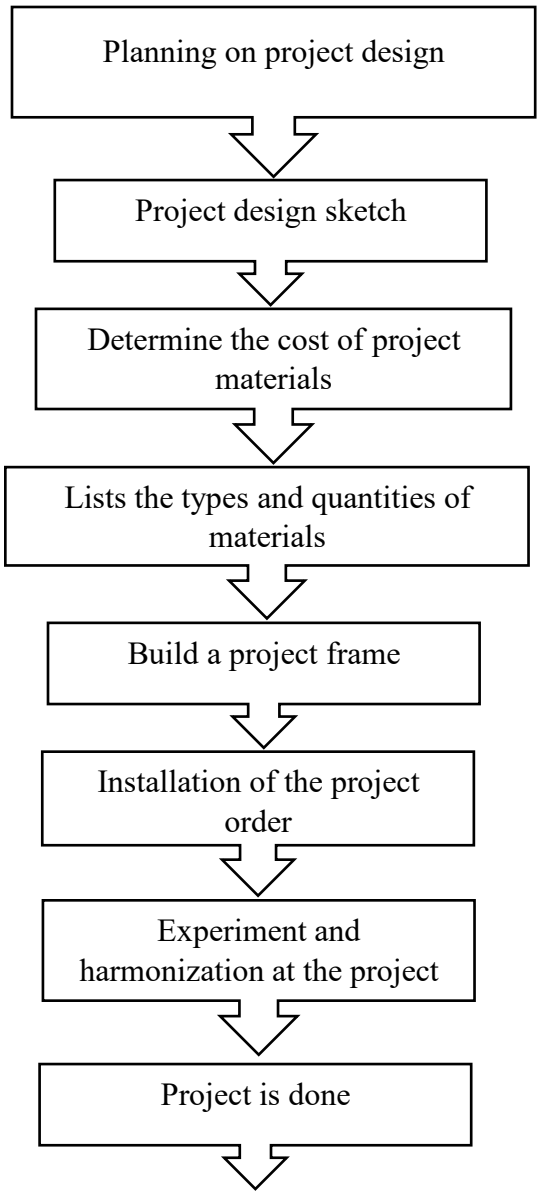
3.3 PROJECT INTRODUCTION

Project methodology can be defined as a series of systematic activities to solve a problem by developing a programming application. A methodology will use a technique used to perform specific activities. There are several types of development methodologies that can be used in developing a system application. Each approach chosen should be appropriate to the project

3.4 METHODOLOGY FLOW CHART



3.4.4 Project Implementation Flow Chart In Semester 6



3.5 Semester 4 & 5 Project Replacement Chart

No	Activities	Semester 4			s	e	m	e	s	t	e	r		5			
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	Project title selection																
2.	Came up with a proposal																
3.	Provide the material																
4.	Produce the main parts of the project																
5.	Installation process																
6.	Testing process																
7.	Make a neatness																
8.	Presentation																
9.	Project reports																

3.6 DISCUSSION

In the process of this methodology, several methods or procedures for implementing good projects need to be taken into account in order to facilitate the journey of success and ensure the success of the project. Discussion is a method used in the early stages of planning. There are some work procedures that need to be implemented, including:

- **Identify key requirements**

  - The problems encountered
    - In order to produce this project the main requirement is to identify the problem faced by the user as well as the project selection
    - These issues are identified through studies conducted on existing products as well as consumer surveys.

  - Increasing ideas
    - After identifying the problem you are facing, the next step is to get and gather the ideas you have to solve the problem.

  - Option of ideas
    - Through discussions held between members of the group as well as getting ideas from the supervisors, we have chosen the best ideas through some of the ideas available.

- **Title Selection and Discussion**

Title selection and discussion are one of the methods used in the early stages of planning. The title is selected after discussion from team members and supervisors. Before choosing a title or project to work on, be aware of its uses and benefits to users.

Discussion is a method in the early stages of planning. There are a number of work procedures that need to be done such as problems faced, ideas spread and idea selection.

- **Development of Ideas**

Through discussions, research through the brainstorm, and questionnaire conducted, several ideas were listed. After thinking about it the "Automatics Arc Welding Machine" was chosen for this idea, because of its easy-to-use concept for polytechnic students. Its use is very simple because it uses electricity and it is also automatic and does not use much manpower.

In addition, this tool also has high commercial value because of the high demand from consumers especially to welding workshops workers. The idea we want to highlight is to produce a product that has many uses at a low cost.

- **Design**

In the production of this innovative product, there are several components that need to be designed to suit the desired product design. Among the components that should be available on this part of the machine are steel made

- **Analysis**

Once the design process is complete, an analysis is needed to determine the pros and cons of the product. The analysis is divided into two parts, namely, research and chart. The

analysis needs to be carefully researched to get the right information about the material to be used.

- **Prototype**

The prototype construction began with the preparation of materials, hardware and components to be used. It starts with the purchase of the necessary goods and makes the construction of the skeleton and then assembles the components according to the position proposed in the framework.

- **Experiment**

Once the prototype is ready to be built, an experiment will be conducted to determine the feasibility and effectiveness of the equipment. This test is carried out to repair and repair the deficiencies in the equipment. Review is necessary to ensure that the projects to be created meet the needs of the users.

3.7 RESEARCH DESIGN

Design plays a very important role in our lives because it influences everything we do. All design should be the solution to the problems caused by the human environment. While design can fully meet the needs of a given situation, the design is said to have succeeded in designing a design, this project emphasizes several important aspects to ensure that the design that meets the needs and resolves the problems that arise. Some of the aspects mentioned are as follows:

3.7.1 Main function

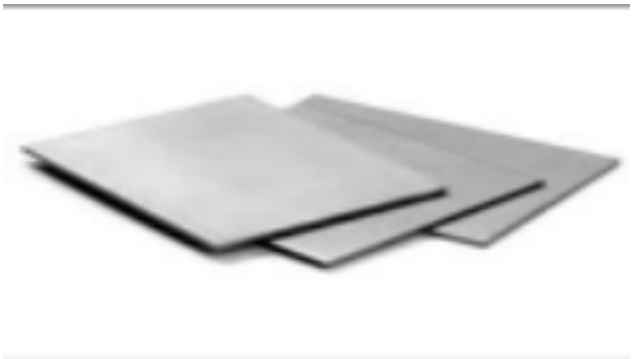
This Arc Welding Automatics makes welding easier

3.7.2 MATERIALS USED

1. Mild Steel Hollow

- Hollow steel is a steel pipe shaped box. Usually this hollow iron is made from galvanic, stainless steel or steel only.
- This steel is used to make welding table legs
- It is also used to create a stand for holding the

2. Mild Steel Plat 1.5mm



- This tool is used to create the layer welding table.

3. Treaded rod

- function to move the nut
- function to move the welder down

4. Nut

- Pasted on a moving plate

5. **Push Start Button**

- To start the engine

6. **Motor 10000 watt**

- Serves to move the treaded rod

3.7.3 EQUIPMENT USED

In completing this project, we first identified methods of cutting and connecting metal for use. Connection work is a process of combining two or more metal materials. The work of connecting materials can be done by means of bonding and welding. Some of the tools used to complete this project are:

1. Measurement tape

.

- ✧ A measuring tape is a flexible form of ruler. It contains a plastic, glass fiber, or metal with linear measurement marks, measuring it in a matrix unit. Surveys typically use a measuring tape in an appropriate position for extending the measuring tape.
- ✧ It is one of the most common measuring instruments for measuring large ranges and measuring around curves or corners; it is simply carried by inserting it into a pocket or toolbox

2. Disc cutter Machine

- ✧ The saws are generally made of copper, steel, valium but carbide at the tip of the blade and are used for some use.
- ✧ These saws are suitable for cutting aluminum, baking, copper, machine steel and stainless steel. This type of saw is an option for cutting work because the cut material is not wasted and the cut surface can be easily trimmed using grease.
- ✧ In addition, the cutting process does not change the nature of the material.

3. Gas metal arc welding (MIG)

- ✧ In the process of MIG the electrode melts and mixes with the parent metal melt forming a puddle. In this welding too, the electrode melts and acts as a charging rod.
- ✧ Therefore, the electrode must be supplied continuously throughout the welding process. For continuous supply throughout the welding process is carried out. For continuous supply the electrode is made in the form of a wire that can be pushed out of the welding machine automatically at the specified speed.
- ✧ The welding process can be done automatically or semi-automatically. In automatic MIG welding, wire threading, gas flow (power) systems and welded nozzle travel throughout the connection are processed first and further processing is done automatically. But in semi-automatic welding, the electrode wire supply, the power system and the gas stream are processed, while the welding nozzle is operated manually.
- ✧ The engine recommended for use with MIG welding is a motor generator or a continuous-type power supply that supplies a constant current of up to 250 amps. During welding using this machine, the voltage changes is automatically adjusted according to the clearance distance between the tip of the electrode and the workpiece, while the current changes inversely.

4. Angle Grinder Machine

✧ Hand grinding machines are machines that work to move objects. Originally the milling machine was only intended for hard metal objects such as iron and stainless steel. Grinding can be used to sharpen objects such as knives and chisels, or it can also be used to create objects such as trimming the cutting result, trimming the welding results, forming an arch on the angled workpiece, preparing the surface of the workpiece for welding, and more.

5. Hand Drill Machine

✧ This machine is easy to carry there. Its purpose is to drill a small hole and operate with electric power. There are two types of mobile drill machines:

A. Pistol Type

- This type is lightweight and can be held in one hand. It is suitable for light work.

B. The type of work is heavy

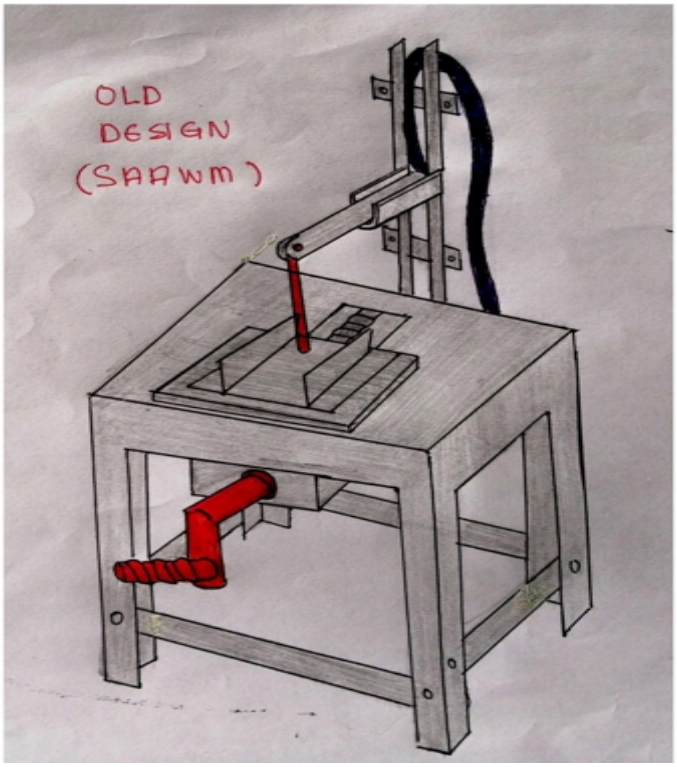
- This type is heavier and has to be held with both hands. It is used for heavy work.

3.8 PROJECT DESIGN CONCEPT

Initially one of the team members designed a design for use in this project. It was also agreed by the project supervisor to be used through this project but in the end, the proposed design was problematic. As a result, discussions on the redesign of a new design have been made and have agreed to use other designs to be used to make this project a success. This sketch has been measured with accuracy and balance so as not to damage the project.

3.8.1 Design Concept Analysis

a) First Design



The diagram above shows the first design drawn by a member of this group. This design shows an isometric view

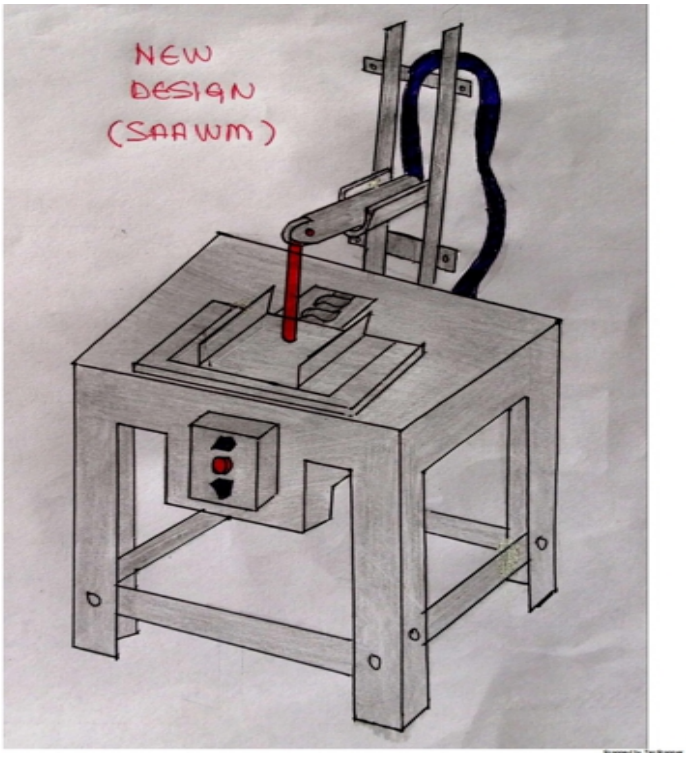
Advantages

- The cos is cheap
- Free maintenance

Disadvantages

- Using human energy

b) Second Design



Advantages

- uses electricity to move the plate
- Save time
- Save energy

Disadvantage

- The cost is quite expensive

- Concluding the design selection, our team chose the second design because it was more mechanical, unique and effective than the first design. It works when the shutter is pressed and the plate and the welder move in the prescribed direction. It allows the user to easily measure the angle of the welder

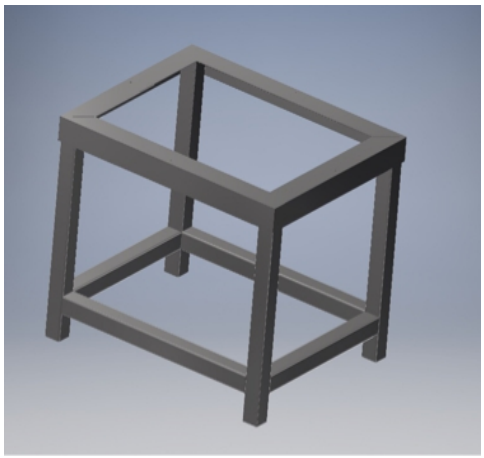
3.9 IDEA SELECTION

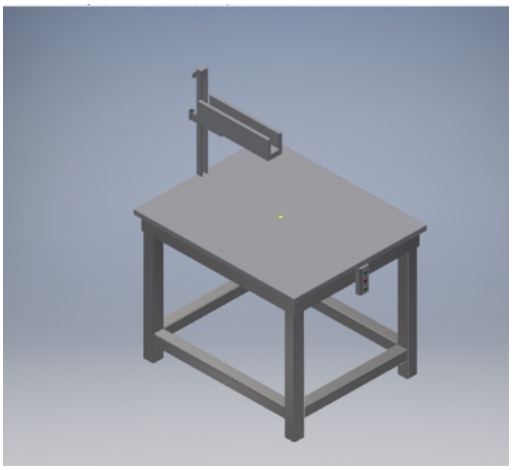
a) Material selection

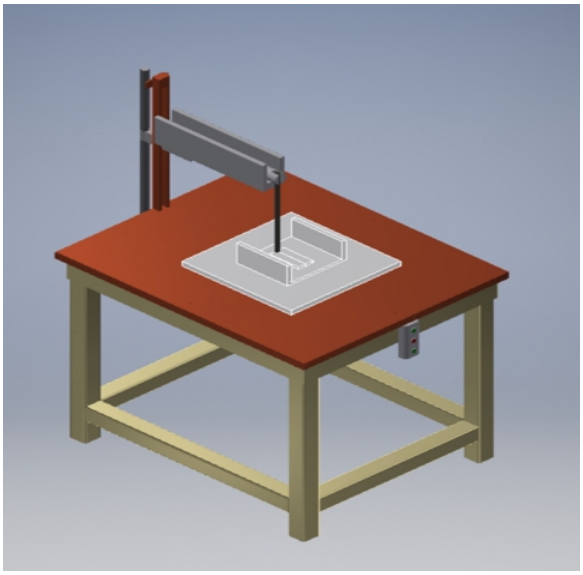
The cost of materials used is the most important factor in producing a product or project that has more use but less costly and in line with the existing product in the market so that it can compete with other products. In addition, the cost of materials needed should also be adjusted to the strength and usability of the material.

According to the results we have obtained to complete this project, it is the team's cooperation to purchase the necessary materials and to allocate the cost of the purchase of the company.

b) The outline and shape of the project







3.10 Work Steps

Make the frame part of the welding table

1. Measure and cut the iron to be cut using a hacksaw machine according to the marked size

2. Connect the cut iron using an inert gas arc welding machine (MIG)

3. Cover the entire frame of the table with a plate.

4. Drill a hole in the table to connect a small part

5. External framework and completed projects

CHAPTER 4

PROJECT PLANNING

4.1 INTRODUCTION

Research and planning is an analysis done on a new design and there are changes to the existing design. So, to produce this project, we have done a little research and plan to make sure this 'Automatic Arc Welding Machine' is more perfect.

This test is also very important to ensure that our project runs smoothly and perfectly. This test is conducted in the welding workshop to ensure that the project runs smoothly. Test methods are the most important aspect to determine project outcomes.

4.2 DETERMINATION OF PROJECT HIGH

We have done some research before creating this project. The most important aspect of this project is the height of the project because the height of the project plays an important role so that the material passing through this machine does not get stuck with the bevel gear that is under the machine.

4.3 PROJECT MAINTENANCE

After reviewing the project height, we turned to project maintenance. Most machines are made of thin iron, they need to be replaced with new ones when used frequently because it is likely to damage the product if not maintained but, we modified our project by using stainless steel on all the frame of the machine and the plate on the top of the machine. This allows the plate on the machine to be opened for maintenance.

4.4 COST OF MANUFACTURING AND PRODUCTION

NO	METHOD	QUANTITY	PRICE PER ITEM	TOTAL PRICE
1)	Battery	1	RM 50.00	RM 50.00
2)	Motor	1	RM 40.00	RM 40.00
3)	Plat	1	RM 30.00	RM 30.00
4)	Bolt & nut	8	RM 0.60	RM 3.00
3)	Thin flat washer	2	RM 1.50	RM 4.80
4)	Bearing	4	RM 26.00	RM 104.00
5)	Miter gear	2	RM 55.00	RM 110.00
6)	Electrod holder	1	RM 28.00	RM 28.00
7)	Rod	300g	RM 5.00	RM 5.00
8)	Hollow iron		RM 170.00	RM 170.00
JUMLAH	**RM 544.80**			

4.5 PROJECT MARKETABILITY

Each product produced has its own market value. The same goes for the 'Automatic Arc Welding Machine' 'that we have produced. One of the reasons our project can be marketed is because this project can reduce accident statistics in the workshop. Our project also has a design that is suitable for use especially by students. It further makes it easier for new welders to try this machine.

We are confident that our project can penetrate the market as our project can reduce accidents while using it. In addition, we also ensure the ability to produce the best quality of our projects. The prices of our products are also reasonable and do not require sufficient skills for our project. Apart from that, the maintenance cost is also very cheap and easy.

4.6 CONSUMER SURVAY

This questionnaire study was conducted to obtain data, opinions, suggestions or comments related to our project, methods or all matters related to project production. This questionnaire was conducted to the respondents who were directly or indirectly involved.

FINAL YEAR PROJECT SURVAY

We students from the packaging mechanical engineering department would like to conduct a questionnaire for the purpose of the final year project to be implemented. This project is called 'AUTOMATIC ARC WELDING MACHINE'. This project is designed to make it easier for welders to do welding work in the workshop without high risk. Welding products will also look beautiful and quality.

Gender

- ◯ Male
- ◯ Female

Have you ever had difficulty welding in a workshop?

- ◯ Yes
- ◯ No

Will this project reduce the risk during welding work?

- ◯ Yes
- ◯ No

Can the advantages of this project help facilitate welders?

- ◯ Yes
- ◯ No

Will the welding result look quality and neat by using this machine?

- ◯ Yes
- ◯ No

Is the cost of maintaining and manufacturing this project lower than the existing machine?

- ◯ Yes
- ◯ No

Is this project suitable for marketing?

- ◯ Yes
- ◯ No

Can this machine make it easier for welders to work easily?

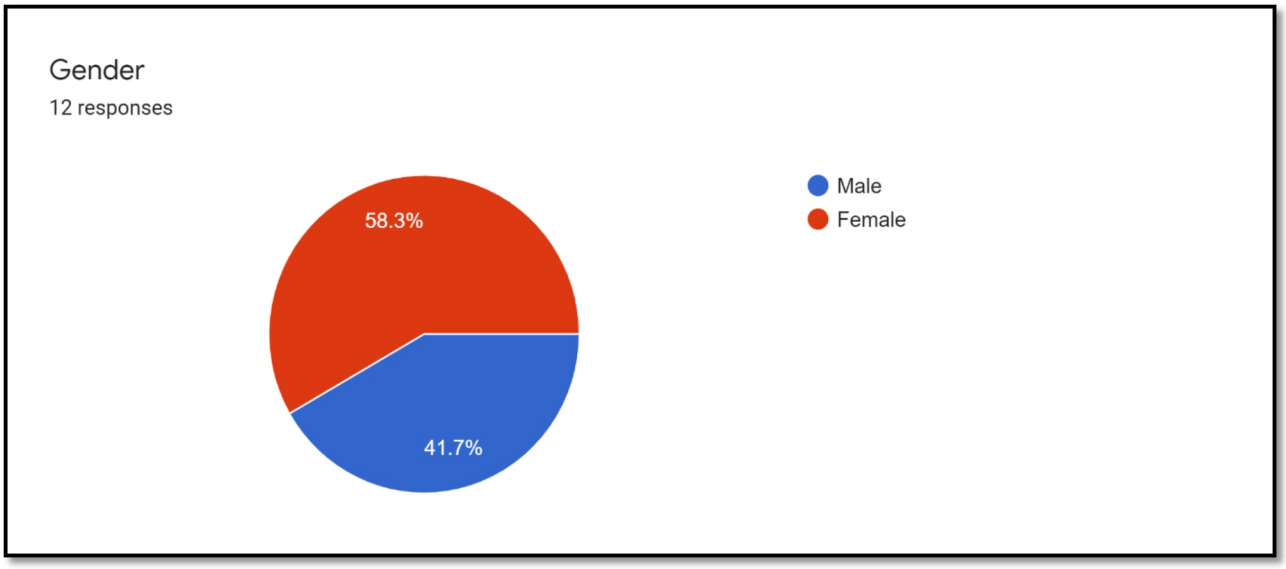
- ◯ Yes
- ◯ No

Does this machine have ergonomic properties?

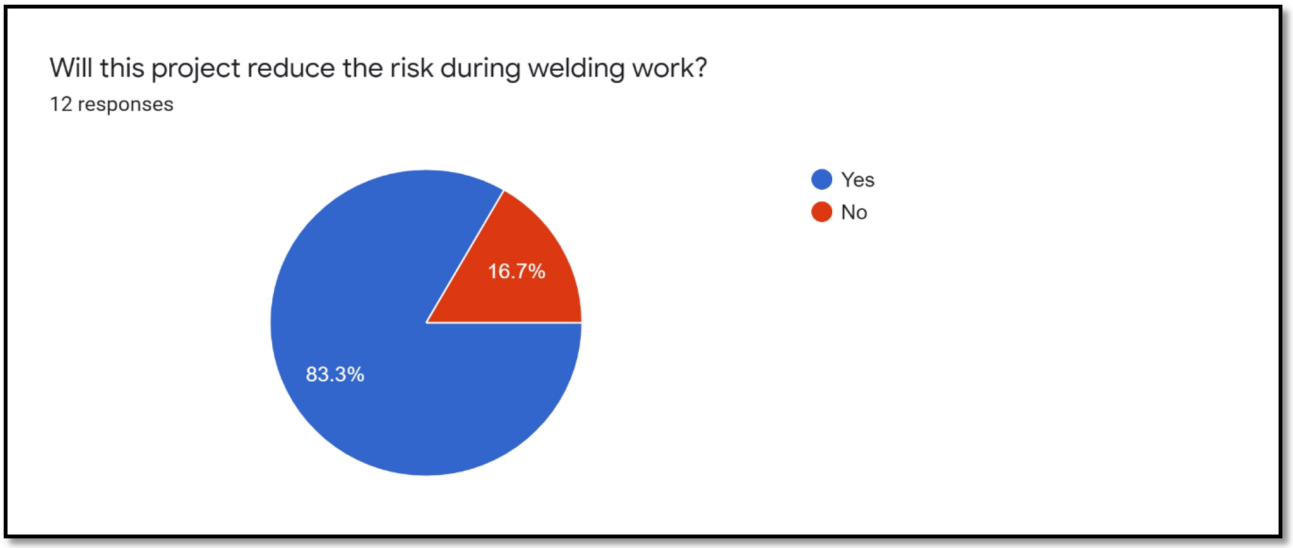
- ◯ Yes
- ◯ No

Submit

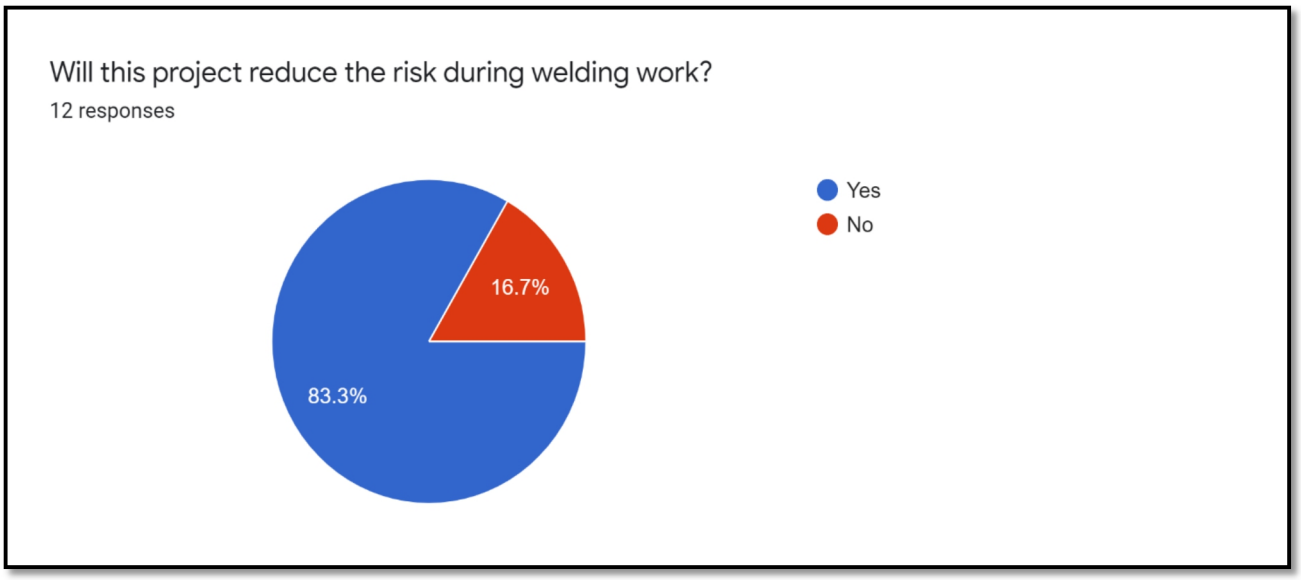
4.7 SURVAY RESULT



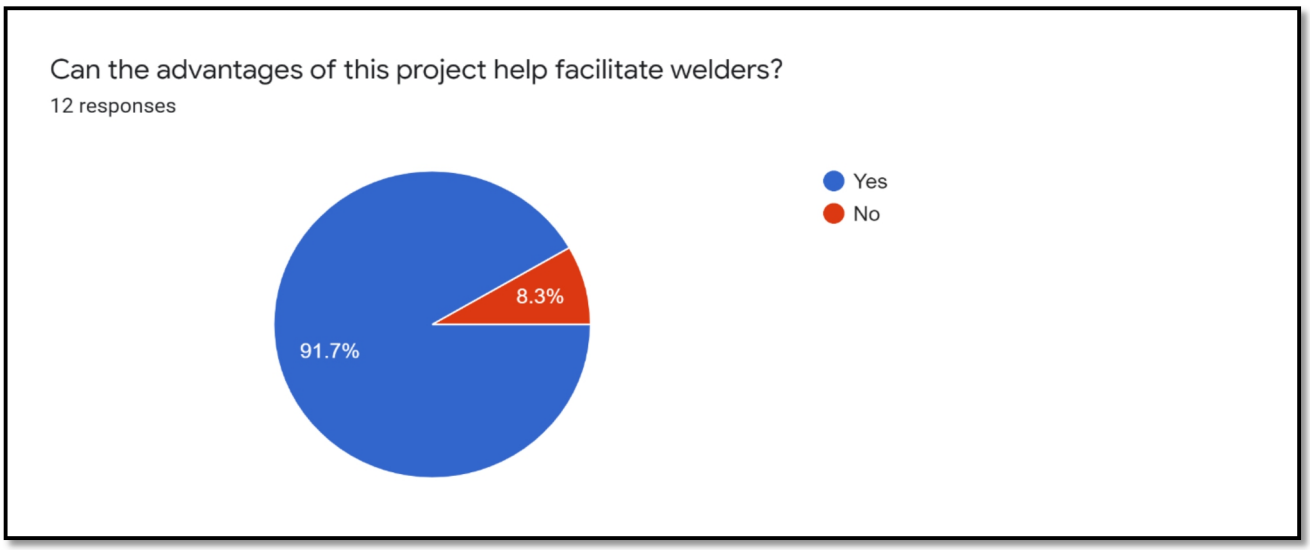
The diagram above shows the number of 'Automatic Arc Welding Machine' residents who responded to this study was 58.3% among men while 41.7% among women. The total number of all respondents is only 12 people. Studies from this found that men are more responsive than women.



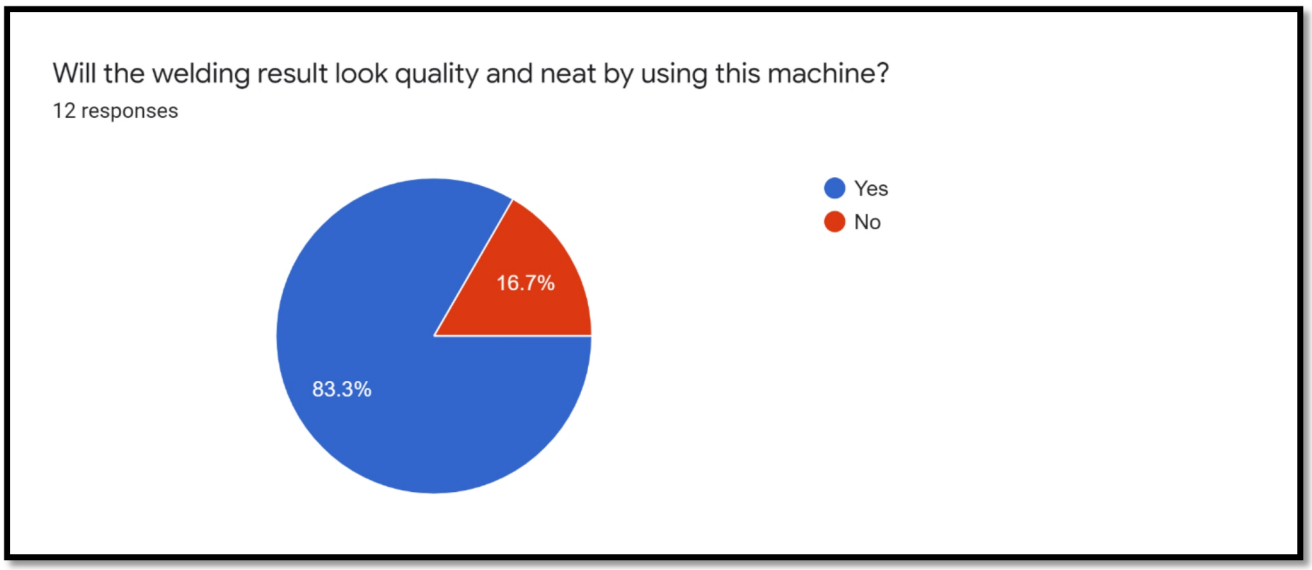
The diagram above shows that 83.3% have had difficulty welding. While 16.7% never experienced it. The results of this questionnaire show that only a handful of students do not have difficulty welding. This means that welding work is quite difficult if not used properly.



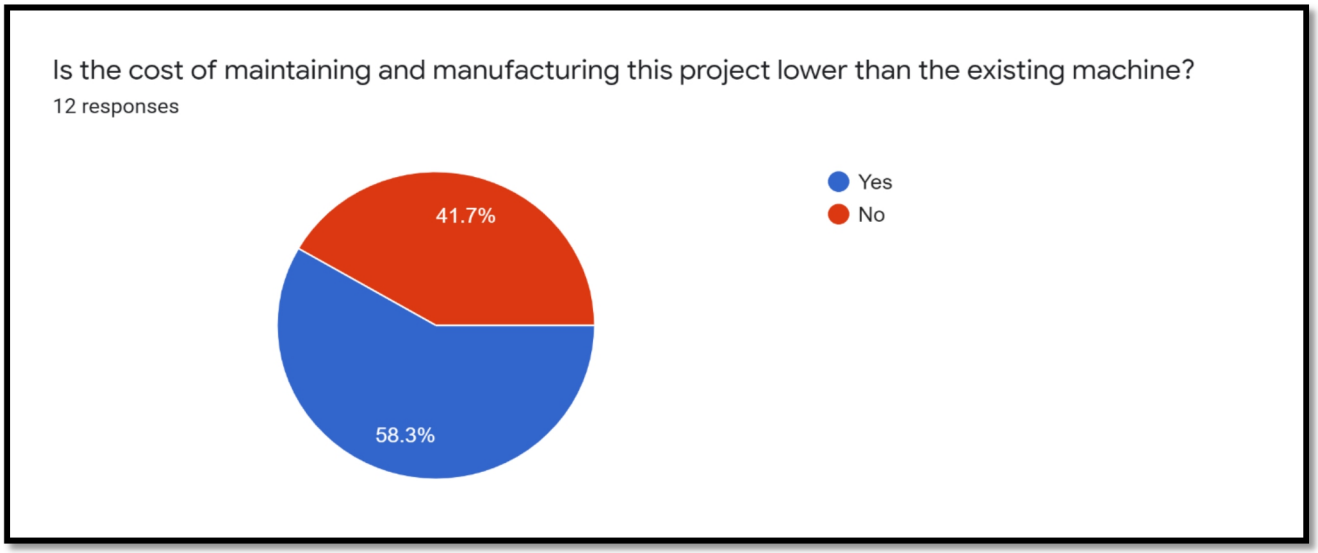
The diagram above shows 83.3% of students who can reduce the risk during welding work. While 16.7% of students said they could not reduce the risk. It is clear that the majority can reduce the risk is higher than not.



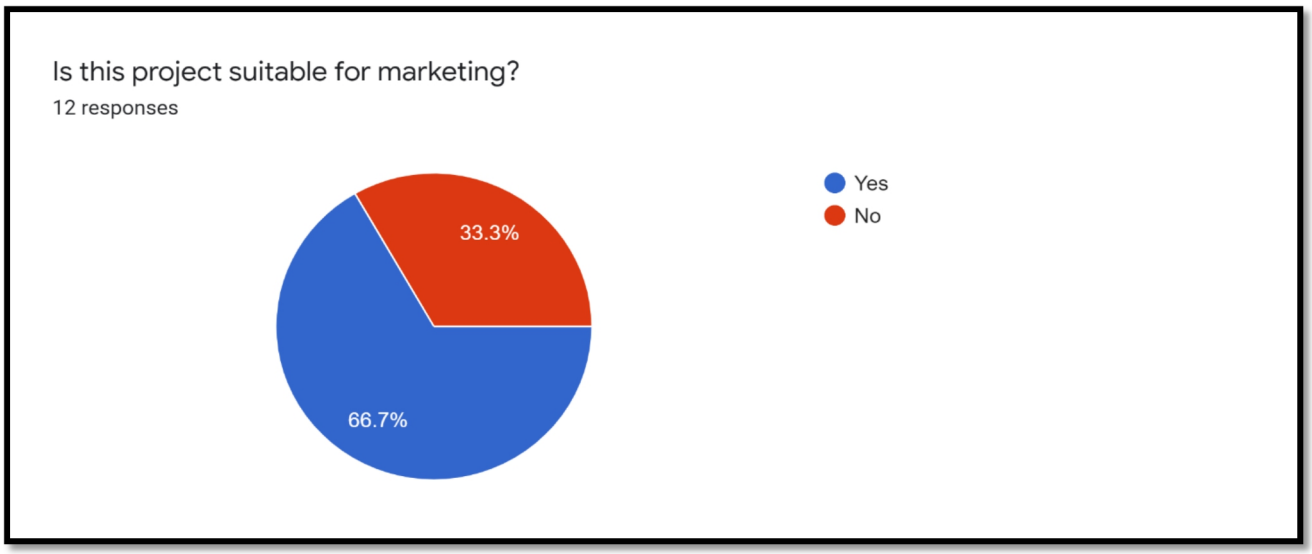
The diagram above shows that 91.7% said yes in this survey while only 8.3% said no. This indicates a large number agree with this product which helps make it easier for the welder to do the job perfectly.



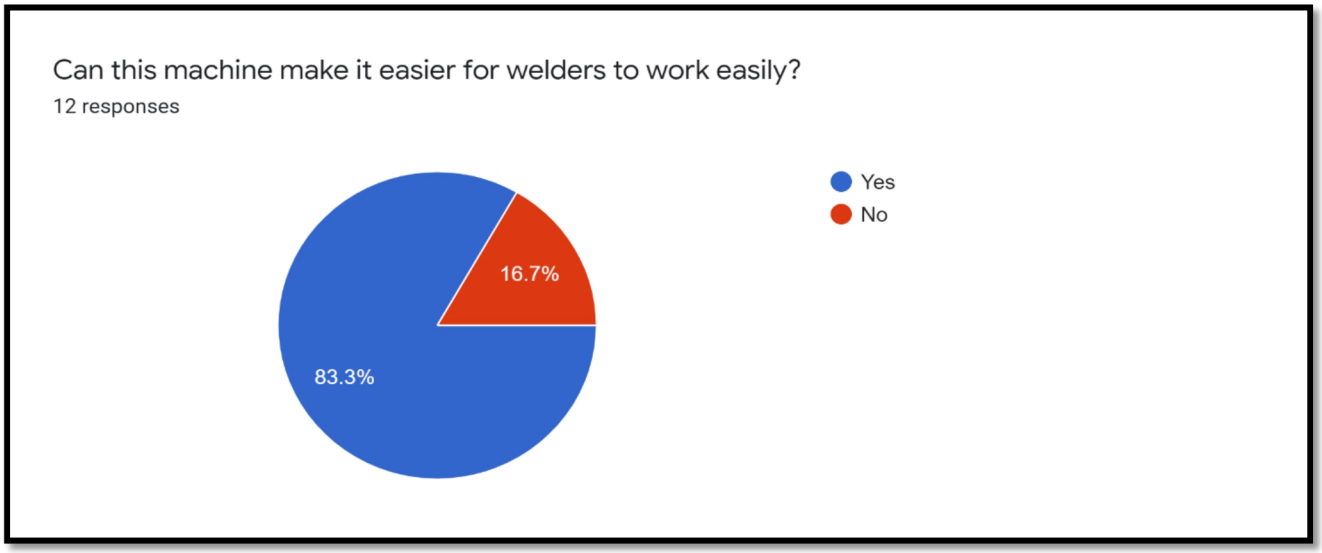
The diagram above shows 83.3% sure that the welding results using this machine will look quality and neat. While 16.7% are not confident that the welding results using this machine will be neat. This shows that many students are confident in the results of this machine.



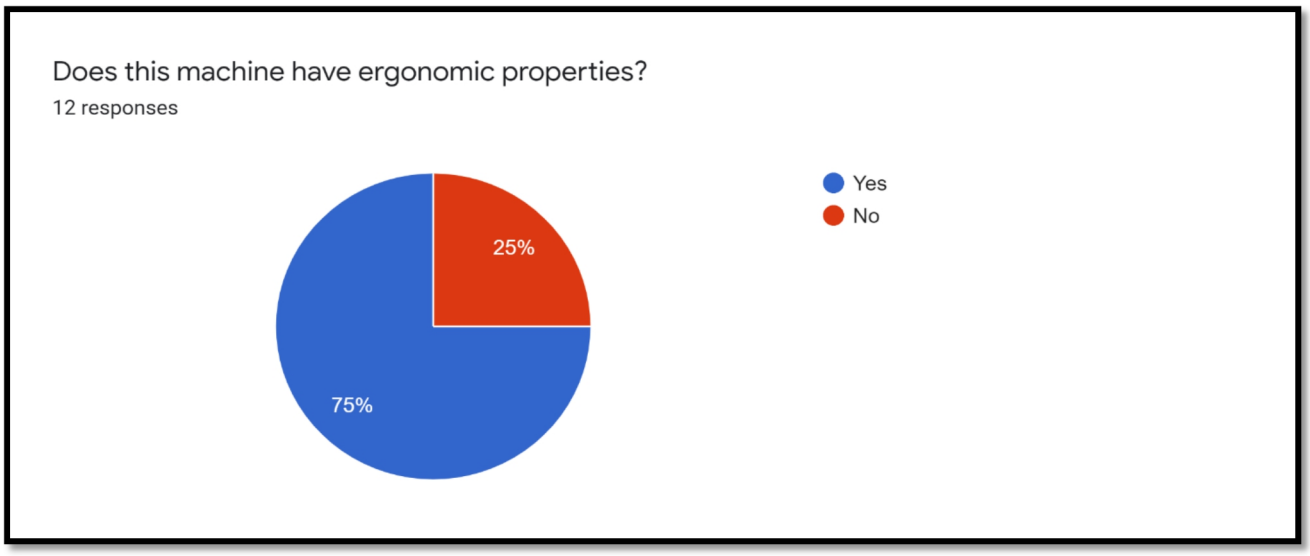
The diagram above shows 58.3% who said yes to this question. This is because it has been proven that maintenance costs are lower than buying new ones. While 41.7% of students said no to the maintenance cost. Maybe they are easier to use existing machines. This shows many students agreeing on low maintenance costs.



The diagram above shows 66.7% agree that this product can be marketed while 33.3% disagree. The majority show this product can be marketed because of its reasonable manufacturing cost and our hope to be able to enter the international market.



The diagram above shows that 83.3% of students said yes that this machine facilitates welding work. While 16.7% said no to this statement. This states that this machine is very convenient for welders because there is no need to hold the electrode as it used to be because it has been upgraded.



The diagram above shows that 75% say yes this machine has ergonomic properties while 25% disagree. The majority of students choose this product has ergonomic properties because the height of this machine corresponds to the height of the student has made it easier when doing welding work.

CHAPTER 5

SUGGESTIONS AND REFERENCES

5.1 Suggestions

1. Introduce this product throughout the polytechnic as it can facillitate the work of students workshops.

5.2 References

In the process of preparing this final project report, we have used several resources as a references. Among them,

- **Lecture**

  Milions of thanks to Mr. Roslan Bin Kamaruddin, as our project supervisor who provided a lot of information and guidance in making this project a sucess.

- **Sample report**

  We make example of existing reports to be used as a resource in the process of preparing our final project report.

- **Websites**
  - https://www.twi-global.com/technical-knowledge/faqs/what-is-welding
  - https://youtu.be/JvVMhwlnUUE
  - https://www.yourarticlelibrary.com/welding/electric-arc-welding/electric-arc-welding-meaning-procedure-and-equipments/95973

5.3 Conclusion

In conclusion, the construction of this machine can be taken into account for students who have problems using existing welding.

5.4 Attachment