



MULTIFUNCTION WRENCH

FINAL YEAR PROJECT REPORT

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sebagai memenuhi sebahagian syarat penganugerahan Diploma
Kejuruteraan Mekanikal**

JABATAN KEJURUTERAAN MEKANIKAL

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TAJUK : MULTIFUNCTION WRENCH

SESI : JUNE 2020

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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').

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ABSTRACT

The wrench is employed to carry or turn a smooth circular object. Easy to use, this wrench may be a heavy-duty tool that's very handy on many projects. Supported the issues of many inexperienced users who used a wrench to tighten or loosen a bolt and nut beyond the manufacturer specifications, there's a risk that the threads will stretch causing the fixing to lose tension, which might be dangerous. The objectives of this project are to fabricate a multipurpose wrench with a far better grip. Second, to suit different thicknesses of bolt and nut and last, to save time. Various processes must be done consistent with proper procedures to make sure that this project does not have any problems. Among the measure of labour wiped out preparing this project are the process of designing project, material selection and welding process in combining parts. Supported the research finding, this multifunction wrench is recommended to ease the human burden. Multifunction wrench has many advantages but there also are disadvantages permanently. These challenges are being taken as a chance to enhance and further development for future generations also as enhancing their knowledge of the project that we are performing on.

ABSTRAK

Sepana digunakan untuk memegang atau memusingkan objek bulat. Mudah untuk digunakan, sepana ini adalah alat tugas berat yang sangat berguna untuk banyak projek. Berdasarkan masalah ramai pengguna yang tidak berpengalaman yang menggunakan sepana untuk mengetatkan atau melonggarkan bolt dan nat melebihi spesifikasi pengeluar, terdapat risiko bahawa gigi mata sepana akan meregang menyebabkan pemasangan untuk kehilangan cengkaman, yang boleh menyebabkan bahaya. Objektif projek ini adalah untuk membuat sepana serbaguna dengan cengkaman yang lebih baik. Kedua, agar sesuai dengan ketebalan bolt dan nat yang berbeza dan terakhir, untuk menjimatkan masa. Pelbagai proses perlu dilakukan mengikut prosedur yang sewajarnya bagi memastikan projek ini tidak mempunyai sebarang masalah. Antara ukuran kerja yang dilakukan dalam menyediakan projek ini adalah proses mereka bentuk projek, pemilihan bahan dan proses kimpalan dalam menggabungkan bahagian projek. Berdasarkan penemuan penyelidikan, Sepana serbaguna ini disyorkan untuk meringankan beban manusia. Sepana serbaguna ini mempunyai banyak kelebihan tetapi terdapat juga keburukan untuk kebaikan. Cabaran ini telah diambil sebagai satu peluang untuk meningkatkan dan memajukan lagi pembangunan generasi akan datang serta meningkatkan pengetahuan mereka tentang projek yang sedang diusahakan.

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CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

Wrenches perform an equivalent function as ratchets and sockets, tightening and loosening fasteners but there are differences and situations involve one over the opposite. For instance, a box-end wrench may be a good option for loosening stuck fasteners because you'll apply more torque without risking damage to a ratchet mechanism. A wrench with an open-end fit around a fastener rather than over it, so you'll slip a wrench into an area where there's not room for a socket.

Over the years, manufacturers started arising with tools that are easy to use, versatile and comes for a reasonable price point. That is why you will consider them because the more sensible choice.

However, existing common wrench cannot fit various sizes of bolts and nuts. Sometimes an inexperience user used the incorrect sizes of wrenches to open the bolts which could lead on to the danger of accidents.

This Multifunction Wrench which provides you versatility over many sizes of bolts, and therefore the firm grip with large handle is enough to open any bolt. Multifunction Wrench are often used when a user isn't sure about the dimensions of the nut that want to be tightened or loosened. It will overcome the common problems of fix-size wrench like the necessity of the many sizes of wrenches in a tool box, can injure a user, waste time or it can damage fastener.

As for teaching and learning process for Mechanical subject, students will perform practical task involves with bolts and nuts. Thus, multifunction wrench would be helpful in terms of cost saving.

1.2 PROBLEM STATEMENT

Based on the problem, we see that many inexperienced users who underestimate the torque being applied by an impact wrench. In an effort to ensure that the nut or bolt is adequately tightened, they stretch or strip the threads. Strictly speaking, an impact wrench is designed to loosen fixings rather than tighten them.

If any fixing is tightened beyond the manufacturer specifications, there is a risk that the threads will stretch causing the fixing to lose tension, which could be dangerous. Damaging threads is usually caused by cross-threading the nut or bolt prior to tightening it with an impact wrench.

1.3 RESEARCH OBJECTIVES

The objectives of this project are to satisfy the requirements of consumer mechanical users:

- i. To design a wrench that hold either bolt or nut to fastened or loosen it
- ii. To fabricate multipurpose wrench and comfort handling

1.4 RESEARCH QUESTIONS

This study will answer the following research questions:

- i. Is it possible to create a multifunction wrench that are high in quality?
- ii. What type of material that can be used to make wrench cheaper?
- iii. What are the possibilities of making wrench with other material?

1.5 SCOPE OF RESEARCH

The scopes and limits to this research are:

- a) This multifunction wrench can't be used on tight spots
- b) The diameter of bolts and nuts must be a minimum of 3cm

1.6 SIGNIFICANCE OF RESEARCH

Over the years, manufacturers started arising with tools that are easy to use, versatile and comes for a reasonable price point. That is why you will consider them because the more sensible choice. However, existing common wrench cannot fit various sizes of bolts and nuts. Sometimes an inexperience user used the incorrect sizes of wrenches to open the bolts which could lead on to the danger of accidents.

This Multifunction Wrench which provides you versatility over many sizes of bolts, and therefore the firm grip with large handle is enough to open any bolt. Multifunction Wrench are often used when a user isn't sure about the dimensions of the nut that want to be tightened or loosened. It will overcome the common problems of fix-size wrench like the necessity of the many sizes of wrenches in a tool box, can injure a user, waste time or it can damage fastener. As for teaching and learning process for Mechanical subject, students will perform practical task involves with bolts and nuts. Thus, multifunction wrench would be helpful in terms of cost saving.

1.7 CHAPTER'S SUMMARY

In this chapter, the studies explained about its origin of ideas and inspirations. All the objectives were made out of all the problem statements. The objective for this project along with the importance of multi-use wrench that will be cheap and light causing it to be more convenient for all kind of people, and even the scope of this project is focusing at the work that everyone can do. Thus, this new wrench could be used for daily routine with a really good care for a longer lifetime.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

A literature review is a body of text that aims to review the critical points of current knowledge and or methodological approaches on a particular topic. Literature review are secondary sources and as such, do not report any new or original experimental work.

Most often associated with academic-oriented literature, such as thesis, a literature review usually precedes a research proposal and results section. Its ultimate goal is to bring the reader up to date with current literature on a topic and forms the basis for another goal, such as future research that may be needed in the area. A well-structured literature review is characterized by a logical flow of ideas; current and relevant references with consistent, appropriate referencing style; proper use of terminology and an unbiased and comprehensive view of the previous research on the topic.

In this chapter, we will show the material that we use. Since wrench are made from iron and bronze with a metal, made a blacksmith like the way they made swords and armoury. In the dark ages, the wrench was very bulky and does not function very well. Back in those days, wrench is rarely used by them because it was such unnecessary.

2.2 TYPES OF WRENCH

Prepared by **Ezza Nuraleez Binti Seidi**

Wrenches are used to fasten a joint comprising a nut and bolt. Wrenches also are referred to as spanners in some parts of the country. They're made up of a chromium-vanadium alloy. Chromium plating helps in preventing the wrench from rusting. The patent of the primary wrench belongs to Sollymon Merrick, who had it patented within the year 1835. There are many sorts of wrenches that a standard person may have in his day-to-day life for various purposes




Types of Wrench	Feature
 <p data-bbox="231 981 496 1014">Open-ended wrench</p>	<p data-bbox="544 768 1385 965">This type of wrench is open-ended at both its ends. The openings are U-shaped. These openings aren't of an equivalent size. These wrenches are useful when handling nuts and bolts that are difficult to access. they supply far more ease in turning such nuts and bolts.</p>
 <p data-bbox="240 1272 488 1305">Box-ended wrench</p>	<p data-bbox="544 1037 1385 1395">A box-ended wrench features a closed-loop system at both its ends. This loop is typically designed to suit a hexagonal shape, and in some case, it's going to be designed to suit a square shape. The loops at both the ends are of various sizes. These wrenches are utilized in cases where open-ended wrenches are of no good. Box-ended wrenches will avoid the rounding-off at the sides which will occur on use of open-ended wrenches.</p>
 <p data-bbox="228 1671 507 1704">Combination wrench</p>	<p data-bbox="544 1426 1385 1832">A combination wrench, because the name suggests, may be a combination of both an open-ended wrench also as a box-ended wrench. This wrench features a closed-loop system at one end, while it's open-ended at the opposite. These are often used to unfasten nuts and bolts with the box-end, then separate them quickly using the open-end. Combination wrenches are generally put to use during this combination, and hence both the ends are of an equivalent size.</p>

Table 2.2.1 - Types of wrenches

2.3 MATERIAL OF WRENCH

Prepared by **Ezza Nuraleez Binti Seidi**

Material selection is very crucial phase during designing of wrench. There are a lot of materials for designing of wrench so it is very difficult task to select the appropriate materials for designing of wrench.

2.3.1 Material selection for wrench depends on following terms

- i. Cost of material & its availability
- ii. Environmental condition where product (gear box) is to be used
- iii. Quality of wrench
- iv. Type of duty such as heavy duty, light duty, medium duty, heavy duty & extra heavy duty

2.3.2 On the basis of above terms, we may understand about materials, as described below, suitable for making wrench or spanner

- i. Alloy steel (hardened and tempered)
- ii. Chrome vanadium steel DIN-838
- iii. Highly fractural toughness and good tensile strength materials such as SAE 4340 & SAE4140

2.3.3 Specific properties of material for manufacturing wrench

Mechanical properties of selected material play a very important role in respect of life, productivity, and capability to provide torque of wrenches. Let us consider some specific properties of material for wrenches.

Tensile strength	Elongation	Reduction of area	Hardness (HRC)	0.2 % of proof stress
689 M Pa	20 %	40 %	18	80

Table 2.3.3 – Specific properties of material

Above mentioned values are provided for special grade of alloy steel used for manufacturing the wrenches, apart from this material should have good resistance against corrosion and should have larger fracture toughness with good tensile strength.

2.4 METHOD OF MAKING THE WRENCH

2.4.1 PRODUCE WRENCH

Prepared by **Ezza Nuraleez Binti Seidi**

There is specific process for manufacturing wrench such as Forging, annealing process, rolling, punching process, drawing and polishing process, CNC rough cutting, surface grinding, vibrating, heat treatment, electroplating process, fine cutting via CNC and at last assembly.

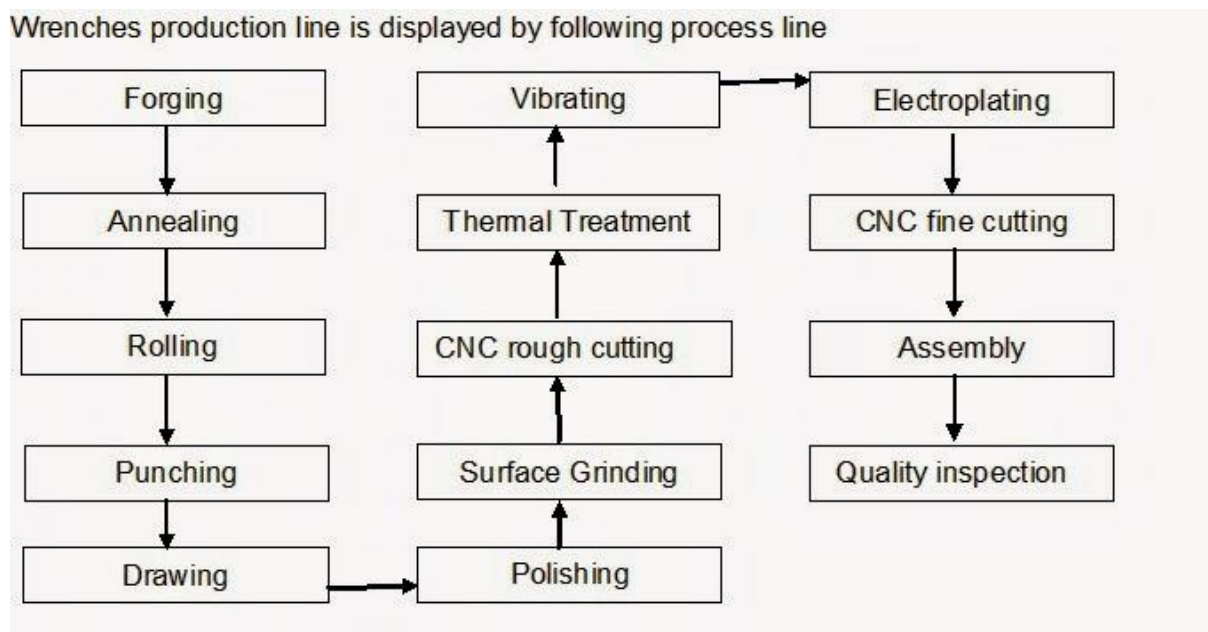


Figure 2.4.1 – Wrenches production line

As mentioned in above production line, we may understand the current technique to produce the wrenches are as following:

1. Creation of rough cast with the help of thermal forging.
2. Annealing process and removal of carbide materials attached due to previous step.
3. Providing required shape.
4. CNC rough cutting to achieve desired specifications.
5. Heat treatment to increase the toughness of material.
6. Finally, material will go for a protective layer to withstand against oxidation and attrition

2.4.2 WELDING METHOD

Prepared by Muhammad Nawawi Bin Mohammad

In 1800 Humphry Davy discovered the short pulsed electric arcs. Independently a Russian physicist Vasily Petrov discovered the continuous electric arc in 1802 and subsequently proposed its possible practical applications, including welding. Arc welding was first developed when Nikolai Benardos presented arc welding of metals using a carbon electrode at the International Exposition of Electricity, Paris in 1881, which was patented together with Stanisław Olszewski in 1887. In the same year, French electrical inventor Auguste de Méritens also invented a carbon arc welding method, patented in 1881, which was successfully used for welding lead in the manufacture of lead-acid batteries. The advances in arc welding continued with the invention of metal electrodes in the late 19th century by a Russian, Nikolai Slavyanov (1888), and an American, C. L. Coffin. Around 1900, A. P. Strohmenger released in Britain a coated metal electrode which gave a more stable arc. In 1905 Russian scientist Vladimir Mitkevich proposed the usage of three-phase electric arc for welding. In 1919, alternating current welding was invented by C.J. Holslag but did not become popular for another decade.

Competing welding processes such as resistance welding and ox fuel welding were developed during this time as well but both, especially the latter, faced stiff competition from arc welding especially after metal coverings (known as flux) for the electrode, to stabilize the arc and shield the base material from impurities, continued to be developed.

During the middle of the century, many new welding methods were invented. Submerged arc welding was invented in 1930 and continues to be popular today. In 1932 a Russian, Konstantin Khrenov successfully implemented the first underwater electric arc welding. Gas tungsten arc welding, after decades of development, was finally perfected in 1941 and gas metal arc welding followed in 1948, allowing for fast welding of non-ferrous materials but requiring expensive shielding gases. Using a consumable electrode and a carbon dioxide atmosphere as a shielding gas, it quickly became the most popular metal arc welding process. In 1957, the flux-cored arc welding process debuted in which the self-shielded wire electrode could be used with automatic equipment, resulting in greatly

increased welding speeds. In that same year, plasma arc welding was invented. Electro slag welding was released in 1958 and was followed by its cousin, electro gas welding, in 1961.

Arc welding is a welding process that is used to join metal to metal by using electricity to create enough heat to melt metal, and the melted metals when cool result in a binding of the metals. It is a type of welding that uses a welding power supply to create an electric arc between a metal stick ("electrode") and the base material to melt the metals at the point of contact. Arc welders can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes.

The welding area is usually protected by some type of shielding gas, vapor, or slag. Arc welding processes may be manual, semi-automatic, or fully automated. First developed in the late part of the 19th century, arc welding became commercially important in shipbuilding during the Second World War. Today it remains an important process for the fabrication of steel structures and vehicles.



Figure 2.4.2 – Arc Welding

2.5 MATERIAL SELECTION

2.5.1 CHROME

Prepared by Muhammad Nawawi Bin Mohammad

As said over, Chrome alludes to the chemical component Chromium, which is the 24th by atomic number within the periodic table having a place to the Group 6 components – the D block. It is symbolized by ‘Cr’ and because it may be a d block component, it has the property of existing in numerous oxidation states. The foremost common oxidation states in which it is found are +3 and +6. Chromium may be a shiny and fragile metal and is greyish in colour.

Chromium metal has been found in uncommon minerals. However, nearly all the Chromium used for commercial purposes are derived from Chromite, which is an Iron-Chromium Oxide. Chromium is commonly utilized as a sacrificing metal to anticipate another metal from oxidation. This can be primarily seen within the case of steel which ought to be protected from rusting upon the exposure to air and dampness. Typically accomplished through a handle called chrome plating, where the liquidized form of Chromium is connected on the other metal of intrigued, to avoid it from oxidizing. The rationale behind this is that Chromium could secure any other metal which encompasses a lower oxidation potential compared to Chromium. Within the popular illustration of the metal Iron in steel, Iron encompasses a lower oxidation potential within the nearness of Chromium, which makes Chromium more vulnerable for wearing off, while the Iron remains protected.

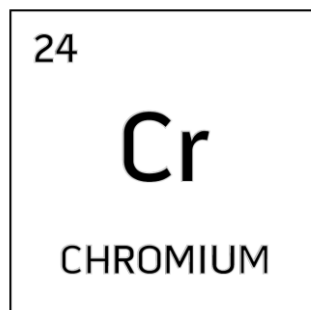


Figure 2.5.1 Chromium

2.5.2 STAINLESS STEEL

Prepared by **Ezza Nuraleez Binti Seidi**

Stainless Steel is the shape of steel that does not erode when exposed to air and dampness. This can be not vulnerable to oxidation. It is a combination which is primarily made of Iron, and other components such as Carbon and Chromium. In common, the Chromium substance ought to not be less than 10.5%. Stainless steel varies from Carbon steel due to the sum of Chromium present. Carbon steel gets rusted quickly when exposed to air and dampness. Iron, when exposed to air, forms Iron oxides which settle as a layer of rust which quickens erosion, forming more iron oxide.

However, due to the nearness of Chromium, the iron within the steel is ensured from oxidation. As said over, within the case of exposure to air and dampness, it is Chromium that gets oxidized to begin with. Stainless steel comes in several grades depending on the quality and the wrapping up of the steel, and its uses are decided appropriately. Stainless steel is frequently utilized when both the quality of the steel, as well as resistance to corrosion, is required.

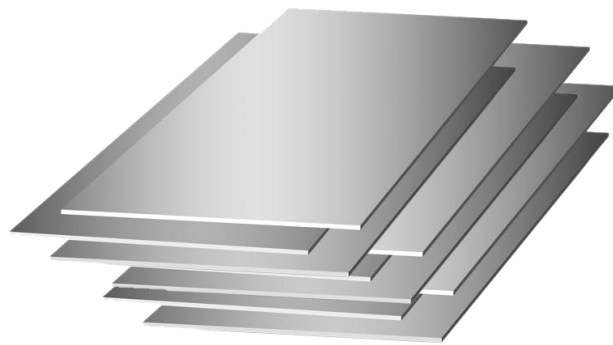


Figure 2.5.2 Stainless Steel Sheet

2.6 CHAPTER SUMMARY

As to conclude this chapter, literature review is important to showcase all the studies of materials and methods to enhance the knowledge on this project. Every thesis and others projects that are related to this wrench we are about to make is really helpful especially for us to understand it fully.

After a lot of materials and methods were discussed and researches were done, the materials that are the most compatible for our project is alloy steel. Due to its characters and advantages, meanwhile the methods that we decided to carry on is welding method. This is because of its low-cost benefits and great for beginner's process

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Methodology can be the ‘analysis of the principles of methods, rules and postulates employed by a discipline’, ‘the systematic study of methods that are, can be or have been applied within a discipline’ or ‘a particular procedure or set of procedures’. Methodology includes a philosophically coherent collection of theories, concepts or ideas as they relate to a particular discipline or field of inquiry. Methodology refers to more than a simple set of methods, rather it refers to the rationale and the philosophical assumption that underlie a particular study relative to the scientific method. This is why scholarly literature often includes a section on the methodology of the researchers.

Each step of project is a process to complete the project. Every step must be followed one by one and must be done carefully. If some error occurs, it can make a project probably could not operate or do not look neat and perfect.

Before the project finish, various process needs to be done according to proper procedures to ensure that projects do not have any problems. Among the measure the work done in preparing this project are:

- Process of designing project
- The motor
- Welding process in combining parts

3.2 FLOW CHART

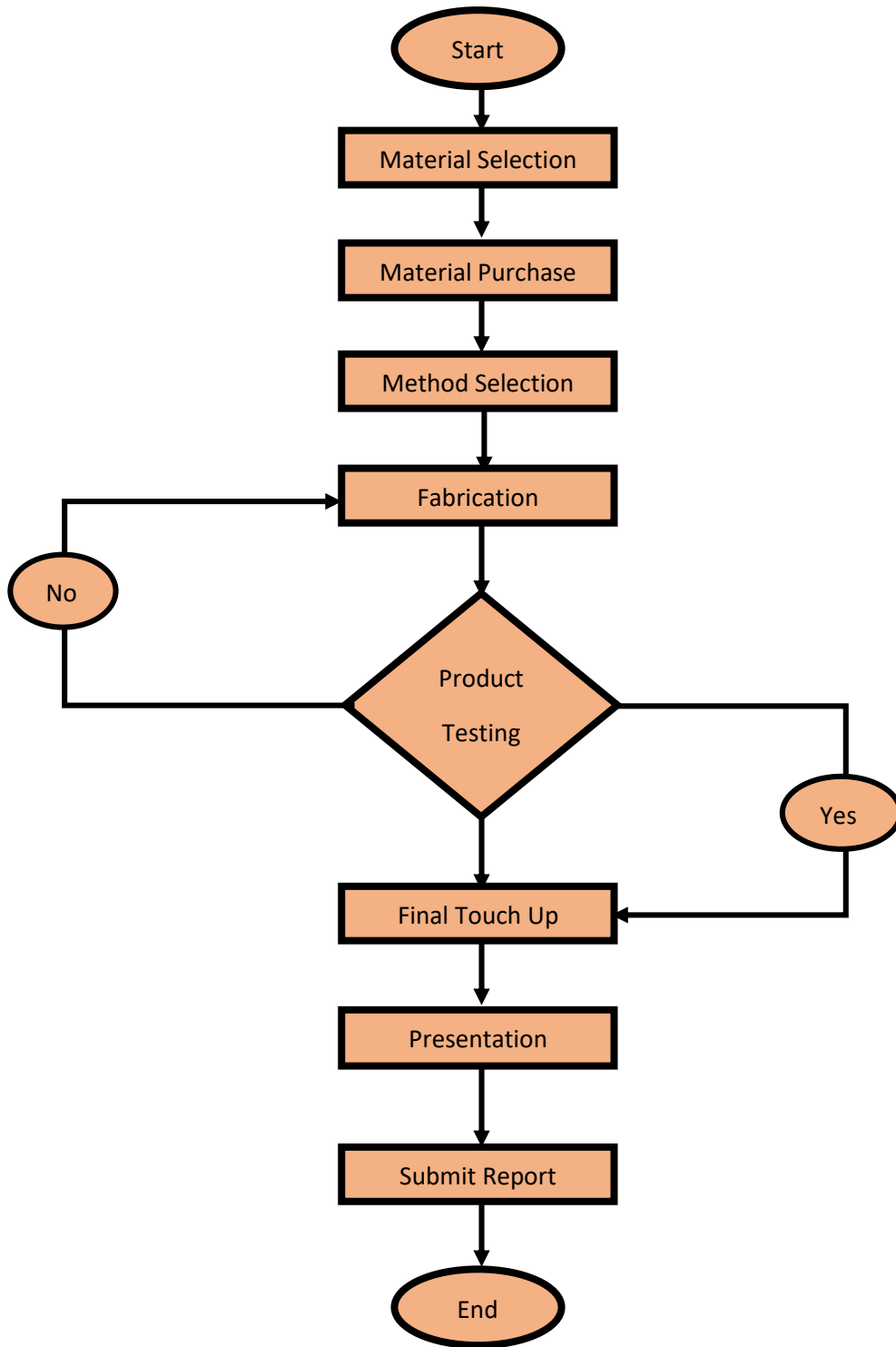


Figure 3.2.1 Flow Chart

3.3 FLOW CHART EXPLANATION

Prepared by Ezza Nuraleez Binti Seidi

- **Material Selection**

The process of material selection is one of the most important process in this final year project. The main factor of material selection is to discuss and finalized which materials that will be use in the project in order to avoid wasting of money and time. The material selection need to be done precisely so that the risks could be avoided.

- **Material Purchase**

The method of materials purchasing is pivotal to gather and gets all the materials required. In this handle a parcel of inquire about on the places and providers that the materials are aiming to be buy is done. This step is critical so that the hazard of fabric squandering or money-loss will not happen. Be that as it may, to carry out material obtaining, a well-made acquiring arranges required to be made. To begin with, the providers will be reached to form beyond any doubt the accessibility of the materials. At that point, the calculation of the sum of materials required additionally the cost of the materials. After that, overviews of cost must be carried out to decide the way better offering costs. At that point at last, the buys might be made.

- **Method Selection**

A method for making a wrench includes a step of forging a cylindrical alloy stick in a mould into a basic form including a head and a handle. The head is then treated to machine the two opposite surfaces and at least one hole is drilled in the head and a recess is defined in one of the surfaces of the head to form a prototype. The prototype is then proceeded by step of heat treatment and then put in a mould and plastic material is introduced to cover the head, the handle and the grip portion.

1) Forging

Forging is known as one of the oldest metalworking processes together with casting (differences between forging and casting) and machining . It is the process that steel billet is formed into the desired shape under the workforce of tooling by different forging operations, such as hammering, pressing, rolling, squeezing, etc. To finish a forged part, the operations will be completed in different equipment.

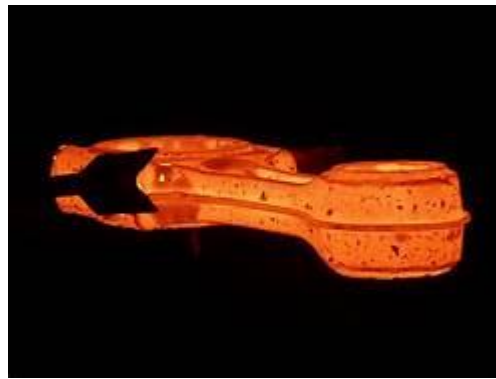


Figure 3.3.1 – Hot Forging

Hot forging takes place when a piece of metal is superheated beyond its crystallization point. The average temperature at which this happens depends on the type of metal where steel crystallizes at up to 1150o C, aluminium alloys between 360o C to 520o C, and copper alloys between 700o C to 800o C. The required temperature must be maintained above the recrystallization point or the point at which the metal begins to cool. Recrystallization can form microscopic crystals that warp when the metal is reheated causing it to “strain harden”, which makes it unworkable.

Environmental factors can influence the hot forging process where contact with the atmosphere can cause oxidation. To avoid this, forging may be completed in an environmentally controlled chamber or isothermal forging, which is similar to a vacuum.

The main advantage of hot forging is the strength a metal gains. Metals hot forged have a strong ductility, the ability to be significantly deformed and reshaped giving them a stronger resilience to tensile stress. Parts made using hot forging are stronger because the forging process changes the internal grain of the part changing its form and strength characteristics.



3.3.2 Cold Forging

The most common metals in cold forging are standard or carbon alloy steels. It is used to produce small, high volume products like fasteners such as nails, screws, rivets, and such. The lack of the need for heat makes it inexpensive and efficient. The types of cold forging methods used depends a great deal on the metal and the required shape. Below are descriptions of some common cold forging processes.

2) Heat Treatment

Heat treating (or heat treatment) is a group of industrial, thermal and metalworking processes used to alter the physical, and sometimes chemical, properties of a material. The most common application is metallurgical. Heat treatments are also used in the manufacture of many other materials, such as glass. Heat treatment involves the use of heating or chilling, normally to extreme temperatures, to achieve the desired result such as hardening or softening of a material. Heat treatment techniques include annealing, case hardening, precipitation strengthening, tempering, carburizing, normalizing and quenching. Although the term *heat treatment* applies only to processes where the heating and cooling are done for the specific purpose of altering properties intentionally, heating and cooling often occur incidentally during other manufacturing processes such as hot forming or welding.



Figure 3.3.3 – Heat Treatment

3) Welding

Welding aluminium requires different welding techniques, different shielding gases, different specifications, and different pre-weld and post-weld processing than welding steel. The welding processes that are fit to weld both may require alterations so that they can be used to weld aluminium. Aluminium can be welded with relative ease, but first and foremost, the correct welding process must be selected.

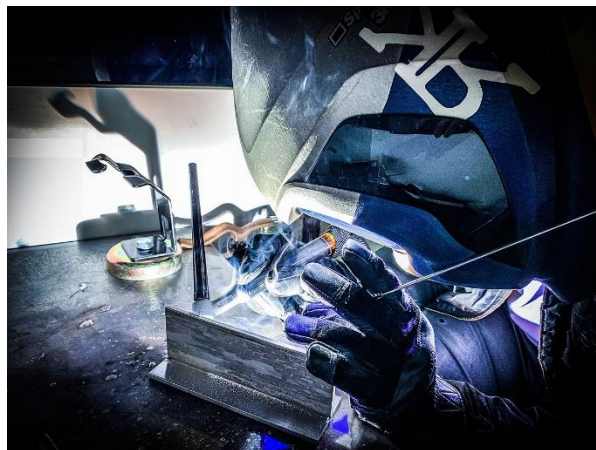


Figure 3.3.4 GTAW

One of the most popular welding processes for aluminium is gas tungsten arc welding (GTAW), otherwise known as tungsten inert gas (TIG) welding. GTAW is a great process for aluminium because it does not require mechanical wire feeding, which can create feed ability issues. Instead, the filler material is fed into the puddle by the welder with his hand. Also, the GTAW process is extremely clean, which prevents aluminium from being contaminated by the atmosphere.

- **Fabrication**

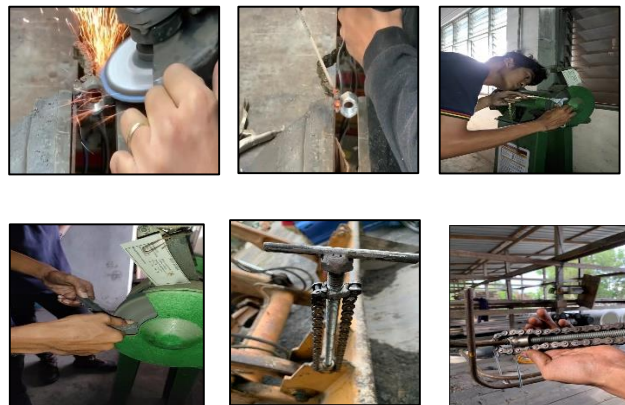


Figure 3.3.5 – Fabrication Process

As shown in Figure 2, fabrication process starts with cutting a steel and flat bar according to design measurements. It is accurately cut to ensure it fit with the chain well. And then using the welding machine to install and combine the part. Lastly, smooth the threaded rod and chain surface using grinding machine. The dimension of threaded rod, chain and nut is 15mm, 428 chain and 19mm.

- **Product Testing**

Test run is carried out to determine the strength and end result of the product. In this test run, Wrench is tested to determine the strength and stiffness. The test was run as in picture below:



Figure 3.3.6 – Product test on cylindrical shape



Figure 3.3.7 – Product test on different size of socket



Figure 3.3.8 – Can turn or hold bold and nut

- **Report Writing**

Report writing is one of the most crucial step in every project invented. It is important to make a report based on the project, test run and analysis so that future improvements nor expansion of knowledge could be done. Our report writing is based on the analysis and findings that we collected throughout this whole process of completing this project.

3.4 PRODUCT DESIGN

Prepared by Mohammad Nawawi Bin Mohamad



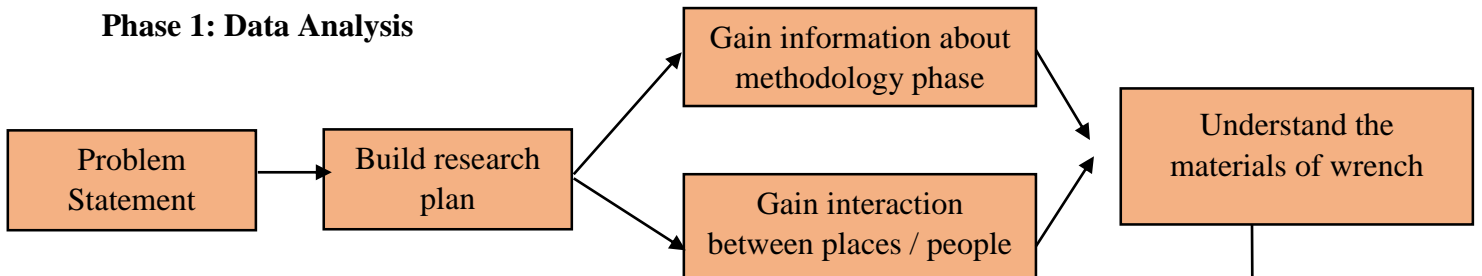
Figure 3.4.1 – Design



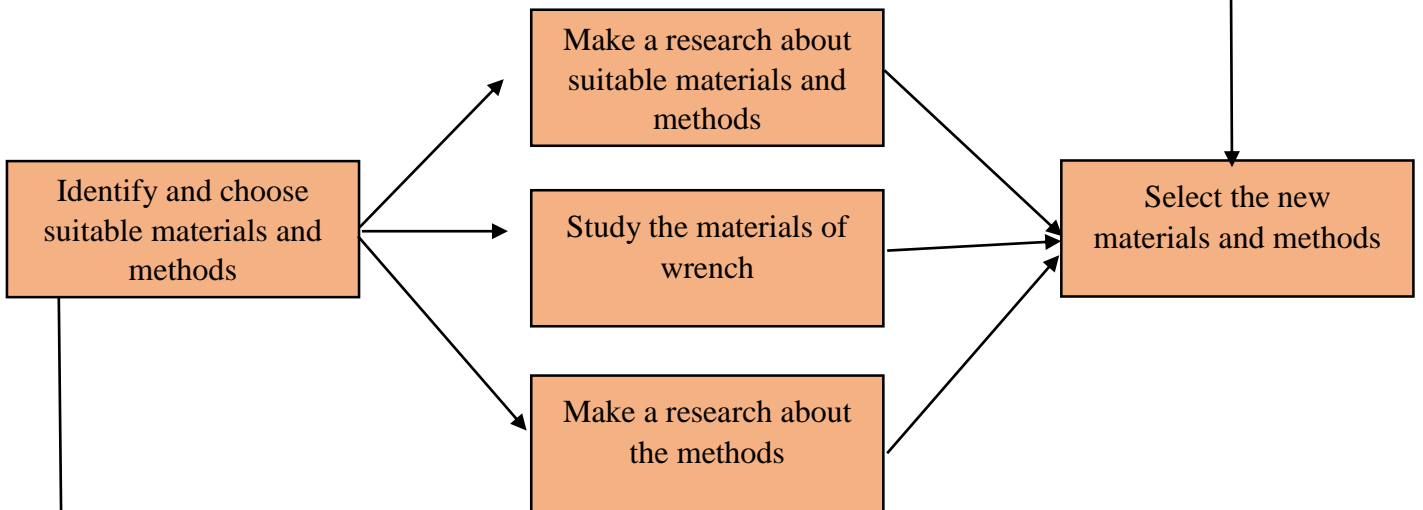
Figure 3.4.2 - Chain

3.5 METHODOLOGY PHASE

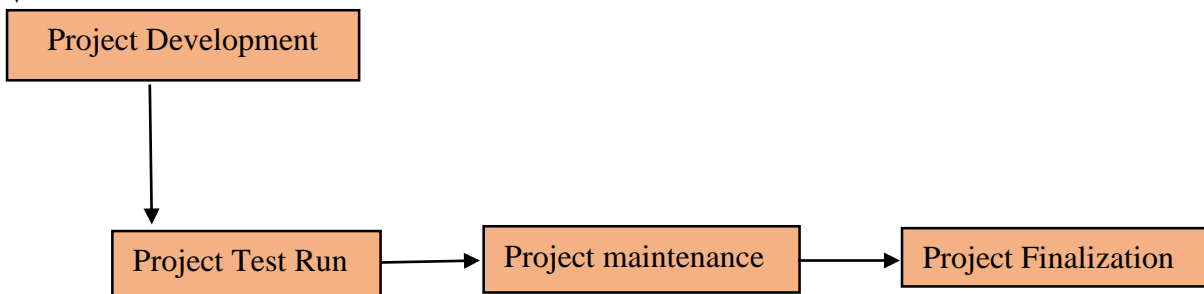
Phase 1: Data Analysis



Phase 2: Method and Material



Phase 3: Preliminary Study



3.6 BUDGET CALCULATION

Prepared by Muhammad Nawawi Bin Mohamad

No	Materials / Equipment	Amount	Price
1.	Full Thread Screw	20cm	RM34
2.	Nut Carbon Steel	!0pcs	RM8
3.	Linear Steel Metal Rod	20cm	RM6
4.	Socket Wrench Set	1 box	RM28
5.	Chain	428x114L	RM15.50
6.	Welding Rod	1 box	RM6
7.	MIG Wire	1unit	RM25.50
8.	MIG Welding Machine	1 unit	RM499
9.	Protective Glove	1 box	RM20
Total			RM642

Table 3.6.1 Budget Calculation

3.7 PROJECT ACTIVITY

Mid-term break – 28/9-4/10/20

WEEK	STATUS	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
DATE		10-16/8/20	17-23/8/20	24-30/8/20	31/8-6/9/20	7-13/9/20	14-20/9/20	21-27/9/20	5-11/10/20	12-18/10/20	19-25/10/20	26/10-1/11/20	2-8/11/20	9-15/11/20	16-22/11/20	23-29/11/20
SURVEY <ul style="list-style-type: none"> material place to buy the material total costing 																
CHOOSING <ul style="list-style-type: none"> product design material place to buy the material 																
FINAL DECISION <ul style="list-style-type: none"> product design material buying items for project 																
METHOD SELECTION <ul style="list-style-type: none"> welding part by part electrical use 																
FABRICATION PROCESS																
TEST RUN <ul style="list-style-type: none"> product testing 																

<p>ANALYSIS DATA</p> <ul style="list-style-type: none"> • product analysis • final touch up of the product 																	
<p>PREPARATION</p> <ul style="list-style-type: none"> • preparing for presentation day • video and slide making 																	
<p>PRESENTATION DAY</p>																	
<p>FINAL REPORT</p> <ul style="list-style-type: none"> • hand out final report to supervisor 																	

Table 3.7.1 - Project Activity

3.8 SUMMARY

As a conclusion, the methods implemented in this project are very crucial and important to complete the project. The materials used in the project will create a light and very strong wrench yet very cheap, hence this project is very convenient to everyone especially the people who have to work with bolts and nuts and also the. However, this method will affect the result totally if one of the method is change.

CHAPTER 4

FINDINGS AND ANALYSIS

4.1 INTRODUCTION

This chapter combine data and analysis of the Multifunction Wrench and its materials calculations. This data and analysis are very important for this project to achieve the objectives and scope of the project. This data indicates the successful results of the materials testing. After getting all of this data, we analyze every single possible to make it perfect.

4.2 ADVANTAGE AND DISADVANTAGE

Prepared by Ahmad Alfian Afnan Bin Mohammad Roston

Every project has its own pros and cons, the pros will help the people and also the industries occupations. However, the cons or the disadvantages must be improved or change for the future so that we could enhance the good and very efficient product that hardly to find disadvantage of the project.

The Multifunction Wrench has a lot of advantages to help the people and also the industries occupations. Besides of the advantages, this project also disadvantages that we must overcome it in the future for the better good.

4.3 CONCEPT DESIGN

Prepared by Ahmad Alfian Afnan Bin Mohammad Roston

The design of the concept that has been developed are going to be considered through several criteria as shown in Table 2. The concept design that gets the very best points value and meets the specified criteria are going to be selected as a final design. Design 2 has the foremost advantages compared to the opposite design. Thus, it's selected as a final design.



	 Design 1	 Design 2
Advantages	<ol style="list-style-type: none"> 1. Adjust the diameter itself 	<ol style="list-style-type: none"> 1. Strong 2. Easy to use 3. Affordable material
Disadvantages	<ol style="list-style-type: none"> 1. Less strong 2. Automatic mechanism is hard to design 	<ol style="list-style-type: none"> 1. Manual adjust
Total of Advantages	1	3

Table 4.3.1 Selection Process

4.4 TEST RUN

Prepared Ahmad Alfian Afnan Bin Mohammad Roston

Multifunction Wrench been tested on car and motorcycle to assess the potential and therefore the safety of the wrench. To measure the impact of Multifunction Wrench, data is collected by observation and feedback form students during practical works. It's divided into two sessions which is before and after the usage of innovation. Several special needs students are experiencing the usage of a traditional wrench and Multifunction Wrench for a few hours' session respectively.



Figure 4.4.1 - Easy to hold smaller size of object



Figure 4.4.2 - Combination of chain and modified socket can open any object with cylindrical shape



Figure 4.4.3 – Fit different size of socket

4.5 ANALYSIS

Prepared by Ahmad Alfian Afnan Bin Mohammad Roston

To use this multifunction wrench, place the top of the wrench with the teeth on it against the thing that's getting to be tighten, loosen or hold. When the T-holder being twist to tighten the moving arm chain, the thing will fully grip by the action of both T-holder and chain. Hold the chain wrench handle with one hand while the opposite hand is installing round the object to be hold to the chain.

Twist the T-holder to stiffen the chain that being hold round the object. Most wrenches have small pins that stick out from the side of the chain and slide the chain into a notch on the wrench handle. Once the chain is attached, install the wrench handle to maneuver the thing in whichever direction.

This multifunction wrench can also be wont to hold depending on the dimensions of the thing. People and industries occupations can use this multipurpose wrench safety which is when holding hot objects, their hand is often prevent from injury and scald.

4.6 CHAPTER'S SUMMARY

Wrenches perform an equivalent function as ratchets and sockets, tightening and loosening fasteners but there are differences and situations involve one over the opposite. For instance, a box-end wrench may be a good option for loosening stuck fasteners because you'll apply more torque without risking damage to a ratchet mechanism. A wrench with an open-end fit around a fastener rather than over it, so you'll slip a wrench into an area where there's not room for a socket. Over the years, manufacturers started arising with tools that are easy to use, versatile and comes for a reasonable price point. That is why you will consider them because the more sensible choice.

However, existing common wrench cannot fit various sizes of bolts and nuts. Sometimes an inexperience user used the incorrect sizes of wrenches to open the bolts which could lead on to the danger of accidents. This Multifunction Wrench which provides you versatility over many sizes of bolts, and therefore the firm grip with large handle is enough to open any bolt. Multifunction Wrench are often used when a user isn't sure about the dimensions of the nut that want to be tightened or loosened. It will overcome the common problems of fix-size wrench like the necessity of the many sizes of wrenches in a tool box, can injure a user, waste time or it can damage fastener. As for teaching and learning process for Mechanical subject, students will perform practical task involves with bolts and nuts. Thus, multifunction wrench would be helpful in terms of cost saving.

CHAPTER 5

DISCUSSION, CONCLUSION AND UPGRADE PLAN

5.1 INTRODUCTION

This chapter combines the data and analysis of our final year project, Multifunction Wrench and the computation of the materials we obtain. All of the data and analysis are very important for the project to achieve the goals and scope of the project. This data shows the results of successful testing of the materials we create. After getting all this data, we analyse every possibility to make it perfect without any problems.

5.2 DISCUSSION

The project of multifunction wrench has many benefits to help the people and also industries occupations. In addition, these advantages of the project are also detrimental that we must overcome future problems for the greater good of its function. Test are already conducted to determine the full potential of this multifunction wrench and it is proven that it can function.

To use this multifunction wrench, place the end of the wrench with the teeth on it against the object that is going to be tighten, loosen or hold. When the T-holder being twist to tighten the chain, the object will fully grip by the action of both T-holder and chain. Hold the chain wrench handle with one hand while the other hand is installing around the object to be hold to the chain. Twist the T-holder to tighten up the chain that being hold around the object. Most wrenches have small pins that stick out from the side of the chain and slide the chain into a notch on the wrench handle. Once the chain is attached, install the wrench handle to move the object in whichever direction. This multifunction wrench also can be used to hold depending on the size of the object. People and industries occupations can use this multipurpose wrench safety which is when holding hot objects, their hand can be prevent from injury and scald.

5.3 UPGRADE SPESIFICATION

Prepared by Ahmad Alfian Afnan Bin Mohammad Roston

The Multifunction Wrench we are about to make is used to hold or turn a smooth circular object. Easy to use, this wrench is a heavy-duty tool that is very handy on many projects. To use this chain wrench, place the end of the wrench with the teeth on it against the object you want to tighten, loosen or hold. Affix the wrench so that the side with the chain attached to it is opposite the direction to want to turn the object. Hold the chain wrench handle with one hand while using the other hand to wrap the chain around the object. Affix the whip end of the chain that you wrapped around the object to the wrench's main handle. Most wrenches have small pins that stick out from the side of the chain and all you have to do is slide the chain into a notch on the wrench handle. Once the chain is attached, ratchet the wrench handle to move the object in whichever direction you need.

CONCLUSION

As a conclusion, with this innovation, people and industries occupations will be able to do a better work because of the Multifunction Wrench provide comfort handling, grip and mechanical advantage in applying torque to tighten, loosen or hold sockets and other objects or keep them from turning.

The Multifunction Wrench can be used in all kind and size of sockets and other objects that will be turning. A design project for a new product or some feature of a product can be initiated by the desire to redesign it. Redesign is fostered by market demand for a new model or the desire to include a new technology in an existing product. Redesign can also be initiated to fix a problem with an existing product, reduce product cost, simplify manufacturing, and respond to a required change of materials or for many reasons.

Often the desire to change the product design is the need of the product to be less expensive, to have new features or to last longer. All the upgrades and improvements will be made so that this project could give more benefits and advantages . Hence, hope that this project could expand even more through out all the upcoming generations.

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