

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

WELDING JIG

JABATAN KEJURUTERAAN MEKANIKEL

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JUN 2020

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**Laporan ini dikemukakan kepada Jabatan Kejuruteraan Mekanikal sebagai
memenuhi sebahagian syarat penganugerahan Diploma Kejuruteraan
Mekanikal**

JABATAN KEJURUTERAAN MEKANIKAL

JUN 2020

AKUAN KEASLIAN DAN HAK MILIK

TAJUK : WELDING JIG

SESI : JUNE 2020

- 1.Kami, **1. MOHAMAD RASHIDI BIN SARBAINI (08DMP18F1145)**
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Adalah pelajar tahun akhir **Diploma Kejuruteraan Mekanikal, Jabatan Kejuruteraan Mekanikal, Politeknik Sultan Salahuddin Abdul Aziz Shah**, yang beralamat di **Persiaran Usahawan, 40150, Shah Alam, Selangor**. (selepas ini dirujuk sebagai 'Politeknik tersebut').

2.Kami mengakui bahawa "Projek tersebut di atas' dan harta intelek yang ada di dalamnya adalah hasil karya/reka cipta asli kami tanpa mengambil atau meniru mana-mana harga intelek daripada pihak-pihak lain.

3. Kami bersetuju melepaskan pemilikan harta intelek 'projek tersebut' kepada 'Politeknik tersebut' bagi memenuhi keperluan untuk peanugerahan **Diploma Kejuruteraan Mekanikal** kepada kami.

Diperbuat dan dengan sebenar-benarnya diakui

Oleh yang tersebut;

ABSTRAK

Kimpalan merupakan satu kaedah yang digunakan untuk menyambung dua bahan logam untuk membentuk satu komponen dengan menggunakan haba, tekanan atau kedua-duanya sekali. Kimpalan mempunyai kaedah-kaedah sambungan yang digunakan untuk menyambung dua bahan logam tersebut. Penciptaan jig kimpalan ini lebih menfokuskan kepada arah pembelajaran yang menggunakan lima kaedah sambungan. Ketidakesesuaian bahan penyokong memberikan impak yang besar terhadap penyambungan kimpalan. Oleh demikian, penggunaan penyokong yang tidak berkesesuaian akan menyebabkan kedudukan bahan yang dikimpal akan bergerak semasa pengimpalan dilakukan. Ini akan menyebabkan hasil kimpalan yang didapati tidak memuaskan. Natiujahnya, jig kimpalan diciptakan untuk mendapatkan kedudukan bahan kimpalan yang sesuai serta mendapatkan kedudukan kimpalan yang tepat. Di samping itu, ia menjadi satu bahan sokongan yang berkesesuaian yang memudahkan sewaktu mengimpal dan dapat mengurangkan pergerakan bahan kimpalan sewaktu pengimpalan. Justeru itu, Jig ini direka dengan menggunakan keluli lembut yang tidak mudah karat serta mempunyai kos yang rendah. Bukan itu sahaja, kedudukan jig yang stabil serba sedikit dapat membantu sewaktu pengimpalan. Penggunaan jig hanya dapat digunakan bahan-bahan logam yang permukaannya rata. Pada amnya, jig kimpalan ini merupakan satu rekaan yang memakan kos yang rendah berbanding jig kimpalan yang menggunakan keluli asli. Seajarnya itu, jig kimpalan ini mudah dipindahkan ke tempat yang lain kerana saiz yang sangat padat dan ringan serta mudah disimpan dan tidak memakan ruang yang besar.

ABSTRACT

Welding is a process used to link two metal materials, by applying heat , pressure or both at once, to create one part. Welding has techniques for the relation between the two metal components. Creating this welding jig focuses mainly on learning path using the five attachment approaches. The incompatibility of the supporting material affects the welding relation greatly. Therefore the use of unsuitable supports during welding can allow the position of the welded material to change. That will result in unsatisfactory results in welding. As a result, the welding jig was produced to obtain the proper position of the welding material as well as the correct position of the welding material. It also becomes an appropriate supporting material which facilitates the welding process and can minimise the movement of welding material during welding. Hence, this Jig is made using soft steel that doesn't easily rust and has low cost. Not only that, the jig's reasonably stable location during welding can help. The use of jigs can be used only on flat-surface metal materials. This welding jig is typically a low cost design compared to welding jigs which use natural steel. Accordingly, due to its very small and light nature, and easy to transport, this welding jig is quickly transferred to another position and does not take up much room.

PJCONTENT

CHAPTER	CONTENTS	PAGES
	FRONT PAGE	
	DECLARATION OF OWNERSHIP AND COPYRIGHT	
	ACKNOWLEDEGEMENT	
	ABSTRACT	
	ABSTRAK	
	CONTENTS	
	LIST OF TABLES	
	LIST OF FIGURES	
1	INTRODUCTION 1.1 Research Background 1.2 Problem Statement 1.3 Research Objectives 1.4 Research Questions 1.5 Scope of Research 1.6 Significance of Research 1.7 Chapter's Summary	
2	LITERATURE REVIEW 2.1 Introduction 2.2 Method comparison 2.3 Research methodology 2.4 Material Selection 2.5 Chapter's Summary	

3	METHODOLOGY
	3.1 Introduction
	3.2 Flow Chart
	3.3 Flow Chart Explanation
	3.4 Project Design
	3.5 Operational Methodology
	3.6 Methodology Phase
	3.7 Budget Calculation
	3.8 Project Activity
	3.9 Chapter's Summary
4	FINDINGS AND ANALYSIS
	4.1 Introduction
	4.2 Advantage and Disadvantage
	4.3 Test Run
	4.4 Chapter's Summary
5	DISCUSSION , CONCLUSION AND UPGRADE PLAN
	5.1 Introduction
	5.2 Discussion
	5.3 Upgrade Specification
6	CONCLUSION
7	REFERENCES
8	APPENDIXES

CHAPTER 1

INTRODUCTION

PREPARED BY MUHAMMAD MUIZZUDDIN

1.1 RESEARCH BACKGROUND

Welding is a process or arrangement that joins two materials using heat, pressure or both at once to become one desired material. There are many types of welding and each type has a different source. Several various energy sources, including gas flame (chemical), electric arc (electrical), microwave, electron beam, vibration, and ultrasound, can be used for welding. While welding is mostly an industrial process, it can be carried out in many different conditions, including open air, underwater, and outer space.

Welding has since become one of the important elements in the field of engineering. There are different kinds of joints in welding that can be used to achieve the desired result. Students will be introduced to the techniques used during welding as well as the forms of joints used in learning and research sessions in higher education institutions that belong to engineering fields such as polytechnics and technical colleges. All students who come to higher learning institutions have diverse perspectives and backgrounds, resulting in gaps in welding skills.

Therefore, the development of thoughts that derive from the situation. We have come out with idea to design a support tool that will assist students during welding and welding jigs are the supporting tool. Welding jig is a supporting element that can be used during welding process. Which we already know that welding jig has long been invented, but most of the welding jig that invented only can do 2-3 type of join only.

This research is motivated by the development of welding jigs that can help students accomplish the standard needed during teaching and learning sessions. This welding jig will

also help students develop their ability and thereby increase the abilities of the students. So we sought to construct this jig as a solution to the problems we observed

1.2 PROBLEM STATEMENT

Inadequacy of the material used for welding as support material may cause errors while welding. This is due to the use of supporting materials that can shift the position of the iron plate during welding due to their irregular surface and instability. Thus, since the motion of the plate happens during the welding process, this creates difficulties in achieving the desired welding outcome.

In addition, the iron plate's unsuitable location makes it impossible to obtain an ideal position for welding. To achieve a neat welding outcome, each welding joint has an acceptable welding position. Inadequate welding location would also result in unsatisfactory welding performance. This is because during welding, each weld joint has its own position to get a neat and beautiful outcome and the position of the plate plays an important role in ensuring that the position can be easily accomplished during welding

1.3 RESEARCH OBJECTIVES

The objectives of this research are:

- 1) It's conveniently accessible to ensure the position during welding.
- 2) Develop a secure support material which can be used during welding
- 3) Obtain an acceptable plate location that supports the welding operation throughout the operation.

1.4 RESEARCH QUESTION

This study will answer the following research question:

- I. Is it possible to perform five joint at the same time in one jig?
- II. During the welding, can this substance hold the plate?
- III. Will the plate positioning support the plate during the process welding?

1.5 SCOPE OF RESEARCH

The scope and limit to this research are:

- I. In welding jig you can do five kind of joint (edge joint, lap joint, corner joint, butt joint and tee joint)
- II. Can hold two plates while welding
- III. Size of wide plate is $\leq 5\text{cm}$, length $\leq 14\text{cm}$, thick $\leq 0.5\text{cm}$

1.6 SIGNIFICANCE OF RESEARCH

What we already know is that in Malaysia, this welding jig has been widely developed. In comparison, out of the five types of joint, the joints that can be made are only up to three varieties. Furthermore, to avoid unintended injuries, the shape of the jig plays a very important role in keeping the plate in the right place while welding. The result of this analysis also have certain advantage for students who are less experienced in welding. The higher learning institute also profits from this by reducing the number of student errors at the institute.

1.7 CHAPTER'S SUMMARY

In this chapter, the thesis discusses the original roots of the definition and its inspiration. Based on all the program statement found, all priorities are made. The target for this project, along with its significance, is the welding that will allow student to support the plate with precise location during welding. Therefore, this welding jig can be used to provide student who are inexperienced and less experienced in welding with a new experience

CHAPTER 2

LITERATURE REVIEW

PREPARED BY MOHAMAD RASHIDI AND MUHAMMAD MUIZZUDDIN

2.1 INTRODUCTION

Three ways to solve the problems found during the process of welding will be shown in this chapter. Each methodology has its own advantages and disadvantages. Each method is compared with our products that have their own special characteristics and benefits. A variety of assistance tool innovations are used to help improve the welding process. Metal materials such as steel, iron, mild steel and stainless steel represent the invention of the support structures.

The support structures that have been built have different types and purposes that can be supported during the welding process. These support tools have evolved over time and added to the existing functionality and advantages. Every support tool created has its advantages. Some have clamps that can prevent the movement of the plate. Hence, there are also those that help to get a position during welding easily.

Nowadays, the development of support software has evolved exponentially. In addition, the production of support software nowadays has more benefits as well as different features. Therefore, about 3 ways to address the problems that arise during the welding process and contrast between these materials and our product material will be explained in this chapter.

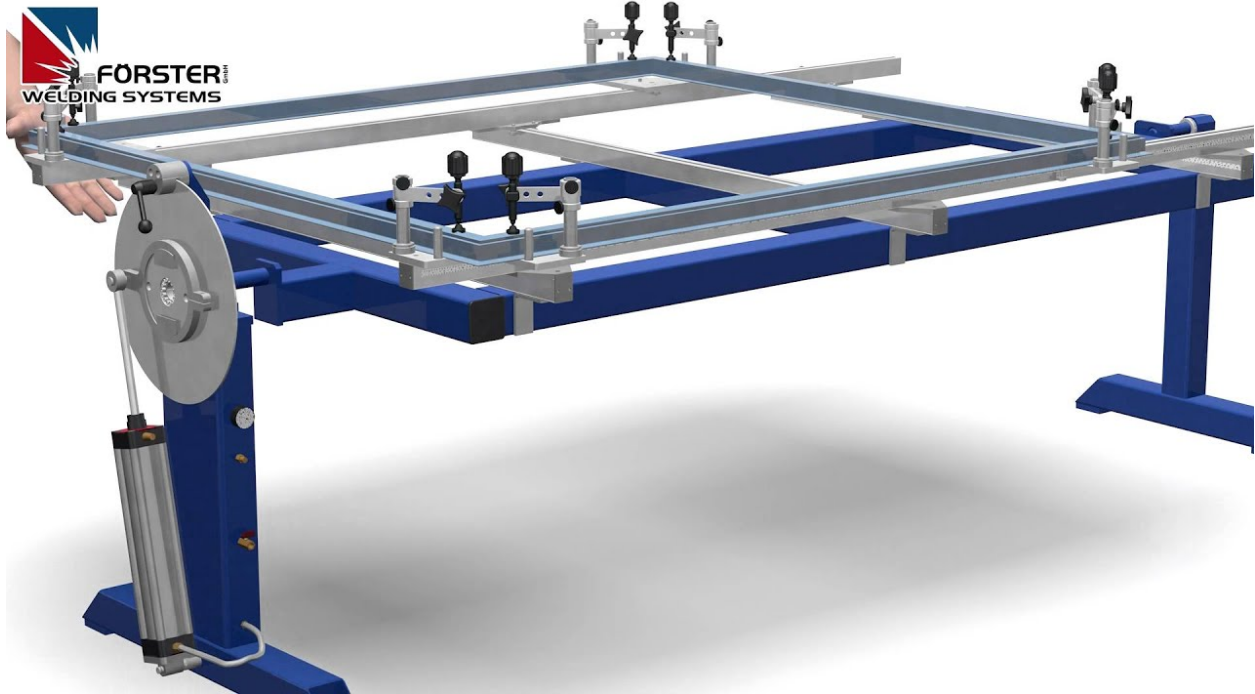
2.2 METHOD COMPARISON

2.2.1 WELDING TABLE

INTRODUCTION

To be able to square corners, do gauging, and calculation, many occupations need a welder. A welding table is the ideal platform to do all that without having to put up with additional stress or additional difficulties. For mounting purposes, such as bending brakes and jigs, a welding table could be used. The clamp is another major component of the welding table. Some tables have this built in and this can be applied on other tables.

The clamp is built to hold the work in place so that it doesn't slip on the table. Another valuable advantage of keeping a clamp on the welding table is that it can be used when operating to keep cables out of the way. Other accessories, such as hot-rolled steel grill tops and a drawer-like tray to catch debris, are available.



THE ADVANTAGES OF WELDING TABLE

The welding tables come in different sizes and are accessible. The operational height can be changed from around 880 mm to 980 mm according to your needs. The feet are made of 80 mm x 80 mm x 6 mm steel tubes. The overall weight of the welding tables is around 500 kg-1000 kg and their load size is up to 3000 kg. The welding table provides new and flexible possibilities of metalworking with its grid of holes. The welding table also provides a benefit in the development of small batch series, in addition to the simpler production of single items. The welding table ensures quick and reliable processing options for basic 2D modelling (railing construction) but, above all, precise working on more dimensional objects.

2.2.2 WELDING JIG

In the face of friction, fire, motion, and force, a jig is a large brace that holds a welding project steady. By holding pieces together in a vice grip, a quality jig will streamline welding operation.

A jig pushes the workpiece while the instrument stays stationary, whether the welding is completely manual, partly automated, or totally robotic. A fixture requires both the instrument and the workpiece to be moved together, so a jig is very similar to a welding fixture. Some jigs are connected to welding tables and have a frame welding fixture feature. All jigs are ergonomically constructed to reduce the effort necessary to complete a job.

In order to perform the weld, the jig should be stationary in the face of the welding instrument, but should still be able to move. A good jig can have several fixtures, allowing several parts to be welded at the same time, or on the same frame to weld various shapes and metals. A successful jig should be flexible, adaptable and capable of meeting the welder's precision specifications.





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THE ADVANTAGES OF WELDING JIG

- 1) They boost profitability.
- 2) Speedy production work is provided.
- 3) It lowered production expenses.
- 4) can effectively machine complicated and heavy parts.
- 5) Higher velocity, feed and cutting depth can be used thanks to high clamping rigidity.
- 6) Improved machining precision is accomplished by jigs and fixtures.
- 7) As a consequence of testing and quality management of finished parts, this decreases spending.

2.2.3 WELDING CLAMP

Welding clamps are holders of metal sheets or legs that tie two parts of materials securely together temporarily. This makes running the arc and welding the parts together simpler for welders without caring about movements in the boards. Welding clamps have different forms and shapes and have their own advantages on each clamp. Welding clamps help to keep the workpiece immobile throughout the welding process

In a close alignment, the clamps help you to solder parts together. They are particularly useful for dealing with large sheets and metal frames that are hard to keep together by hand alone. But that doesn't mean that they're useful just for bigger shields.



ADVANTAGES OF WELDING CLAMP

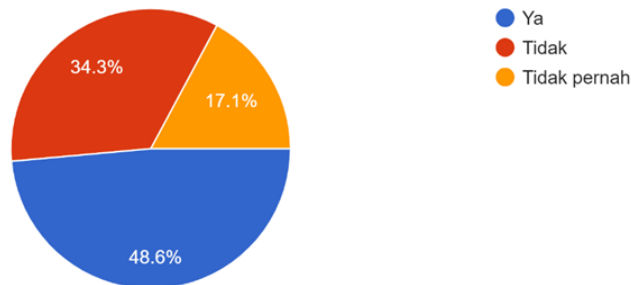
Welding clamps provide a solid grip that will hold the workpiece so that it does not slip through the process. The risk of a miscarriage is very minimal. Furthermore, each clamp has its own benefits, such as hold an angled plate, and keeps the plate very firmly.

2.2 RESEARCH METHODOLOGY

Welding has since become one of the important elements in the field of engineering. There are different kinds of joints in welding that can be used to achieve the desired result. Students will be introduced to the techniques used during welding as well as the forms of joints used in learning and research sessions in higher education institutions that belong to engineering fields such as polytechnics and technical colleges. All students who come to higher learning institutions have diverse perspectives and backgrounds, resulting in gaps in welding skills. There are questionnaire that have been answered by polytechnique student and the comparison between method

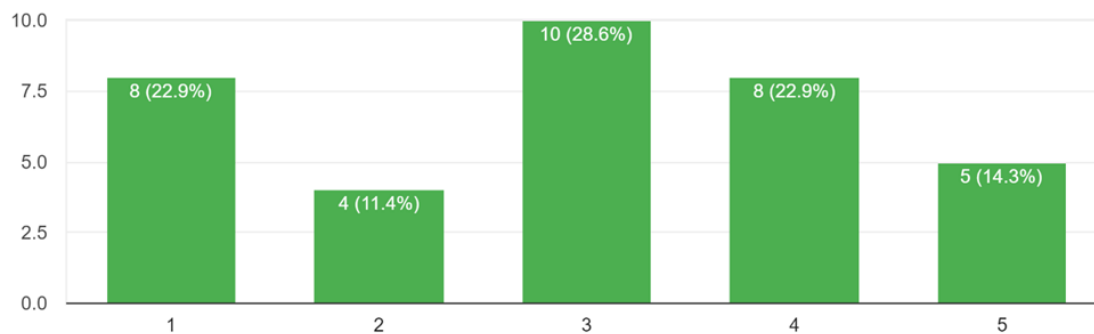
Adakah anda baru mempelajari skill welding ?

35 responses



Nilaikan skill welding anda?

35 responses



2.3 MATERIAL SELECTION

STAINLESS STEEL



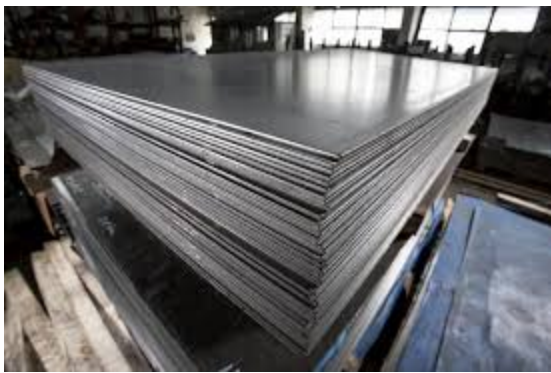
A type of metal commodity that is more resistant than standard steel to rust, staining and corrosion. That is an iron and carbon alloy. In materials used in building and tools, stainless steel is also used.

The name of a family of iron-based alloys known for their corrosion and heat resistance is stainless steel. The minimum chromium content of 10.5 percent is one of the key characteristic of stainless steel, giving it its superior corrosion resistance relative to other steel forms. Stainless steel is predominantly made of iron and carbon, like the most steels, but with the inclusion of many other alloying elements, chromium is the most prevalent. Nickel, magnesium, molybdenum, and nitrogen are other common alloys that are used in stainless steel.

Hygienic, non-porous surface combined with the simple cleaning capacity of stainless steel allows it's the primary alternative for the application needing tight sanitation supervision, such as hospital, kitchens and other food processing plants. Hygienic, non-porous surface combined with the simple cleaning capacity of stainless steel. For most architectural metal uses, artistic appearance offers a modern and desirable appearance

Its polished and easily handled surface makes it an easy choice for application that often need an appealing surface. Its strength to weight superiority enables it to be used over standard grades with a decreased material thickness, also creating cost saving. Because of the use of advance steel making methods, the simplicity allows stainless steel to be cut, machined, processed, welded and moulded as quickly as conventional steels.

MILD STEEL



Mild steel is a low carbon steel type. Carbon steels are metals that contain a small amount of carbon (max 2.1 percent) which improves the properties of pure iron. Depending on the specification for the carbon steel, the carbon content difference. In the range of 0.05 to 0.25 percent, low carbon steels produce carbon

Different grades of mild steel exist. But all of them have a carbon content below the limits described above. Other elements, such as corrosion resistance, wear resistance, wear resistance and tensile strength, are added to improve useful properties

One of mild steel's most advantageous qualities is that it can be bent, sliced and twisted to make the desired form smoother than the most metals. It is one of the reasons why carbon steel (mild steel) is common in many sectors, from the development of household product to the DIY and home improvement project's structural application. The high demand level makes mild steel a commonly processed commodity and therefore a very cheap material..

Mild carbon steel is lighter compared to high-carbon steel. The primary element determining the weight is the proportion of carbon. It is therefore safe to deal with mild steel and is used for the manufacture of auto parts, pipelines and i.e. fencing and ornament for homes and businesses

2.3

2.5 CHAPTER'S SUMARRY

At the conclusion o this chapter, it is essential for the literature review to demonstrate all the study of the material and method to improve knowledge of this project. Every thesis and other related to welding jig is very helpful especially for us to fully understand its shortcoming and advantages

After discussing and conducting research on many material and a method, mild steel is the most suitable material for our project. Compared to other metals because of its lightweight and easy-to-shape properties and benefits

CHAPTER 3

METHODOLOGY

PREPARED BY MOHAMAD RASHIDI

III.1 INTRODUCTION

What does methodology mean? A methodology is a plan-of-attack, especially when the plan-of-attack is frequently used. This may be clear, but the term technique is connected to the method of the term. A technique, in reality, is a system of continuously observed processes. For starters, scientists use different methodologies when they conduct experiments. The universe might appear to be nothing but confusion and disorder. But occasionally, in truth, there's a method to this madness and there's methodology also.

There will be a lot of detail in this chapter on the process and path through the making of our final project. The flow map will demonstrate the method of developing the whole project for us. The procedures we conducted will be explained in this flow map. First is the Gantt Map, which displays the true and the preparation of our final year project trip over all 13 weeks. In this chapter, however, we will also show three methods we have studied in order to carry out our project for the final year.

Among all the approaches shown are used to solve the problem. The welding jig is the most common way to complete it. This method has a lot advantages and disadvantages.. Hence, we will discuss these three approaches in this chapter and which one we have selected.

3.2 FLOW CHART

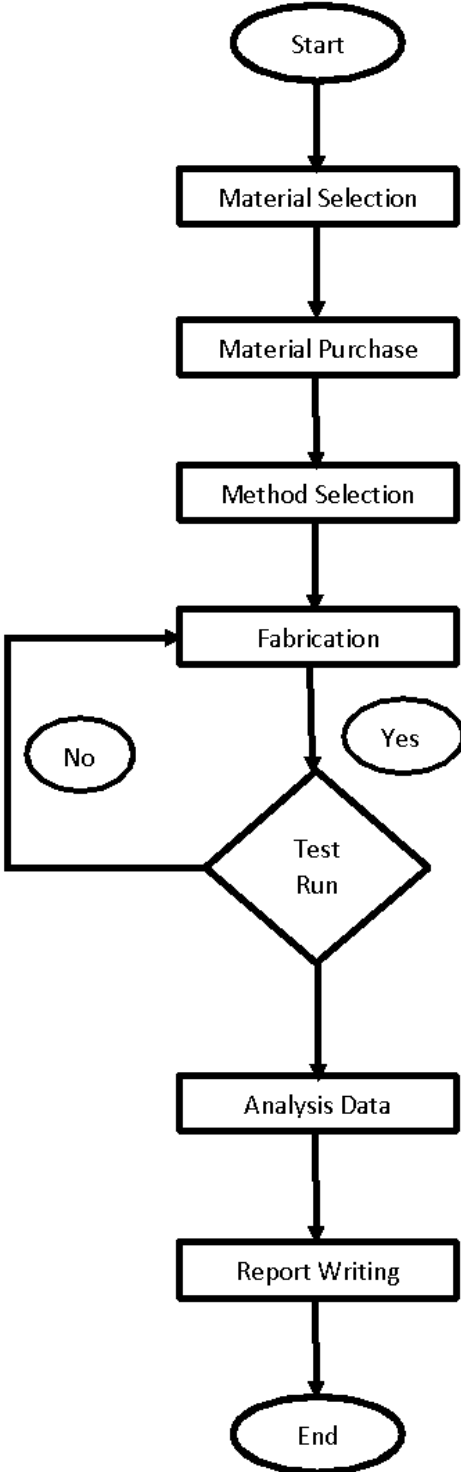


Figure 3.2.1 – Flow Chart

III.2 FLOW CHART EXPLANATION

● MATERIAL SELECTION

One of the most significant processes in this final year is the method of content collection. In order to prevent wasting resources and time, the key consideration in material procurement is to negotiate and finalise which materials will be included in the project. The choosing of content must be handled specifically so that the risks can be minimised.

1) MILD STEEL



One of mild steel's most advantageous qualities is that it can be bent, sliced and twisted to make the desired form smoother than the most metals. It is one of the reasons why carbon steel (mild steel) is common in many sectors, from the development of household product to the DIY and home improvement project's structural application. The high demand level make mild steel a commonly processed commodity and therefore a very cheap material. Therefore, we selected mild steel as the key material for our project's production.

2) HIGH-TEMPERATURE SPRAY



Specially designed to cover metal surfaces working at temperatures from 500 ° F to 1500 ° F, a high temperature / heat resistant coating.

It acts much like galvanising, leaving an ideal primed surface for top coating as it locks itself to bare metal surfaces.

● MATERIAL PURCHASE

To gather and acquire all the materials required, the process of buying materials is critical. In this phase, a lot of analysis is conducted on the locations and vendors that are going to buy the products. This move is necessary in order to avoid the possibility of material waste or lack of capital. However, it was important to make a well-made buying strategy to carry out material transactions. Next, manufacturers will be called to make sure the supplies are available. Then, the measurement of the sum of materials needed and the cost of the materials as well. After that, in order to determine better sale prices, price surveys must be carried out. Then the sales will actually be made.

● METHOD SELECTION

This method selection procedure is necessary in order to ensure that the method selected is reliable and acceptable for the product. This choice of approach would prevent cash-lost and time-taking procedures. It is therefore essential to carry out this method selection process. There are three methods that could be carried out to solved problem occur when welding :

1) Welding table



A welding table is the ideal platform to do all that without having to put up with additional stress or additional difficulties. For mounting purposes, such as bending brakes and jigs, a welding table could be used. The clamp is another major component of the welding table.

The clamp is built to hold the work in place so that it doesn't slip on the table. Another valuable advantage of keeping a clamp on the welding table is that it can be used when operating to keep cables out of the way.

2) Welding Jig



A jig is a large brace that holds a welding project steady. By holding pieces together in a vice grip, a quality jig will streamline welding operation. A jig pushes the workpiece while the instrument stays stationary. In order to perform the weld, the jig should be stationary in the face of the welding instrument, but should still be able to move. A good jig can have several fixtures, allowing several parts to be welded at the same time, or on the same frame to weld various shapes and metals.

3) Welding Clamp



Welding clamps are holders of metal sheets or legs that tie two parts of materials securely together temporarily. In a close alignment, the clamps help you to solder parts together. They are particularly useful for dealing with large sheets and metal frames that are hard to keep together by hand alone. But that doesn't mean that they're useful just for bigger shields.

Does the method work

Many debates, tests and trials have been performed to determine the most appropriate way to fix the issue that happens during welding. Therefore, the use of the welding jig is determined. This is because it takes less cost and less machinery to weld the jig.

● FABRICATION

- 1) Measure the pieces of iron so that the pieces of iron are cut according to the shape desired.

- 2) Perform cuts on pieces of iron by following the measurements prescribed.
- 3) Welding iron sheets, depending on the specified configuration of the project.
- 4) For the final step, using high temperature paint as coating.

- **TEST RUN**

The test run is carried out in order to assess the product's power and end result. The welding jig would be checked in this test run to be able to implement all 5 joints or not. The welding will be tested for each joint after the test run, the welding jig be able to perform the five required welding joints.

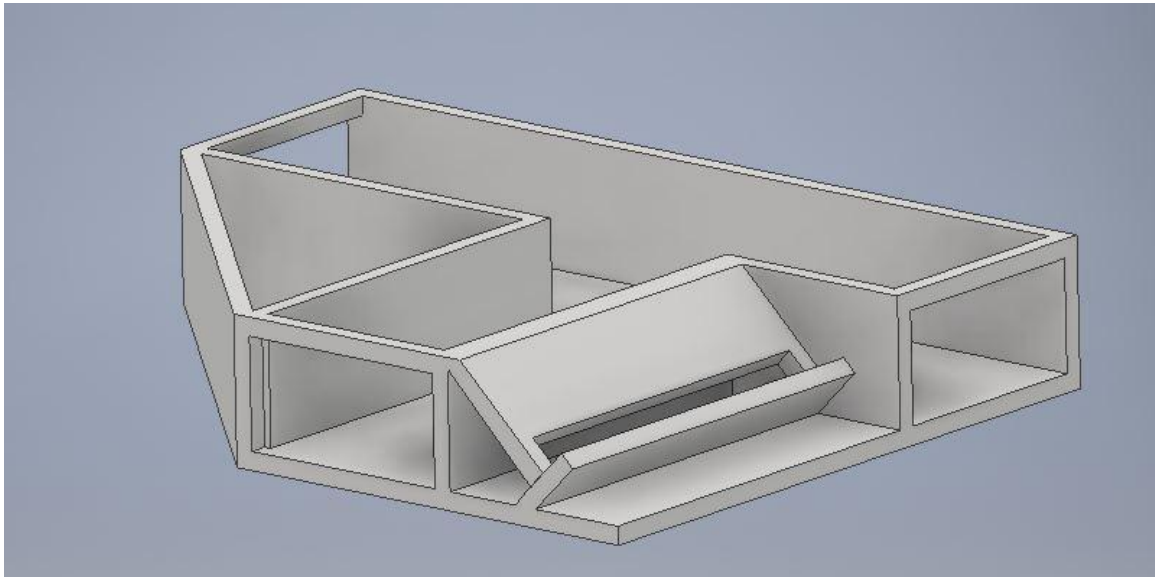
- **DATA ANALYSIS**

The data assessment process uses analytical and logical method to examine each component of the information supplied. This method of study is only one of the many measures that when performing a research project must be done. In order to generate results, debates and conclusions, data from the test run is obtained, checked and evaluated.

- **REPORT WRITING**

In any project developed, report writing is one of the most important phases. A project-based paper, test run and review can be planned so that potential progress or awareness extension can be made. Our writing of the study is focused on the research and conclusions we have learned during this whole project completion period.

3.4 PROJECT DESIGN



III.5 OPERATIONAL METHODOLOGY

1) SELECT THE POSITION OF JIG

Depending on each joint, select the position of the jig. Each joint has its own jig position that allows the position to be quickly reached while welding.

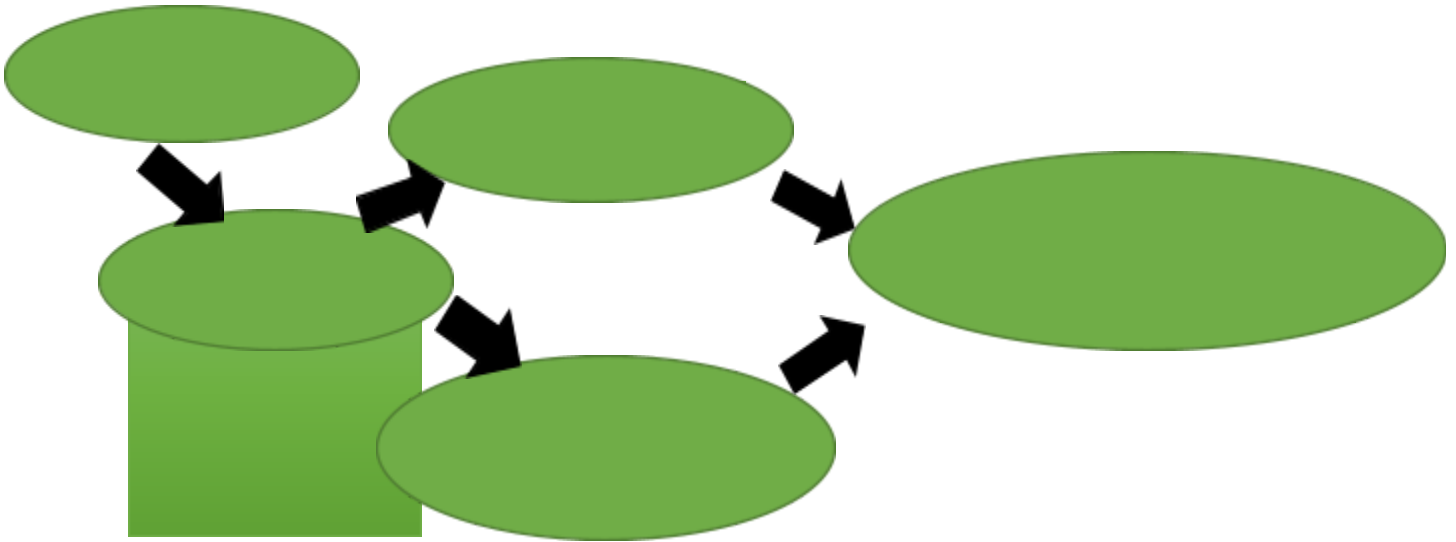
2) PLACE THE WORK MATERIAL

place the plate based on each welding joint. use a clamp to ensure that the workpiece does not move during welding. this can increase accuracy as well

as achieve satisfactory results. The welding process should be carried out after that.

III.6 METHODOLOGY PHASE

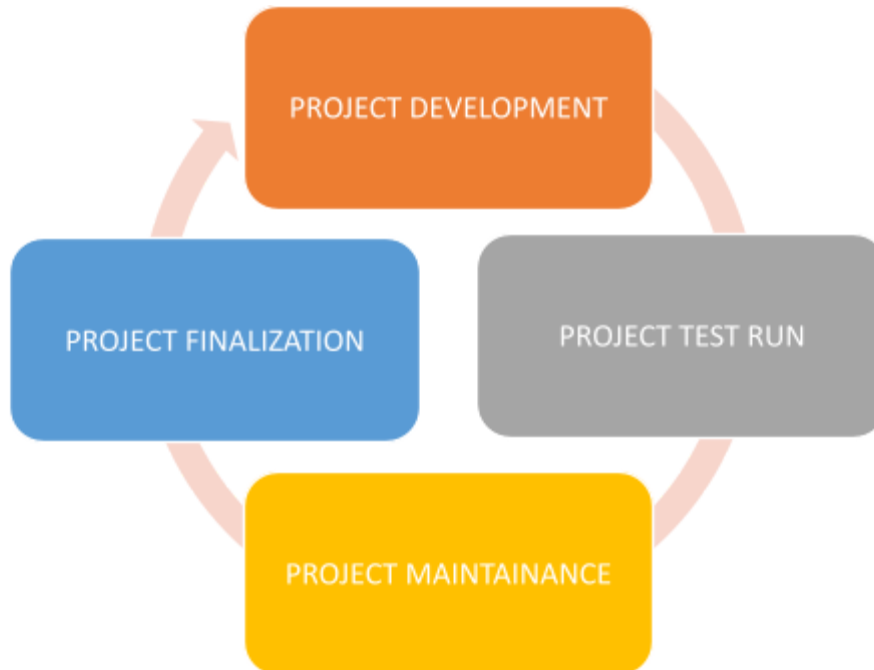
PHASE 1: DATA ANALYSIS



PHASE 2: METHOD AND MATERIAL



PHASE 3: PRELIMINARY STUDY



III.7 BUDGET CALCULATION

<u>NO</u>	<u>MATERIAL OR EQUIPMENT</u>	<u>PRICE</u>
1	Mild steel sheet	RM60
2	Mild steel hollow square	Rm 70
3	High temperature paint spray	Rm 20
4	Worker fee	Rm 60

Table 3.8

	Planning
	Actual

3.9 SUMMARY

In conclusion, the approaches applied in this project are very useful and necessary for the project to be accomplished. The materials used in the project would produce a lightweight brace with a light and very solid welding jig without any rusting problems that is ideal for a five-shape welding joint and easy to carry anywhere.

CHAPTER 4

FINDINGS AND ANALYSIS

PREPARED BY MUKESH ROSHAN

4.1 INTRODUCTION

The description and data of the welding jig and measurement are combined in this chapter. For this project to achieve the aims and scope of the project, such data and analysis are very important for this project, the result of good material testing are shown by such data. We evaluate every possibility of making it the best and most ideal after obtaining all this knowledge.

4.2 ADVANTAGE AND DISADVANTAGE

Each project has its pros and cons, and the pros will support both the community and the environment. However, for the future, the drawbacks or the cons must be changed or altered so that we can strengthen the nice and very successful goods that are difficult to find in the project

The main benefit of the welding jig is that it can help students keep the plate when welding. However, the downside is that only few joints can be accomplished by welding jigs.

4.3 TEST RUN

1) SELECTED THE POSITION OF JIG



2)R RESULT





4.3 CHAPTER'S SUMMARY

In conclusion, analysis, data and finding have been generated for this chapter. This welding jig has a lot of benefits, but there some drawbacks. Therefore, for the future generation, the challenge for the change and further growth as well as to further enhance their awareness of the project we pursue. Test were carried out determine if our group's welding jig concept could allow student to hold the plate while the welding process was in progress. And it clearly seen that this welding jig will assist student in welding

CHAPTER 5

DISCUSSION , CONCLUSION AND UPGRADE PLAN

PREPARED BY MUHAMMAD MUIZZUDDIN

5.1 INTRODUCTION

This chapter discusses the project debate conclusion and upgrade plan all together. The study was performed from the data from the project's test run. The discussion of all the outcomes of the test run and interpretation will therefore be clarified in this chapter. Then, based on the debate and upgrade plan that has been made, the decision will be made

5.2 DISCUSSION , CONCLUSION AND UPGRADE PLAN

In conclusion, it can be stated on the basis of this project that this welding jig gives not only students but also higher learning institution many advantages. In addition with all the support provided in welding by the welding jig, students who are less skilled in welding will become eligible. Thus, the institution of higher learning is able to offer student an even greater positive effect. Therefore, hope that this project will be able to support thousand of student, not only in Malaysia but all over the world, who want support while welding.

5.3 SUMARRY

In conclusion, this project proves that this Welding Jig can support material which can be used during welding. Pursuant to the objective of this project, which is to provide benefits and help users. This Welding Jig would also encourage the development of more useful innovation products in the future.

