



**ADJUSTABLE ALLEN KEY
FULL REPORT**

MECHANICAL ENGINEERING DEPARTMENT

DATE:

CLASS: DKM5C

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ADUSTABLE ALLEN KEY

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**Laporan ini dikemukakan kepada Jabatan Kejuruteraan Mekanikal
sebagai memenuhi sebahagian syarat penganugerahan Diploma
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3. Kami bersetuju melepaskan pemilikan harta intelek 'projek tersebut' kepada 'Politeknik tersebut' bagi memenuhi keperluan untuk penganugerahan **Diploma Kejuruteraan Mekanikal** kepada kami.

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We are grateful to Allah SWT finally we manage to complete the project. We hope that this report can be used as an example and guide to the relevant parties in the future.

ABSTRACT

The scant documentation available indicates that the idea of a hex socket screw drive was probably conceived as early as the 1860s to the 1890s, but that such screws were probably not manufactured until around 1910. This allen key is used to drive bolts and screws with hexagonal sockets in their heads. According to our research, the existing products have a lot of problematic issue compared to our product. one of the most common problems we found is the existing products doesn't have a storage space and little bit heavy. when compared to our products, we provide a very small allen key. Our product is not only easy to use, but they also can give too many benefits to our buyers. this is because, one of the things we created, has come in many different sizes and shapes. isn't this cheaper for all ? a low price but can buy all kinds of sizes and shapes of allen key. Research objective is to combine more size of allen key become one size. Methodology is a method and technique for designing, collecting and analyzing data to produce evidence that supports a study. I hope my project can reduce the burden on users. For the future recommendation of this project we think we should add more size of allen key.

ABSTRAK

Menurut dokumentasi yang sedia ada, idea pemacu skru soket hex mula muncul seawal tahun 1860-an hingga tahun 1890-an, tetapi skru itu tidak lagi dihasilkan sehingga tahun 1910. '*Allen key*' ini digunakan adalah untuk menggerakkan bolt dan skru dengan soket heksagon di kepalanya. Menurut kajian yang kami lakukan, '*allen key*' yang sedia ada mempunyai beberapa masalah berbanding dengan produk kami. Salah satu masalah produk yang sedia ada adalah seperti tidak mempunyai ruang simpanan dan agak sedikit berat. Jika dibandingkan dengan produk kami, kami menyediakan '*allen key*' yang agak kecil. Bukan sahaja mudah digunakan tetapi produk kami juga memberi kelebihan kepada pengguna. Salah satu kelebihan yang terdapat pada produk kami adalah mempunyai pelbagai ukuran dalam satu '*allen key*'. Bukankah ianya terlalu murah untuk satu '*allen key*' yang mempunyai pelbagai saiz? Kos yang sangat murah untuk satu '*allen key*' yang mempunyai pelbagai saiz. Tujuan produk ini dicipta adalah untuk menggabungkan ukuran '*allen key*' dalam satu produk. Metodologi pula adalah satu kaedah untuk merancang, mengumpulkan dan menganalisis data untuk menghasilkan bukti yang menyokong kajian. Harapan saya supaya projek ini dapat mengurangkan beban pengguna. Cadangan yang akan datang untuk projek ini, kami ingin menambahbaik produk kami dengan menambah saiz lain pada allen key tersebut.

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CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

One of the most useful hand tools to have in your garage or home toolkit is the Allen key set. This is a type of wrench that is L shaped. It is light, small, and easy to carry around. One instance of its size is 5/18 hex size that has a 200mm length on its long leg and 36mm on its short leg. So, we can have an entire range of keys in a small bag a foot long and six inches in diameter.

Allen is a brand of hand tools, most widely recognized for its wrenches, known generically as "Allen wrenches". As a brand, it is owned by Apex Tool Group. An Allen wrench comes in many convenient sizes. The Allen wrench dates back to the mid1900s. It became the standard name for what had previously been called a hex key. The inch-based set of Allen wrenches is considered standard in the industry.

The Allen wrench has six sides that provide a better grip for turning a bolt head or nut. It can be used with nuts that have a hole in their head that is hexagonal shaped. In many cases, the other side of the key will have a flat head or a Phillips type shape so we can use it with many types of screws.

This is simple, L shaped, and light. The contact surfaces of the bolt remain protected from damage. We use this with a headless screw. The key has a hexagonal face on one end and a hex ball at the other. The standard sizes available are 0.7, 0.9, 1, 1.25, 1.3, and 1.5mm. Then, 2 to 6 in 0.5mm increments, 7 to 22 in 1 mm increments, and 24, 25, 27, 30, 32, 36, 42, and 46 mm.

1.2 PROBLEM STATEMENT

This Allen key is used to drive bolts and screws with hexagonal sockets in their heads. According to our research, we have a lot of problematic issues compared to existing products. One of the most common problems we found is doesn't have a storage space. When compared to our products, we provide a high-end Allen key. Not only it is convenient for storage, it is also easy to use for everyone.

Secondly, the existing Allen key price is expensive to obtain. This is because you have to spend a lot of money to buy different types and sizes of Allen keys. Here, we focus on the financial sector. Our product is not only easy to use, but they also can give too many benefits to our buyers. This is because, one of the things we created, has come in many different sizes and shapes. Isn't this cheaper for all? A low price but can buy all kinds of sizes and shapes of Allen key.

Third, we found that some existing Allen keys is in poor quality. For example, the material used is fragile and rusty. We have replaced existing materials with better quality materials. Among the non-corrosive iron is nonferrous metal. Nonferrous metal means that it is a metal that contains little or no carbon at all. Examples: Brass, Aluminum, Zinc, Lead, Bronze, Silver, etc.

Lastly, the main reason of this product to be create is because to solve all the problems that the users has. We also got a problem when we want to use this Allen key in mechanical workshop but the Allen key that we take is not the same size, so we need to find it again. It will waste our time.

1.3 OBJECTIVE PROJECT

The objectives to this research are:

- i. Combine more size of Allen key become one size
- ii. Make a lighter Allen key to carry out
- iii. Easy to bring anywhere since the Allen key can keep in the small place such as in the pocket

1.4 RESEARCH QUESTIONS

This study will answer the following research questions:

- What is the advantage of adjustable Allen key?
- Does this adjustable Allen key reduce your costs compared to the existing Allen key?
- Is it easy for us to use adjustable Allen key with more than one size in one Allen key?

1.5 SCOPE OF PROJECT

The scope of this project is about the improvement of the Allen key. This adjustable Allen key is not just for Allen key user but it is suitable for everyone for example, the cyclist. I believe all the cyclist need this Allen key because it will make them easier to change their seat position either high or low.

The scope and limits to this research are:

- i. This adjustable Allen key is suitable for everyone
- ii. The scope of this project is about the improvement of the Allen key

1.6 SIGNIFICANCES OF PROJECT

Every innovation we create must have its own approach and benefits, so our idea of creating the adjustable Allen key is a good idea. It is also can help the underprivileged because the price is affordable and also give benefits to consumer. With this portable adjustable Allen key, it can ease the consumer to bring it everywhere. It can prevent us from injured because its safety.

1.7 CHAPTER SUMMARY

In this chapter, the studies had explained about its origin of ideas and inspirations. All the stated objectives can be achieved through problem statement. Thus, with this adjustable Allen key we can create an innovation that give benefits to everyone. This adjustable Allen key is not only useful for Allen key user but everyone also can use it as well. This is because this adjustable Allen key is portable and not heavy at all. The conclusion is, this adjustable Allen key can give a good impact and advantages to the user. We believe that everyone will go get this Allen key for their house or anything else.

CHAPTER 2

LITERATURE REVIEW

2.1 INRODUCTION

Literature means research articles that are referred to understand and study the research issues. The literature review is used to provide contextual studies by looking at the research that has been conducted in the field of research and not just summarizing the research conducted by other researchers.

2.2 TYPES OF ALLEN KEY

There are several basic types of Allen key: sizes and handle (to support hand rotation) . All should be combine to one to help the user problem. Allen key are made in different size to settle our problems.

Sizes

The tool is usually formed of a single piece of hexagonal rod of hard [steel](#), with blunt ends that are meant to fit snugly into the screw's socket, bent in an "L" shape with unequal arms. The tool is usually held and twisted by the long arm, creating a large [torque](#) at the tip of the short arm. Reversing the tool lets the long arm reach screws in hard-to-reach places.

Each key is meant to be used with screws of a specific socket size, with rather tight tolerances; so the tool is commonly sold in kits that include half a dozen or more keys of different sizes. Usually the length of the key increases with the size of the socket, but not necessarily in direct proportion.

Handle

The handle use for support in rotation to open or close the hex screw . Variants of the tool have the short end inserted in a transverse handle, which may contain multiple keys that can be folded into the handle when not in use.

2.3 SYSTEM OF ALLEN KEY

A **hex key** or **Allen key**, is a simple tool used to drive bolts and screws with hexagonal sockets in their heads.

The tool is usually formed of a single piece of hexagonal rod of hard steel, with blunt ends that are meant to fit snugly into the screw's socket, bent in an "L" shape with unequal arms. The tool is usually held and twisted by the long arm, creating a large torque at the tip of the short arm. Reversing the tool lets the long arm reach screws in hard-to-reach places.

Each key is meant to be used with screws of a specific socket size, with rather tight tolerances; so the tool is commonly sold in kits that include half a dozen or more keys of different sizes. Usually the length of the key increases with the size of the socket, but not necessarily in direct proportion.

Variants of the tool have the short end inserted in a transverse handle, which may contain multiple keys that can be folded into the handle when not in use.

2.4 MAINTAINANCE

For this Allen key, maintenance is to check whether or not the spring on the Allen key is working and then check the handle so that it can shift. Stop iron that is rusty.

2.5 ESTIMATE WEIGHT

The estimate load is really important to use the weight of this Allen key because it will lighten the user's load. A well-used Allen key is deemed useful because it works well.

2.6 CHAPTER SUMMARY

In conclusion, after conducting a study on the materials and components needed to build this project, it was found that components with appropriate specifications should be used to prevent accidental accidents. In addition, the projects we create can combine more size of Allen key become one size compared to existing projects. At the same time, the materials used for existing project repairs are significantly higher than our project cost.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

A methodology is a plan-of-attack, especially when that plan-of-attack is used repeatedly. This might be obvious, but the word methodology is related to the word method. In fact, a methodology is a system of methods followed consistently. Scientists, for example, use various methodologies as they perform experiments. It might seem like the world is nothing but chaos and disorder. But actually, sometimes there is a method to this madness. And sometimes there's a methodology.

In this chapter, there will be a lot of information about the process and journey through out the making of our final project. There will be flow chart showing the process of us making the whole project. This flow chart will explain the processes we took. Next, is the Gantt Chart, which will show the actual and planning throughout all the 13 weeks of our final year project journey. However, in this chapter, we also will show 3 methods we researched to carry our final year project. Although, these 3 methods have it own pros and cons and it will be explained individually by the teammates.

Methodology is a method and technique for designing, collecting and analyzing data to produce evidence that supports a study. Methodology describes how a problem is studied and why a method and technique is used.

Methodological studies are a rigorous planning in the course of this semester. In order to facilitate the final project journey, the methodology must be set as best as possible. With this, every step of the journey of this project will not fall short of the set path or more precisely the end result of the study will meet the needs of the problem to be solved. Therefore, it is very important to know and understand in depth each of the processes involved in structural engineering studies.

3.2 FLOW CHART

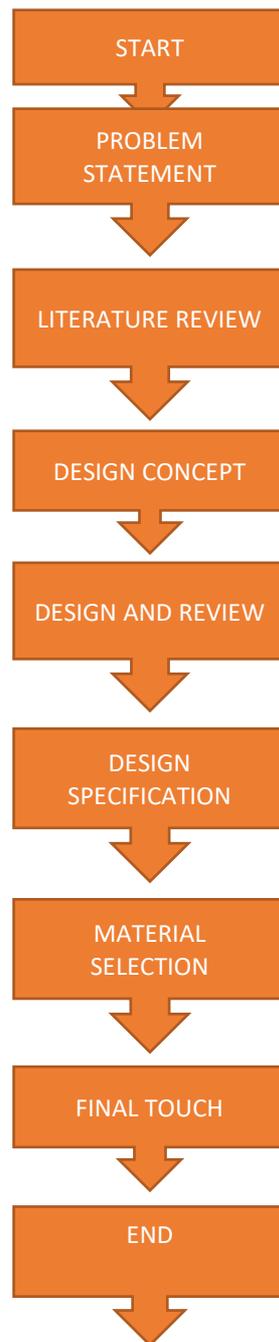


Figure 3.2.1 Flow Chart

3.3 FLOW CHART EXPLANATION

- **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.

1. Round Aluminium



Figure 3.3.1.1 Round Aluminium

Aluminium is an extremely versatile metal with a number of advantages, it is recognized for being both lightweight and flexible. It can be cast, melted, formed, machined and extruded meaning that it can be manufactured into a variety of shapes and then subsequently fabricated to suit a whole variety of uses.

A known lightweight metal, it has a specific weight of approximately 2.71 g/cm³. It's about a third of the weight of steel, which makes it easier and cheaper to transport than most other metals. The strength of aluminium can be adapted using varying alloying elements to provide better benefits including higher strength or easier formability. Because of its lightweight nature, corrosion resistance and ease of fabrication, aluminium sheets are the firm for projects like vehicle paneling, artwork, building cladding and kitchen fitting among other applications.

2. Stainless Steel Round bar



Figure 3.3.2.2 Steel Round Bar

Stainless Steel Round Bar also known as marine grade, provides corrosion and pitting resistance in more aggressive environments stainless bar are used for products that require very high corrosion protection. Higher levels of molybdenum and nickel increase corrosion and surface pitting resistance. stainless steel round bar exhibits the same high strength, toughness and workability as 304 bar.

- **Material Purchase**

The process of materials purchasing is crucial to collect and obtains all the materials needed. In this process a lot of research on the places and suppliers that the materials are going to be purchase is done. This step is important so that the risk of material wasting or money-loss will not happen. However, to carry out material purchasing, a well-made purchasing plan needed to be made. First, the suppliers will be contacted to make sure the availability of the materials. Then, the calculation of the amount of materials needed and also the price of the materials. After that, surveys of price must be carried out to determine the better selling prices. Then finally, the purchases could be made.

3.4 INTERVIEW AND RESEARCH

We did an interview with Mr. Halim at AD Mega Hardware. There, Mr. Halim explains everything about the methods and materials used to make the adjustable Allen key today. Mr. Halim agreed with our project and was very interested in it because he told us that it was a very good Allen key and easy to use. During the interview, many questions were asked about the materials needed in the production of this Allen key. For example, the current materials used in Allen key is round aluminium. In addition, he told us about the process of making adjustable Allen key made of round aluminum, nickel alloy, spring and Allen hex bolt nut. Later, he explained the nature of the pros and cons of the material.

3.5 FINAL TOUCH UP PROJECT



Figure 3.5.1 Final Touch Up



Figure 3.5.2 Final Touch Up

3.7 GANTT CHART

WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ACTIVITY															
Project activity (Discuss about few project that we have to do)															
Problem statement (carry out more things)															
Objective (easy to bring)															
Project (Adjustable allen key project has been chosen)															
Methodology (The preparation during Project)															
Literature review (Some research has been search like advantages, picture and benefits)															
Survey component (Material that we use is stainless steel)															
Conclusion (The project is suitable for everyone and give many benefits)															
Presentation (Presentation about Project 2)															
Writing & Submit Proposal (The complete proposal have to submit)															
Submit Log Book (The complete log book have to submit)															

Table 3.7.1 Gantt Chart

3.8 CHAPTER SUMMARY

As a conclusion, the methods implemented in this project are very crucial and important to complete the project. Thus, as stated in the interview, this project is agreed and accepted by Mr. Noor Azlan, a supervisor who has been teach and opinion. The materials used in the project will create a light and very strong aluminum Allen key yet very cheap, hence this project is very convenient to the amputees and also the environment because of it bio-degradable character. However, this method will affect the result totally if one of the method is change.

This chapter also describes the cost of materials, quantities, prices and overall cost allocated to complete this project. Design study conducted it helps to simplify the process of designing how to fit in and not spend too much and the materials you want to use are easy to find. In addition, this chapter will also know the specifications of the materials available in the market as well as the different prices accordingly different shops. Material selection factors are also very important in the production of this project

CHAPTER 4

FINDINGS AND ANALYSIS

4.1 SURVEY

The survey was completed and we found issues with the new allen key and aspects that need to be changed. We can decide the portion that needs to be enhanced on the allen key from the survey we did. This will assist us in changing the Allen key.

4.2 RESPONDENT DEMOGRAPHY PROFILE

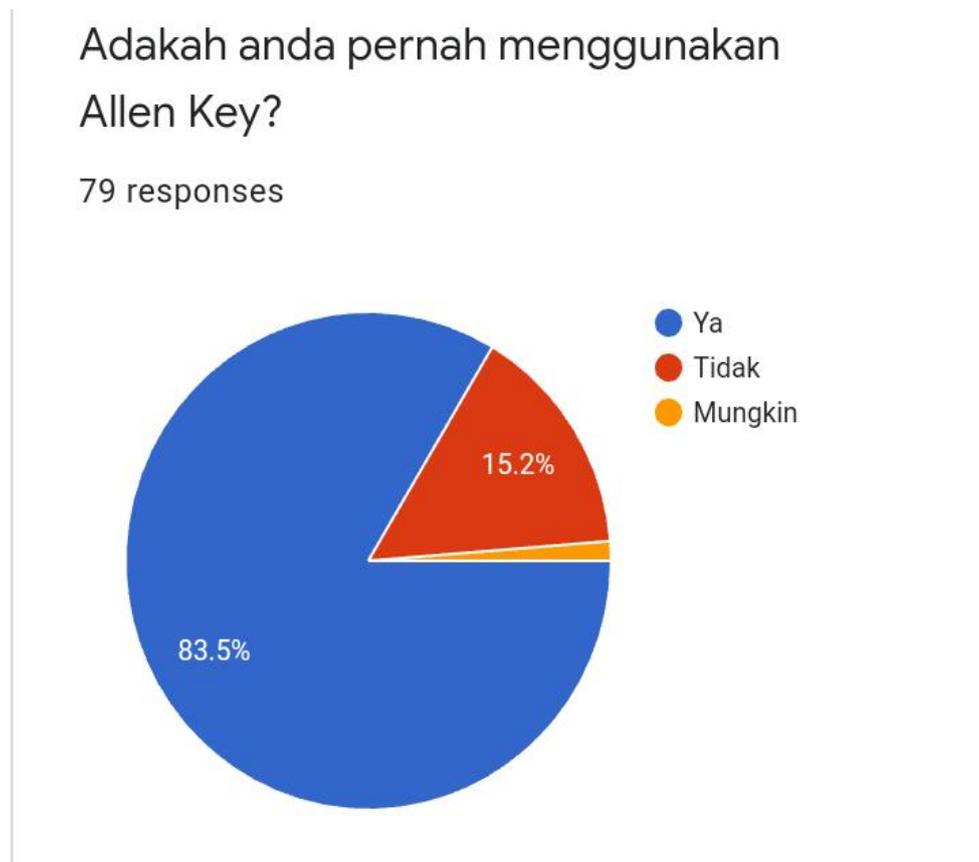


Figure 4.2.1 Respondent

Adakah Allen Key yang sedia ada tidak mempunyai tempat yang sesuai untuk disimpan?

79 responses

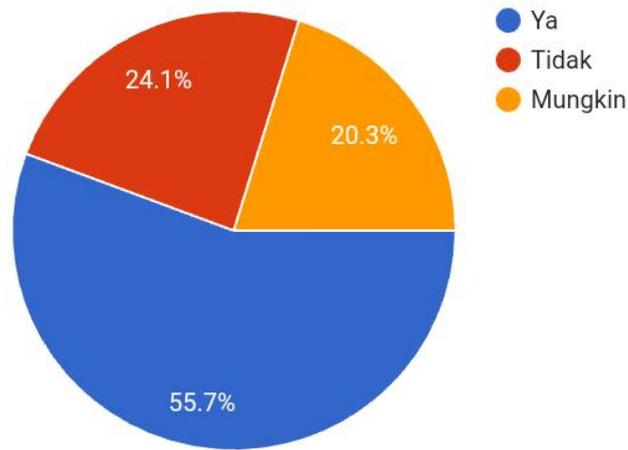


Figure 4.2.2 Respondent

Pernahkah anda tersilap mengambil saiz Allen Key ketika sedang membuat kerja?

79 responses

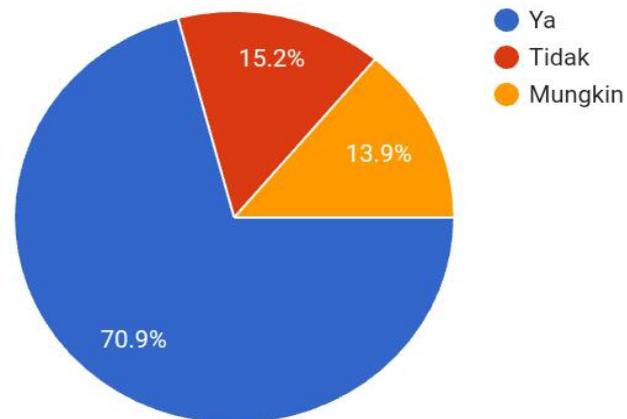


Figure 4.2.3 Respondent

Adakah Allen Key yang anda guna sedikit berat?

79 responses

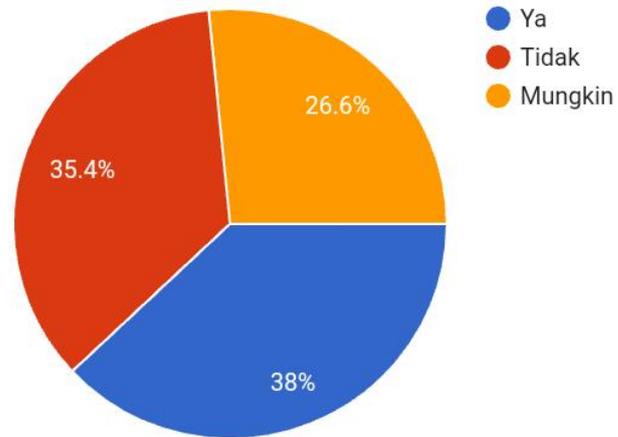


Figure 4.2.4 Respondent

4.3 MATERIAL COST

No	Materials / Equipment	Quantity	Price/Unit	Total
1.	Round Stainless Steel	1	30	30
2.	Aluminium Plate	1	20	20
3.	Spring	1	1	1
4.	Allen hex bolt nut	1	20	20
Total				71

Table 4.3.1 Material Cost

4.4CHAPTER SUMMARY

In this chapter, we can see many who show that the allen key is updated and can be used for all.

The estimated cost is also relevant in the development of projects because it can measure the amount used during production.

After the data are collected, it is important to draw conclusions about the survey as it also helps in the production process.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 INTRODUCTION

This chapter explains about discussion, conclusion and upgrade plan all together for the project. From the data from the test run of the project, the analysis has been done. Hence, the discussion from all the results of test run and analysis will be explaining in this chapter. Then, the conclusion will be made based on the discussion and upgrade plan that have been made.

5.2 DISCUSSION

Based on the data we collected, we can agree to the fact that we need to increase the quality of product. Aluminium is an extremely versatile metal with a number of advantages, it is recognized for being both lightweight and flexible. It can be cast, melted, formed, machined and extruded meaning that it can be manufactured into a variety of shapes and then subsequently fabricated to suit a whole variety of uses.

Due to its extreme versatility and strength, the use of Aluminium is becoming more popular, especially with the advantages it has to offer. Through the process of aluminium extrusion it can be supplied in ever more complex designs. This extrusion can be supplied in a variety of finishes including anodised, mill or painted and can then be further machined or fabricated.

Aluminium is a corrosion resistant metal that naturally generates a protective coating. The coating formed is extremely thin and is generated when aluminium comes into contact with an oxidising environment. This protective aluminium oxide layer helps protect the surface of the metal from corrosion. Additionally, getting surface treatment such as painting or anodising can further improve the overall corrosion resistance of the metal.

It is an excellent conductor of heat and electricity. Although aluminium is not as conductive as copper it is approximately a third of the weight meaning that an aluminium wire with half the weight of a copper wire would have the same amount of

electrical resistance. As a result, it is the chosen material for power transmission lines. It is also an excellent conductor of heat and is used as heatsinks in a variety of applications such as LED lights, electrical products, computer motherboards.

5.3 CONCLUSION

Based on this throughout project, it is confident to say that this bio-friendly aluminium composite Allen key gives a lot of benefits not to just humans, but also the environment. Plus, aluminium has a very low melting point therefore it can be easily melted and 100% of it can be reused. It will help them a lot especially in the price range area the weight of aluminium is a very light material between density is about 1/3 of steel (2.7g/cm³). In hopes that this project could make it to the mechanic and student to be widely use, because it will greatly leave a positive effects to the environment and also for product. 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 throughout all the upcoming generations.

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