PROJECT GROUP REPORT

COURSE : Introduction to Mechanical Engineering (SKMM 1922)

FACULTY OF MECHANICAL ENGINEERING

SEMESTER : 1	SESSION : 2017/2018	
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Criteria	**Weightage (%)**	**Evaluation Scale**			**Score (1-10)**	**Score (%)**
		1. Below Expectation (1-3)	**2. Between Acceptable to Outstanding (4-7)**	**3. Outstanding (8-10)**		
Introduction	10	Only one part from either of Background, Objective, Scope of study was presented	Only two parts from either Background, Objective, Scope of study was presented	Background, Objective, Scope of study were all presented		
Literature Review	20	Literature covers Some relevant aspects and without references	Literature covers **some** relevant aspects and/or complete with references	Literature covers **ALL** relevant aspects and complete with references		
Methodology	20	Some steps are missing or not sequential. Or no methodology is presented.	Most of the steps are presented but lacking some details.	Steps are easy-to-follow, logical and adequately detailed including Gantt chart.		
Results and Discussion	20	Little Discussion on the facts put forward from Literature or discusses irrelevant facts	Discusses some of the facts put forward from Literature	Discusses all the facts put forward from Literature		
Conclusion	10	Do not answer ALL the objective(s)	Answers ALL the objective(s) but also include some discussion.	Answers ALL the objective(s) precisely and concisely. No discussions.		
References	10	Sources of references poorly cited or not listed in the write-up.	Fair amount of cited sources.	Multiple sources of references correctly cited. Proper referencing format (B.S. or Harvard)		
Report Formatting	10	A lot of errors in formatting. Not following UTM Thesis guideline	Some missing or inaccurate formatting	Complete. Title page with appropriate format, TOC, Division of chapters, page numbering format. spacing, etc.		
Total Score	**100**					**100**

ACKNOWLEDGEMENT

Assalamualaikum, first of all we want to thank to all who have supported us in making this go-kart project from the beginning to the end of this project especially to our lecturer, Dr. Iskandar Shah bin Ishak who have been providing us with countless information about this project and also the spirit to make sure that this project becomes a successful project. We also want to give our gratitude to all the laboratory staffs who play very important and huge roles by always guiding us and also helping us in completing this massive project. A big thanks also to all our beloved friends who always willing to lend us a hand in any kind of aspects throughout this project and also to Faculty Of Mechanical Engineering itself for giving us the opportunities to do this go-kart project. Without all the guidance and information, we would not be able to complete such a great task and responsibilities that had been given to us. Although all the difficulties and lack of time in producing this project, we still able to complete this project on time and on high.

List of Contents

INTRODUCTION

Go-kart is a simple four-wheeled, single sealed racing car used mainly in United States. They were initially created in the 1950s, where the engine mainly from discarded lawn engine. Go-kart is a driving and racing miniature, skeleton frame, and rear engine automobiles called karts (DiNozzi. B, 1999). A go-kart, by definition, has no suspension and no differential. They are usually raced on scaled down tracks, but are sometimes driven as an entertainment or as a hobby by non-professionals. Karting is commonly perceived as the stepping shone to the higher and more expensive ranks of motor sports.

Go-kart is a non-popular sport previously, but today it has become one of the most popular sports by multiple group age. Nowadays, racing go-karts are considered as one of the most economic activity where a large number of people can participate. We regularly hear about motorsports racing such as formula one, NASCAR, rally art and many more. Those motorsport activities are out of reach of the average people because of strict regulations and high cost. But apparently, go-kart motorsport gives chances to public to get involved in legal racing with no restricted age and low budget needed. Seven times formula one World Champion; Michael Schumacher started his involvement in motorsports with karting. He joined go-kart motorsports at his hometown, Germany and won first go-kart championship when he was 19 years old (McCauley. J, 2008).

All go-karts look alike, but the fact is go-kart have its own classes such as sprint kart, road racing kart, indoor karting and speedway karting. In 2 addition, with small engine and skeleton frame go-karts speed can reach up to 100 miles per hours and stand a weight up to 210 pounds. The development in karting has expanded rapidly together with advanced technology. As this motorsport become popular among citizens, those go-karts manufactures started to do more research and development to improve the go-kart in terms of the chassis design, speed, braking system and transmission system. Today is go-kart frames are made from lighter iron, chromoly and others which is more durable and it can absorb more vibration even if it has no suspension. Designers, engineers and others have involved directly towards new achievement in improving all aspects in the go-kart. The usage of advance technology in manufacturing is widely utilized to invent a better go-kart.

1.1 History of Go-Kart

Go-kart technology has been widely developed since the introduction of wheels. But, it was not fully implemented in racing activity until the past three hundred years in America. The first go-kart was simply a cart consisting of wheels and handles jointed together as children pushed from behind when learning to walk or a four-wheeler platform where children can sit on it while another push the kart around.

Go-kart was invented in California by Art Ingels and Lou Borelli using 100cc mower engines and strong steel frames. Then, newly designed karts were beginning to gain popularity in Britain around the year 1959-1960. Go-kart has long existed in our world whether used in sport or recreation. By definition of International Karting Commission – Federation International Automobile(CIK-FIA), a kart is defined as a land vehicle with or without a bodywork, with 4 non-aligned wheels in contact with the ground, two of which control the steering while the other two transmit the power. Its main parts are the chassis(which consists of a body frame work that is made up of a set of bent steel pipes that are wheeled together) with an engine, four wheels and tyres attached on it.

1.2 Problem statement

- To learn and to practise the use of machines involved in making the go-kart.
- To improve the skill and knowledge of Mechanical engineering student in designing and importance of project developing go-kart.
- Almost all go-karts that have been produced are the same in terms of configuration so this project allows the students to invent something new towards the go-kart by using their creativity skills.

1.3 Project objectives

- To fabricate an ideal go-kart body.
- To identify which material is suitable to be used in the production of a go-kart.
- To utilize the use of recycled materials in any parts of the go-kart body.
- To develop creativity skills in the go-kart modification.
- To design a brake system of the go-kart.

1.4 Project scope

- The go-kart is able to move with the assistance of a cordless tool.
- The go-kart body is mostly made of metal and timber materials.
- Go-kart body should be able to bear the weight of a person.

1.5 Problem background

According to the Merriem-webster, the definition of go-kart is a small motorized vehicle used especially for racing. The first go-kart was made in 1956 by the man named Art Ingels also called the father of go-karts. It was made from scrap metal and a lawn mower engine. Nevertheless, It did not take long for this fad to catch on and go-cart tracks started to pop up all across America. By the late 1950s, an American company modified a 2-stroke chainsaw motor and the McCulloch MC-10 became the first motor manufactured specifically for go-cart racing. In aspects our project, the go-kart is divided into few parts from rear drive system, body and chassis frame to control systems. In control system parts, we need to develop adjustable handle, adjustable clamp, fork handle, headset, clamping control and arms control. While in body and chassis frame parts, it consists of main chassis, front guard, speed pedal, brake pedal, front sash, rear sash, pillow block, cordless support, wood backrest and seat. However, on the last parts, it consists of cordless drill, sprocket chain, wheel shaft and drive shaft. We are required to complete the project on week of 14 as the final week to finalize the work.

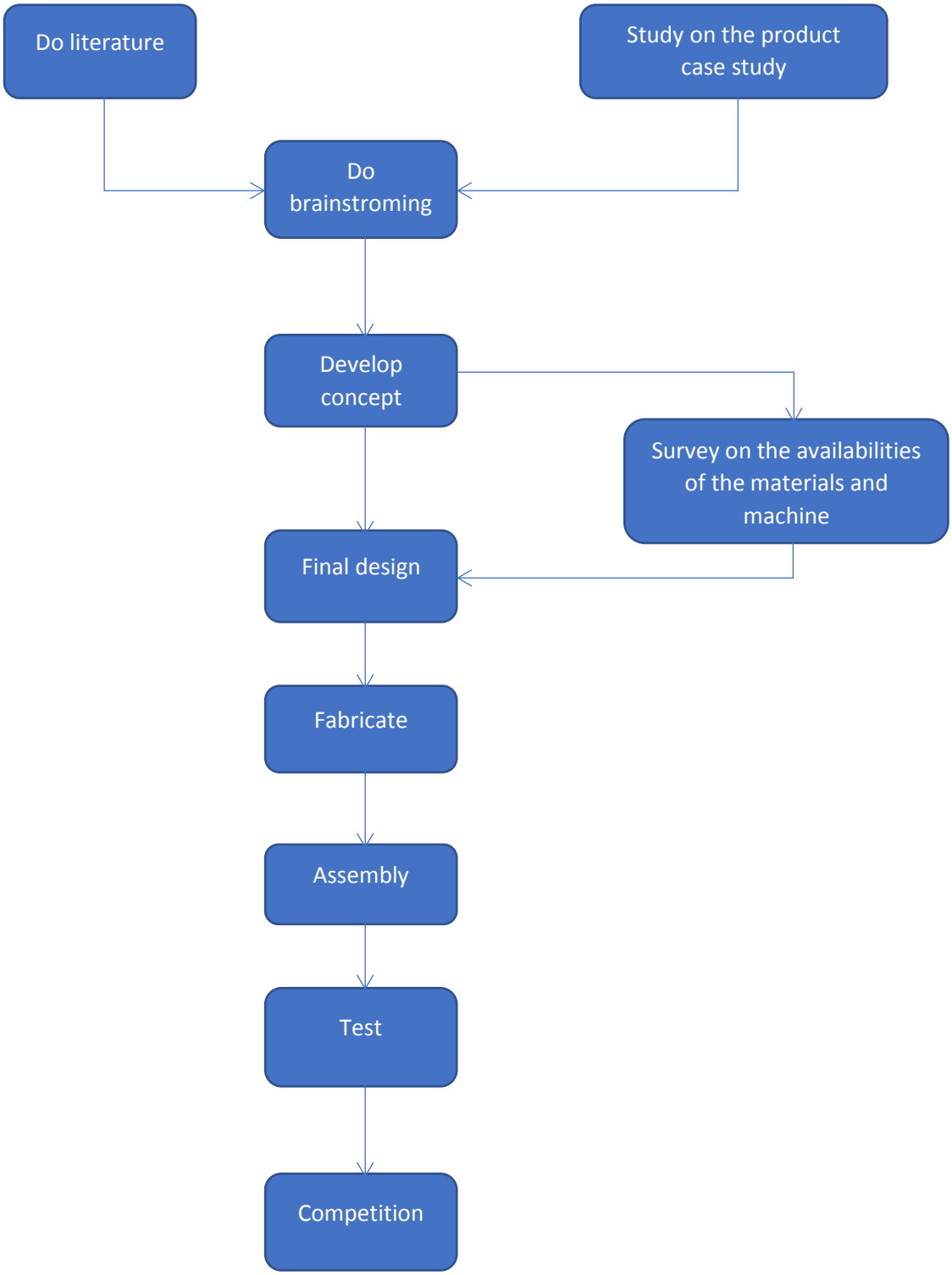
In terms of dimensions, the control system's width is not exceeding 600mm while the body and chassis frame's width and height are 871mm and 678mm respectively. Lastly, the dimensions of rear drive systems are not exceeding 676mm. For the safety precaution, the go-kart must be installed a brake pedal and speed control.

LITERATURE REVIEW

This project deals with the design and fabrication of go-kart body. The objectives of this project are to fabricate an ideal go-kart body, to identify which material is suitable to be used in the production of a go-kart, to utilize the use of recycled materials in any parts of the go-kart body, to develop creativity skills in the go-kart modification and to design a brake system of the go-kart. The main problems identified are since the students are still new to this course, this project has introduced the students about all the machines involved in making this project. Furthermore, this project improves the skill and knowledge of Mechanical Engineering students in designing and importance of project developing go-kart. The scopes of this project is that the students must apply the knowledge of a cordless tool in order to motion the go-kart. The materials involved must be metal and timber materials as majority. The go-kart should be able to bear weight of a person.

METHODOLOGY

3.1 Flowchart and explanation



To build the go kart, we need to identify the case study. Then, we would do the brainstorming to analyse the process to build the go kart. We also need to think of the design by developing the concept. We need to choose a suitable design to fabricate the go kart that provides many advantages. We must have the materials to build the go kart. Our faculty has provided us the materials and we also used some recycled materials such as steering wheel, seat and door stopper. Machines also provided by our faculty but we needed to check them first about the availability of the machine before we could use it. Then, we had the final design by sketching the whole part of the go kart. This would become more easier to fabricate the go kart. We divided the tasks fairly to each one of us to complete all the parts of the go kart. After all parts have been done, we assembled all the parts to form a go kart. We assembled the parts by using fasteners such a bolts and nuts, screws and nails. Then, we welded them to make sure that the bolts and nuts are fully tighten. After that, we tested the go kart to know that either we have to repair it or not. Lastly, we joined the competition of the go-kart on 28th of December 2017.

3.2 Gant chart

ACTIVITY	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11	WEEK 12	WEEK 13	WEEK 14
STUDY DESIGN														
DISCUSSION AND BRAINSTORMING														
MEASURE RAW MATERIAL BASED ON DRAWING AND DISTRIBUTE RAW MATERIAL														
CUTTING PROCESS (METL & WOOD)														
MARKING FOR DRILLING (METAL & WOOD)														
START DRILLING														
ASSEMBLE (WOOD) AND DRILLING FRONT PART (STEEL)														
ASSEMBLE BODY AND SEAT														
MEASURE AND CUTTING HANDLE PART														
ASSEMBLE HANDLE AND FRONT PART														
MODIFIED SPROCKET AND WELD STEEL PART														
MODIFIED PILLOW BLOCK AND MILLING METAL ROD														
ASSEMBLE ALL PARTS														
DECORATE														

3.3 Manufacturing process

3.3.1 Lathing

Lathing process is carried by the lathe machine. It is a tool which rotates the work piece on its axis to perform various operation. In manufacturing the go-kart, we used lathe machine to do the operations such as facing, turning, and also to die a thread on the cylindrical work piece. Facing is the act of cutting a surface of a cylindrical work piece into planar surface. Turning is the process where cutting tool, a non-rotary tool bit, describes a helical tool path by moving more or less linearly while the work piece is rotated by the lathe machine. We used turning process to decrease the outer diameter or to increase the inner diameter of the cylindrical work piece. Lathing service can be found at machine syop E01.

3.3.2 Milling

Milling is the machining process where a rotary cutter is used to remove material from a work piece. Mostly, work piece of rectangular shape, square used milling process. Milling machine carried out variety of operations such as milling, drilling, slot making, surface finishing and so on. Milling machine deals with multiple direction in the axis of x, y and z. It can perform vertical milling and horizontal milling. In this project, we used milling machine to drill hole on the work piece. Milling is one of the most common processes in industry used to cut and machining raw material into specific shapes and sizes. Milling machine can be found at machines syop E01.

3.3.3 Welding

Welding is fabrications which join two components permanently. It is one of the permanent fasteners. Many different energy sources can be used for welding, including gas flame, electric arc, a laser, an electron beam, friction and sound. Basically, in this project, we used gas flame or electric arc. For smaller and thinner work piece, we used power source of electric arc for smaller and quicker welding while larger and thicker work piece, technician taught us to use the gas flame. Welding is a dangerous and unhealthy process if proper precautions are not taken. When we were welding the work piece, we are required to wear a heavy leather gloves and protective clothing such as leather jacket for protection to the extreme heat and flames. Besides, a goggles and welding helmet is essential to protect us from exposure of high brightness of weld area which will causes inflammation of the cornea and burn the retinas of the eyes. The goggle is added with dark UV- filtering face plates. Welding service can be found at fabrication lab P23.

3.3.4 Places

(a) Central store E07

- To get the materials used in this project.
- Cutting metals based on its dimension

(b) Workshop E01

- Milling and drilling process used to make slot and holes on certain part by using milling machine
- Lathe process used to reduce diameter of hollow tube and also to make alignment on its surface by using lathe machine.

(c) Fabrication Lab (P23)

- Grinding process used to smoothen some of pointy edges on handle parts by using grinding machine.
- Welding process used to join certain parts of the go-kart permanently using different technique such as MIG - Gas Metal Arc Welding (GMAW) and Stick - Shielded Metal Arc Welding (SMAW).
- Assembly process used to ensure that each part is fixed with one another and also as last task before finishing process is done.
- Finishing process is carried out. For example, removing dust and rust from each single parts of the go-kart by rubbing them with sand paper. After that, all the parts are sprayed. Finally, after all process are done, all part are reassemble again hence it is complete.

RESULTS AND DISCUSSION

4.1 Concept generation

- **Frame Design**

  The main component of the frame are divided into the two major parts, main chasis for steering and seat positions and rear sash for transmission and gear system that connects a cordless to the wheels. Material of the main chasis has to be good in order to bear the weight of a person. Keeping the frame as light as possible was a top priority. When power is limited, vehicle weight is a large factor in vehicle performance. The frame is one of the largest and heaviest components of the car, and which is why special attention was placed on the vehicles frame weight. The strategy utilized to minimize weight consisted of determining defined goals for the chasis and employing the correct material in the best places to accomplish those goals. Furthermore, overall frame structural rigidity is important to enhancethe capabilities of a 4-wheeler vehicle.

- **Body And Composites**

  The seat in this kart is also designed to be very light. It is very simple made of plastic material and is attached to the chasis. The seat can be adjusted either to be moved to the front or to the back which is the good position of the driver body rest according to the ergonomics point of view and is kept almost parallel to the fire wall.

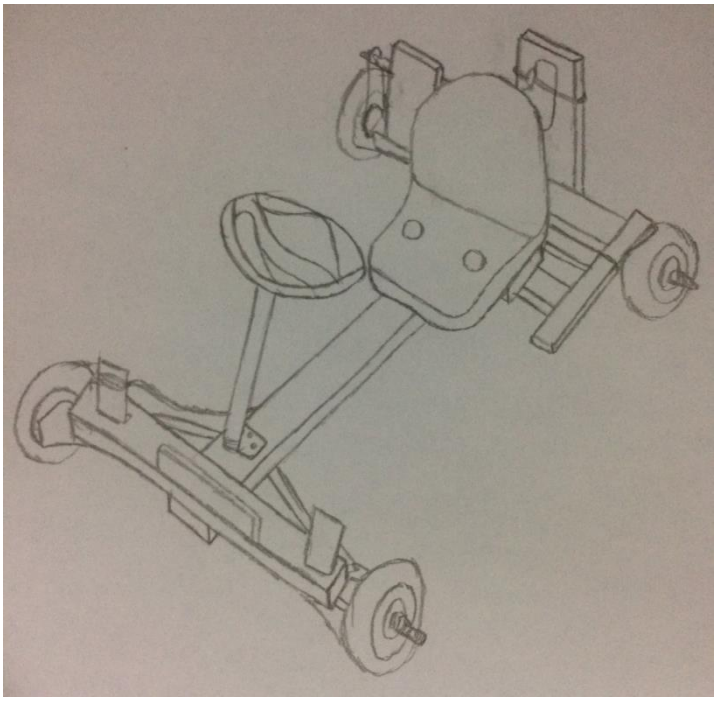
- **Steering System**

  The purpose of the steering system is to provide directional control of the vehicle with minimum input. The steering must not be very weighty in order to consider the lower support system of the main chasis and also the handle system so that it is effortless when controlling the vehicle.

- **Brake System**

  The objective of the brakes is to stop the car safely and effectively. In order to achieve maximum performance from the braking system, the brakes have been designed to lock up rear wheels, while minimizing the cost and weight.

4.2 Final design / Drawing



4.2.1 Recycled materials used

- Steering wheel
- Seat
- Door stopper (for brake system)

  Creativity that we applied in this go-kart project is that the seat can be adjusted either to the front or to the back according to driver's convenience. If the driver happens to be a tall person, he/she can adjust it to the back so that he/she will never face difficulties in driving the go-kart. Otherwise, if the driver is a short person, he/she can move the seat to the front so that their legs can reach the pedals.

No	Components	Dimensions	Quantity
1	Shaft		2
2	Steering wheel		1
3	Seat		1
4	Sprocket		2
5	Wheel		4
6	Chain		1

1. Shaft

For this project, we use two shaft which are drive shaft and also wheel shaft. The wheel shaft is use to enable the rotation of the wheels by joint them to the wheels at both ends. We use sprocket to transmit the rotation movement of the drive shaft which connected to cordless drive in order to make the wheel rotate. Meanwhile, drive shaft is connected to cordless drive to make the go-kart move.

2. Steering wheel

We use recycle steering wheel for this go-kart. Instead of using handle as a steering wheel, we use real car steering wheel to make difference from others. The real car steering also provide more efficiency especially in turning and cornering.

3. Seat

For seat, we also use seat from recycled material. We took this seat from recycled places in order to cut our budget. Our seat is strong enough to support at least 75 kg driver and also comfort enough for the driver. The biggest advantage of our seat is that the driver able to move the seat front and backward depending on the driver's comfort.

4. Sprocket

We use two sprockets in this project. Small sprocket is located and joint with the drive shaft and the other one which is larger than the first one is located and joint with the wheel shaft. The function of these two sprockets is to transmit the rotation power of the cordless to the wheels with the help of chain.

5. Chain

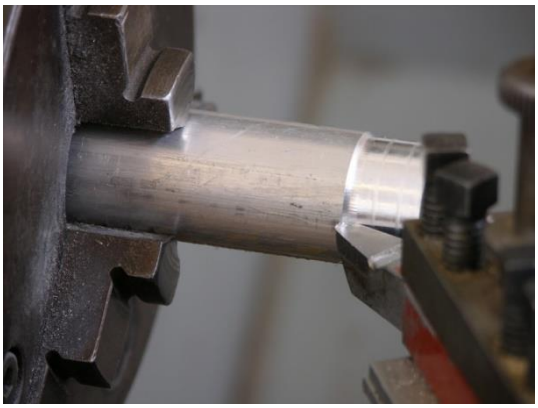
Instead of using motorcycle chain which many of others contenders used, we used bicycle chain. We had a bit of difficulties when it comes to this part. This is because, our bicycle chain did not really fit in with those two sprocket. The chain is a little bit lose when we try to fit in with the sprockets. To solve this problem, we adjusted the position of the pillow block of the drive shaft to make this chain more tense.

4.3 Process involved

No	Process	Machine/tool	Part produced	Description
1	Lathing	Lathe machine	Shaft, fork handle	To decrease the diameter of the materials
2		Hand saw	Main chasis, rear sash, pillow block support, front sash, front guard	To cut the materials based on the measurement
3	Welding		Dropped axial, clamping control, headset, handle	To assemble the parts
4	Milling		Dropped axial, arm control, clamping control, headset, handle	To make holes at the body of parts (iron)
5	Drilling	Drill	Cordless support, pillow block support, front sash	To make holes at the body of parts (woods)

1. **Lathing Process**

   Two shaft and one fork handle were produced by using llathe machine. The measurement of shaft and fork handle is __ mm and 22 mm (diameter).



Lathing process

2. **Hand Saw Tools**

Main chasis, rear sash, pillow block support, front sash and front guard were produced by using the hand saw to produce the exact measurement. The measurements for each materials are 985mm (length),676mm (length), 280mm (length), 600mm (length) and 341mm (length).

Cutting Process using Hand Saw Tool

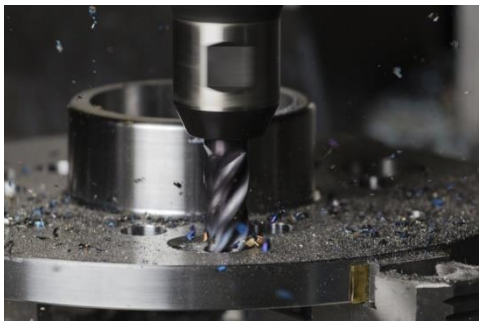
3. **Welding Process**

Welding process is to joint the parts of dropped axial, clamping control, headset and handle.

Welding Process

4. **Milling Process**

   Milling process is to make holes at the parts of dropped axial, arm control, clamping control, headset and handle. The diameter of the holes are 6mm and 8mm.



Milling Process

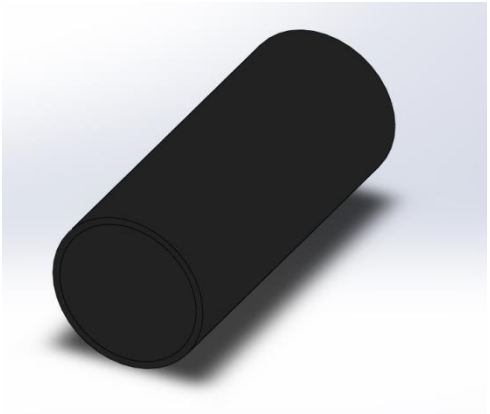
5. **Drilling Process**

   Drilling is process to make holes at parts of cordless support, pillow block support and front sash. It usually use to drill holes at the woods. The diameter of the holes is 8mm.

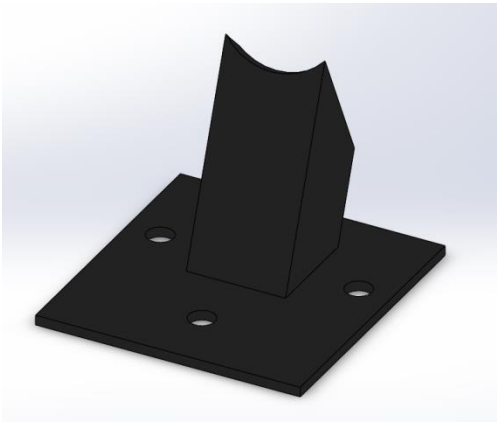
Drilling Process

4.3.1 Steering System

Steering wheel

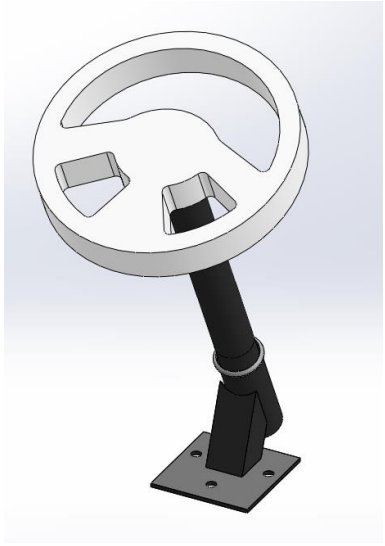


Handle extensions

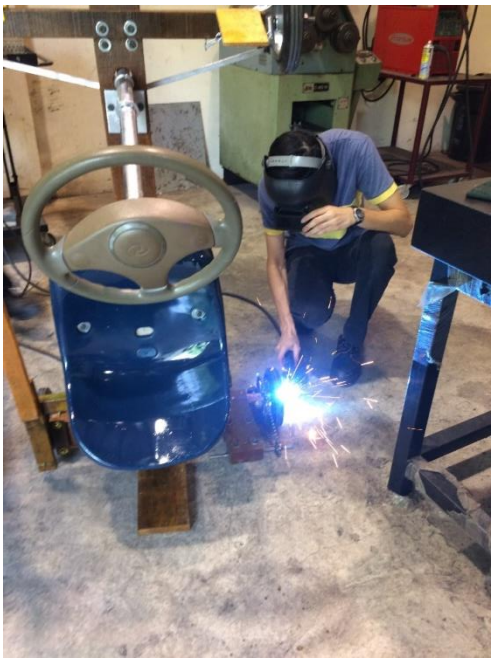


Headset

Bicycle fork set bearing



Assembly of parts



4.4 Discussion

We have discussed about the safety of the go-kart that we need to consider while designing any parts of the body so that we are able to produce a good quality product. Furthermore, any failure after being evaluated could be avoided. The go-kart is an affordable product because mostly, we used materials that can be recycled in order to make it environment-free and also to fit our budget but we confirm that it is in high and good quality as we also made consideration in choosing the materials. Apart form that, our product is made of steels as the support parts so that it has a broad range of long span while the other parts are made of good quality wood materials or otherwise, if it is not in a good condition, it will easily crack or decay that will lead to dangerous and risky product.

Why we choose this design? This is because it requires minimal framework to construct it and it would save much time. Next, we could construct a stable product as we were not making it complex design that needs us to put so much ideas to produce a complicated project. It is just a simple but nice go-kart project. This project does not have to use fuel to accelerate it. To accelerate it, we use a cordless tool instead and it is connected through sprocket and chain system to the rear wheels. The design is easy to construct and it has safety features, it is more economical and also environmental friendly. The option that we discussed was either to use a T-shaped handle or a steering as the control part. So, we decided to use a steering wheel because it is effortless.

In conclusion, we have successfully produced an ideal go-kart that is suitable to everyone. The product used up many recycled materials such as the steering wheel and the seat. Everyone also learnt about the machines involved in making this project.

CONCLUSION AND RECOMMENDATION

We are able to build a go-kart with our engineering knowledge. We are also able to use grinder, drilling machine hole, threading machine, welding and many more. Besides, we also learnt how to organize task efficiently without procrastination. In addition, we produced a creative idea with our new breaking system. Furthermore, we areable to solve and deal with real situation of mechanical problem. Next, we have been taught to acknowledge the mechanical industry working circumstances. We could improve our skills of working as a teammate and also, sharpen the practical skills. Our recommendation is, after every difficulties that we have faced while making this project, we hope that it will give us a good result aside from the experiences that we got.

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